

“Your bodies may at last turn all to spirit”: Medical Science and the
Anatomia Animata in Milton's *Paradise Lost*

Submitted by Charlotte Mai Nicholls to the University of Exeter
as a thesis for the degree of
Doctor of Philosophy in English
in June 2010

This thesis is available for Library use on the understanding that it is copyright material
and that no quotation from the thesis may be published without proper
acknowledgement.

I certify that all material in this thesis which is not my own work has been identified and
that no material has previously been submitted and approved for the award of a degree
by this or any other University.

Signature:

Abstract

“Your bodies may at last turn all to spirit”: Medical Science and the *Anatomia Animata* in Milton's *Paradise Lost*

This thesis takes issue with the standard critical attribution to Milton of a backward Aristotelian scientific paradigm for his work, demonstrating that body and soul represented in *Paradise Lost* are inscribed in terms of radical contemporary medical theories of vitalism. Milton's close friendship with his doctor, Nathan Paget, links him to Paget's colleague, Francis Glisson, Regius Professor of Physic at Cambridge University, an academic and practising physician who was closely involved in cutting-edge contemporary medical research. Not only can Glisson's heretical notion of the energetic, living nature of substance be seen to match the dynamic scale of nature represented in *Paradise Lost*, but in fact Milton's animist materialism corresponds *precisely* to the chemical innovations made by Glisson in the anatomy of blood and bodily fluids and spirits.

Exploring Milton's representation of body and soul, spirit and matter, in the light of these contemporary medical innovations, this thesis focuses upon the way that his theodicy is supported by this most heretical natural philosophy. Milton's vital *anatomia animata* is shown to be central to the harmonious integration of science and theology in *Paradise Lost*; it complements the literalism of the poem and provides a non-satanic logic of self-determination. Beginning with the basic evidence of Milton's materialism of the soul in the *Christian Doctrine*, the first chapter correlates the theological assertions made with the language of natural philosophy that Milton uses to make them. The next chapter addresses the problem of the antinomy between the material soul proposed by Milton and the Aristotelian terminology with which he describes it, arguing that the latter is more heterogeneous than literary critics have acknowledged. The third chapter examines several versions of vitalism in order to delineate a working, medical model of the active matter presupposed by Milton's body-soul composites and the wider natural philosophy of *Paradise Lost*. This model of active matter and spirit is then used in chapter four to illuminate the representation of Creation, demonstrating the acute accuracy with which Milton's Creation draws upon contemporary medical research into conception. Chapter five extends the analysis to compare early notions of chemical digestion with the metabolic transformations of paradise. The final chapter demonstrates that the physiological and psychological corruptions of the Fall correspond to the effects of the putrid or poisonous ferment, while Milton's representation of regeneration calls upon the vital, generative *anatomia animata*.

This work is dedicated to my parents in loving recognition of their long
years of caring.

Acknowledgements

First of all, I would like to thank Karen Edwards for her acute and illuminating insights and her unshakable and sustaining belief in this research project. I would also like to thank the AHRC for the grant that made it possible and I must also thank the Fund for Women Graduates, who made me a grant that made all the difference in the later stages of writing. Caroline Green has been a lifeline and has regularly reminded me that the sky still seems to be at the top. Finally, I offer thanks to Shamsar for his endless patience and most of all thanks to Elsa, for whom the sun rises in the morning.

Contents

Introduction: Milton and the new physic	p. 1
Chapter one: Theological imperatives and natural philosophy	p. 25
i. The material soul of the <i>Christian Doctrine</i> ii. The contemporary medical body: some terminology iii. Material and immaterial spirits	
Chapter two: Aristotelian Soul and some problems of monism	p. 44
i. Hylomorphism ii. The other tradition iii. Milton's Aristotle: the problem of form and matter iv. Form, matter and the animated human v. Form, matter and causality	
Chapter three: Medical vitalism	p. 77
i. Models of vitalism ii. Similary attraction iii. Chymical blood iv. 'kindly heat of various influence': vital heat in <i>Paradise Lost</i>	
Chapter four: Creation and conception	p. 105
i. Body out of spirit ii. The embryo earth iii. Holy light and vital spirit	
Chapter five: Body into spirit	p. 132
i. Models of transformation in the animate body ii. Digestion and sublimation in the <i>scala naturae</i> iii. 'A wilderness of sweets': odour in paradise iv. Penetration of substances v. Active matter	
Chapter six: The corrupted monism of the fallen soul	p. 174
i. Discordance in the <i>vitae chorea</i> ii. Vital heat and toxic fermentation iii. Effects of the fruit iv. Sulphur and nitre in <i>Paradise Lost</i> v. Curse and contagion vi. Fallen physiology and the atoms of chaos vii. Regeneration and mercy	
Conclusion	p. 215

Introduction

Milton and the New Physic

Milton suffered two debilitating illnesses in the last twenty years of his life, and my dissertation is going to argue that this fact is relevant to the natural philosophy of the animate human body of *Paradise Lost*. That he finally went completely blind in 1652 is well documented, and the lament for his lost sight at the beginning of Book 3 of *Paradise Lost*, with its paean to the visual beauty of the natural world and the wisdom that is available from studying it, makes the depth of the loss painfully apparent:

Thus with the year
Seasons return, but not to me returns
Day, or the sweet approach of even or morn,
Or sight of vernal bloom, or summer's rose,
Or flocks or herds, or human face divine;
But cloud instead, and ever-during dark
Surrounds me, from the cheerful ways of men
Cut off, and for the book of knowledge fair
Presented with a universal blank
Of nature's works to me expunged and razed,
And wisdom at one entrance quite shut out.¹

The beauty of nature, human conviviality and the wisdom available in the 'book of knowledge' of the world are the central losses in this passage. There are well known descriptions of both his earlier and final attempts to slow or arrest the deterioration of his sight. One of the most famous is that of his nephew, Edward Phillips, who notes that during Milton's exchange with Salmasius,

his Sight, what with his continual Study, his being subject to the
Head-ake, and his perpetual tampering with Physick to preserve it, had
been decaying for above a dozen years before, and the sight of one for
a long time clearly lost.²

¹ *Paradise Lost*, ed. Alastair Fowler, 2nd edn. (Longman: Harlow, 1997), 3. 40-50. All references to *Paradise Lost* are to this edition, and will hereafter be given parenthetically in the text.

² *The Early Lives of Milton*, ed. Helen Darbishire (London: Constable & Co, 1932). 72.

Tentative diagnoses of amaurosis or gutta serena were made at the time and have been repeated in more current analyses. Milton himself intimates just such a diagnosis in the description of his blindness in the sequence of verse quoted above: “So thick a drop serene hath quenched their orbs, / Or dim suffusion veiled” (*PL* 3. 25-6). James Hanford’s study of Milton’s blindness and the medical evidence we have concerning it remains a most accurate survey of the issue.³ He describes the orthodox, Galenic analysis of the illness thus: “A redundant humour in the brain flowed down into the optic nerve and congregated there, preventing the ‘spirits of sight’ from finding access to the eyeball. This humour was itself the ‘gutta serena’ or clear drop – clear because it could not be seen outwardly.”⁴ Arnold Sorsby comments on Milton’s self-diagnosis in *Paradise Lost*, that “Drop serene and dim suffusion are not so much alternate diagnoses as different names for very much the same thing, for gutta serena was the name for blindness with a transparent (i.e., non-obscured) pupil and suffusio nigra stood for blindness in which the pupil was black (and not grey).”⁵

Less often commented on are Milton’s years of suffering from gout. As with his blindness, an accurate diagnosis is extremely difficult to make. F. Dudley Hart observes that “although Sydenham (1624-89) was able to distinguish between acute rheumatism and gout, the latter term continued to embrace a large and undefined collection of syndromes throughout most of the 18th century.”⁶ The fundamental feature of gout is that of intense and agonising periods of pain in the joints (particularly the feet) and Milton’s death in 1674 was probably caused by associated renal failure.⁷ Significantly, both disorders were thought to stem from the same problem of errant phlegmatic humours which, originating in bad digestion, excreted out of the brain and collected in the wrong areas of the body. Sorsby quotes a nineteenth century source to explore the link between the two conditions suffered by Milton:

The Arabians, who had adopted generally the humoral pathology of Galen, conceived both these diseases to be the result of a morbid rheum or defluxion falling on a particular part of the visual orb, in one case producing blindness with obscurity, whence the name of an obscure rheum or gutta, and in the other without obscurity, whence the

³ James H. Hanford, ‘Milton Forswears Physic’, *Bulletin of the Medical Library Association* 32.1 (1944), 23–34.

⁴ Hanford, ‘Milton Forswears Physic’, 24.

⁵ Arnold Sorsby, ‘The Nature of Milton’s Blindness’, *British Journal of Ophthalmology*, 14. 7 (1930), 339-354, 340.

⁶ F. D. Hart, ‘William Harvey and his Gout’, *Annals of the Rheumatic Diseases* 43 (1984), 125-127.

⁷ Barbara Lewalski, *The Life of John Milton* (Oxford: Blackwell, 2003), 536.

contrary name of a transparent or serene rheum or gutta. But as various other diseases and particularly of the joints were also supposed to flow from a like cause, and were far more common, the term gutta and rheuma were afterwards emphatically applied and at length altogether limited to these last complaints: whence the terms gout and rheumatism.⁸

This etymological link is thus part of a theoretical link; the blindness Milton suffered would have been diagnosed as having the same causal origin as the agonising gout that was to end his life. There is considerable contemporary evidence to support this connection; in 1649 Culpeper prescribes hot, dry remedies for gout, but these are often given as remedies for eye complaints too. For “Gout and other cold afflictions of the joints,” he prescribes “*Herba Campborata*,” noting that it “is of a drying faculty, and therefore stops defluxions either in the eyes or upon the lungues, the gout, cramps, palsies, aches, strengthens the nerves.”⁹

It will be useful to pause and examine the other treatments that Milton’s doctors would have taken from the orthodox, Galenic tradition of medicine. Because gutta serena and gout were held to have the same cause, treatments of them are often similar or identical. First published in the sixteenth century, but republished in 1616, Walter Baley’s work demonstrates the links between the conditions. For amaurosis and gutta serena he prescribes an electuary (a sweetened medicine) that is “commended to comfort the stomach, and to preuent the ingendring of grosse phlegme in the braine.”¹⁰ He admits that the eye condition is incurable, but proposes certain treatments:

Amaurosis is commonly an hindrance to the whole sight, without any appearance at all in the eye, for the apple appeareth sound and vnchanged, onely the *Neruus opticus* is stopped: this disease is vncurable, because there are no remedies therefore... [nevertheless] wherefore as yet the humor being not settled as *Aetius* doth testifie, that he saw one that did recouer the sight, onely with the applying of cupping glasses with scarification. Remedies are not to be neglected, often purgation... the braine must be dryed with a cappe fit for the same, cautiers must be applyed at the roote of the eare... When the eye is exasperated, annoynt it with fresh butter, and instilling therein womans milke, also the muscilage of philium, of quinces, of

⁸ Soresby, ‘Milton’s Blindness’, 340. His source is given as J. M. Good, *The Study of Medicine* (London, 1822), 3: 219.

⁹ Nicholas Culpeper, *A physycall directory, or, A translation of the London dispensatory made by the Colledge of Physicians in London* (London, 1649), 136.

¹⁰ Walter Baley, *Two treatises concerning the preseruacion of eie-sight. The first written by Doctor Baily sometimes of Oxford: the other collected out of those two famous phisicians Fernelius and Riolanus* (London 1616), 44.

fenugreek, and of tragagant are to be applied, let the Muscilage be drawne in the decoction of Mallowes, Holy-hocks, Violets &c.¹¹

In addition to various purgatives and ointments, Baley mentions scarification, cupping and cauteries as well as a ‘cap’ which is fitted to dry the brain, but he does not say exactly what they entail. Paré, another sixteenth-century doctor whose work was reissued in the seventeenth century, gives a little more detail.

Writing of gutta serena, as well as other diseases of defluxion of the humours, Paré observes that if the humours are travelling under the skull then the condition is incurable, but if the humours are between the skull and the skin, a skilful doctor

applies astringent medicines to the shaved crown, as *Empl. contra rupturam*, which may streighten the veines, and as it were suspend the phlegme, useth cupping, and commands frictions to bee made towards the hinde part of the head, and lastly, maketh a Seton in the necke. There are some who cauterize the toppe of the crowne with a hot iron, even to the bone, so that it may cast a scaile, thus to divert and stay the defluxion.¹²

Most of Paré’s remedies involve traumatising the skin to encourage the production of pus, which was essentially thought to be already there in the ‘defluxion’, causing the problem. Scarification is the infliction of grazes and cuts for this purpose; cupping glasses (still used today in various, mainly non-European, forms of medicine) were heated cups placed on the skin to create warmth and suction that were thought to bring the humours to the surface. Cauteries, recommended by Baley to be applied at the base of the ear and by Paré to the top of the head, were heated metal implements intended to cauterise, or rather burn, the skin. Paré advises they “be made a triangular Iron, sharpe at the end, that it may the more speedily penetrate” and warns that the patient’s head must be held firmly.¹³ Cauteries and ‘issues’ are both also prescribed by Paré for the treatment of gout.

Many have found benefit by issues; for the Arthritick malignity flowes forth of these, as by rivelets... If any had rather use an actuall cautery, let him take such an one as is triangular and sharpe, that so hee may with more speed and lesse paine performe that which hee intends, and let him thrust it through a plate of iron which hath a hole therein, and

¹¹ Baley, *Two treatises*, 44.

¹² Ambroise Paré, *The workes of that famous chirurgion Ambrose Parey translated out of Latine and compared with the French* (London, 1634), 645.

¹³ Paré *Workes*, 649.

let the place bee marked lest hee should err; the ulcer shall be kept open by putting in a pill of gold, silver, lint, of the root of orris, hermodactiles, gentian, waxe, wherewith some pouders of vitrioll, mercurie or allum shall be incorporated, lest it should fill up with flesh sooner than the Physician shall thinke fit.¹⁴

I am going into considerable detail for a number of reasons, but the primary one here is to try to bring to life something of the actual experiences of those using Galenic medicine in the seventeenth century. Twenty-first-century medicine has, in Europe at least, made such stories a distant horror, vaguely noted, but we know that these treatments were part of Milton's "perpetual tampering with physic." The evidence here shows that, having struggled perpetually with such treatments for more than a decade in an unsuccessful effort to save his sight, the onset of gout would, in traditional classical medicine, have prescribed the same treatments over again. Milton, with the help of his doctor, would – I believe – have researched other bodies of knowledge rather than repeat again the unsuccessful treatments of the 1640s. This dissertation proposes that such a painfully embodied existence, and the many efforts made to alleviate the disability and pain, contributed to Milton's assertion of the monist system of body and spirit which characterises his representation of the human body and soul in *Paradise Lost*. In short, his animist materialism bears the features of medical knowledge at the cutting edge of research in the 1650s and 1660s.

There is evidence of a major change of diagnosis that came after the loss of Milton's sight. The anonymous biographer, describing the final loss of Milton's sight in the midst of polemical duels, remarks defensively

his Eysight totally faild him; not through any immediat or sudden Judgement, as his adversaries insultingly affirm'd; but from a weakness which his hard nightly study in his youth had first occasion'd, and which by degrees had for some time before depriv'd him of the use of one Ey: And that Issues or Seatons, made use of to save or retrieve that, were thought by drawing away the Spirits, which should have supply'd the Optic Vessels, to have hastn'd the loss of the other. Hee was indeed advis'd by his Physitians of the danger, in his condition, attending so great intentness as that work requir'd.¹⁵

The same biographer adds later that his blindness 'proceeded from a Gutta Serena' but the previous treatment is now thought to have damaged the sight rather than preserving

¹⁴ Paré, *Workes*, 706.

¹⁵ Darbishire, *Early Lives*, 28.

it.¹⁶ Here the treatments in question are ‘issues and seatons’ both of which are mentioned by Paré. A seton relies upon the same humoral logic of the other treatments we have examined. John Kirkup describes it thus: “Two parallel incisions were made... leaving a wide skin bridge beneath which threads of horsehair, pack thread or coarse wool were passed. The ends were left long for easier replacement, if required and also to facilitate daily back-and-forth movement of the threads in order to provoke a permanent discharge.”¹⁷ I propose that from this last passage of the biography we can see that his ‘tampering’ became more carefully researched than critics have heretofore noted, and that the changing natural philosophy that informed seventeenth-century medicine in particular, can be seen in the natural philosophy of *Paradise Lost* and also in relation to the materialist theology of the *Christian Doctrine*. Certainly, through the years of unsuccessful treatment his medical regime seems to have changed from one which validated issues and setons to one which re-diagnosed them as harmful.

There is a clear shift of emphasis in the anonymous biography and James Hanford observes that this re-diagnosis

may well reflect the advanced opinion of some of Milton's friends among the new men of science. If the Anonymous Biographer was indeed, as some have believed, Dr. Nathan Paget, Milton's own physician in his later years, he may here be giving the substance of a professional opinion of his own. Paget was one of the group that collaborated with Glisson in the preparation of his classic study of rickets.¹⁸

That Paget had some sort of friendship with Milton is well documented, but Hanford makes a clear case for Milton’s close relationship with Paget over a number of years, as does Christopher Hill. Both cite Paget’s arrangement of Milton’s third marriage to his cousin, Elizabeth Minshull, and his involvement in obtaining an introduction to Milton for the Quaker Thomas Ellwood as evidence of genuine intimacy. Both note the close professional connection between Paget and Glisson. Hill makes a study of the contents of Paget’s library, noting clear interests in socinian ideas, anti-trinitarianism and mortalism, as well as numerous medical texts that showed him to be a “liberal,

¹⁶ Darbishire, *Early Lives*, 32.

¹⁷ John Kirkup, *The Evolution of Surgical Instruments* (San Francisco: Norman Publishing, 2006), 403. Kirkup also gives an account of the issue that is parallel with Paré’s: “Issues... [were] artificially produced by incision or by actual or potential cautery to create an indolent infected sore that discharges imagined deleterious humours... If the burn mortified the outer table of the skull, dead bone would act as a foreign body sequestration to provoke a long period of discharge” (402-3).

¹⁸ Hanford, ‘Milton Forswears Physic’, 30.

reforming, chemically minded doctor”; he concludes that “His library, and his friendship with Quakers, suggest he was interested in exactly the area of radical thought to which Milton belongs.”¹⁹ Hanford extends his investigation of the relationship to show further evidence of Milton’s relationships with figures such as Henry Oldenburg, Samuel Hartlib and Robert Boyle: his conclusion is that Milton had a sustained social interest in medical experimentation and research, including the work of the early Royal Society.²⁰

I propose that we think again about the connections Milton had with radical elements of the medical profession, in particular his links with Nathan Paget. John Rogers points to Paget as a direct link between Glisson and Milton; in 1651 there is a brief note to the Examinations Committee of the Council of State in which there is a recommendation for the reprinting of one of Milton’s tracts (probably the *Defence of the English People*). Included in the same note is a complaint that one Peter Cole has been printing an unauthorised English translation of Glisson’s first medical treatise, *De Rachitudo*, the patent of which was actually owned by William Dugard, Milton’s printer.²¹ Critics speculate reasonably that Milton was protecting the interests of his friend Paget as well as those of his printer, for Paget was one of a group of eight men from the College of Physicians who contributed to *De Rachitudo*.²² Fifteen years later, during the plague of 1665, he and Glisson were named as some of the few brave enough to remain in London to treat the ill and dying.²³ Paget also had a copy of Glisson’s *Anatomia hepatis* (1654) in his library, as well as a revised version of 1657 which

¹⁹ Christopher Hill, *Milton and the English Revolution* (London: Faber and Faber, 1977), 493–495.

²⁰ James H. Hanford, ‘Dr. Paget’s Library’, *Bulletin of the Medical Library Association* 33.1 (1945), 90–99, 98.

²¹ John Rogers, *The Matter of Revolution: Science, Poetry and Politics in the Age of Milton* (Ithaca: Cornell University Press, 1996), 105. This connection has also been noted by Hill, *Milton and the English Revolution*, 492; also by William Riley Parker, *John Milton: A Biography*, 2 vols. (Oxford: Clarendon, 1968), 2: 979.

²² Francis Glisson, *A Treatise of the Rickets*, trans. Philip Armin (London, 1651). Those named in the preface are Francis Glisson, George Bate, Nathan Paget, Assuerus Regimorter, Thomas Sheaf, Edmund Trench, Robert Wright and Jonathan Goddard.

²³ Guido Giglioni, ‘The Genesis of Francis Glisson’s Philosophy of Life’, Ph.D. thesis, John Hopkins University, 2002, 18. This study of Francis Glisson’s philosophy and practice is rare in its translations and detailed analyses of Glisson’s actual texts; I use it extensively. Glisson had a career that spanned decades, so when using Giglioni’s translations I note the source materials from which he is working in order to retain a sense of the time at which Glisson’s work was produced. For this information Giglioni cites Nathaniel Hodges, *LOIMOLOGIA sive Pestis Nuperæ apud Populum Londinensem Grassantis Narratio Historica* (London, 1672). “Neque vero deerant insuper *Insignissimi et Clarissimi viri*, qui privatam in Peste compescenda (periculi tanti Consortes) operam navarunt, e quorum numero (non sine honoris præfatione nominandi) erant *Viri eruditi et sagacissimi Franciscus Glisson*, Prof. Reg. *Cantab. Nathan Pagetius*, *Thomas Whartonus*, *Petrus Earwickius*, *Humphredus Brookes*, et alii haud vulgaris famæ etiamnum hodie in vivis” (18–19).

included a study of the lacteals, which implies a sustained and detailed interest in Glisson's work.²⁴ This treatise contained many of the central ingredients of Glisson's theory of vital, active matter and was one of the earliest anatomical texts to use the notion of chemical fermentation in the fluids and spirits of the body. 'Ferment' is a term which was used consistently to describe the explosive political events of the Civil War and Interregnum; it continues to be a popular term for the unrest of the period. It also became a popular medical topic through the 1660s and it is usually associated with the work of the neuro-anatomist Thomas Willis; however, his *De Fermentatione* (1659) was not published until five years after Glisson's tract on the liver.

The change of diagnosis noted in the anonymous biography was not an unlikely occurrence. The ferociousness of the debates and power struggles in the medical profession of the period has been well documented. Academically trained physicians faced competition and often criticism from healers of all sorts: at the respectable end of the scale were clergymen and clerical doctors, surgeons and apothecaries; also offering forms of physic were midwives and charitable gentlewomen, astrologers and those offering chemical solutions and medicines, such as distillers, itinerant drug-sellers and peddlers.²⁵ In the developing medical market place of the Interregnum the new "chymistry" was frequently expressed as an entirely new approach to natural philosophy, one based on observation and analysis of physical processes, the truth value of which transcended systems of traditional Galenic physic and Aristotelian categories.²⁶ As the conflict continued after the Restoration Milton's friend Marchamont Nedham entered the fray on the side of the chymical practitioners, claiming that:

²⁴ *Bibliotheca Medica, Viri Clarissimi Nathanis Paget, M. D.* (London, 1681).

²⁵ The social, professional and political conflict between different groups is clear in almost any study of the history of medicine of this period. Perhaps the most famous texts on this subject are Harold J. Cook, *Decline of the Old Medical Regime in Stuart London* (Ithaca: Cornell University Press, 1986); Charles Webster, *The Great Instauration: Science, Medicine and Reform 1626-1660* (New York: Holmes & Meier, 1976).

²⁶ William R. Newman notes that the contemporary term 'chymistry' marks the crossover process from medieval alchemical practice into proto-modern concerns with interacting substances: "Lawrence Principe and I have been using this archaic word for nearly a decade to refer to early modern alchemy-chemistry, a discipline that still viewed the transformation of base metals into gold (*chrysopoeia*) as viable and yet contained much in addition that is identifiable to us moderns as chemistry" (*Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution* [London: University of Chicago Press, 2006], xi). For reasons of clarity I will also adopt this archaic term, since the stage of development of alchemy/chemistry in the medical works I am studying is precisely within the epistemological shift that Newman describes.

it was the Interests of the Collegiate Corporation of Physitians, who lived in ease and Splendour, practising with old Maxims and Medicines, not to permit a new laborious Sect of Philosophers, working Knowledge out of the fire, by their Industry and Successes, to bring a reproach upon them for their Idleness and Superstitious devotion to their old heathenish Authors.²⁷

The bitterness of the debate is clear, and the radical religious critique of pagan sources made by proponents of the chymical art is evident.²⁸ Practitioners and theorists such as Paracelsus and later Van Helmont and Fludd combined Christian theology with their alchemy and experimentation, claiming for example that the separation of substances functioned as the biblical accounts of creation by separation:

Whereas Galenic doctors usually create their remedies by combining different substances in order to graduate the qualities of hot and cold, moist and dry in the compound, he [Paracelsus] devotes himself not to compounding, but to extracting. He aims at separating what is already present in matter rather than creating something that does not exist in nature. In his conception alchemical *scheidung* also assumes a religious significance: the doctor... simply re-enacts, in an earthly dimension, the original *scheidung* of beings according to Genesis.²⁹

Much emphasis and support were lent to the proponents of the ‘philosophy of fire’ by idealistic members of the Hartlib circle and religious enthusiasts. The process of purification was going to reverse the effects of the Fall itself. Working amidst these debates was Paget’s one time colleague, Francis Glisson, Regius Professor of Physic at Cambridge University, Fellow of the College of Physicians and early member of both the “1645 group” and the Royal Society. In the struggle between orthodox Aristotelian natural philosophy and the new spagyric philosophy of fire that raged around him, Glisson worked hard to find a middle ground.³⁰ In 1654 he defended traditional medicine, whilst simultaneously proposing the chymical elements as the ultimate components of the universe, declaring that Galen’s four humours were “idly clamoured by divers chemists upon the mistake that they contradict their 5 principles. Which

²⁷ Marchamont Nedham, *Medela Medicinae, A Plea for the Free Profession, and a Renovation of the Art of Physic* (London, 1665), 9.

²⁸ For a detailed account of the earlier medical debates of the 1620s that shows the interconnection of experimentalism, medicine, chemical philosophy and religious doctrine between Mersenne and Gassendi in France and Robert Fludd in England, see Allen G. Debus, *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*, 2 vols. (New York: Dover, 1977), 1: 260-279.

²⁹ M.L. Bianchi, ‘The Visible and the Invisible. From Alchemy to Paracelsus’, in *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*, ed. P. Rattansi and A. Cleruzio (London: Kluwer, 1994), 17-50, 21.

³⁰ Probably of Paracelsian coinage, ‘spagyric’ philosophy is the philosophy of alchemy.

indeed they do not, nor yet Aristotle's 4 elements, since they are intended but for intermediate and not ultimate elements".³¹

In 1639 Glisson had been among the first to accept and teach Harvey's research on the circulation of the blood.³² Glisson's 1654 publication of *Anatomia hepatis*, in which he uses a chymical notion of the blood's composition, was early in the field, since, unlike Harvey, he was also one of the first in the orthodox medical profession to absorb and use the doctrine of the chymists.³³ Clericuzio notes

By the end of the 1650s most English physicians no longer questioned the importance of chemistry for both medicine and natural philosophy. Willis, Bathurst, Power and Charleton conceived chemical principles as the ultimate ingredients of mixed bodies although they gave a corpuscular interpretation to this theory.³⁴

Nevertheless, Nedham's tract in particular caused a storm of controversy because of the virulence of its attacks on orthodox, Galenic medicine. The complexity of the factional debate can be seen in Nedham's attempts to ally his work with that of eminent contemporaries: "The numerous references to Willis and Boyle in a book which was meant to promote Helmontian medicine show that Nedham's effort was to legitimate Helmontian iatrochemistry as part of the new experimental science".³⁵ There was in fact a conciliatory position taken by some elements of the medical establishment from an early point of the debate; George Castle, Francis Glisson, George Ent and Thomas Wharton were among many who worked using aspects of both chymistry and Galenism. Caught between warring factions, Glisson extended his definition of anatomy (which already mediates between the abstract divisions of logic and the divisions of the body into constituent parts) to include "*Anatomia spagyrica*" as a chymical anatomy of the different constituent parts of a given substance, here that of the blood; briefly he notes

³¹ Francis Glisson, *Anatomia hepatis*, in *English Manuscripts of Francis Glisson: 1. From Anatomia hepatis (The Anatomy of the Liver), 1654*, ed. A. Cunningham (Cambridge: Cambridge Wellcome Unit, 1993), 75.

³² Roger French, *William Harvey's Natural Philosophy* (Cambridge: Cambridge University Press, 2006) 286-7.

³³ Various sections of this are available in English in *English Manuscripts of Francis Glisson: 1*. Page references are to this edition. Giglioni's study of Glisson's work provides a number of detailed translations from those sections which were until then only available in Latin. In fact the text originated as a series of lectures given in English. It was Glisson's friend and colleague George Ent who translated the text into Latin for publication.

³⁴ Antonio Clericuzio, "From Van Helmont to Boyle. A Study of the Transmission of Helmontian Chemical and Medical Theories in Seventeenth-Century England," *British Journal for the History of Science* 26 (1993), 303-334, 313.

³⁵ Clericuzio, 'Van Helmont to Boyle', 323.

the all-important “elements of the mixture, as they call them: spirit, oil, water, salt and dead earth.”³⁶ This inclusiveness, and in particular the careful combination of Aristotelian natural philosophy with a new attention to the dynamic matter of the chymists, matches Milton’s own in both *Paradise Lost* and the *Christian Doctrine*. Milton uses the tropes and ontological categories of natural philosophy and chymistry in conceiving of the body-soul composite and his work is both Galenic and Aristotelian. This is often taken as an indication of his lack of scientific awareness: both Galenic medicine and Aristotelian natural philosophy have too often been perceived by historians of medicine (and literary critics) as vehicles of backward-looking orthodoxy, in direct conflict with the radical proto-scientific heroics of figures such as William Harvey and Robert Boyle. I argue, on the contrary, that this is a reductive position to take.

Kester Svendsen takes the standard line in his statement that Milton’s “medical allusions are traditional, even old-fashioned, familiar and acceptable to a mid-seventeenth-century reader if not to a late seventeenth century scientist.”³⁷ This is a mistake of the literary critic: Svendsen is underestimating the complexity of Milton’s engagement with natural philosophy; his own investigation often consists of lists of cross-correlated examples which lack depth of analysis. It is also a mistake of the historian of science in that Svendsen ignores the interplay between the new chymical philosophy and older modes of understanding embodied ontology; he underestimates the degree to which the Galenic and Aristotelian basis of seventeenth-century natural philosophy supported radical experimental enquiry, particularly in the realm of biological enquiry. The physiological discoveries of now valorised figures such as William Harvey (as well as more obscure ones such as Francis Glisson) emerged from an Aristotelian and Galenic basis. There is a distinct match of source and process between Milton’s vitalistic conception of the body-soul composite and the vitalist natural philosophies that were emerging from anatomy and medical research at the same time. Milton is no mechanist, but as Guido Giglioli has observed of the standard critical approach to Harvey’s natural philosophy: “Starting from the assumption that the corpuscularian and mechanistic world-view represents the *telos* towards which seventeenth-century natural philosophy was irresistibly drawn, it is easy to characterise

³⁶*Anatomia hepatis*, 19.

³⁷ Kester Svendsen, *Milton and Science* (Cambridge: Harvard University Press, 1956), 210.

alternative views as traditional and outdated.”³⁸ Walter Pagel has shown that the anti-Aristotelian force of seventeenth-century empirical enquiry took a different, less antagonistic form in the developments of biologists than in those of other sciences, a form which led to a tendency towards vitalist solutions.³⁹ In fact this vitalism has been shown to be part of a significant shift in epistemology that was both philosophically fertile and politically radical in its relation to notions of the body politic.⁴⁰ To dismiss such enquiry because it did not lead in a clear line of experiment and discovery to what we as readers assume to be true progress (that is, towards a science we recognise and valorise as part of a tradition which led to our own world view) is to lose a richly significant thread of thought which holds a place in history in its own right and can illuminate another level of coherence and beauty in the organisation of Milton’s poem.

Milton’s materialism has been the subject of a number of excellent studies in recent years. John Rumrich has made fundamental contributions to the study of Milton’s animist materialism and its theological coherence, referring in particular to the Hebraic traditions which inform it.⁴¹ Michael Lieb’s study, *The Sinews of Ulysses*, examines the sources and syntheses of transcendent Platonic form and the material forms of the Aristotelian tradition in Milton’s work with philosophical verve and precision; his *Dialectics of Creation* offers much detail on the bodiliness of Milton’s poetics and contains a fertile but incomplete appendix on the presence of alchemy in Milton’s natural philosophy.⁴² The most outstanding elucidation of Milton’s materialism, however, is that of Stephen Fallon’s *Milton Among the Philosophers*, which delicately and coherently uncovers the profound and interdisciplinary logic of Milton’s materialist

³⁸ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 71.

³⁹ Walter Pagel, ‘The Reaction to Aristotle in Seventeenth Century Biological Thought: Campanella, Van Helmont, Glanville, Charleton, Harvey, Glisson, Descartes’ in *Science, Medicine and History. Essays on the Evolution of Scientific Thought and Medical Practice Written in Honour of Charles Singer*, ed. E. Ashworth Underwood, 2 vols. (London and New York: Oxford University Press, 1953), 1: 489-509.

⁴⁰ Rogers, *The Matter of Revolution* has most recently illustrated the political resonances between medical theory and the shifting representations of the body politic through the turbulence of the seventeenth century. D. P. Walker has explored the political implications of the doctrines of reward and punishment in the afterlife in *The Decline of Hell: Seventeenth-Century Discussions of Eternal Torment* (London: Routledge and Kegan Paul, 1964). Pagel proposes that this vitalism as antecedent to the monads of Leibniz (‘Reaction to Aristotle’, 503).

⁴¹ John Rumrich, *The Matter of Glory: A New Preface to Paradise Lost* (London: University of Pittsburgh Press, 1987). For a psychoanalytic approach to similar themes see Rumrich, *Milton Unbound: Controversy and Reinterpretation* (Cambridge: Cambridge University Press, 1996).

⁴² Michael Lieb, *The Sinews of Ulysses: Form and Convention in Milton’s Works* (Pittsburgh: Duquesne University Press, 1989); *Dialectics of Creation: Patterns of Birth and Regeneration in Paradise Lost* (Amherst: University of Massachusetts Press, 1970).

position.⁴³ Locating Milton's work in relation to contemporary philosophical and theological debates provoked by the mechanist theories of Descartes and Hobbes, as well as the less dualistic stance taken by the Cambridge Platonists More and Cudworth, Fallon explicates the way that Milton's animist materialism compares to that of Hobbes but finds as well a theological analogue in the Augustinian tradition of evil as ontological deprivation. My study everywhere presupposes and relies upon the work Fallon has done on Milton's monism in humans, angels and the natural world, while exploring it in relation to Milton's Aristotelianism (which Fallon only touches on) and a particular set of medical theories that were at the forefront of experiment and research in the contemporary natural philosophy of the animate body.

While Svensen's *Milton and Science* remains the foundational work on Milton and medicine, his attribution to Milton of a backward and stolid medical science has been challenged more recently by John Rogers. Rogers has made an innovative contribution to the study of Milton's natural philosophy; building on the work of Christopher Hill, which initiated serious scholarly interest in Milton's radicalism, Rogers includes Milton's *Paradise Lost* in his study of what he terms the 'Vitalist Moment' in the natural philosophy of the Interregnum. Rogers reasonably equates animist materialism with vitalist natural philosophy, observing that it

holds in its tamest manifestation the inseparability of body and soul and, in its boldest, the infusion of all material substance with the power of reason and self motion. Energy and spirit, no longer immaterial, is seen as immanent within bodily matter, and even non-organic matter, at least for some vitalists, is thought to contain within it agents of motion and change.⁴⁴

What Rogers offers in particular is a re-invigorated study of the notion of the body politic, one which takes up the links between contemporary chymistry and contemporary political radicalism and rereads the long-noted 'alchemical' motifs of Milton's greatest poetry in the light of this contemporary explosion of radical natural philosophy and medicine. He observes that in contemporary medical science

The brain, the heart, the stomach – all the traditional centres of bodily control – are dethroned as the agents of the body's government. In their place rise the random, disparate masses of body tissue that find

⁴³ Stephen Fallon, *Milton Among the Philosophers: Poetry and Materialism in Seventeenth-Century England* (Ithaca: Cornell University Press, 1991).

⁴⁴ Rogers, *Matter of Revolution*, 1-2.

themselves capable of actions and reactions independent of any efferent centre of command.⁴⁵

The radical implications of a vital, decentralised body politic have been argued well both in Rogers's work and in that of Hill.⁴⁶ My study diverges from Rogers's foundational work on two issues: to begin with I have not, here, explicated the full political implications of a re-reading of Milton's vitalism; my study is rather centred upon the coherence between Milton's natural philosophy of the body and soul and his theology of free will. Milton is definitely a vitalist poet, but I suggest, contra Rogers, that his vitalism is not characterised by *random* masses of body tissue, but is a logical system that supports his depiction of the relation between humankind and God, rather than conflicting with it. My second point of divergence is in the definition of vitalism; this study will pick out from a number of vitalist theories the work of Francis Glisson, which offers the closest analogue to the biology of Adam and Eve and the natural philosophy of the unfallen paradise in which they live. Other theories of active matter proposed by mechanists or, in particular, iatro-mechanists like Thomas Willis, will be used to read the sequences of the poem which deal with the Fall and fallenness.

The differentiation that I make is based upon the fact that contemporary medicine offered a number of different ways of accounting for biological causality. Nevertheless, there were also some particular, foundational discoveries and changes in the natural philosophy and medical precepts of the mid seventeenth century that were particularly relevant to most versions of what we can call vitalism. Harvey's discovery of the blood's circulation had been accepted in many quarters, and for those who accepted it, the Galenic system of humours emanating from bodily organs was totally disrupted.⁴⁷ If the blood circulated, the venous blood could not be emanating from the liver while the arterial blood originated in the heart. Famously, Harvey declared the blood to *be* the spirit, drawing on his anatomical investigations to assert that the functions and effects of the blood in the body showed that it must "clearly appear that the remarkable virtues which the learned attribute to the spirits and the innate heat

⁴⁵ Rogers, *Matter of Revolution*, 107.

⁴⁶ Christopher Hill, 'William Harvey and the Idea of Monarchy' in *Past & Present*, no. 27 (April, 1964), 54-72. See also Hill, *Intellectual Origins of the English Revolution Revisited* (Oxford: Clarendon, 1997).

⁴⁷ For a detailed examination of the development and reception of Harvey's researches in Britain and throughout Europe, see French, *William Harvey's Natural Philosophy*, chapter 6 'Early reactions in England', 114-149; and chapter 9 'Circulation throughout Europe', 227-285.

belong to the blood alone.”⁴⁸ Harvey made contradictory statements at other times, but he and those following in his footsteps and developing his theses were some of the most inventive and experimental of those exploring the implications of where or what spirit might be if it was not the immaterial principle of the Cambridge Platonists or Cartesian mechanists. Harvey’s study of animal reproduction had begun to show that the heart and liver were not formed before traces of blood appeared in the egg, so the Aristotelian teaching of the primacy of form and the passive, non-active nature of matter was in question. Increasingly accurate anatomical research had started to build on these discoveries and alarming evidence was emerging to illustrate that there was no appreciable difference between human and animal brains.⁴⁹ Finally, what J. B. Van Helmont, the controversial physician and revisionist of Paracelsus, named ‘the madness of catarrh’, that is the sort of reliance upon models of the bodily humours that we have seen in Milton’s early diagnoses and treatments, was subject to a new anatomical precision that showed that there were no passages by which these deleterious humours could pass from the brain to the eyes or the joints.⁵⁰ Walter Pagel’s study of the work of Van Helmont notes that in his work on the chymical anatomy of the body, Van Helmont had, “with an imposing array of observations and arguments... demonstrated that this concept had been based on a humour that did not really exist, on channels freely invented, and a production and propagation... just as fictitious as the channels along which it was supposed to travel.”⁵¹ The field of medicine had been thrown wide open, and into the fray stepped another explanatory system: that of fermentation.

A more ‘modern’ diagnosis than the Galenic one that we have glanced at would have the anatomical complexity to assume that different bodily cavities (torso

⁴⁸ William Harvey, *The Works of William Harvey*. I have used the 1874 edition, ed. R. Willis (Whitefish: Kessinger Reprints, 2009), 510.

⁴⁹ This alarming discovery is turned around and used by Willis to argue for the necessary existence of the immaterial soul. In his dedicatory letter to Gilbert Sheldon, Archbishop of Canterbury, Willis states that “Concerning the Soul, I have enter’d upon a great and difficult thing, and full of hazard; where we may equally fear the Censures of the Church, as the Schools.” Later he notes that: “as we have shewn, by comparing the Corporeal Soul of the Brute, with the Rational of Man, what vast difference there is between them, perhaps it might be to the purpose, to compare the Brains of either, and to observe their differences. But... we have noted little or no difference, in the Head of either, as to the Figures and Exterior Conformations of the Parts, the Bulk only excepted; that from hence we concluded, the Soul Common to Man with the Brutes, to be only Corporeal, and immediately to use these Organs.” (Thomas Willis, *Two discourses concerning the soul of brutes which is that of the vital and sensitive of man*, trans. S. Pordage [London, 1683], A2).

⁵⁰ For an examination of early alchemical revisions of this theory see Walter Pagel, *Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance*, 2nd edn. (Basel: Karger, 1982), 166-8.

⁵¹ Walter Pagel, *Joan Baptista Van Helmont: Reformer of Science and Medicine* (Cambridge: Cambridge University Press, 2002), 137.

and head) were separate and humours could not move so easily from one area to another. Doctors such as Thomas Willis, Walter Charleton, or Charleton's colleague and one-time inspiration, Frances Glisson, redefined the originary causes of the illness, turning from the Galenic balance of humours to the hot medical topic of chymical transformations in the body, and attributed gutta serena to a ferment in the blood, causing tartareous or 'morbific' dregs to build up in vulnerable areas. Paget, too, who owned books by these and many more radically chemically minded authors, would have been aware of this change. When Willis examines the brain looking for the causes of blindness or other sensory deprivation his focus is upon the flow of animal spirits in the nerves that connect the eyes and brain: "it plainly appears, that the Offices of the Interior Motions, and Senses, as well as the Exterior, are acted by the help of the Animal Spirits, ordained within certain and distinct Paths, or as it were small little Pipes."⁵² The move from prescribing issues and seatons to drain the morbid matter to one that expressed a concern that this treatment had caused the removal of necessary spirits for the other eye would fit easily into this shift in medical knowledge.

In his *Experimental Philosophy* (1664) Glisson's student, Henry Power, in fact notes precisely Milton's disease in a digression from his main subject which is the power of fermentation in the substances and spirits of the body and the wider natural world. This is a rare reference to disease since Power is writing in this publication as a natural philosopher rather than as a physician. He notes that the eye is full of animal spirits and that

Dimness of sight comes from deficiency of them, though the parts of the eye otherways be entire enough, as in sick and old persons, and in those troubled with an *Amaurosis*, or *Gutta Serena*. I had the last year a patient... who fell casually stark blind in his right eye; in which you could outwardly discover no fault at all (the Disease being *Amaurosis*, or obstruction of the Optick Nerve) for, that Nerve being by successful means disobstructed and relaxed, so that the Animal Spirits were able to flow to the Retina again, he shortly after recovered his sight.⁵³

Power declines to elaborate upon the actual means by which the visual nerve is 'disobstructed' and relaxed but the diagnosis of cause no longer concentrates upon phlegmatic humours from the digestion or the brain; instead, the focus of the problem is

⁵² Willis, *Two Discourses*, 27.

⁵³ Henry Power, *Experimental Philosophy, In Three Books containing New Experiments Microscopical, Mercurial, Magnetical, With some Deductions and Probable Hypotheses, raised from them, in Avouchment and Illustration of the now famous Atomical Hypothesis* (London, 1664), 68.

on a lack of animal spirits. The change of diagnosis in the anonymous biography (in which the Galenic treatments were supposed to have increased the blindness by further reducing the animal spirits) matches this shift.

Thomas Willis, a founder member of the Royal Society and an early pioneer of the study of neuro-anatomy, was part of a new generation of doctors whose research synthesised chymistry, corpuscularian doctrine and the Aristotelian and Galenic foundations of contemporary medicine. He was at the forefront of the new, experimental philosophy. In his study of the pathology of fever Willis makes a succinct summary of the shift from one model of causality to another:

it hath been far otherways taught, by the Opinion of the Vulgar, to wit, that fumes and vapors are raised up from the Chyle, or Humors growing hot within the Viscera of Concoction, which cloud the Brain... this Opinion easily falls, since the Circulation of the Blood, and the more plentiful Suffusion of it on the Brain, have been known; and that the rather, because a passage from the Stomach into the Head, thorow so many Inwards, and bony Cloysters, like stops, seem impervious, or not passable for the sending up of fumes. Without doubt, much the greatest part of the Humor, with which the Brain is watered, and the Spirits inhabiting it, over-turned, during Sleep, is carried by the Arteries, and distilled in immediately from the Mass of Blood.⁵⁴

This shift affects not only the diagnosis of blindness, but also, of course, that of arthritic complaints such as gout. Instead of anatomically unverifiable floating humours, the problem must be in the chymical composition of the blood, which does travel through recognisable passages to the brain. By 1672 and the publication of Thomas Willis's *De anima brutorum*, Willis is elaborating on the 'modern' opinion that gout is caused by a ferment in the blood, and citing the build up of a salty deposit on the joints and a connected pathological acidity in the juice of the nerves, which activates the disease: "according to the opinions of... [the] Moderns, it be affirmed, that some impurities falling off from the heated Blood, and received by the joints, is the material cause of the

⁵⁴ Thomas Willis, *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*, trans. S. Pordage, (London 1684), 91. Willis published his major tracts on fermentation and fever in Latin in a compendium of 1659; All citations (apart from those to *Two Discourses*, Pordage's translation of *De anima brutorum*, which is cited as an individual publication as stated above) are taken here from Samuel's Pordage's English translation published some years later in which the tracts remain individually paginated. For a succinct introduction to Willis's work and its religious and political background see, James P B O'Connor, 'Thomas Willis and the background to *Cerebri Anatome*' in *Journal of the Royal Society of Medicine* 96. 3 (2003), 139-143.

Goutish pain.”⁵⁵ Of course the publication of this research post-dates the production of *Paradise Lost* by several years. But Willis was far from being the first to propose that the fluids of the body distilled spirit out of themselves. In Glisson’s work, too, the Galenic model is rejected because it “presupposes a pervasive motion of phlegmatic humors outside the vessels.”⁵⁶

Gigliani’s analysis of Glisson’s teaching notes or *determinationes* of the early 1650s shows that arthritic diseases such as gout were already being re-diagnosed as a problem of fermentation. The humoral theory is not entirely dispensed with; indeed Glisson, just like most other doctors of the time, continues to use the languages of the older tradition fairly regularly. However, humoral theory is superseded in terms of identifying the pathological cause of gout:

Glisson considers that in themselves, bile, phlegm, melancholy, and serum, even when they become dominant in the mass of blood... do not cause arthritis. The real cause is a process of fermentation occurring in the blood, and especially in the serum, which brings the mass of the blood to a ‘vinous condition’. This is also proven by excesses of wine and sex, which increase the disposition to arthritis by facilitating the fermentation of the blood and consequently the exaltation of the spirits. The result of this fermentation is a tartareous residue which takes the form of a calculous sedimentation in the joints.⁵⁷

The active, vital matter of humans, angels and the natural world of *Paradise Lost* is, I will argue, formulated in the terms of precisely this sort of medical research. The continued respect for Aristotle in the sphere of cutting edge contemporary physic and the powerful religious determinants of chymical research make it possible for Milton to cohere his theological imperatives with the natural philosophy that underpins them.

⁵⁵ Willis, *Two Discourses*, 214.

⁵⁶ Gigliani, ‘Genesis of Francis Glisson’s Philosophy of Life’, 149.

⁵⁷ Gigliani, ‘Genesis of Francis Glisson’s Philosophy of Life’, 149. Gigliani cites MS Sloane 3310 (“Arthritidis causa non est necessario frigid”), ff. 45r-50r. Glisson’s teaching notes are described thus: “Among Glisson’s manuscript papers there are more than 250 of his ‘solutions’ (*determinationes*) of students’ disputations on various topics, ranging from recent discoveries in anatomy to *materia medica*, from new developments in therapeutics to prophylaxis, from the penetration of revolutionary ideas in medicine to the proper way of administering bloodletting. Relying on the dates that some of the *determinationes* have and on internal evidence, we can assume that Glisson wrote most of his *determinationes* between the end of the 1640s and the beginning of 1660s” (104).

Thesis overview

Each chapter of my dissertation explores different areas of *Paradise Lost*, but each chapter also revisits certain central passages and themes in the light of new layers of natural philosophy, medical doctrine and research. Satan's attempt upon the sleeping Eve provides one of the most detailed representations of the workings of body and spirit in *Paradise Lost*; the borders between chaos and the created world and the interactions of light and matter in the cosmology of *Paradise Lost* give a wider context of natural philosophy in which to place the human body-soul composites and the angels they encounter; Raphael's comments on angelic love and digestion and his "one first matter all" speech are for me, as for many students of Milton, invaluable resources in understanding the natural philosophy of the body and the natural world in the poem. Finally, Milton's insistence in the *Christian Doctrine* on the coincidence of nature, Aristotelian causality and divine agency is a central motif in this study, which aims to set Milton's representation of body and soul harmoniously within the context of both contemporary medical theory and his own fundamental theological criteria.

Chapter 1 begins with an examination of Milton's comments on the soul and its embodiment in the *Christian Doctrine*; noting his consistent use of the language of natural philosophy in describing the body-soul composite, this chapter explores the way that natural philosophy serves Milton's materialist theology. Focusing on his evident traducianism, in which the rational soul is produced through the same process of generation that produces the body, the chapter notes the amalgamation of the traditionally immaterial rational spirit with the bodily spirits of medical tradition and charts some of the objections that this heresy drew from other commentators. Traducianism relied upon the theory that out of matter or material forms could come, eventually, rational thought, and thus it demanded a re-evaluation of the ontological status of matter as active, or even vital. This 'hylozoism' was defined by Ralph Cudworth (amongst others) as one of the four fundamental heresies that support atheism, but for Milton the orthodox theory of creationism (or indeed any theory of generation that attributes the origin of the fallen soul to God) could not be integrated with a coherent theodicy. Comparing Francis Glisson's 'hylozoistic' natural philosophy to Milton's animist materialism, I note that there are fundamental similarities between Glisson's vitalism and the natural philosophy expressed in Raphael's "one first matter

all” speech. Finally I turn from Milton’s declared monism to note the seeming discrepancy between this monism and the Aristotelian language with which he describes the body-soul composite, asking if and how this monism can be coherent in an Aristotelian framework.

Having observed Milton’s Aristotelian natural philosophy of the animate body-soul composite and his concurrent commitment to monism, Chapter 2 goes on to investigate this antinomy. Charting critical difficulties in reconciling the dualism of form and matter and the related problem of transcendence and immanence of body-soul ontology in Milton’s work, this chapter opens up the question of the heterogeneity of the Aristotelian inheritance in seventeenth-century science and observes that the innovations of the medical tradition evolved out of a more measured and respectful response than that given by other areas of developing ‘science’ to the classical heritage that was being gradually overturned. The central dualism with which Milton must contend in order to make his monist natural philosophy, and thus his theory of body and soul, consistent is that of matter and form; this is relevant to his natural philosophy as a whole, but to generation and the traducian heresy in particular. Examining this more closely prepares us for a reading of the causal modes in both the creation and the natural philosophy of unfallen paradise. From a brief examination of the coherence between theology and the cosmology described in *Paradise Lost* emerges a natural philosophy in which Aristotelian structure is made dynamic with elements of contemporary chymical theory. This is a combination characteristic of Glisson’s work and the chapter explores further how Aristotelian categories of form and matter are re-interpreted in his physiology as similiary (unformed) fluids and spirits and (formed) organs. Looking in particular at the representations of Eve in *Paradise Lost* we can chart significant similarities between physiology in the poem and that described in Glisson’s medical research. Any immediately identifiable dualist concepts are reserved for the action of Satan upon Eve or the serpent. The adjustments to notions of form and matter in Glisson’s work and in Milton’s poetry match, but they also also rearranged in the same way in Milton’s *Art of Logic*. While it has remained something of a neglected text, the *Art of Logic* explores directly Milton’s interpretation of the Aristotelian causal modes, giving us a sense of how he is reinterpreting notions of causality in a philosophical sense. Again, his innovations and adjustments repeat those of the radical, chymically-minded physician.

Having shown that Milton's 'science' is not as backward or as orthodox as critics such as Hunter and Svensen have claimed, the dissertation offers a closer, more detailed scrutiny of contemporary medical vitalism. Chapter 3 takes up Roger's attribution to Milton of a radical vitalist materialist natural philosophy, but seeks to elaborate the somewhat unsophisticated version of vitalism that he offers. Demarcating different strands of vitalism within contemporary medical discourse, this chapter explores the underlying determinants of Francis Glisson's vitalist philosophy with a new attention to the breadth and detail of his work. His re-evaluation of the intrinsic power of matter is made by vitalising an essentially Aristotelian structure (in particular the productive relations between form, matter and vital heat) with the independent interactive material forces observed in chymical medical theory. Standard models of force and bio-mechanism in the body are re-defined into a dynamically vital but stratified ontological order of spirit and thicker substance. This model of the causal power of matter and spirit is shown to be coherent with Milton's natural philosophy of matter and spirit as they are represented in the cosmological meeting point of chaos and holy light in *Paradise Lost*. The chapters that follow will use this essential model of vital matter to elaborate comparisons between medical processes as they were re-imagined by vitalist physicians and the representations of bodily processes and animation in various areas of *Paradise Lost*.

Chapter 4 is the first to do so, and it examines the parallels between the new theories of conception that were being developed (most famously by Harvey, but also by Glisson and others) and various accounts of Creation in *Paradise Lost*. In comparing the different medical theories of conception, this chapter begins by observing that the Aristotelian dualism of form and matter met distinct problems in the experimental work done by Harvey in his research for *Generazione animalium*. It goes on to show that Glisson's chymical anatomy of the blood both emerged from and worked to authenticate such research by modifying this Aristotelian doctrine. The chapter demonstrates parallels between the physicians' vital fluid of conception and the warm prolific humours of the Creation and between the creative agencies of Holy Spirit, vital spirit and light. Thus the 'mixt' of active and vital fluid and spirit, which transforms itself into blood and, eventually, organs, gives a basis in the natural philosophy of the body for the divine spirit and matter that enact the work of Creation in *Paradise Lost*. Overall, the chapter seeks to place the work of Glisson and of Milton in harmony with

each other, thus validating both the scientific knowledge base of the poetry and the religious intent of the medical work.

In reading Milton's Creation, vitalism gives us a model of how body emerges from spirit in *Paradise Lost*; the same medical vitalism can also be read alongside the emergence of spirit out of body, a dynamic that works throughout the natural philosophy of unfallen paradise, in what Fallon describes as the "metabolism of the animate world," as well as in the metabolism of humans and angels.⁵⁸ A dualism that is more obviously relevant to human body and soul, is that of the anima, or bodily animation and its relation to the notion of *nous*, or abstract, rational faculty. My approach to this relation between one order of animation and another will be through an exploration of the dynamic of digestion, for it is Raphael's natural philosophy of nutrition which links the human rational faculty (as well as his own superior intellect) into the dynamic order which includes the lower faculties. In all areas, medical, philosophical and poetic, what we find is an Aristotelian basis which has been vitalised (and thus radicalised) by chymical theories of medical knowledge and substance transformation.

Building on the work of Fallon, and Schoenfeldt, chapter 5 begins with a focus upon the way that *Paradise Lost* uses digestion as a fundamental model for physical and spiritual transformation. The body-soul composite of *Paradise Lost* sublimes lower level spirit and matter into blood, organs and, finally, intellectual activity. The first section of this chapter analyses the process of sublimation as it was proposed by more radical elements (both vitalist and mechanist) of the medical establishment, exploring their appropriation and reinterpretation of this alchemical concept. It demonstrates how the successive sublimations in the radical medical body-soul composite match and substantiate those represented in unfallen paradise. The second section goes on to consider the implications of certain key concepts and phrases borrowed from the radical medical tradition. The "spirits odorous" of the flowers and fruit of paradise are considered in the light of the Helmontian notion of the 'odour' as an active element of the ferment. The particular responses of the different angels to the odorous sweetness of paradise open up an analysis of the differences and similarities between angelic and human physiology and psychology in Milton's materialist paradigm. The examination of Milton's material angels, and their capacity to interpenetrate one another, leads to a

⁵⁸ Fallon, *Milton Among the Philosophers*, 106.

consideration of the contemporary debate on the penetration of substances; in direct conflict with both Aristotelian orthodoxy and the emerging mechanist models, the material spirits of both Milton and Glisson rely for their vital interactions and sublimations upon this mutual penetrability.

The final section of chapter 5 investigates the similarities and differences between ideas of matter in vitalist monism and corpuscular mechanism. The mechanists are shown to have borrowed much from chymical doctrine, but Milton's position is located in the theological connection between vitalism and free will as opposed to the voluntarist theology that supported the mechanist proponents of active matter. Chapter 6 continues the investigation into corpuscular versions of active matter in the body; the focus is upon the dualism inherent in the works of Walter Charleton and Thomas Willis on the corporeal soul. The *vitae chorea* (dance of life) that Glisson envisages in the vital interactions of the body's substances is re-modelled to incorporate the battles between the (rational) spirit and the flesh that characterise orthodox Pauline dualism. This discordance is shown to correlate with corruption and increasing distance from God in Milton's schema of spirit and matter; it is also correlated with the notion of the corrupting ferment in medical research. This chapter delineates the differences between the ferment as productive of perfecting vital heat in the healthy body-soul composite and the toxic fermentation that brings disease. Once again, Glisson's work correlates most closely with Milton's natural philosophy of spirit and matter, this time because he differentiates most carefully between the perfecting action of the body's fluids and spirits and the corrupting influence of the putrefying ferment. The physiological effects of the fruit can thus be read through the lens of this theory of poisonous fermentation. This notion of the ferment itself stands upon various determinants; it retains something of the Galenic notion of disease as a self-causing imbalance, but it also demonstrates the contemporary development of ideas of external infection. Like the ferment, the fruit's spirits cause a hallucinatory exhilaration of the highest spirits of the body (and thus a concomitant loss of rationale), which leads to a sulphurous burning of the blood and, finally, to the build up of stony deposits in the animate body.

Exploring again the literal linkage between matter and spirit in the macrocosmic Creation and the microcosmic animate body, this chapter shows how demonic reduction of sulphur and nitre (the ingredients of life) in heaven and hell parallels the feverish action of the diseased blood in contemporary medicine. The

ubiquitous and fertile nature of the ferment solves the problem of how the Fall might infect not only Adam and Eve's offspring with natural evil, but the wider natural world in which they live. This corruption and the newly conflicting relation between different levels of spirit and matter in the body-soul composite leave it in a literally chaotic state. The final section of the chapter, however, turns to healing and regeneration, considering the medical significance of the action of prevenient grace on the human heart. Drawing a comparison between the vitalist Creation of chapter 4 and Milton's distinctly vitalist representation of the regeneration of the body-soul composite, this chapter turns once again to Glisson for an analogous natural philosophy. Corruption is shown to be the true curse of the Fall; Milton's Michael offers Adam and Eve a process of growth and change that is a ripening rather than a decomposition and physical death appears as much a final mercy as a punishment.

Chapter 1

Theological imperatives and natural philosophy

i. The material soul of the *Christian Doctrine*

The animist materialism of the body-soul composite in *Paradise Lost* is theorised in the *Christian Doctrine*. Without wishing to use the *Christian Doctrine* as a ‘gloss’ on *Paradise Lost*, this study seeks rather to uncover new levels of congruity and coherence between the two works. There are three central points that appertain to the materiality of the human form that are both directly stated in the work of doctrine and represented in the poem. Perhaps one of the most well known is that of Mortalism; implied, but never directly stated in *Paradise Lost*, it is a point of doctrine argued at some length in the *Christian Doctrine*. The rational soul, as the primary agent of sin, receives the same punishment as the rest of the human form; this aspect of the soul will be explored in chapter 6. Another striking aspect of the soul that Milton describes is its profoundly embodied state; the terminology used to describe it uses medical lore and categories of natural philosophy. Finally, Milton’s natural philosophy and his theology both demand the support of the traducian heresy, that is, the material origin of the rational soul itself.

In the *Christian Doctrine*, Milton makes his fundamental point that man “is not... composed of two different and distinct elements, soul and body... the whole man is the soul, and the soul the man: a body, in other words, or individual substance, animated, sensitive and rational.”⁵⁹ The drive of Milton’s argument is towards his famous and peremptory conclusion that:

⁵⁹ All references are made to *Complete Prose Works of John Milton*, ed. Don M. Wolfe et al. 8 vols. (New Haven: Yale University Press, 1953-1982), 6: 317; hereafter cited as *CPW* by volume and page numbers. This is a different system to the orthodox Galenic/Aristotelian triumvirate of vegetative, vital and rational. As we shall see later, this indicates, in fact the anatomy of the late seventeenth century proposed both by vitalists and by certain mechanists who attributed activity and motive force, if not life, to matter.

The idea that the spirit of man is separate from his body, so that it may exist somewhere in isolation, complete and intelligent, is nowhere to be found in scripture, and is plainly at odds with nature and reason.⁶⁰

There could not be a more clearly phrased opposition to the orthodox assertion of an abstract intelligence which inhabits an instrumental body, and which ascends (or descends) at the moment of bodily death; the spirit here must be an integral part of the physical entity. In Milton's biblical exegesis of the term, he does not simply use the more materialistic biblical terminology of the Old Testament.⁶¹ He states that

man himself, the whole man, I say, when finally created is specifically referred to as *a living soul*. Hence the word soul is interpreted by the apostle, I Cor. xv. 45, as meaning *animal*. And all the properties of the body are attributed to the soul as well: touch... the ability to eat... hunger... thirst... [and] apprehensibility.⁶²

This soul is not trapped within a body, it *is* bodily; one of the most heretical aspects of this body-soul composite is its emergence out of the material bodies of human parents. God, in Milton's reading, ceased direct creation of everything, including the human soul, on the seventh day:

On the seventh day God ceased to create and completed the entire work of creation... the human soul is generated by the parents in the course of nature, and not created daily by the immediate act of God.⁶³

This denial of creationism was extremely problematic to orthodox writers in both religious and medical disciplines. Thomas Willis and Ralph Cudworth both bring the traducian heresy up in order to criticise and dismiss it. Willis's dismissal is comparatively brief; anxious about the implications of his study of the brain and nervous system he insists on the first page of his treatise that

some deserving very ill of themselves, have affirmed the Souls of Man and the Beasts only to differ in degrees of Perfection; and so that either alike must be either Mortal or Immortal, and alike propagated ex traduce or from the Parent. Wherefore that the Dignity, Order, and Immortality of the Rational Soul, discriminated from the Corporeal, may be vindicated, and likewise that we may make a way to the

⁶⁰ CPW 6: 319

⁶¹ On the whole (although not exclusively) the Old Testament has a tendency to treat the soul as a physical entity, either as the holistic 'living soul' or as the blood ('soul' designates a living human being, for example, at Genesis 2:7, Exodus 1:5, Leviticus 17:15 and animation, or life is equated with the blood at Genesis 9:4, Leviticus 17:14, Deuteronomy 12:23).

⁶² CPW 6: 318.

⁶³ CPW 6: 319.

remaining Pathology, or Method of Curing of the Brain and Nervous
Stock... therefore at present, we shall endeavour to deliver a certain
Doctrine of the Soul⁶⁴

Willis is keen to differentiate his study from the accusations of atheism that physic often attracted. From Thomas Browne's wry comment upon "the generall scandall of my profession" through to theatrical conflation of the anatomist and the atheist in Tourneur's attempt to imagine a totally amoral character in *The Atheist's Tragedy* (1611) there is, throughout various genres of Renaissance literature, a fascinated tendency to associate the medical practitioner with a dangerous godlessness.⁶⁵ This tendency still emerges in the modern critical tradition although the 'atheistic' attempt to escape the confines of religious doctrine and taboo is now more often celebrated as a proto-modern concern with rational thought and scientific rigour, rather than a scandal.

Cudworth, in contrast to Willis's brief disclaimer, devotes his immense study to the discovery of scandalous atheism, which, it seems, lurks deviously in almost all forms of materialist thought, and in particular that which concerns the soul. He is clear about the relationship between materialist versions of the soul and atheism; modern atheist doctrine, he states, declares that

life and animality, soul and mind, being all but accidents and affections in this matter (as if therefore they had no real entity at all in them), are generable out of nothing, and corruptible into nothing, so long as the matter, in which they are, still remains the same. The result of which is no less than this, that there can be no other gods or god than such as was at first made or generated out of senseless matter and may be corrupted again into it... here indeed lies the grand mystery of Atheism.⁶⁶

If life and animation, as well soul and mind are effects of matter (which is traditionally endowed with a negative or lesser ontological force than immaterial agents such as

⁶⁴ Willis, *Two discourses*, 1.

⁶⁵ Thomas Browne, *Religio Medici* (London, 1642). For more detailed discussions on the various angles of this problem see Guido Giglioni, 'Anatomist Atheist? The 'Hylozoistic' Foundations of Francis Glisson's Anatomical Research' in *Religio Medici: Medicine and Religion in Seventeenth-Century England*, ed. Grell and Cunningham (Aldershot: Scolar Press, 1996) pp115-135; Jonathon Sawday, *The Body Emblazoned: Dissection and the Human Body in Renaissance Culture* (London: Routledge, 1995) see especially Chapter 4 'Execution, Anatomy and Infamy'; John Henry, 'Medicine and Pneumatology: Henry More, Richard Baxter and Francis Glisson's *Treatise on the Energetic Nature of Substance*' in *Medical History* 31 (1987), 15-40.

⁶⁶ Ralph Cudworth, *The True Intellectual System of the Universe: wherein all the Reason and Philosophy of Atheism is Confuted* (1678). I have used the 1820 edition (Whitefish: Kessinger Reprints, 2010), 1:257-8.

Aristotelian form, Platonic ideas or Holy Spirit) then everything of traditionally immaterial being including abstract thought and ultimately God can be corrupted back into nonentity. In orthodox thought, creationism ruled that the rational soul was inspired by God into each new human life; it was normally carefully partitioned off from the lower orders of animation that were shared with the rest of the living world, and reserved for the concern of theologians. Willis must concern himself with the rational soul because of the nature of his research, but physicians and natural philosophers would normally ensure that they had made some sort of disclaimer to any knowledge of or concern with the rational soul in their writings.⁶⁷

Speculation on the crossover between the notion of rational spirit that constituted the orthodox soul (and was related by implication, particularly through the Creation narrative, to the notion of Holy Spirit), and the notion of medical spirits in the body drew vitriolic responses from orthodox writers of both medicine and theology. Burton's *Anatomy of Melancholy* puts it thus:

Hierome, Austin, and other Fathers of the church, hold that the soul is immortal, created of nothing, and so infused into the child or embryo in his mother's womb, six months after the conception; not as those of brutes, which are ex traduce, and dying with them vanish into nothing. To whose divine treatises, and to the Scriptures themselves, I rejoin all such atheistical spirits.⁶⁸

Although various writers of the Renaissance did articulate this cross-over of ideas about spirit (often those whose work occupied the borders between medicine and theology, such as Michael Servetus), they were, as Walker notes, unusual and extremely heretical.⁶⁹ Milton, however, cannot accept creationism for reasons of theodicy. This infusion of the soul into the foetus (and pre-existence, the Platonic position) both imply that since the Fall, the soul which originates with God must either be created impure and thus fallen, which would imply God's responsibility for its impurity, or it must be created pure and then trapped in a fallen body. Milton argues with some passion that:

to create pure souls which lack original righteousness, and then put them into contaminated and vicious bodies, to surrender them to the

⁶⁷ Maurice Kelley notes that Creationism "became the prevailing view of the medieval church and of Reformation Calvinism" (*CPW* 6: 316, n. 58).

⁶⁸ Burton, *Anatomy of Melancholy*, section i, memb. ii, subsect. ix, 'of the rational soul' (<http://www.psyplexus.com/burton/6.htm> [16/03/08]).

⁶⁹ Walker, 'Medical spirits', 289.

body as to an enemy, imprisoned, innocent and unarmed, with blinded intellect and with will enchained, quite deprived, in other words, of the strength which is needed to resist the body's vicious tendencies – to do all this would argue injustice as much as to create them impure would argue [God's] impurity.⁷⁰

A soul newly or directly created by God could not be impure or fallen, for that would impugn God's own purity, and the infusion of innocent souls into 'contaminated and vicious bodies' would equally impute to God a cruel injustice. The harsh truth of evil, suffering and death that Milton lays at the door of the Fall must not be imputed to God's direct action, therefore the rational soul itself must emerge from the natural, material process of generation. Repeatedly, Milton insists that "if sin is transmitted from the parents to the child in the act of generation, then... the original subject of sin, namely the rational soul, must also be propagated by the parents."⁷¹

The arguments made by Cudworth, as well as less complex ones made by lesser figures such as Burton, assume that the material is ontologically deficient because it grows, changes and corrupts. Milton, in contrast, attributes to matter an originary purity because of its necessarily divine origin, and thus retains a certain amount of changeability within the category of the divine itself.⁷² Matter cannot have been a prior factor independent of an infinite creative God, and the corruptions to which it is subject are not part of its essence. Instead, when it "has become the property of another, what is there to prevent its being infected and polluted, since it is now in a mutable state, by the calculations of the devil or of man... which proceed from these creatures themselves."⁷³ Matter that is not under the direct control of God is vulnerable to pollution, infection and misuse, but free will is a mutable state since it demands that God should not directly control material ontology. Yet material ontology originates with God as all things do; in one aside, Milton declares that "God is as truly the Father of the flesh as he is of the spirits of the flesh."⁷⁴ There is no other, immaterial realm dividing matter from God; consequently spirit and flesh are not the dual ontological categories for Milton that they are in all areas of contemporary orthodoxy.

⁷⁰ CPW 6: 321.

⁷¹ CPW 6: 321.

⁷² See chapter 2 and chapter 6 for Milton's rejection of the scholastic notion of God as *Actus Purus*.

⁷³ CPW 6: 309.

⁷⁴ CPW 6: 324.

Milton's reference to the "spirits of the flesh" adds a peculiar twist to the Pauline notion of spirit. To begin with, these spirits are multiple, rather than a singular category of spirit; these spirits are also *of the flesh*, which leaves them barely distinct from the category of flesh at all. I would like to explore the language with which Milton describes spirit, soul and body in the light of his consistent use of the terms and concepts of the natural philosophy of the body. In his explication of the biblical use of the term 'spirit', Milton makes a clear appeal to contemporary natural philosophy of the body:

In Holy Scripture that word *spirit* means nothing but the breath of life, which we breathe; or the vital or sensitive or rational faculty, or some action or affection belonging to them.⁷⁵

Relentlessly excluding the singular, immaterial and abstracted theories of spirit, this definition marks the joining together of religious spirit and bodily spirits. Inherent in Milton's materialist description of the soul-body composite are the ontological categories of spirit that we only otherwise meet in medical discourse. He states that:

in a context where 'body' means merely physical trunk, "soul" may mean either the spirit or its secondary faculties, such as the vital or sensitive faculty. So to avoid confusion, "soul" is as frequently distinguished from "spirit" as it is from "body."⁷⁶

This statement defines contextual usages of the terms as opposed to their 'actual' meaning. Even when one is in the context of 'body' meaning mere 'physical trunk', soul does not simply mean 'will' and neither does spirit equate directly to intellect, despite the fact that the will is enacted by the vital motion of the body, and the spiritual faculty of reason deals with the intelligible. We can assume that his reference to 'the spirit' is to the primary order, the rational faculty, but (and here we depart from theological orthodoxy and approach rather the Aristotelian) the terms 'spirit' and 'soul' may also both refer to secondary faculties, either vital or sensitive. We begin to see Milton's explication of theological terms within the order of natural philosophy: all three ontological categories (vital, sensitive and rational), whether traditionally material or immaterial are indicated by the term 'soul'.

⁷⁵ CPW 6: 317.

⁷⁶ CPW 6: 318-9.

The overall argument gives a combination of theological imperatives – the necessity of working from the Genesis account of creation with accuracy and the necessity of theodicy – which are then supported by a matrix of natural philosophy in the form of Galenic categories and Aristotelian materialism. It is no surprise that Milton should have a notion of the body-soul composite that supports his theodicy, nor that he should have worked it out and represented it in some detail. Milton’s final comments in this discussion turn to the Aristotelian conception of the soul as defined by the scholastic position, *anima est tota in toto, et tota in qualibet parte*:

which I think a very strong one indeed, that if the soul is wholly contained in all the body and wholly in any given part of that body, how can the human seed, that intimate and most noble part of the body be imagined destitute and devoid of the soul of the parents.⁷⁷

This scholastic tag obviously resonates with Milton’s assertion that the whole man is the soul and the soul the whole man; this coincidence of body-soul models is taken further however when Milton mentions the materiality of Aristotelian form. Briefly, he comments that “nearly everyone agrees that all form – and the human soul is a kind of a form – is produced by the power of matter.”⁷⁸ But, of course, the fact is that while forms *per se* were conceived of as material, or rather that the division of form and matter were given by Aristotelian orthodoxy as only divisible by intellectual abstraction, the human soul was consistently conceived of as the exception to this rule.

ii. The contemporary medical body: some terminology

Since Milton’s representation of the body-soul composite is couched in terms of natural philosophy, let us look at the words in some very early contexts to build up a sense of their original meanings. In the opening paragraphs of Galen’s *On the Natural Faculties* he gives a compact series of definitions of his own terminology thus:

I mean by an effect that which has already come into existence and has been completed by the activity of these faculties - for example,

⁷⁷ CPW 6. 321-2. Milton continues, qualifying this basic statement with the paternalist note “or at least of the father, when communicated to the son in the act of generation”. This is one of many examples of how Milton’s belief in rational human free will and his patriarchal assumptions occasionally confound each other; as it is an aside I shall leave it as one.

⁷⁸ CPW 6: 322.

blood, flesh, or nerve. And activity is the name I give to the active change or motion, and the cause of this I call a faculty. Thus, when food turns into blood, the motion of the food is passive, and that of the vein active. Similarly, when the limbs have their position altered, it is the muscle which produces, and the bones which undergo the motion. In these cases I call the motion of the vein and of the muscle an activity, and that of the food and the bones a symptom or affection, since the first group undergoes alteration and the second group is merely transported.⁷⁹

‘Faculty’ is given as a cause here. Galen is concentrating, in this text, upon the natural faculties, and those of generation, nutrition and growth, rather than any of the higher faculties. Before Harvey’s discovery of the circulation, the food was envisaged as turning into blood through the vegetative action of the liver and venous system; the heart vitalised the arterial blood.⁸⁰ An ‘activity’ is an active motion in the body, impelled through an active part such as the muscle; the symptom, or affection, is the motion of that part which is acted upon and moved, such as the food. The Aristotelian schema of cause, act and effect clearly orders this conception of the body’s functioning, and the binary order of passive substance (matter) which is acted upon by a cause of motion (form) is clearly present. Milton’s inclusion of the faculties, and of the ‘actions’ and ‘affections’ belonging to them, in his definition of the soul identifies his comment as being underpinned by the Galenic/Aristotelian medical tradition.⁸¹ The notions of vital, sensitive and rational faculties and the concomitant ‘actions’ and ‘affections’ are drawn straight from medical orthodoxy, but they include the rational faculty in a distinctly unorthodox way. Nevertheless, while it is true that according to Galen, the cause of actual change in the body is named a ‘faculty’, in fact Galen is quite explicit about the emptiness of the term, noting that: “so long as we are ignorant of the true essence of the cause which is operating, we call it a faculty”.⁸² Milton, as we shall see, was more precise about how what impels action in the body-soul composite. While Galenic medicine was grounded in Aristotelian natural philosophy, one fundamental problem shared with metaphysical philosophy and theology (a problem that the notions

⁷⁹ Galen, *On the Natural Faculties*, section 2. (<http://classics.mit.edu/Galen/natfac.1.one.html> [01/04/08]).

⁸⁰ Gail Kern Paster, ‘Nervous Tension: Networks of Blood and Spirit in the Early Modern Body’ in *The Body in Parts: Fantasies of Corporeality in Early Modern Europe*, ed. D. Hillman and C. Mazzio (London: Routledge, 1997), 116-7.

⁸¹ It is not the work of this thesis to define Aristotle or Galen’s original (and sometimes distinctly different) conclusions concerning the body and its animation, but rather to explore some of the relevant interpretations contemporary with Milton’s work. Although there are areas of contention between Aristotelian ideas and those of Galen, we shall assume that: “it was largely with Aristotle’s philosophy that Galen had put Hippocratic precepts and practice into a rationalised understanding of the natural world” (French, *William Harvey’s Natural Philosophy*), 5.

⁸² Galen, *On the Natural Faculties*, section 4.

of ‘spirit’ and ‘faculty’ were designed to suture) was that of causality. Motive force and the origin of motion were loci about which questions of ancient philosophy and the new mechanical philosophy circled continually: the branch of study which included medicine was no exception.

Milton’s definition of the word spirit, which identifies the traditionally immaterial abstract capacity of the mind with the functions of the body, also demands a closer examination of its various contemporary meanings. In contemporary thought medical spirit is conceived of as a substance of sorts, but it is volatile, rarefied and active: it occupies the border between the potential motive force and actual impact and motion. The classical body of medical knowledge inherited by the seventeenth century was made up of a tripartite system of interlocking orders of animation where faculties were motivated by different sorts of spirit. Walker gives a fairly concise definition of medical spirits as

very fine, hot vapour, deriving from the blood and breathed air... They are usually divided into three kinds: natural, vital and animal... the vital spirits are manufactured in the heart and conveyed by the arteries; their main function is to distribute innate or vital heat to all parts of the body. Animal spirits are elaborated from these and are contained in the ventricles of the brain, whence through the nervous system they are transmitted to the sense-organs and muscles; their functions are motor-activity sense-perception and, usually, such lower psychological activities of appetite, *sensus communis* and imagination. They are the first, direct, instrument of the soul.⁸³

We must add some detail to the ‘lowest’ order of spirit, the natural spirits. In the original Galenic schema they are produced in the liver; they emanate through the veins with the venous blood and function in the order of nutritional and reproductive faculties. These faculties we share not only with animals but also with plant life, thus the designation of this ‘lowest’ order of animation as the ‘vegetative soul’.⁸⁴ The vegetative faculty deals entirely with involuntary functions, primarily those of the lower abdomen, and often does not gain the critical attention demanded by the more dramatic faculties of voluntary motion, sense perception and imagination. Nevertheless we can see the basic

⁸³ D. P. Walker, ‘The Astral Body in Renaissance Medicine’ in *Music, Spirit and Language in the Renaissance*, ed. Penelope Gouk (London: Varorium Reprints, 1985), 119-133, 121.

⁸⁴ For a wider exploration of the orders of spirit and faculty which preceded Harvey’s discovery of the circulation of the blood see Paster, ‘Nervous Tension’, 107-125; John Henry, ‘The Matter of Souls: Medical Theory and Theology in Seventeenth-Century England’, in *The Medical Revolution of the Seventeenth Century*, ed. French and Wear (Cambridge: Cambridge University Press, 1989), 87-113.

tripartite structure in Walker's description of natural, vital and animal spirits of medical tradition. Faculty', then, holds a similar place to the term 'spirit' in that both seek to fill the motive gap which precedes a detectable effect (structurally comparable to the Aristotelian category of efficient cause) without necessarily proffering a mechanical or observable explanation of how they motivate action.⁸⁵ Where mechanist philosophies elaborated dualist solutions, Milton and Glisson propose an ensouled body animated by the interactions of spirit and thicker substance; Milton extended this model to include the rational spirit, endowing it with both a material origin and a material function.⁸⁶

Such solutions were deeply unpopular. There was some uneasy debate between the natural philosophers' use of the term spirit and that of the theologians. Walker has shown that it was precisely the category confusion between body and soul which was potentially problematic in the notion of 'spirit' as it was being used throughout the Renaissance. He notes that the tradition of thinking in terms of medical spirits,

is especially likely to lead to... confusions, since one of its main uses was to bridge the metaphysical gap between body and soul, matter and mind, while for any Christian thinking about medical spirits, there were also present the well established meanings of spirit as the highest divine part of the soul or as part of the godhead, the Holy Spirit.⁸⁷

Such attempts, he states, led to "strange and philosophically audacious conceptions of the human soul, and theologically unorthodox conceptions of God."⁸⁸ There were, even within the arena of university medicine, many variations between different models; for example Galen's assertion of a *rete mirabile*, a cluster of veins and arteries in the neck as the organ where vital spirits were transformed into animal spirits was shown by Vesalius to be a discovery of animal anatomy, not a feature of the human form.⁸⁹ The primacy of the organ in the motive action of the body, however, remained fairly constant until the chymical philosophy of the seventeenth century provoked a number of different theories of active or vital matter. Harvey's discovery of the circulation of the

⁸⁵ French notes that the term 'faculty' "was naturally a butt of the rhetoric of the new philosophers" and that Glisson's colleague George Ent compared it to a *deus ex machina*; nevertheless the term was still current and without satisfactory replacement in the work of what French calls the "non-traditional physicians" (*William Harvey's Natural Philosophy*, 177).

⁸⁶ See chapter 5.

⁸⁷ D. P. Walker, 'Medical spirits in philosophy and theology from Ficino to Newton', in *Music, Spirit and Language in the Renaissance*, ed. Penelope Gouk (London: Variorum Reprints, 1985), 278-306, 288.

⁸⁸ Walker, 'Medical spirits' 288.

⁸⁹ Walker notes that Melanchthon, to whom Milton refers repeatedly, followed Vesalius with regard to the theory of the *rete mirabile* ('Medical Spirits', 300). Milton's Eve has animal spirits exhaling directly from the blood rather than transforming through the action of an organic bodily structure (*PL*, 4. 805).

blood in 1628 and his reassertion, defence and development of his work twenty years later was to completely destabilise the Galenic system of emanation from organic bodily centres, showing that the nutritional faculty could not be based on the liver as organic centre to the system of veins, venous blood and natural spirits. Nevertheless, a triple order of faculty and spirit remained the basis of thought upon which the body was imagined, observed and then reconceived throughout the seventeenth century.

The key notion in a vitalistic conception of the body (as we have seen in Milton's notion of the material soul) is that of spirit as substance, or a rarefied, active degree of matter. The interplay between the various spirits and substances of the body seem to be the very process of life in Glisson's vision. The natural spirits of the body receive the flow of vitalising vital spirits through the blood in a process which is a struggle for and against assimilation, part conflict and part seduction. The natural spirits do participate in their vitalisation, but they also struggle against it. In *De Rachitide*, Glisson sketches a process which seems to give a bodily unconscious within the flow and pulse of the blood, where the force of life, part aggressive, part sexual, works to assimilate the matter and vegetative spirit of the body into its own higher, more vital substance:

Inborn [natural/vegetative] spirits, like a bride, entice and at the same time repulse the vital spirits, which in a sense play the role of the bridegroom; on the other hand, the vital spirits, stimulated by their heat and urged by the force of the pulses, assail the inborn spirits in a way which is bolder and more daring than usual, and penetrate stealthily into the inborn spirits' territory. In the meantime, the inborn spirits receive them not without a certain pleasure (although discreetly, unwillingly, and reluctantly). Indeed, the bodily pleasure itself is based on an amorous wrestling, and the most important part of life itself lies in such a battle concerning the mutual union of both spirits." The vital constitution is the result of the struggle between the two kinds of spirit, of their tendencies and counter-tendencies (*nixus* and *renixus*).⁹⁰

The vital spirit of the blood (traditionally the arterial blood) is imagined as pulsing with the forces of desire and conquest; unlike a modern conception of the body, the blood does not feed, it seems rather to pillage or seduce the lower order of spirit. However the desired result is the vitalisation of that natural spirit – in being assimilated it attains a higher order of vitality.

⁹⁰Glisson quoted in Giglioli, 'Genesis of Francis Glisson's Philosophy of Life', 76-77. Giglioli cites *De Rachitide*, 107-110.

iii. Material and immaterial spirits

Of course there are many and various gaps and inconsistencies in the tripartite model; not only of motive causality (that is, how the body is impelled to action by its spirits) but of what they are made, and how they flow about the body. In a dualist version, the upward motion, assimilating of the bodily spirits is arrested as the animal spirits meet the rational spirit, or the orthodox soul. From being causal agents of transformation in the body they become ‘instruments of the soul’, which acts upon them conversely, with a top-down motion.⁹¹ In his tract of 1659, *Immortality of the Soul*, Henry More also traverses the fault lines between religious notions of spirit and those of philosophy and natural philosophy in the following definition:

WE have done with the notion of that *Infinite* and *Uncreated* Spirit we usually call God; we come now to those that are *Created* and *Finite*, as the Spirits of Angels, Men and Brutes, we will cast in the *Seminal Forms* also, or *Archei*, as the *Chymists* call them, though haply the world stands in no need of them. The Properties of a Spirit, as it is a notion common to all these, I have already enumerated... [as] *Self-motion, Self-penetration, Self-contraction and dilatation, and Indivisibility*, by which I mean *Indiscernibility*: to which I added *Penetrating, Moving, and Altering the matter*. We may therefore define *this kind of Spirit* we speak of, to be *A substance Indiscernible, that can move it self, that can penetrate, contract, and dilate it self, and can also penetrate, move, and alter the matter.*⁹²

For More, all movement of matter originates with spirit, which is a kind of substance different altogether to both divine Spirit (which is infinite and uncreated) and to the dull material it animates. It can best be defined in opposition to ‘body’: “if we divide Substance in generall into these first kindes, viz. *Body* and *Spirit*, and then define *Body* to be *A Substance impenetrable and discernible*. Whence the contrary kind to this is fitly defined, *A Substance penetrable and indiscernible.*”⁹³ Where body is essentially impenetrable, spirit moves through other substances material and immaterial; where

⁹¹ Thomas Willis and Walter Charleton both theorise a power struggle between the different orders of spirit in the body. See chapter 6.

⁹² Henry More, *The Immortality of the Soul, so farre forth as it is demonstrable from the Knowledge of Nature and the Light of Reason* (London, 1659), 25.

⁹³ More, *The Immortality of the Soul*, 16-17.

body is ‘discerpible’, or divisible, spirit must be, in contrast, be indivisible and elastic.⁹⁴ As in the religious and medical models, spirit is the active force, body is inert, yet oddly intractable in its impenetrability.

Glisson too, shows himself to be well acquainted with the iridescent signifying of the word spirit but, unlike More, he embraces the new chymical definition. From his earlier, animistic images of the spirits’ activities in the body, comes a more scientifically nuanced version of active substance. In *Anatomia hepatis* he shows that his professional usage of the word draws meanings from his early training in classics through to his later interest in chymistry. Giglioli translates thus:

“The word *spirit*”, Glisson writes, “insofar as it is attributed to the bodies, has different meanings”. It can generically refer to any kind of body which has been rarefied to the point of becoming volatile (in this respect “wind, air, breath and exhalations in general” were rightly viewed by the ancient authors as sorts of spirit). It can also mean “any body that is subtle, active, and very penetrating”. Finally spirit can also mean “that element which, after a due process of fermentation, but not before, strives upwards spontaneously, and becomes volatile”. This is “the most precise meaning of the word *spirit*, in that it is understood as an elementary part of a compound. The chemists call it *mercury*”.⁹⁵

Carefully beginning by locating his work as natural philosophy, Glisson gives a set of definitions that shows how, even when clearly demarcated from theological concerns, the term, like the body it describes, is subtle, active and penetrating. Glisson does not define spirit in terms of a binary opposition to body or matter. The natural world is full of spirituous breath; the classical definitions are included, but, unlike Henry More’s account, Glisson’s spirit also validates the newest domain of medical theory with its chymical definition.

It is, as we shall see, this expansion into the realm of the chymistry of interacting elements that enables Glisson to develop his conception of living, perceptive, motivated matter. The formulation of his system of vitalist natural philosophy came to its peak in his late tract *De Natura Substantiae Energetica*,

⁹⁴ More makes this definition of ‘discerpible’ early in his *Immortality of the Soul*: “By *Actuall Divisibility* I understand *Discerpibility*, gross tearing or cutting one part from another. These are immediate properties of Matter” (12-13). Milton’s angels are not quite what More would call ‘indiscerpible’ as they do get wounded in the account of the war in heaven, although angelic substance heals without the suffering of human flesh; angelic substance is also capable of becoming less rarefied and grosser with repeated sin.

⁹⁵ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 124.

published in Latin in 1672. Although the tract itself postdates the publication of *Paradise Lost*, its conclusions give a matrix of natural philosophy that supports precisely the sort of theological assertions made by Milton in his poetry and prose. It is an unforgettable moment of Raphael's teaching where he explains that from the "one first matter all, / Indued with various forms, various degrees / Of substance" emerges life, which becomes

flowers and their fruit
 Man's nourishment, by gradual scale sublimed
 To vital spirits aspire, to animal,
 To intellectual, give both life and sense,
 Fancy and understanding, whence the soul
 Reason receives, and reason is her being.
 (PL 5. 471-87)

The assertion of a variety of spirits and the inclusion of the rational faculty in the whole category of living soul in the *Christian Doctrine* are restated and elaborated to create the category of intellectual spirits. These spirits take a mediating position between the intelligential spirits of the angels and the medical spirits which transform the stuff of food into the organic body and that into the sentient, rational self. While vegetation is in the early stage of this process, human natural spirits are missing from this schema (a point to which we will return later), but intellectual spirits have been conceived of as a continuation of the upward process of transformation, creating a physical link between the sub-organic process of nourishment, the sentient self and the faculty of rational thought.

This scale of nature is materially dynamic in the same way that Glisson's perceptive matter is dynamic. Giglioni paraphrases, translating from *De Natura Substantiae Energetica*:

Glisson regarded matter as an inherently living and perceptive substratum... as the organic efflorescence of forms is only a progressive and temporary superposition originating from matter itself, so the living modes ('*modes vitalis*'), the 'souls', are the result of inner self-modification of life that 'does not live on a borrowed life but on itself'.⁹⁶

⁹⁶ Glisson in Guido Giglioni, 'Anatomist Atheist? The Hylozoistic Foundations of Francis Glisson's Anatomical Research', in *Religio Medici: Medicine and Religion in Seventeenth-Century England*, ed. Grell and Cunningham (Aldershot: Scolar Press, 1996), 115-135, 126.

The dynamic force of the “one first matter all” and the materiality of spirit are explicated with an almost uncanny precision. Pagel catches the essence of this tract with his summary thus:

It is his endeavour to demonstrate the identity of all functions in principle which separates Glisson by a wide gulf from Descartes... To Glisson, ‘soul’ is but one aspect, one grade of the living, i.e. of the ‘energetic substance’. There is no difference in kind between these aspects and grades, from the lowest stage of matter endowed with the most ‘dim perceptions’ to the higher forms of consciousness in the living animal. In Glisson’s philosophy, matter appears as much ‘spiritualised’ as soul is ‘materialised’, so that the contrast between them is only artificial.⁹⁷

Cudworth’s response to this heretical philosophy is almost identical to the objection we saw earlier to the notion of a material soul. Defending the dualist thesis, Cudworth declares that the notion of active, animate substance assumes a world where:

By reason of which life (not animal, but only plastical), all parts of matter being supposed to form themselves artificially and methodically... and therefore also sometimes by organisation to improve themselves further into sense and self-enjoyment in all animals, as also to universal reason and reflexive knowledge in men; it is plain that there is no Necessity at all left either of any Incorporeal Soul in Men to make them Rational, or any Deity in the Universe to solve the Regularity thereof.⁹⁸

The notion that matter has the power to bring forth living forms is treated as a denial of divine agency. To this anxious religious philosophy is added a political dimension when Cudworth attacks the notion that living matter can organise itself into ever more complex forms and organisms. Cudworth asserts the impossibility that “*greater perfections* and higher degrees of being should rise and ascend out of lesser and lower” without the total “overthrow of the natural order”.⁹⁹ This accusation is not without some sort of basis, certainly in the work of Milton and even in that of Glisson.

⁹⁷ Walter Pagel, ‘The Reaction to Aristotle in Seventeenth-Century Biological Thought: Campanella, Van Helmont, Glanvill, Charleton, Harvey, Glisson, Descartes’, in *Science, Medicine and History. Essays on the Evolution of Scientific Thought and Medical Practice Written in Honour of Charles Singer*, 2 vols. ed. E. A. Underwood (London: Oxford University Press, 1953), 1: 489-509, 507.

⁹⁸ Cudworth, *The true intellectual system*, 233-4. Cudworth’s notion of ‘plastic nature’ gives God instead a delegated spiritual force in the world to perform these tasks.

⁹⁹ Cudworth quoted in Giglioli, ‘Anatomist Atheist’, 127.

In his teaching notes from Cambridge, Glisson gives a social metaphor to express his conviction that the body's spirits struggle to exalt themselves and the substance of their foods; in short that they "sublime by gradual scale" the matter and natural spirits of food into vital and thence animal spirit. He notes:

It is not absurd to think that in the natural polity (*naturalis politia*) parts advance in the same body from a lower degree of rank to a higher one. Like in the civil state (*respublica civilis*), it is not improper that the same citizen is promoted from a baser function to a more distinguished one.¹⁰⁰

Social transformation in the 1650s is for Glisson an unassailable and positive truth, implicitly linked to the notion of meritocracy. This is the sort of linkage between the political and the bodily that Rogers finds in the work of Milton, and which conservative contemporary commentators such as Cudworth deplored as liable to set the world upside down.¹⁰¹ The distrust of animist materialism, or vitalism, united many mechanist philosophers with their conservative contemporaries. Although he lacks Cudworth's fervour for the hunting down of atheism, Robert Boyle was to contend that matter that moved itself was a dangerous notion:

... [T]he erroneous idea of nature would, too often, be found to have a strong tendency to shake if not to subvert, the very foundations of all religion; misleading those, that are inclined to be its enemies, from overlooking a necessity of God, to the questioning, if not to the denial of his existence.¹⁰²

Nevertheless, Boyle does not make the confident assertion that all vitalists are atheists – he rather describes vitalism as error which may logically lead to a questioning of God's action or existence.¹⁰³ The accusation of 'atheism' was ubiquitous as was the

¹⁰⁰ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 77. Giglioni cites MS Sloane 3310, f. 229v. It is worth noting here that Francis Glisson was, like Milton a product of the middle class. He was almost certainly the son of a taylor from Bristol. See R. Milnes Walker, 'Francis Glisson and His Capsule', in *Annals of the Royal College of Surgeons of England*, 38 (1966), 71-91, 72.

¹⁰¹ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 77. Glisson was not a blazing revolutionary. His belief in social transformation is balanced by his description his work on fever, in which his metaphor is of "tumultuous and seditious" motions of the blood, and pathological fermentation in the body is described as "a civil war aroused among the elements of the mixt". Giglioni cites MS Sloane 3308, f.304v; 3308, ff. 303r-304r and *De Ventriculo*, 574-576.

¹⁰² Boyle quoted in Shapin and Schaffer, *Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life* (Chichester: Princeton University Press, 1985), 202.

¹⁰³ Boyle's uneasy approach to vitalism looks mild in comparison with that of Newton in the late 1660s: "Hence it is not surprising that Atheists arise ascribing that to corporeal substances which solely belongs to the divine. Indeed, however we cast about we find almost no other reason for atheism than this notion of bodies having, as it were, a complete, absolute and independent reality in themselves" (*Leviathan and the Air Pump*, 203).

assumption that if the *res ipsa* (thing in itself) had caused its own existence then the power of God was somehow nullified. It is, after all, Satan's claim to be self-created that is the foundation of his apostasy. However vitalist monism and self-determining matter do not necessarily deny God's position as creator. It is essential to the theological aspect of this debate to differentiate between the self-causing theory of the apostate Satan and the self-determining state of Milton's human body-soul composites. Let us ask, then, how Milton can claim that the self-determination of a material body-soul composite, generated out of vital matter and spirit, does *not* preclude the causal agency of divinity. The following chapters will examine more closely the representation of cause in the works of both the poet and the doctors who were his contemporaries to see if the causal agency of divinity can be retained within a traducian paradigm.

This association of vital matter with the denial of God's existence is not necessarily made through irreproachable logic. Giglioni has claimed that the development and acceptance of the practice of anatomy was inevitably a secularising process in medicine because, "otherwise anatomy becomes a subset of natural theology" but it is possible to argue that, during the period of Glisson's practice, natural theology was a definition of their work that anatomists would have welcomed.¹⁰⁴ Certainly, medical writers made clear efforts to preface and explain their work as respectful and devout investigations of God's creation; to write all this off as cynical pandering to religious hegemony seems reductive. To imply that "Glisson was upholding atheistic doctrines" would hold more in common with the accusations levelled by More and Cudworth than with Glisson's own assertions.¹⁰⁵ Medical practice and theory were challenging to religious orthodoxy in many ways; the power shifts in the body of man have been shown to relate to the power shifts in the contemporary body politic, certainly, but both the contemporary scandal and the modern celebration seem to codify the relation into a binary opposition between a suspiciously simplistic godless physic and an unconvincingly hegemonic 'religion'. For our purposes, the reassessment of this 'rift' means an investigation of doctrinal notions which can be found encoded in contemporary 'scientific' works as well as the theological implications of materialism; perhaps in this matter, Milton's work using materialism as a support for his theodicy in the *Christian Doctrine* can illuminate the religious dimension of Glisson's radical theory of *biouisia* (the life of matter) which drew such vitriolic accusations of atheism.

¹⁰⁴ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 68.

¹⁰⁵ Giglioni, 'Anatomist Atheist', 124.

The different discourses of theology and natural philosophy (amongst many others) are, in *Paradise Lost*, supposed to stand together like the inadequate concepts of the intellect that Glisson works with. In the *Christian Doctrine* Milton directly states what is everywhere else implied in his work: that a biblical description or a theological perspective may stand without excluding a supplementary explanation drawn from natural philosophy, indeed the natural philosophy must support the religious doctrine. This employment of making multiple discourses coherent then starts to approach *scientia*, or an inductive process for the reader, if all the representations of science lead back to the same principle (a good, merciful and all powerful God juxtaposed with free human consciousness) arrived at by the theological framework. This interdependence of natural philosophy of the body and theological commitments is in evidence throughout the *Christian Doctrine*. For example, the assertion that God can be said to shape a child in the womb without excluding the truth value of ‘natural causes’ must then infuse those natural causes with the work of God, giving the divine as immanent and the ‘natural’ as divinely ordered.¹⁰⁶ This finally leads us to one of Milton’s strongest statements on the matter of the coherence of different disciplines. In Chapter 8 of the *Christian Doctrine*, he notes of God’s general providence that:

God’s ordinary providence is that by which he maintains and preserves that constant and ordered system of causes which was established by him in the beginning... This is commonly and indeed too frequently called Nature; for nature cannot mean anything except the wonderful power and efficacy of the divine voice which went forth in the beginning, and which all things have obeyed ever since as a perpetual command.¹⁰⁷

We have here a notion of divine cause that includes a system of semi-independent causes emerging from it. This statement, again, insists upon the coincidence of the four Aristotelian causes, notions of nature (and by implication natural law) and the eternal resonance of divine command is given as that by which this system is maintained and preserved. The “efficacy of the divine voice” implies the efficient cause, but the creation and God’s providence are here modelled as being the initial establishment of the system of causes itself. Causality, natural process and divine command are different languages but one process, just as poetry, natural philosophy and theology are different

¹⁰⁶ God “did not merely breathe that spirit into man, but shaped it in each individual as a fundamental attribute, and separated its various faculties, making it beautiful and orderly” (*CPW* 6: 317).

¹⁰⁷ *CPW* 6: 340.

discourses that can describe the same ultimate referent. Thus the final question is whether or not the poem manages to make these models coherent in the natural philosophy of the body and the created world, and if it does, how precisely does it do so?

Chapter 2

Aristotelian Soul and some problems of monism

We have touched upon the problems of heresy that monism evoked in the seventeenth century and concede with John Rogers and Christopher Hill that the proliferation of monist models of natural philosophy were part of the ‘Vitalist Moment’ that issued an uncomfortable challenge to authoritarian structures of power, whether monarchic political models or determinist theologies. Having located Milton’s monism of body and soul within a framework of natural philosophy, we have noted that it bears the hallmarks of Aristotelian organisation of knowledge in the system of causes, the notions of vital, sensitive and rational faculties, their actions and affections, and the impelling power of ‘spirit’ in body and world. There are, however, several areas of Aristotelian orthodoxy that Milton himself modifies or even reverses. Most fundamental of these is the thesis of the non-activity of matter and the corresponding form/matter dualism. In his representation of generation we find a careful modification of the theory of education of forms, and in the *Christian Doctrine* a revision of the tradition of God as *Actus Purus* (and an associated attribution of divine origin to matter) which undoes the corresponding Christian elaboration of form/matter dualism. Milton counters and reorganises these problems in the philosophical mode of the *Art of Logic* and in the poetic mode of *Paradise Lost* in the same ways that Glisson and Harvey do, providing less detail, but also giving a theological framework that both supports and demands such a system of natural philosophy. In fact what we will see is that in the medical context Aristotelian thought offers monism a wide, flexible inheritance of thought – specifically a system of four causal modes rather than just the binary of form and matter. There is, moreover, a corpus of observational natural history and philosophy identified by Newman and Pagel within this tradition, which seems to contribute more to the burgeoning ‘scientific revolution’ of the seventeenth century than has been noted by Milton criticism.

Critics have raised a number of questions about the materiality of the human soul proposed by Milton and his use of natural philosophy to support his case. While Svendsen simply argues that Milton's natural philosophy is Aristotelian and thus dated by the standards of science in the mid seventeenth century, William B. Hunter has argued that Milton's Aristotelian world view is fundamentally conventional in its dualism of form and matter.¹⁰⁸ John Rogers, in contrast, has located in *Paradise Lost* a focus upon notions such as fermentation, thus suggesting a much more contemporary scientific influence in the politicised vitalism of the poem's natural philosophy. He does supply a refreshing corrective to the conclusions drawn by critics such as Svendsen though his description of Milton's radical vitalism requires closer examination. Interestingly, much of the argument he makes for the radical dissonance between Milton's materialism (and its political connotations) and his theology repeats, in a different register, the claims made by contemporary commentators and modern critics: that is, that living, active matter must not need – and must therefore preclude the existence of – divine power. This assumption that one 'natural' mode of operation must exclude the (divine) other is something of a tautology in that it repeats uncritically the premises of dualism – sometimes, in the case of modern critics, as they seek to celebrate Milton's monism.

It is perhaps naïve to assume that Milton is unaware of the equation made by contemporary commentators between materialist philosophy and atheism. One moment in the *Christian Doctrine* in which he makes the equation between natural and divine causality is in his direct defence of traducianism. Indeed Milton deals directly with such a possible dissonance in a passage in which, despite the powerfully argued rejection of Creationist theories of ensoulment, he concludes his discussion with a series of references to various biblical texts which state that it is God who forms the human in the womb. In one of his most eloquent interpretations he asserts that God “did not merely breathe that spirit into man, but shaped it in each individual as a fundamental attribute, and separated its various faculties, making it beautiful and orderly, Zech xii. 1: *forming the spirit of man within him.*”¹⁰⁹ This interpretation of biblical text is rich in the language of the body offered by contemporary natural philosophy, but it simultaneously

¹⁰⁸ William B. Hunter, 'Milton's Power of Matter', *Journal of the History of Ideas* 13. 4 (1952), 551-562.

¹⁰⁹ *CPW* 6: 317. Other passages noted are: Job 10: 8-10; Psalms 33: 15; Isaiah 44: 24. Fundamental attributes can be defined as “The fundamental and permanent properties of substance, so-called by logicians in contradistinction to accidents, which are modifications representing circumstantial properties only” (<http://www.jewishencyclopedia.com/view.jsp?letter=A&artid=2101> [30.12.08]).

insists on the creative agency of divinity. Divine action upon the human faculties mirrors the divine action upon the abyss of chaos, which is also made beautiful and orderly through a process of separation at the Creation in Milton's defence of original matter in the *Christian Doctrine*.¹¹⁰ It is clear that for Milton divine agency *does* harmonise with a material soul, generated ex traduce, but the question remains of how this harmony might work.

Shortly after describing the coincident action of divine and natural causes in foetal development Milton directly deals with this dissonance, noting that "it does not follow from these passages that natural causes have not in each case made their usual contribution towards the propagation of the body."¹¹¹ This is a direct claim that the natural and the divine act causally within the same phenomenon; it cannot be a binary set of causes because to the 'natural' is attributed a plurality of causes. This process is presented in an Aristotelian framework, thus requiring four modes of causation: efficient, final, formal and material. Multiple causal modes change the very terms of the body/soul debate. Despite Milton's rejection of the Trinity as three beings in one, the notion of God (who is in Christian Aristotelian terms, a First Cause) having multiple modes of operation was also deeply familiar and theologically satisfactory to many. I suggest that the plurality of causal mode in Aristotelian tradition helps to deconstruct the binary logic of dualism. We need not reject out of hand, therefore, the traditional comments made by critics such as Svensen who emphasise the Aristotelian character of Milton's natural philosophy. We need rather to read *how* this multiple causality works in order, finally, to assess how the Aristotelian heritage might support contemporary radical medical enquiry.

i. Hylomorphism

To think in terms of multiple causes is not necessarily materialistic or monistic, but it gives a way of breaking the binary order of form and matter fundamental to

¹¹⁰ CPW 6: 308. Creation as chymical separation was a matter of much enthusiasm for the more mystical cabalists and chymical experimenters such as Robert Fludd. See Norma Emerton, 'Creation in the thought of J. B. Van Helmon and Robert Fludd' in *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*, ed. P. Rattansi and A. Clericuzio, (London: Kluwer, 1994).

¹¹¹ CPW 6: 323.

dualism and makes possible the coincidence of God's orthodox commandment and a responsive, active material actuality. When Milton rests his traducianism (and thus part of his theodicy) on the "strong argument" that "the soul is wholly contained in all the body and wholly in any given part of that body" it is clear that 'soul' itself is envisaged as working in more than one ontological mode, but this is also one of the moments in which he most clearly aligns his thinking in an Aristotelian tradition.¹¹² This tradition itself poses a problem to monist vitalism, for as we have noted, much of the Aristotelian inheritance is marked by a distinct dualism. Moreover, as Fallon observes, "Christian Aristotelians followed Aquinas in excluding the production of the soul from the power of matter".¹¹³ Milton is quite clear about his monist stance; indeed the radical vitalism that Rogers attributes to Milton's natural philosophy relies upon monism for consistency. It is inescapable, however, that as we saw in the last chapter, Milton insists on a coincidence between the "system of causes" – clearly an Aristotelian reference – which is "too often called Nature" with "the wonderful power and efficacy of the divine voice which went forth in the beginning." Indeed, he posits that the one cannot mean anything but the other.¹¹⁴ In this equation natural causes are identified with the First Cause of divinity and clearly placed in an Aristotelian structure.

Therefore we need to know first how Milton's vitalist monism can be coherent in an Aristotelian framework and then whether that vitalism is coherent in relation to his theology, or whether rather the one contradicts the other. The philosophical Aristotelian formulation of the soul as *anima* which acts upon the passive stuff of matter on the face of it leaves us with dualism of form (the primary precondition for functional existence and life) and matter (the secondary precondition giving potential for existence, or what the mechanists would call extension). Pagel summarises the dualism of Aristotle's *De Anima* to conclude:

Owing to its material composition and organisation a natural object contains life and function – *potentially*. It may attain *reality* by the action of the *anima*, evidently a functional impulse which 'perfects'

¹¹² CPW 6: 321-2.

¹¹³ Fallon, *Milton Among the Philosophers*, 99.

¹¹⁴ A similar point is made in Leibniz's argument against occasionalism (that is, God's direct causal intervention in every movement or event) when he states in *Theodicy* that "the law set up by God does in fact leave some vestige of him expressed in things... things have been so formed by the command that they are made capable of fulfilling the will of him who commanded them... [T]here must be residing in things a form or force... from which a series of phenomena follow according to the prescription of the first command" (R. S. Woolhouse, *Descartes, Spinoza, Leibniz: The Concept of Substance in Seventeenth-century Metaphysics* (London: Routledge, 1993), 147. Leibniz offers a mechanical solution, however, where Milton's will draw on chymical theories of substance to articulate substance vitalism.

the body by enabling it to step out into reality. The *anima* indicates for instance a plan inherent in the form and function of a vital organ such as the eye. It is not, however, a material body such as the heart.¹¹⁵

The definition of form as precondition for life may or may not work in a metaphysical study, but it takes some peculiar twisting to fit it to evidence of procreation in the medical arena. In Aristotelian theories of animation, the fluidity of the semen is ignored; it represents “pure form.” The female contribution of menstrual blood is the corresponding “pure matter,” and the formative sperm acts upon the matter of the blood in the womb to create the foetal heart. The semen can act in this way because it contains *pneuma*; it is “a pneumatic substance – full of life-giving spirit and it is the final most potent product of the blood’s concoction”.¹¹⁶ There is a mismatch between soul-as-form and soul-as-vital-heat here, and Fallon traces this fracture to a conflict in the vast Aristotelian corpus inherited by the seventeenth century.

Fallon differentiates Aristotelianhylomorphism (that is, the soul-as-first-act, or form as precondition for animate life) from Milton’s materialism: “the soul for Milton is a substantial, corporeal entity, not an abstract combination of the shape, internal organisation, or faculties of the body.”¹¹⁷ Clearly marking Aristotle’s equivocation on the bodily status of the soul, Fallon quotes from *De Anima*, where the soul is: “a ratio or formulable essence, not a matter or subject... the soul cannot be without a body, while it cannot be a body; it is not a body but something relative to a body.”¹¹⁸ This soul as abstract three dimensional plan recalls Pagel’s definition, but Fallon finds a more materialist version of ‘soul’ in his quotation from his *De generatione animalium*. Here, as he points out, soul is some sort of intermediate substance between the ethereal and the bodily:

Now as far as we can see, the faculty of Soul of every kind has to do with some physical substance which is different from the so-called ‘elements’ and more divine than they are; and as the varieties of Soul differ from one another in the scale of value, so do various substances concerned with them differ in their nature. In all cases the semen contains that within itself that which causes it to be fertile,... the *pneuma* which is enclosed within the semen or foam-like stuff, and the

¹¹⁵ Pagel, ‘Reaction to Aristotle’, 500.

¹¹⁶ William Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature*, (London: University of Chicago Press, 2004), 169-70. Newman cites Aristotle, *De Generatione Animalium*.

¹¹⁷ Fallon, *Milton Among the Philosophers*, 100.

¹¹⁸ Fallon, *Milton Among the Philosophers*, 100.

natural substance which is in the pneuma; and this substance is analogous to the element which belongs to the stars.¹¹⁹

This was and still is a much-quoted passage from Aristotle. Harvey makes use of it in his own *De generatione animalium*, as he speculates on the power of bodies to generate young. We can thus see, even having looked only briefly at the different definitions of ‘soul’ in the Aristotelian tradition, that the label ‘Aristotelian’ is insufficient in a detailed discussion of Milton’s natural philosophy. It is, I argue, the tendency to treat Milton’s Aristotelian heritage as univocal, rather than heterogeneous and often contradictory, ignoring the ideological forces at play and accepting the rejections of its contemporary detractors, which can lead to a reduction or dismissal of Aristotelian thought.

In the medical usage of the notion of soul there is a model of soul-as-form, but the notions of pneuma or vital heat may also signify animation. Moreover, the stubbornly amorphous materiality of bodily fluids disrupts the sort of relation of form (anima) to matter that Hunter claims is adopted by Milton in his approach to natural philosophy. In a dualist philosophy, the ‘power of matter’ is almost an oxymoron, for that ‘power’ is pure potentiality, the passive part of a system whereby “the formal element represents the activity or actuality of each entity; the material element is passive, with a characteristic capacity for being formed.”¹²⁰ Hunter appreciates the heretical audacity that Milton shows in insisting that the human soul is, like other forms, “produced from the potency of matter.” He opens his discussion by insisting that this power of matter cannot be thought of as the material cause, and continues it by arguing that the power of matter to which Milton refers is straight Aristotelian *potentia materiae* (the inert creative potential of substance as opposed to the active creative agency of form) and is consistent with an orthodox, scholastic Aristotelian dualism.¹²¹ He touches on Milton’s use of various traditions in a single footnote that concedes a departure from Aristotelian orthodoxy, stating that in the *Art of Logic* “in one important passage he seems to use the Platonic conception: ‘the efficient produces the form not yet existing and induces it into the matter’” and suggesting that he may be “trying to reconcile the two systems.”¹²² What undermines his argument for Milton’s orthodox Aristotelianism is that he does not acknowledge the direct explanation given in that very paragraph of

¹¹⁹ Fallon, *Milton Among the Philosophers*, 101. Fallon takes this from Aristotle, *Generatione Animalium*.

¹²⁰ Hunter, ‘Milton’s Power of Matter’, 552.

¹²¹ Hunter, ‘Milton’s Power of Matter’, 552.

¹²² Hunter, ‘Milton’s Power of Matter’, 553.

how the definition of form “combines the Platonic and the Aristotelian.”¹²³ Milton is evidently quite comfortable with revising received notions of form and matter, and as will become clear, he does so in much more radical ways than this.

Michael Lieb, in contrast to Hunter, points to precisely this quotation in his exploration of the dichotomy of matter and form in Milton’s work (specifically in the *Art of Logic*). His study has more breadth than that of Hunter, and he argues convincingly that Milton does as he says: uses motifs of thought both Platonic and Aristotelian. However, his chapter, ‘The Metaphysics of Form’, lacks a sense of Milton’s progression; comparing work from the 1630s with that of the 1660s it thus attempts, but never quite achieves, a delineation of how transcendent soul and immanent soul are reconciled. Lieb draws most of his examples of anti-Aristotelian thought or Platonic imagery of body and soul from Milton’s earliest work, such as the *Prolusions* and the *Masque*, without positing a development of thought between this early work and that which is the focus of this study and came decades later.¹²⁴ He claims that:

[Milton’s] ontology never loses sight of the material continuity uniting all phenomena, even while it is insisting upon such dichotomies as body-spirit, external-internal, visible-invisible, corporeal-incorporeal. The result is to give credence to those dichotomies by maintaining that in fact they do not exist... Even as body becomes spirit, internal external, visible invisible, corporeal incorporeal, a continuity underlies that movement so categorically that the transcendent, the *per quam*, takes on a meaning it would never otherwise have, a reality that language could never bestow upon it.¹²⁵

This concluding summary of his study of Milton’s employment of the notion of form mystifies as much as it enlightens. We know that the Lady of *Comus* may rarefy her corporeal body by focusing her mind upon heavenly things, or ‘imbrute’ her soul by concern with physical satisfaction, but precisely how this Platonised version of the transcendent human soul can be made to harmonise with the later assertions of Aristotelian immanence of form (in particular the statement that the human soul is a material form) is not made clear. I would argue that it is in Milton’s late, great works

¹²³ CPW 8: 232.

¹²⁴ Nevertheless, Lieb gives an illuminating account of the Aristotelian and Platonic ontological motifs employed by Milton in a variety of his works. In contrast, Fallon’s *Milton Among the Philosophers* makes a clear argument for the evolution of Milton’s thought away from Platonist transcendentalism in his early work and towards a profound materialism in his late work.

¹²⁵ Lieb, *Sinews of Ulysses*, 20.

and particularly in *Paradise Lost* that immanence and transcendence finally cohere into a system in which the natural philosophy of the body-soul composite supports a theodicy based on free-will. In Lieb's statement the question remains: what constitutes that 'continuity' between categories still structured as binary opposites? The possibility stands that it is something very like Glisson's underlying "natural perception," with its carefully worked out relationship to the various grades of matter that constantly metamorphose into new individuations. With reference to Raphael's "one first matter all" speech, Lieb notes that "material refinement from "body" to "spirit" constitutes not a dichotomy but a progression."¹²⁶ This does describe the dynamic scale of nature proposed by Raphael, but leaves open the nature of the dynamism itself, not answering the questions of how Milton might resolve contemporary debates about ideas of substance, matter, form and causality, or whether there is an overall coherence to the various traditions used, although he observes that various traditions are evident. I suggest, therefore, a closer examination of the particular problems of posing a monist natural philosophy within an Aristotelian paradigm and I propose that Milton's adjustments to the system of causes that he inherited are matched by those of developing contemporary medicine.

ii. The other tradition

It is clear that the conventional scholastic theories of matter and form were becoming increasingly unsatisfactory in the latter half of the seventeenth century. Hunter sketches out various objections made in particular to the scholastic theories of the productive interactions of form and matter, noting the sceptical enquiries of Daniel Sennert, Robert Boyle and Joseph Glanville. A particularly colourful and scathing critique is that made by Glanville, who states "all that can be made of this *power* of the *matter*, is merely a *receptive capacity*: and we may as well affirm, that the world was *educ'd* out of the *power* of the *imaginary space*; and give that as a sufficient account of its Original. And in this language to grow rich were to *educ*e money out of the *power* of the Pocket."¹²⁷ Packed into Glanville's statement is a web of different contexts which relate to causality and production. Interiority of the imaginary space, myths of origin

¹²⁶ Lieb, *Sinews of Ulysses*, 19.

¹²⁷ Glanville quoted in Hunter, 'Milton's Power of Matter', 556.

and, of course, fiscal economy were all contexts in which scholastic logic was clearly becoming inadequate. The classic Aristotelian precept that a form educes further forms out of matter could not answer the insistent empiricist and sensualist questions that demanded a proof of *how* a process worked.

If we are to look for the most convincing debunking of Aristotelian natural philosophy, we need to turn to Robert Boyle, a man now treated as a founder of modern scientific method. Boyle's mechanist perspective on matter is that it must be understood in terms of a binary relationship with motion:

The matter existing in the entire universe is thus one and the same, and is always recognised as matter simply in virtue of its being extended. All the properties which we clearly perceive in it are reducible to its divisibility and consequent mobility in respect of its parts, and its resulting capacity to be affected in all the ways which we perceive as being derivable from the movement of the parts.¹²⁸

This notion of extended matter in motion formed the basis of atomist philosophy and has been celebrated as part of the 'scientific revolution'; much contemporary debate concerned the motive force or cause of motion in matter and the relation of that motive force to God. The escape from scholastic formulae seems to have been exhilarating, and adherence to Aristotelian orthodoxy is described by Glanville as a positive stumbling block to the furtherance of knowledge,

Knowledge is capable of far greater Heights and Improvements... than it hath yet attain'd; and there is nothing that hath stinted its Growth and hindered its Improvements more, than an over-fond, superstitious opinion of Aristotle, and the Ancients, by which it is presumed that... little or nothing can be added to their discoveries: so hereby a stop hath been put upon Inquiry, and men have contented themselves with studying their Writings, and disputing about their Opinions, while they have not taken much notice of the great Book of Nature.¹²⁹

There is here, however, a clue to the inadequacy of the critical tradition that writes off Milton's natural philosophy as 'Aristotelian', for there is in fact a significant contemporary practice of study of the 'Book of Nature' that is still within the Aristotelian paradigm. Pagel makes it clear that Glanville and other dualist adherents to

¹²⁸ Boyle quoted in Woolhouse, *The Concept of Substance*, 87. The quotation is taken from *The Origin of Forms and Qualities* (1666).

¹²⁹ Glanvill quoted in Pagel, 'Reaction to Aristotle', 496.

the new mechanical philosophy of Descartes were reacting violently against the ‘tyranny of the Stagirite’ and, indeed, that it can seem that “antagonism to Aristotelian philosophy appears as the common denominator of all the varied motives, currents and trends of thought which made for the advancement of modern science in the seventeenth century.”¹³⁰ The exception to this shift of perspective, however, was in the area of biological, and specifically medical, research.

Boyle himself divides the Aristotelian heritage into two comparable categories, commenting in his *Origins of Forms and Qualities* of 1666:

I here declare once for all, that where... I do indefinitely depreciate *Aristotle’s* doctrine, I would be understood to speak of his physicks, or rather the speculative part of them (for his historical writings concerning animals I much esteem) nor do I say that even these may not have their use among scholars, and even in universities, if they be retained and studied with due cautions and limitations.¹³¹

This differentiation, which sections off Aristotle’s observational work on the natural world, is significant. It illustrates Pagel’s point again, that the biological inheritance of Aristotelian thought, that which dealt with the ‘Book of Nature’, was of more value to seventeenth-century scientific development than were the other areas of his philosophy. Harvey, now hailed as the father of modern physiology, declared: “the authority of Aristotle has always such weight with me that I never think of differing from him inconsiderately.”¹³² Likewise, Francis Glisson’s work shows a genuine respect for the ‘ancients’ and ongoing attempts to correlate new evidence with old theories. In determining a debate for his students at Cambridge he declares: “It is an old saying that the truth is the daughter of time. In the last centuries, the principles of the medical art found out and openly demonstrated many phenomena of great importance and unknown to the ancients.” Nevertheless, his tone is polite and conciliatory as he continues:

I think it is better to rest upon demonstrated principles than on the mere authority of someone. For this reason, in the determination of the present *quaestio*, I am not so much concerned with the authority of the ancients as with the truth of the thing, for the determination of such a *quaestio* depends on the circulation of the blood, the distribution of the lacteals, and other anatomical findings which were totally

¹³⁰ Pagel, ‘Reaction to Aristotle’, 498.

¹³¹ Boyle quoted in Rose-Mary Sargent, *The Diffident Naturalist: Robert Boyle and the Philosophy of Experiment* (London: University of Chicago Press, 1995), 25.

¹³² Harvey, *Works*, 207. Nevertheless, Harvey and those following him do differ from Aristotle when they settle upon the blood as the primary ‘seat of life’ rather than the Aristotelian heart.

unknown to the ancients. There is no doubt that if Hippocrates and even Galen, or any other honest physician of the old times had lived now and had seen the things discovered in this age, they would have reconsidered their opinions in many respects.¹³³

This shows a distinctly different relationship with the classical heritage to that shown by Glanville. Giglioni characterises Glisson's work as a mediation between Aristotelian structure and radical contemporary chymical innovation:

Like Harvey, Glisson was Aristotelian to the core, but unlike Harvey he was not suspicious of new scientific trends such as chemistry. Whereas Harvey is reported to have been extremely diffident toward all chemical neoterics, Glisson showed interest on many occasions in the chemical philosophy both for its theoretical implications and for its practical and therapeutic uses¹³⁴

This use of chymical research, particularly that of the famous chymical philosopher and physician Jean Baptiste Van Helmont, was one element of Glisson's thought that allowed him to theorise a much more systematic theory of vitalism than that found in Harvey's various flirtations with the notion. Glisson's method of writing is often scholastic in character, with evidence carefully schematised and logically weighed (indeed his original training was in classics), but his research was undoubtedly experimental; a membrane of the liver he discovered and recorded retains the name 'Glisson's capsule' today.¹³⁵ Despite, or perhaps as part of his conciliatory approach, he used chymical experiment and theory to revise in particular the Aristotelian premise of form as precondition for life.

Glisson was far from being the only medical professional to attempt an amalgamation of such antagonistic bodies of knowledge; one precedent had been set earlier in the century by Daniel Sennert. In his study of the cross-fertilisation of ideas between seventeenth-century atomism and alchemy, William Newman notes that Sennert's medicine and natural philosophy draw heavily on Aristotelian thought, and that "this tradition was highly Aristotelian in character, and yet it reflected a type of Aristotelianism that finds little or no representation in modern histories of

¹³³ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 106-7. Giglioni cites MS Sloane 3310, f. 291r.

¹³⁴ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 123.

¹³⁵ R. Milnes Walker, 'Francis Glisson and His Capsule', *Annals of the Royal College of Surgeons of England* 38 (1966), 71-91.

philosophy”.¹³⁶ This tradition, central also to medieval alchemists, “was not the highly abstract, even metaphysical natural philosophy of Aristotle’s *Metaphysics* and *De caelo*, but instead the more empirically oriented parts of the Stagirite’s corpus, such as the *Meteorology* and certain portions of *De generatione et corruptione*”.¹³⁷ From the work of figures such as Boyle and Glisson, we could add the influence of *De generatione animalium* to this other tradition. Tellingly, throughout his study of the development of Glisson’s hylozoistic philosophy of *biouisia*, or the living nature of substance, Giglioli refers to these latter sections of the Aristotelian corpus repeatedly, much more often than to any other sections of his work. This tradition, with its focus upon the transformation of substance, found that Aristotelian thought could support soul as vital heat and movement as easily as it proposed soul as form.

So we have a number of claims made about the ‘science’ of *Paradise Lost*: Svendsen claims that Milton’s ‘science’ is backward and Aristotelian, just as Hunter contends that matter, as in orthodox Aristotelian philosophy, is receptive but not active or vital in Milton’s natural philosophy. Both of these positions would preclude the vital body-soul composites, generated *ex traduce*, that Milton proposes but neither seems to explore in any detail the heterogeneity of the Aristotelian inheritance of the seventeenth century. Fallon’s comments on Milton’s vitalism are extensive and illuminating, but do not explore the Aristotelian natural philosophy that underpins it. Lieb does, but he does not find a system of linkage between the transcendent and the immanent ‘soul’. In the next section I will consider first the use to which Milton puts his Aristotelian heritage, exploring some of the revisions he has made to Aristotelian orthodoxy and comparing them to contemporary medical innovations. Even though direct influence is impossible to prove, it is clear that Milton shares some highly idiosyncratic revisions of Aristotelian orthodoxy with contemporary medical researchers and he does so in a way that harmonises with the demands made by his theodicy.

¹³⁶ Newman, *Atoms and Alchemy*, 24.

¹³⁷ Newman, *Atoms and Alchemy*, 25.

iii. Milton's Aristotle: the problem of form and matter

The dualism of form and matter is an essential feature of Aristotelian thought. This dichotomy informs the history of philosophy inherited by Milton and, as a fundamental tool of dualist thinking, must be accounted for if his monism is to be coherent. It is pertinent to the body/soul problem faced by Milton and is also of direct significance to his representation of Creation because it orders the classical theory of the cause of life in conception which preceded and was reformulated by Harvey's *De generatione animalium*, and the work of Glisson after him. When Milton claims that "nearly everyone agrees that all form – and the human soul is a kind of a form – is produced by the power of matter," Fallon notes that he is displaying a disingenuous simplicity, for the fact is that while forms *per se* were conceived of as material, or rather while the coincident categories of form and matter were given by Aristotelian orthodoxy as divisible only by intellectual abstraction, the human soul was consistently conceived of as the exception to this rule.¹³⁸ Moreover, Milton follows this statement with the striking assertion that

I do not see why anyone should make the human soul into an anomaly. For, as I have shown above, God breathed the breath of life into other living things besides man, and when he had breathed it, he mixed it with matter in a very fundamental way, so that the human form, like all other forms, should be propagated and produced as a result of that power which God had implanted in matter.¹³⁹

The demand that the human soul should not be treated as an anomaly in an ensouled world works to deny the specificity of the rational *nous*, but the first question that emerges from this statement is that of the 'power which God had implanted in matter'. What is this power? Milton's formulation proposes that God breathes the breath of life then mixes it with matter in such a way that new forms can then be produced by the power of that matter. This power of matter must contain a force which allows his creatures, as enjoined by God, to 'go forth and multiply', and Milton clearly represents this matter as being able to produce bodily form and the rational soul. It can propagate and produce form, and from thence the faculty of abstract thought. To endow matter with force is problematic in Aristotelian terms. Emphasising the innovative character of

¹³⁸ CPW 6: 322; Fallon, *Milton Among the Philosophers*, 99.

¹³⁹ CPW 6: 325.

Glisson's comparable philosophical manoeuvre, Giglioni states, "According to Aristotle, the soul (and consequently life) can belong only to an organic body, that is, a body morphologically differentiated and capable of being used as an instrument (*organon*)".¹⁴⁰ The contemporary discourse that offers a model of productive spirit and matter is that of medical research, particularly that on generation.

In orthodox medical discourse, as elsewhere, the form/matter binary opposition is thoroughly gendered; vital spirit and perfection of form are associated with masculinity, whilst inert matter and vegetative spirit are ascribed to the female. In Aristotelian thought the matter (the supposed contribution of the female in reproduction) is not capable of activity; life does not inhere in matter, only in form. As we have seen Hunter argue, the potential of matter is simply its suitability for being formed; the possibility is there that a masculine, spiritual form with abstract and active existence will educe more forms out of it. Balme discusses this issue at some length, noting that in *On the generation of animals* the female matter is the menstrual blood, which is "passive" and "is capable only of nourishing, so can produce growth but not articulation."¹⁴¹ In the natural philosophy of the body, the male semen is prioritised over matter, which is at most receptive, since semen provides the movements to provoke forms out of the matter, just as theological Calvinists and thinkers like Cudworth prioritise the spirit with an active and valuable ontology in comparison to the dead weight of flesh. However, as we shall see, there were distinct problems of coherence between this philosophical dualism and the experiments and evidence of the new, anatomical researches in the middle decades of the seventeenth century.

We have already noted Milton's direct statement that the human soul is generated by its parents, and this shift towards attributing equal value to both traditionally male and traditionally female contributions can also be seen in his wider natural philosophy in *Paradise Lost*. He endows the male semen with animating force, but does not conclude that the female contribution is inactive. He asks "how can the human seed, that intimate and most noble part of the body be imagined destitute and devoid of the soul of the parents", adding as a supplementary comment "at least of the

¹⁴⁰ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 56.

¹⁴¹ D. M. Balme, 'Human is Generated by Human', in *The Human Embryo: Aristotle and the Arabic and European Traditions*, ed. G. R. Dunstan (Exeter: University of Exeter Press, 1990), 20-31, 22.

father”.¹⁴² In the *Art of Logic*, his discussion of causality clearly includes both parents as causal in generation: “that which procreates or maintains is an efficient cause. Thus a father and mother procreate”; the mother’s contribution is not excluded from efficient causality, even by being labelled material cause.¹⁴³ This tendency of Milton’s to include both the paternal (traditionally spirit/form) and the maternal (traditionally matter) as part of the primary order of cause in both logic and doctrine is elaborated in Adam and Raphael’s discussion of cosmology in *Paradise Lost*. The angel makes it quite clear that at the meeting point of myth and natural history, the masculine sun and the feminine moon provide “male and female light / Which two great sexes animate the world” (*PL* 8. 150-1). The implication of ‘female light’ adds to the mode of Creation whereby for Milton God impels both spirit and matter, providing both male and female elements of conception, recalling the “coefficient beam” of the invocation to light, and continuing to collapse the gendered binary oppositions of Renaissance and classical natural philosophy, which so often prioritise the male and denigrate the female.¹⁴⁴ Moreover, this comment is situated in an exchange that gives considerable detail in terms of natural philosophy and its relationship to theology.

Adam takes the opportunity of conversing with an ‘intelligence of heaven’ to restate Eve’s earlier question concerning the contemporary issue of geocentric and heliocentric models of the universe, but where Eve had simply asked for what or whom the stars shine, Adam weighs the question down with value judgements.¹⁴⁵ He asks why the insignificant earth should receive light from such a glorious display of stars, and:

How nature wise and frugal could commit
Such disproportions, with superfluous hand
So many noble bodies to create,
Greater so manifold to this one use,
For aught appears, and on their orbs impose

¹⁴² *CPW* 6: 321-2. Aristotle, in contrast, simply states that “the man who has deliberated is the cause, the father is the cause of the child” (*Physics*, 2: 3, 194b, 29-32). Attribution of vital force to the ‘seed’ of both parents is a Galenic rather than Aristotelian notion.

¹⁴³ *CPW* 8: 223.

¹⁴⁴ We should also take into consideration the ongoing shifting of gender categories in the natural philosophy of *Paradise Lost*: for example at the Creation, although the sun, once created is referred to in the masculine (*PL* 7. 370), the light that the ‘darksome’ though ethereal mould of the sun itself absorbs is referred to in the feminine, in fact the light is “Transplanted from her cloudy shrine, and placed / In the sun’s orb, made porous to receive / And drink the liquid light, firm to retain / Her gathered beams, great palace now of light” (*PL* 7. 360-3).

¹⁴⁵ Eve asked “wherefore all night long shine these, for whom / This glorious sight, when sleep hath shut all eyes?” (*PL* 5. 657-8). Satan also exploits this question in his attempt to seduce Eve in her dream when he characterises the moon and stars as shining “in vain / If none regard; heaven wakes with all his eyes, / Whom to behold but thee” (*PL* 5. 43-45).

Such restless revolution day by day
 Repeated, while the sedentary earth,
 That better might with far less compass move,
 Served by more noble than herself, attains
 Her end without least motion, and receives
 As tribute such a sumless journey brought
 Of incorporeal speed, her warmth and light;
 Speed, to describe whose swiftness number fails.
 (PL 8. 26-38)

Stating that such notions were repeatedly found in “traditional cosmologies” and citing Caxton, La Primaudaye and Lodge among others, Svendsen cites this as an example of Milton’s reliance on the encyclopaedic tradition, part of his use of “widely known conventional material in its conventional associations”.¹⁴⁶ Svendsen has, however, neglected his own appeal to Milton’s words in the *First Defence*, where “he warns that ‘we must not regard the poet’s words as his own, but consider who it is that speaks’”.¹⁴⁷ Despite his wonder, Adam has just made a mistake of evaluation, which is a mistake both of theology and of natural philosophy, and Raphael corrects him swiftly. The primary error is theological: Adam should not assume that “bodies bright and greater should not serve / The less not bright, nor heaven such journeys run” (PL 8. 87-88). The ‘journeys’, so fast that one cannot compute their speed, are echoed in Raphael’s answer when he suggests that “me thou thinkst not slow, / Who since the morning hour set out from heaven / Where God resides, and ere midday arrived / In Eden, distance inexpressible / By numbers that have name” (PL 8. 110-114). By Adam’s own logic, the great, bright angel should not have to bother with ministering to his human charges; indeed, by extending this logic one could argue that God should not have to serve his creations although the miracle of redemption to be offered to Adam and Eve will rely precisely on the Son’s willingness to do so. It is in fact Satan who groans over the possibility of the more noble serving the less so when he says of Adam, “oh indignity! / Subjected to his service angel wings, / And flaming ministers to watch and tend / Their earthy charge” (PL 9. 154-157). This is a clear alignment of a dualist model of spirit and body with satanic confusions between power and value.

Milton’s theology and his natural philosophy match perfectly here. The mistake of natural philosophy is intrinsically linked to that of theology and concerns the

¹⁴⁶ Svendsen, *Milton and Science*, 40.

¹⁴⁷ Svendsen, *Milton and Science*, 4.

properties and virtues Adam has ascribed to the bodies of the cosmos, in particular that of matter. Raphael asks Adam to

consider first, that great
Or bright infers not excellence: the earth
Though, in comparison of heaven, so small,
Nor glistening, may of solid good contain
More plenty than the sun that barren shines,
Whose virtue on itself works no effect,
But in the fruitful earth; there first received
His beams, unactive else, their vigour find.
(*PL* 8. 90-97)

Adam is cautioned not to be impressed by brightness with the warning word ‘glistening’. Without the despised earth the glorious sun can *do* nothing, it is ‘barren’ and ‘unactive’. Moreover, the earth may even contain *more* good than the sunlight. The key to generation is reciprocity, thus it is the earth’s material fertility that enables the sunlight to engender life.¹⁴⁸ Satan too notes this process, while making a mistake of theology similar to that of Adam. Gazing at the effect of light on earth he soliloquises to the earth herself that the light is

Light above light, for thee alone, as seems,
In thee concentrating all their precious beams
Of sacred influence: as God in heaven
Is centre, yet extends to all, so thou
Centring receiv’st from all those orbs; in thee
Not in themselves, all their known virtue appears
Productive in herb, plant, and nobler birth
Of creatures animate with gradual life
Of growth, sense, reason, all summed up in man.
(*PL*, 9. 105-113)

Satan, despite his vitriolic outbursts about earthy humanity, shares Raphael’s angelic fascination with the visible world that God has created, the slow transformations of material form that ascend out of water, earth and light, from plant up to rational spirit. This is not to say that he (or Raphael) understands it fully. Like Adam, Satan has missed

¹⁴⁸ Marjara’s wide-ranging study of science and Milton’s representation of the stars and the sun in *Paradise Lost* explores this sequence as part of the highly topical contemporary debate between newer heliocentric, Copernican models of the universe and older Ptolemaic, geocentric ones. While the breadth of information is extremely valuable, his actual analysis gets caught in trying to prove Milton as “biased towards [right, good, modern] Copernicanism”; he declares Raphael’s answer as posing “The basic question... [of] whether or not the solid earth, both in itself and by virtue of its being inhabited by man, contains anything ‘of solid good’” (Harinda Singh Marjara, *Contemplation of Created Things: Science in Paradise Lost*, [University of Toronto Press: London, 1992], 137). In fact the sun is clearly “barren” without the earth, which contains “more” plenteous good.

the fundamental quality of loving humility that characterises spiritual greatness, for this muddled theology once again refuses God's divine position as Creator, comparing God's centrality to the earth's cosmic position (as it would be in the Ptolemaic system at least). Satan thereby misses the difference between the creation's blessing of receiving life and God's position as source and origin of life, which extends glory outwards to his creation, or such portions of it that will accept and revel in it. Satan articulates this confusion about the origin of life in his own claim that the angels are 'self begot' and the muddle of values between what creates and what is created is restated in the temptation scene, in which Eve herself is proposed as divine. The intrinsic theological significance of the contemporary debates on the causes of motion or being is laid bare in the struggles of men and angels to understand the worlds they live in. To underestimate the value or power of matter is a mistake in terms both of natural philosophy and of theology.

The sun can only act in relation to the fertile good of the material earth; there is also another layer of significant natural philosophy in Milton's representation of the sun. It is a popular Renaissance figuration of divine power, and while it has here in Milton's poem neither the direct identity with divinity bestowed upon it by radicals such as Overton, nor the uncritical association made by Neoplatonists such as Ficino, the analogy is potent and complex.¹⁴⁹ Endowed by Aristotle with the power to emit heat that is analogous to the generative heat contained by semen, (as opposed to the normal heat of a fire), the sun occupies a unique position in Aristotelian natural philosophy.¹⁵⁰ Milton's sun, often characterised as working to fertilise earth or matter on the edge of chaos, is obviously Aristotelian in this sense, but the natural philosophy of the poem reduces the ontological dominance of the traditionally masculine formative heat of the sun in relation to both 'female light' of the moon and the 'solid good' of the earth, bringing a sense of multiple rather than binary causality to the generative components of the cosmos.¹⁵¹ Moreover, during Satan's visit to the sun we are given a more detailed representation of solar power altogether; one in which a basically Aristotelian paradigm is revised in the light of chymical theories of dynamism. Characteristically, the poet

¹⁴⁹ Overton, *Mans Mortalitie* (London, 1644); see Nicholas McDowell, 'Ideas of Creation in the Writings of Richard Overton the Leveller and *Paradise Lost*', *Journal of the History of Ideas* 66. 1 (2005), 59-78.

On Ficino, *De Sole* (1494) see Dilwyn Knox, 'Ficino and Copernicus' in *Marsilio Ficino: His Theology, His Philosophy, His Legacy*, ed. M. J. B. Allen and V. Rees (Leiden: Brill, 2002), 399-418. 406-10.

¹⁵⁰ Gad Freudenthal, *Aristotle's Theory of Material Substance: Heat and Pneuma, Form and Soul* (Oxford: Clarendon, 1999), 116.

¹⁵¹ See *PL* 6. 478-81; *PL* 2. 1034-39.

refuses to give a definitive answer to the contemporary question of whether the sun moves the stars or they move themselves; the stars either propel themselves to

Turn swift their various motions, or are turned
By his magnetic beam, that gently warms
The universe, and to each inward part
With gentle penetration, though unseen,
Shoots invisible virtue even to the deep.
(*PL* 3. 582-6)

Marjara cites Kepler, Gilbert and Boyle in his analysis of this relation between sun and stars, arguing that it encapsulates the Aristotelian “notion of celestial influences, but also... the necessity felt in the seventeenth century to find a more satisfactory physics for the motions of the heavenly bodies.”¹⁵² The revision, of course, is in the ‘magnetic’ nature of the sun’s beam, as well as in the attribution to the sun of alchemical activity. The radiant sphere of mineral purity and plenitude that Satan encounters has rivers of potable gold and the atmosphere is of “elixir pure.” The sun is the “arch-chemic sun” and the philosopher’s stone or something very like it (despite the dry comment that it is rather more often imagined than seen on earth) can be found in abundance (*PL*, 3. 591-612). It is nevertheless worth noting in the wake of Raphael’s lesson, that on the sun the gems blaze and the gold might be potable gold, but the glorious, sensuous fertility of paradise and heaven are lacking. Nothing matches the “ambrosial fruit / Of vegetable gold” of the Tree of Life, for example.¹⁵³ There is here a delicate interrelation of a natural philosophy that validates the material with a theology that prioritises humility, loving angelic service and Christ’s (and therefore human) incarnation. That natural philosophy is marked by its Aristotelian character, but it has been made dynamic with a re-interpretation of energy (sunlight, or planetary gravitation and movement) that comes from the alchemical evidence of active materials. This integrative natural philosophy of the cosmos is also found in the integrative medical theories that respected both the Aristotelian heritage and the new, chymical experimentalism.

¹⁵² Marjara, *Contemplation of Created Things*, 124. On this question see in particular 123-127. Henry More had argued in the Preface to his *Immortality of the Soul* (1659) for the sun’s immaterial quality, stating that it’s mythic position as an eye, watching: “can pretend to no strength at all, unless the body of the Sun were Organical, as ours is; when as he is nothing but fluid Light: so that unless he hath a spiritual Being in him, to which this Light should be but the Vehicle, this arbitrary figuring of his fluid Matter cannot be effected. But to grant that there is any such incorporeal Substance in the Sun, is to yield me what I contend for, viz. That there are Immaterial Substances in the World.” (*Immortality of the Soul*, Preface). Again, here activity can only emerge from organic structure, mechanism or immaterial substance.

¹⁵³ In heaven the angels drink, “rubied nectar”, again endowing the mineral with a living, sensuous fruit-like quality (*PL* 5. 633).

iv. Form, matter and the animated human

The form/matter dualism of Aristotelian natural philosophy is clearly difficult to sustain in the sphere of medical evidence. The notion of semen as pure form, or as containing form cannot be supported by experience, and the vitalising function relies upon the attribution of causal force to *pneuma* or bodily spirit. But there *is* a way of reading the human body in terms of form and matter that is particular to Glisson's *anatomia animata*. In *Anatomia hepatis* Glisson does a 'notional' or theoretical analysis of the constituent parts of the body dividing them into the 'organic' and the 'similary' parts, stating that "the similary parts are only founded in the matter, and the organical in the form."¹⁵⁴ It is clear that these are terms in which the notions of form and matter were made particular to anatomy and medicine.¹⁵⁵ Drawing on Galen, Glisson identifies the organic as the structural nature of a body, an organ as we would think of it today, and the similary parts of a body to be the simplest substances of which it is made – the substance which remains if the form (organical structure) of a body is destroyed.¹⁵⁶ Similary parts would include the basic material of bone, blood, the parenchyma of the organs, the substance of the veins and arteries and nerves and so on, whereas an organic part would be the liver, the heart, even the hand itself since this has form and mechanical function. Tellingly, Glisson begins his discussion of the conceptual division of the body by explaining that although it may be usual to exclude the humours and spirits from the category of 'parts' "as not [being] animated," he will instead "take the word 'body' in a more extended sense as including whatsoever is contained in the body as serviceable to life."¹⁵⁷ Glisson therefore sets up and uses the organic/similary paradigm, deliberately relating it to the form/matter binary, but even as he does so the traditional ascription of ensoulment to the organic parts only is being traversed and

¹⁵⁴ *Anatomia hepatis*, 45. In fact Glisson devotes four chapters (Chapter 4, Of the notions of matter and form of the parts; Chapter 5, What is meant by the notions similary, dissimilary, organical, inorganical; Chapter 6: How the similary, dissimilary; organical, inorganical parts are founded; and Chapter 7: How the similary parts represent the whole matter of the parts, and the organical the form) to this discussion.

¹⁵⁵ Glisson notes various ways of 'dividing' the body conceptually: referring to Galen for the notion of situated parts, Laurentius for nourished, nourishing and impelling parts, Hippocrates for containing, contained and impelling parts and common custom for solid parts, humours and spirit he nevertheless settles on similary and organic for the purposes of his tract (*Anatomia hepatis* 25-29).

¹⁵⁶ He draws on more recent medical authorities to include the oppositions 'dissimilary' and 'inorganic' in his analysis, but discounts their practical or positive use since they are only negative oppositions to the positive descriptive terms. That is, a dissimilary part is a mixed body, such as the various (ultimately similary) metals that constitute a watch, or the various (ultimately similary) parts of a hand, the blood, bone, tendon etc. which make it up. Likewise 'inorganic' simply means without a structural form, which brings us back to similary substance. (*Anatomia hepatis* 43-47).

¹⁵⁷ *Anatomia hepatis*, 25.

modified so that bodily fluids and spirits can be treated as active and living in the way that the organic body is. The same medical version of the form/matter dichotomy orders the anatomies of *Paradise Lost*, but here again form (that is, the organic) is not prioritised in terms of being a site of animation or the site of soul.

It is a point of feminist concern that it is Eve's body, rather than Adam's which is normally subject to the gaze of natural philosophy in *Paradise Lost*. We are given a view of Eve's creation whilst Adam's remains in the mythic background; certainly, the description of his creation lacks the physical detail that characterises that of Eve. Moreover, Eve's creation is an intermediate point between Adam, the first human creation, and the generations of their descendents in that God did not breathe the peculiarly human rational soul into her. Milton is quite clear that God does this once and once only: "God made the mother of all things living out of a simple rib, without having to breathe the breath of life a second time Gen. ii. 22."¹⁵⁸ The term 'simple' in medical terms refers to similiary substance; a substance of the body that is similiary matter, which is how bone is categorised. Therefore while Eve's animation relies of course on her formation, the breath of life is replaced with the power of the already living substances of Adam's body, the "rib, with cordial spirits warm, / And life-blood streaming fresh" (*PL* 8. 466-467). In the poem this bone, blood and spirit supply sufficient animation for the formation of a new human being, including that element of the rational faculty that had been breathed in to Adam at his creation. The account in *Paradise Lost* matches the account in the *Christian Doctrine*: Eve's rational soul will emerge from the re-formed simple substances of bone, cordial spirit and life-blood: God (spirit) acts upon simple substance to produce a living, rational form.¹⁵⁹

To give a more detailed view of how the binary order of organic and similiary substance is represented in *Paradise Lost* we might think of Satan's first attempt upon Eve as she sleeps and he squats next to her ear:

Assaying by his devilish art to reach
The organs of her fancy, and with them forge
Illusions as he list, phantasms and dreams,
Or if, inspiring venom, he might taint

¹⁵⁸ *CPW* 6: 320.

¹⁵⁹ Michael Lieb observes that this creation is paralleled by the Satanic creation of Pandemonium, where the fallen "Op'nd into the Hill a spacious wound / And dig'd out ribs of Gold" (*PL* 1. 465-467); Lieb also notes that debased industrial alchemy is the mode of working whereby the "Fabricken huge / Rose like an Exhalation" (*PL*, 1. 710-711) (*Dialectics of Creation*, 243-244).

The animal spirits that from pure blood arise
 Like gentle breaths from rivers pure, thence raise
 At least distempered, discontented thoughts .
 (*PL* 4. 801-7)

Without, for the moment, looking at the mechanics of how Satan is attempting to penetrate Eve's mind/body, what is immediately clear is that Eve has mental organs – presumably parts of her brain, considering Adam's analysis of fancy and reason in their later discussion (*PL* 5. 100-121).¹⁶⁰ The animal spirit was also sometimes termed an organ; Ambrose Paré, for example, states that: "The principall Organe, or Instrument, is the Animall spirit diffused by the nerves into each severall part of the body, by which... actions are performed."¹⁶¹ One may not find the animal spirit's form in an anatomy as one would find the form of the liver, but it is nevertheless treated as a single, differentiated organ. Paré describes it in the singular; it is categorised as a causal force, and therefore analogous to the category of form. This model of the animal spirit's function follows a schema that is more indebted to ideology and dogmatic Aristotelian analysis than to the evidence gleaned from early modern experiment and anatomy; it also corresponds with the top-down model of spirit and flesh proposed by Calvinism in theological terms (which itself parallels monarchy in political terms). Proponents of the mechanical philosophy followed the earlier dualists by imagining a model where the animal spirit was elaborated out of the vital through the cooling action of the brain, only to come into fearsome conflict with the rational soul before they then moved downward through the body, controlling it.¹⁶² Nevertheless, for them, as for the vitalist physicians and Milton's Eve, spirits are plural, material and active, rather than singular and categorised as an organ. As he squats by her sleeping animate body, Satan attempts to access Eve's rational faculty through the upward transformations in the body's similiary substances. The bio-mechanics of this attempt will be the subject of a closer analysis in Chapter 6, but here we can note that Milton's model differentiates organ from spirit, referring rather to the exhaling of plural 'spirits' and, emphasising the upward rise of animal spirits from the blood towards Eve's mental organs; he represents, in short, the motion of the animated body as the upward motion modelled by medical vitalism.

¹⁶⁰ For a more detailed appraisal of Satan's attempts on Eve's animal spirits see chapter 6.

¹⁶¹ Paré, *Workes*, 24.

¹⁶² See More, *Immortality of the Soul*, 25; Charleton, *Natural History of the Passions* (London, 1674), 22; Willis, *Two Discourses*, 1-5.

Ambrose Paré had also categorised the animal spirit as an organ since it works as an instrument of the soul, but while Satan treats both organs and spirits of the blood as sites of vulnerability, there is a clear differentiation made by Milton between Eve's animal spirits and the 'organs of her fancy.' Her mental organs are treated by Satan as instruments with which he is attempting to create dreams and illusion; Karen Edwards notes the mechanistic approach made by Satan here, suggesting an organ as a musical instrument as one interpretation.¹⁶³ However, Glisson's lengthy contemporary consideration of the medical term organic as pertaining to form means that this mechanistic, instrumental attempt is also shaped by the medical notion of the organic. It also carries implications of industrial alchemy: the verbs 'assaying' and 'forging' recall the less respectable history of alchemy as a means of making weaponry and increasing productivity of corrupted alloys of silver and gold. Satan attempts to take control of Eve, to remake her thoughts with a process of industrial alchemy and forging that is both forming in a mechanical sense and implicitly fraudulent in the homonymic appeal to forgery. This process of entering her, assaying and forging, recalls the "impious hands" of Book 1, which "Rifled the bowels of their mother earth / For treasures better hid" invoked to describe the travesty of Creation that is the construction of Pandemonium (*PL* 1. 686-688).¹⁶⁴ The direct attempt to use Eve's mental organs is similar to that with which he overcomes the serpent, although one is through the mouth and the other through the ear. In terms of natural philosophy of body and soul both attempts are characterised by his use of the top down model of active intelligence and instrumental body.

We are told "in at his mouth / The devil entered, and his brutal sense, / In heart or head, possessing soon inspired / With act intelligential; but his sleep / Disturbed not." (*PL*. 9. 187-191).¹⁶⁵ This is the first representation of a body and a spirit in *Paradise Lost* which uses an Aristotelian formula of intelligential act and subjected animal consciousness uncomplicated by sublimation or other such vitalist or chymical concepts. Satan works through the animal's breath to engage in an unnatural imposition

¹⁶³ Karen Edwards, *Milton and the Natural World: Science and Poetry in Paradise Lost*, (Cambridge: Cambridge University Press, 1999), 25.

¹⁶⁴ This web of metaphoric allusions, which includes the industrial alchemy associated repeatedly with Satan and Hell, is described by Lieb as "the degenerate tradition of alchemy as a charlatan's art used to dupe others for the purposes of material aggrandisement" (*Dialectics of Creation*, 238). It is only biological sublimation of the living mind/body composite that is treated as unfallen chymical process. Also used are images of music, exhalation, and that of a brutal debasement of a maternal body similar to that which is enacted upon Sin by both Death and the hell hounds.

¹⁶⁵ Fowler notes that "in Aristotelian psychology, *act* was limited to rational agents" (*PL*, 9. 190, n. 190).

of his own intelligential faculty on to the sleeping serpent's more animalistic sensory consciousness.¹⁶⁶ This parody of God's breath of rational intellect breathed into Adam at his creation reserves control for Satan; the true rational faculty was a gift freely given by God to humanity, becoming part of the dynamic body-soul system.

Characteristically, Milton refuses to be drawn on the question of whether the heart or the head is the central location of the serpent's sensory mode of animation, although he marks the debate itself. However, what *is* made clear is that the "spirit intelligential" uses the serpent as vessel and instrument; at the temptation the poet proposes that Satan's words are made "with serpent tongue / Organic, or impulse of vocal air" (*PL*. 9. 529-530). The debate, again indicated but not resolved, is whether or not the serpent's tongue is shaped to make human speech; Milton suggests the use of the serpent's form as *organon*, but offers the option that the angel uses the air itself, using the serpent as a miming puppet.¹⁶⁷ This equivocation marks a difference from his attempt upon Eve, as the serpent's organs may not really be fit for his purpose. Eve's organs of fancy, however, give his intelligential substance a more suitable (if more resilient) set of instruments with which to create illusion.

The top-down attempt at possession, in which Satan attempts to control Eve's organic brain and thus her bodily actions, also differs from that made on the serpent in that it is supplemented by an attempt upon Eve's bodily fluids. Her thoughts may be reached through her similiary parts: her animal spirit, arising from her blood, is an alternative, if less direct route to her mental processes within her body-soul composite. Both of these aspects of Eve's ontology are 'soul': when Adam later tries to make sense of her dream, he is without doubt talking about her soul, for he begins: "in the soul / Are many lesser faculties that serve / Reason as chief; among these fancy," echoing the definition of 'soul' in the *Christian Doctrine* as various different physical and mental 'faculties', 'actions' and 'affections' (*PL* 5. 100-3). Medical theories of the body are of

¹⁶⁶ For a detailed appraisal of different levels of intellect in the Aristotelian schema see Pamela Huby, 'Soul, Life, Intellect: Some Thirteenth Century Problems' in *The Human Embryo. Aristotle and the Arabic and European Traditions*, ed. Gordon Reginald Dunstan, (Exeter: University of Exeter Press, 1990), 113-157. Huby notes that "Aristotle and his Greek followers had but one word for intellect, namely *nous*. But in medieval Latin the two words *intelligentia* and *intellectus* are in play. By and large, but not universally, *intellectus* is used of the human intellect, including the agent intellect. *Intelligentia*, on the other hand, is reserved for entities at superhuman levels: in the Aristotelian scheme these were God and the intelligences that controlled the movements of the heavens. In the Christian world angels would play a part as well" (118).

¹⁶⁷ For a full discussion of the background to this debate and its place in *Paradise Lost* see Joad Raymond, "'With the tongues of angels": Angelic Conversations in *Paradise Lost* and Seventeenth Century England', in *Angels in the Early Modern World*, ed. Peter Marshall and Alexandra Walsham (Cambridge: Cambridge University Press, 2006), 256-281.

central importance to this schema and we can see in Satan's attempt to make the serpent and Eve's soul "the property of another" the anatomical schema specified by Glisson in *Anatomia hepatis* of organ as form/instrument and similiary substance as vital fluid/matter.¹⁶⁸ In *Paradise Lost* the orthodox terminology of Aristotelian dualism is used only to represent an unnatural and demonic possession. This, as we shall see, contrasts with the use of chymical and vitalist motifs which characterise divinely sanctioned transformations within the natural order. Finally, Satan attempts to use both organic brain and similiary blood and spirits in his assault on her rational soul: both form and matter of her body-soul composite are sites of vulnerability which may lead to or affect her rational mind, neither taking final priority.

v. Form, matter and causality

The breakdown of the Aristotelian form/matter binary is present in this sketch of Eve as Satan perceives her, but is more directly demonstrated in other areas of Milton's work.¹⁶⁹ The four causal modes are fundamental tools of seventeenth-century thought and the rejection or reinterpretation of Aristotelian natural philosophy cannot be appreciated without a clear working definition of them. We can take this moment to define Milton's use of the four modes of causality at the heart of Aristotelian philosophy; his organisation and deployment of them illustrate his 'medical' thinking. Their precise definition is dealt with directly in the *Art of Logic*. Here he pauses briefly to delineate them, stating "A cause is not badly defined as that which gives existence to a thing." He then specifies the modes of cause as "the power or ability... by which, from which, through which, or on account of which a thing is".¹⁷⁰ The phrase 'by which' refers to the efficient cause: this cause, as maker or first impulse to movement, is not included in the effect. The phrase 'from which' signifies the material cause, the substance *out of which* something is made; 'through which' refers to the form and thus the functional capability of a body; 'on account of which' refers to the 'final cause', the end goal or overall intention of the motion.

¹⁶⁸ As early as *Reason of Church Government* of 1642 Milton had referred to the soul's "principall organick parts" being vulnerable to worldly joys as "a diet puffing up the soul with a slimy fleshiness" (CPW 1: 846).

¹⁶⁹ For a detailed study of the dissolution of this dualism in the Creation sequences see chapter 4.

¹⁷⁰ CPW 8: 222.

Central to my argument is the fact that Milton self-consciously proposes this order as different from the classic Aristotelian organisation into extrinsic causes, which are efficient cause and final cause, and the intrinsic causes of form and matter.¹⁷¹ By applying a logic of temporal process, which begins with efficient and material causes and then leads to formal and final causes, Milton shifts the emphasis from an arrangement which implies an individual (and somewhat anthropomorphic) agent making a thing, to a more naturalistic arrangement of two always already divinely animated categories of substance: matter (material cause) and spirit (efficient cause) from which emerge form and function.¹⁷² He pairs the efficient cause with the material cause as “*the first genus of cause*”, that is, initialising impulses, causes that deal with beginnings. This pairing is followed by “*the second, consisting of form and end*”, giving the formal and final causes as structure (and thus functional capability) and desired outcome, to do with utility and teleology respectively.¹⁷³ The Creation is figured through tropes of bodily conception and thus it is significant that Harvey, who juggles endlessly (and often in a contradictory fashion), with the different modes of causality in the *Generation of Animals*, notes that this is how physicians re-order the traditional Aristotelian causal modes.¹⁷⁴ This arrangement, as we shall see, orders the two main accounts of the Creation in *Paradise Lost*.

The unusual priority given by Milton to material causality in the *Art of Logic* is congruous with the materialism of both *Paradise Lost* and the *Christian Doctrine*. The rebuke given by Raphael, that the material element of creation should be given its due value and significance as a genuine cause of life, is in fact a point expounded at some length in the *Christian Doctrine*. In a philosophical meditation on Romans 6:36, “from him and through him and in him are all things”, Milton notes:

There are, to begin with, as everyone knows, four kinds of causes, efficient, material, formal and final. Since God is the first, absolute

¹⁷¹ CPW 8: 230. Aristotle gives the division as intrinsic/extrinsic (*Physics*, 1. 6, 7). Diane McColley notes that Thomas Vaughan “chides the followers of Aristotle who ‘look on God as they do on carpenters, who build with stone and timber, without any infusion of life. But the world, which is God’s building, is full of spirit, quick and living’”. See McColley, *Poetry and Ecology in the Age of Milton and Marvell* (Farnham: Ashgate, 2007), 57.

¹⁷² “*The form is generated within a thing simultaneously with the thing itself...* The rational soul is the form of man, because through it man is a man and is distinguished from all other natures” (CPW 8: 234). Thus the rational soul must emerge from the material and efficient causes. For further information on notions of conception see chapter 4.

¹⁷³ CPW 8: 230.

¹⁷⁴ Harvey, *Works*, 334.

and sole cause of all things, he unquestionably contains and comprehends within himself all these things.¹⁷⁵

This indicates in a general way that the material cause is at least as divine in origin and power as the other modes of cause, as does Milton's bald statement that the original matter "was not an evil thing, nor to be thought of as worthless: it was good, and it contained the seeds of all subsequent good."¹⁷⁶ We can note here that seeds are already fertile in their own right, and add to this his point that "matter was not, by nature imperfect. The addition of forms [which, for Milton are themselves material] did not make it more perfect but only more beautiful".¹⁷⁷ This comment demolishes Platonic equations of the Good with the Beautiful, and also rejects the Augustinian tradition of identifying the material elements of creation with the stain of original sin.¹⁷⁸ Matter already contains the seeds of all that is good, just as the earth is commanded by God to put forth vegetation and fruit trees "Whose seed is in herself upon the earth" before the creation of the sun and sunlight (*PL* 7. 312).¹⁷⁹ Moreover, there is no immaterial aspect to this model of creation; the ultimate focus of his discussion of the Creation is the heretical statement that "not even God's virtue and efficiency could have produced bodies out of nothing... unless there had been some bodily force in his own substance, for no one can give something he has not got".¹⁸⁰

As in the earlier discussion of the human body-soul, the theological statement is formulated in harmony with a basis of natural philosophy. The above is a statement that employs what Balme calls "the root of his [Aristotle's] theory of genesis: anything that is produced can only be produced by a similar thing previously existing."¹⁸¹ This could be (and was) interpreted to support the position that form is a necessary precondition of the eduction of further forms, but Milton and Glisson both reinterpret it radically. In a

¹⁷⁵ *CPW* 6: 308.

¹⁷⁶ *CPW* 6: 308. These seeds are semina – unlike Van Helmont's semina they are material rather than being an immaterial principle which acts on matter, recalling rather Augustinian seminal reasons. Nevertheless, the focus on fermentation in the Creation sequences, locates them firmly in the seventeenth century.

¹⁷⁷ *CPW* 6: 308.

¹⁷⁸ Balachandra Rajan and Regina Schwartz argue that the monism of the *Christian Doctrine* is not represented uncritically or without qualification in the chaos of *Paradise Lost*. See Rajan, *Milton and the Climates of Reading*, (London: University of Toronto Press, 2007), in particular Chapter 7: The Two Creations 112-122. Schwartz, *Remembering and Repeating: On Milton's Theology and Poetics* (London: University of Chicago Press, 1988).

¹⁷⁹ This fertility of the earth is, like the order of events, strictly conformed to the source material in Genesis 1-3.

¹⁸⁰ *CPW* 6: 309.

¹⁸¹ Balme, 'Human is Generated by Human', 23.

reflective motion to Milton's assertion of God's bodily force, Glisson interprets the same axiom to endow the matter of the blood with animating properties. Rather than being separate from the blood, vital spirit is part of the chemical composition of the blood. The vital flow of blood must animate the body because:

if the heart itself (which once was deemed to be the source of life) owes its life and vital heat to the vital blood (as is shown by the circuit of the blood), it will be very difficult to deny life to the blood. For a thing that communicates something to another thing must already have in itself what it is communicating: otherwise it will exceed the limits of its own activity and give to something else what it does not have in its own power.¹⁸²

Aristotelian theory of generation is employed by both authors in the assertion of a heretical materialism; just as the substance of God must have "some bodily force" in order to create materiality, something immanent within the substance of the life-giving blood must have the power of animation. Rumrich maintains that we cannot underestimate the importance of this innovation. He quotes Aristotle's statement: "the begetter is of the same kind as the begotten... in form... They are different in virtue of their matter (for that is different), but the same in form".¹⁸³ What Milton – and Glisson – have done is to reverse this so that "the begetter is of the same kind as the begotten not because they partake of the same *form*, but *because they share the same matter*".¹⁸⁴ Matter is what we share with the universe and, more particularly, those who generate us; form (proper form rather than generic form) is what differentiates us into individual entities.

This renovation of the value and active force of matter was a genuine shift from orthodox medicine to a new model that emerged from Harvey's research. The traditional model of cause in the generation of life is characterised by "Aristotle's account of generation, which holds that the form pre-exists before an embodied thing comes to be in matter."¹⁸⁵ Milton, like Glisson, follows Aristotle in the assertion of likeness between that which generates and that which is generated. In the system of causal modes he, like Harvey and Glisson, rethinks their orthodox arrangement into one

¹⁸²Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 85. Giglioni cites MS Sloane 3310 ("Sanguis est summa et principalis pars corporis") f. 228r. Through this argument we should remember that generation was bracketed with nutrition as powers of the natural/vegetative soul, since both cause and maintain morphological growth.

¹⁸³ Aristotle quoted in Rumrich, *Matter of Glory*, 65.

¹⁸⁴ Rumrich, *Matter of Glory*, 65.

¹⁸⁵ Monte Ransome Johnson, *Aristotle on Teleology* (Oxford: Oxford University Press, 2005), 48.

which renovates the traditionally morally and ontologically deficient mode of the material. Milton asserts that “*The form is generated within a thing simultaneously with the thing itself.*”¹⁸⁶ This is a significant departure from the Aristotelian orthodoxy of form as a precondition of life and it finds a powerful analogue in the work of Harvey. Writing on the development of the chick in the egg, he substantiates his discussion of the different causal modes of generation with the observation that “its parts are not fashioned simultaneously, but emerge in their due succession and order: it appears, too, that its form proceeds simultaneously with its growth, and its growth with its form.”¹⁸⁷ This is a particularly Harveian development from the classical Aristotelian biology preceding Harvey, which had insisted that the movements (the pneuma/heat movements) that inhere in the semen form the heart first; after this, the soul “centred in the heart, controls the further development via the blood.”¹⁸⁸ Milton, then, is using a carefully adjusted version of Aristotelian causality which has distinct similarities to that at the cutting edge of seventeenth-century biological thought.

The *potentia materiae* is not only universal within the created world, it has divine force: it is the material cause and the material cause is given an unusual priority and emphasis in Milton’s accounts of the origins of life. Just as the substance of the blood is given as inherently vital and vitalising in Glisson’s work, and the parents are both given as functioning in the mode of efficient cause of life in the *Art of Logic*, so is the bodily force of procreation given as the source of the rational soul in the *Christian Doctrine*. Milton’s ‘biological’ approach to the body-soul composite is never clearer than in his discussion of God’s creation *ex deo* and the corresponding defence of matter as originating in God and essentially good. The sources of these vitalising revisions may be many and ancient, but there is one particularly dramatic revision which clearly indicates the influence of chymical philosophy. In his discussion of God’s attributes in the *Christian Doctrine*, Milton refuses the scholastic Aristotelian equation of God with the *Actus Purus*, a formula which identifies God as pure actuality, and thus without further potential for perfecting action, on the grounds that “thus he could do nothing except what he does do, and would do that of necessity, although in fact he is omnipotent and utterly free in his actions.”¹⁸⁹ Of course this contradicts directly a

¹⁸⁶ CPW 8: 234.

¹⁸⁷ Harvey, *Works*, 336.

¹⁸⁸ Balme, ‘Human is Generated by Human’, 24.

¹⁸⁹ CPW 6: 146-7. John Rumrich makes this point (*Matter of Glory*, 63); see also Dennis Danielson, *Milton’s Good God, A Study in Literary Theodicy* (Cambridge: Cambridge University Press, 2009), 42.

powerful Christian Aristotelian tradition of God as the Unmoved Mover, as well as the Platonic and Neoplatonic notion of the divine as eternally perfect and unchanging in contrast to the shadowy flux of time encountered by human consciousness. This argument, that to have freedom God has to have potential, enables on a theodical level the attribution of materiality to God; it also means that God himself is in some way subject to change, a heinous denigration to divinity in orthodox thought. Alexander Ross attacks this notion in *Medicus Medicatus* (1645), noting with ire that: “if any matter were in God· then there must be in him a passive possibility, and quantity also, and distinction of parts, all which essentially follow the matter.” “What a strange God,” he concludes.¹⁹⁰

Another place we find this extremely unusual contradiction of scholastic doctrine is in the work of Van Helmont, who, like Milton, finds the imposition of motionlessness upon God to be an impossible constriction upon the divine. Rather, God is

altogether free, as well as in his beck and motion as in his rest, he indifferently and alike powerfully moveth all things: Therefore his own unmoveable essence doth not import a necessity required by the Schooles, but the mere good pleasure of his glory. For his own word... hath departed into Nature, which afterwards is for moving of itself.¹⁹¹

What might at first look like a version of occasionalism turns quickly to a devout vitalism. In his study of Van Helmont as chymical philosopher, Debus clarifies his motivation thus: “van Helmont was primarily concerned with the problem of freeing the Creator from the shackles placed upon him by the Aristotelians.”¹⁹² The parallel between this and Milton’s rejection of God as *Actus Purus* is clear, and the vision of an active Nature still responding to the Word of God recalls once again Milton’s declaration that “nature cannot mean anything except the wonderful power and efficacy

¹⁹⁰ Alexander Ross. *Medicus Medicatus: or the physicians religion cured, by a lenitive or gentle potion.* (London, 1645), 18-19.

¹⁹¹ Van Helmont quoted in Debus, *Chemical Philosophy*, 315.

¹⁹² Debus, *Chemical Philosophy*, 317. Despite the intriguing parallels between the two figures, van Helmont’s vociferous antagonism to the European Aristotelian heritage, and his declared intention of completely rejecting this heritage makes him less appropriate as a source and comparison to Milton than Glisson, whose inclusiveness matches Milton’s own. Giglioni makes it clear that where Glisson is a true materialist, Van Helmont is rather a Neoplatonist. (Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 166). For the distinction between monistic materialism and the dualism of much chymistry and hermetic philosophy, see McDowell, ‘Ideas of Creation in the Writings of Richard Overton the Leveller and *Paradise Lost*’, 67-68.

of the divine voice which went forth in the beginning, and which all things have obeyed ever since as a perpetual command".¹⁹³ Natural things move themselves in the natural philosophy of Milton's epic poetry, as we shall see in the chapters that follow.

Overall, the work of Van Helmont himself shows a number of radical philosophical divergences from Milton's particular vitalism. For example, his vitalism rests upon a notion of empty matter that is essentially water and active, seminal ideas, rather than being a materialist vitalism. Moreover his concept of the 'archeus,' which dominates much of the notion of the body's workings, finds no analogues or correspondences in Milton's work. The body's archeus is:

the organiser that is concerned with the designing of the individual organs and members. He particularises his 'monarchy' in accordance with the requirements of each of them. He establishes for each part a 'stomach' or 'kitchen,' entrusted with the separation and preparation of the nourishment carried to the member by the blood... he remains as 'internal president, curator and rector'.¹⁹⁴

This natural philosophy of the body is structurally quite different to that of John Milton, although there are some Helmontian concepts and many influences upon the work of Glisson that will be relevant to materialist medical vitalism. For now, it is apparent that Milton's revision of the notion of God as *Actus Purus* and his description of the relation between the word of God and the natural world finds itself reflected in the disruptive and divisive medical work of Van Helmont, whom Giglioni shows to be the major source for Glisson's expansion into chymical natural philosophy.¹⁹⁵

The vitriolic conflicts between physicians on the one hand and empirics and chymists on the other were not, however, the only acrimonious disputes, and medical revisions of form and matter from binary categories into a more complex biological process did not go unchallenged by conservative commentators. In a highly charged attack on Browne's flirtation with traducianism in *Religio Medici*, Alexander Ross, described by William Kerrigan as "the furious watchdog of convention in seventeenth-century England", insists that "a body can no more produce a spirit, then an horse can beget a man, they being different species... if the soule were propagated in or by the

¹⁹³ CPW 6: 340.

¹⁹⁴ Pagel, *Van Helmont*, 98.

¹⁹⁵ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life'; in particular Chapter 4 'Chymical Galenism. Innovation and tradition in anatomy,' section 4. The challenge of the chemical sects and section 5. Interpreting Helmont, 120-134.

seed, then this were a true enunciation, Semen est animal rationale, and so the seed should be man.”¹⁹⁶ That is, if it were to propagate the rational soul, semen should contain rational thought, and therefore the form of a man who thinks. There is indeed a problem if one identifies soul as form and then applies this to the evidence of procreating human bodies: it is Milton’s commitment to the vital activity of matter that unravels the genuine aporia indicated by Ross’s blunt *reductio ad absurdum*. To the related question of whether body can emanate from spirit, Milton comments dryly that this is more likely than the orthodox proposition that it should emanate “from nothing at all.”¹⁹⁷ Milton’s materialism goes beyond the conventional medical theory of bodily spirits attacked here by Ross with such outrage. This re-evaluation of materiality and the material cause contradicts orthodox versions of dualism, and contributes to the deconstruction of the traditional binary opposition of form and matter.

Having re-examined the notion of Milton’s ‘science’ being Aristotelian and therefore stiff, conventional and old-fashioned, we have found, rather, that some areas of experimental research in medicine and physiology had a much less antagonistic relationship with its Aristotelian foundations than those in physics, for example. Not only this, but where revisions to notions of causality or the qualities of matter and form were being made in the medical field, they are often paralleled or reflected by the sort of innovations made by Milton in his natural philosophy, whether it is the order of causal modes theorised in the *Art of Logic* or the representation of materiality in the natural philosophy of *Paradise Lost*. Milton’s Eve and the serpent are described in medical terms of organic and similiary parts, but the only representation of classic Aristotelian *intellectus* imposed upon living material form is made in the unnatural attempt made by Satan to insert his own consciousness into control of the animal body. Moreover, the traditional form/matter dichotomy breaks down in the representation of Eve as subject of possession, since both her organic and her similiary parts (blood and spirit) are routes to her higher consciousness. Even Milton’s work on doctrine bears the marks of chymical, medical revision in the prioritising of God’s absolute freedom over the notion of God as pure Actuality, the determinant of form. This sketch of the radical nature of Milton’s Aristotelianism will enable us to build a clearer picture of his vitalist natural philosophy. What is also evident, of course, is that while the Aristotelian corpus, with

¹⁹⁶ Ross. *Medicus Medicatus*, 46. William Kerrigan, *The Sacred Complex: On the Psychogenesis of Paradise Lost* (London: Harvard University Press, 1983), 247.

¹⁹⁷ *CPW* 6: 309.

its tendency to ascribe to things their own 'natural intention', often suggests a sort of vitalism, the radical vitalism Rogers identifies in the period is more complex and more involved with the empiricism of the English Revolution than that of 'the ancients'. If, therefore, we are to continue Rogers' rich and compelling thesis that Milton's vitalism can most lucidly be understood in relation to medical vitalism of the period, we must examine more carefully the precise features of this vitalism.

Chapter 3

Medical vitalism

i. Models of vitalism

There is building evidence that Milton's Aristotelian natural philosophy shares much of its innovation (and heretical implication) with that of contemporary medical experimentalism. Milton solves a series of problems of monism within an Aristotelian framework and these re-evaluations of causality and of matter and materiality in the *Art of Logic*, the *Christian Doctrine* and in *Paradise Lost* have a particularly medical character; they also imply chymical theories of dynamism more than once. With this in mind we will shortly return to the question of what the active matter that constitutes the created world looks like in *Paradise Lost*. First, however, it is necessary to examine a little more carefully what contemporary vitalism means. The representation of the Creation in *Paradise Lost* has been linked by Rogers to the vitalist medical research of Harvey and Glisson, and although various critics have pointed to the shared vitalist materialism of these figures, Rogers is the only critic to explore this linkage in any detail. Indeed he creates a new paradigm in which to view Milton's natural philosophy; he also explicates an impressive political allegory out of the association.

Nevertheless, the exploration of Milton's representation of a vitalist monism benefits from a detailed approach in terms of medical theory. Although Rogers's study of *Paradise Lost* informs much of my own, I would like to investigate with a new attention to detail the notion of vitalism as it was proposed by figures such as Glisson. This will seem at first to take us some distance from *Paradise Lost*, but the work of this chapter is to delineate a model of medical vitalist materialism that can then be correlated with the vitalist materialism in the poem. In order to refine my approach I will take Rogers's use of figures such as Harvey, Glisson, Paracelsus and Van Helmont and focus on divergence or conflict between their versions of vitalist thought. Harvey, for example did not make use of the chymical researches of Van Helmont; Glisson, who did so

extensively, nevertheless dismisses Paracelsus with the words: “either he talks nonsense or smacks of the devil.”¹⁹⁸ Rather than assuming, as Rogers has done, the concurrence of Milton’s notion of vitalism with those of Paracelsus, or Glisson and Harvey (or indeed the concurrence of Glisson’s vitalism with that of Harvey) I would like to re-examine the theoretical structure of Milton’s monist vitalism and its implications for the human body-soul composite.

Rogers states that:

There are moments not only in *Christian Doctrine*, but in *Paradise Lost* as well in which Milton represents the generous, egalitarian vitalism he would have found in texts such as Glisson’s *De rachitude* and Harvey’s *Circulatio sanguinis*, vitalist works in which matter is not segregated by degrees of spiritualization but infused uniformly with spirit and energy.¹⁹⁹

Vitalism here is “egalitarian” in the work of both doctors; what makes it so for Rogers is that it is a uniform infusion of matter with spirit and energy, rather than a system that is segregated into degrees of spiritualisation. Rogers claims, furthermore, that there is a profound fracture of logic between this politically radical vitalist natural philosophy and the representation of God and concomitant theology of the poem; he makes particular reference to the creation sequences and the expulsion of Adam and Eve in the final books of the poem. Indeed he states that in his attempt to represent a vitalist materialist Creation Milton’s use of tropes of fermentation has “sabotaged his attempt to justify the ways of God to men.”²⁰⁰ This sabotage is located in the presence of “tartareous dregs” at the Creation, which, Rogers claims, attribute to God the origin of that which is adverse to life or even that which is evil.

The claim that Milton’s vitalist materialism has sabotaged his theodicy is a grand one and some of the work of this dissertation is to refute it. Before we look directly at the Creation to see if and how Milton’s materialism and traducianism work in terms of ‘science’, theology and the relation between them, we need to ask some questions. Are these texts by Harvey, Glisson and Milton vitalist? And if they are, what form does their vitalism take? Do they represent matter as being uniformly infused with

¹⁹⁸ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 127. Giglioni cites: MS Sloane 3308, f. 221r; also 3309, f. 100r.

¹⁹⁹ Rogers, *Matter of Revolution*, 112.

²⁰⁰ Rogers, *Matter of Revolution*, 137.

spirit and energy? Are spirit and energy analogous, as is suggested here, or do we need to investigate the relation between vital heat and vital spirit in more detail? Fallon defines vitalism as “the belief that life is a property traceable to matter itself rather than to either the motion of complex organisations of matter or an immaterial soul,” thus placing it in contrast to atomism, mechanist philosophy and religious dualism.²⁰¹ I argue that Milton has in fact an ordered system of vitalism in his natural philosophy, which, out of all the versions of vitalist thought heretofore suggested, adheres most closely to that proposed by Francis Glisson, and which does not disrupt or damage, but complements and supports his theodicy. I have already shown a number of instances where the diffusion and deconstruction of the orthodox form/matter paradigm required by Milton’s vitalism is paralleled by similar innovative factors emerging from contemporary medical research. Where Rogers sets Milton’s vital matter in opposition to the “spheres assigned” and “bounds / Proportioned to each kind” of Raphael’s famous speech, I would argue that this vitalism is characterised not by a *uniform* infusion of spirit through matter, but by a scale of matter which includes spirit and which has varying vitality and corresponding value, precisely measured by ‘degrees’ (*PL* 5. 491-2).

Both the dynamic scale of matter/value and the deconstruction of the binary form/matter paradigm are in the medical corpus indicated by Rogers, but the relation between the natural philosophy of the poem and that of the medical theory can be read more subtly than it has been, particularly with regard to Glisson’s work, which eventually developed into a coherent system of vitalist natural philosophy. In contrast, Harvey’s speculation about the relation of blood and spirit (whether one contained the other or whether there was a straightforward identity between them, for example) was left without an unambiguous conclusion. In his late work, *De generatione animalium*, Harvey had suggested that either the heart, the blood or both were the original source of life; the blood’s position with regard to the soul was explored, but not finally answered: the questions of whether the blood was the container of the soul, the embodiment of the soul, the first instrument of the soul or the soul itself lay alongside each other without a final unequivocal answer.²⁰² At the heart of this debate about the nature of animation is the question of whether life is a transcendent principle or an immanent principle: while Harvey toyed with various solutions, Glisson attempted to solve some of the aporias of

²⁰¹ Fallon, *Milton Among the Philosophers*, 111.

²⁰² Harvey, *Works*, ‘Exercise the fifty-second: Of the blood as the prime element of the body’, 379-391.

Harvey's experimental work with a theory of vital, self-active, self-producing blood, which began his journey towards hylozoism (and thus a solution which gives life as immanent to matter). His theory relies upon the notion of fermentation, adopted and developed through the seventeenth century by the chymical philosophers, to imagine the activity of this vitalising blood.

In his assessment of Milton's vitalism, Rogers also takes a significant amount of detail from the works of Paracelsus and Joan Baptista Van Helmont; the link between the different strands of vitalism is, however, far from simple. Paracelsus, although he was a founding figure of alchemical philosophy and medicine, is not easily identified as a monist vitalist; he believed for instance that there were in man two bodies, one visible and one that was invisible and of greater power.²⁰³ He also made many wild and provocative claims; for example he was criticised by Daniel Sennert for declaring that Adam and Eve had no genitals until the Fall.²⁰⁴ Although his influence on the history of medical thought is undeniably profound, his theses often clash with what are to Milton fundamental doctrinal imperatives. Van Helmont, in contrast, can be located securely in the experimental tradition of seventeenth-century medicine and, while still a controversial figure, his theorising was more smoothly absorbed by the medical mainstream: "in the 1650s Helmontian chemistry was widely adopted by English physicians and natural philosophers, mainly those connected with the Hartlib circle."²⁰⁵ Nevertheless, his vitalism remains within a dualist paradigm that owes much to Platonism. His matter is moved by the immaterial '*Idea formatrix seminalis*' derived in part from the Plotinian tradition.²⁰⁶ In fact Pagel notes that Van Helmont criticised Aristotle roundly for the implicit materialism of his thought:

The issue that prompted Van Helmont's sharpest criticism of Aristotle was the correlation which the latter proposed between body and soul. First, Aristotle had postulated that active forces require matter that is already 'disposed' in a certain way... Van Helmont by contrast refused to grant matter – in his view empty water – a share in any forming and individualising activity... there could be no 'natural correspondence of the active and passive... nor could matter be endowed with any potentiality of acquiring a soul.'²⁰⁷

²⁰³ Pagel, *Paracelsus*, 121.

²⁰⁴ Pagel, *Paracelsus*, 335.

²⁰⁵ Clericuzio, 'Van Helmont to Boyle', 304.

²⁰⁶ Pagel, *Van Helmont*, 31-2.

²⁰⁷ Pagel, *Van Helmont* 40.

This ‘vitalism’ is not monist vitalism; although iatrochemistry provided materialist vitalism with much that was useful in evidence of active substance, Van Helmont’s work rather presupposes that life inheres in the immaterial spiritual forces that act upon matter, thus vivifying it.²⁰⁸ We can therefore note to begin with that ‘vitalism’ is itself not the uniform theory one might suppose and turn once again to the work of Glisson.

It is clear that Glisson’s tract on the rickets, researched through the late 1640s and published in 1650, does not propose the systematised vitalism of his later work. Despite the intriguing coincidence of Milton’s intervention in the licensing of *De rachitide*, the fact remains that to find a precise account of Glisson’s vitalist theories we need rather to pay attention to his later works. Giglioni shows that it is later in Glisson’s career, in his production of the tract *De natura substantiae energetica, seu de vita naturae* of 1672 that his theory of the innately active, living nature of substance comes to maturity. This postdates the publication of *Paradise Lost*, but Glisson makes it clear that this philosophical project had developed in response to and through the course of many years of experimental study and research; in short, there are several other texts from the intervening eighteen years that have relevant material in them. *Anatomia hepatis* (1654) contains a detailed theory of the chemical composition of the blood, which shows the materialist vitalist background from which the philosophy of natural perception emerged in Glisson’s work. Furthermore, Giglioni has studied (and made numerous translations from) Glisson’s unpublished manuscripts, many of which set up and resolve the academic debates, or *determinationes*, of his students at Cambridge throughout the 1640s and 1650s, as well as the unfinished manuscript treatises *De inadaequatis rerum conceptibus* and *Disquisitiones metaphysicae*, which he describes as “papers [in which] we can find the ultimate conceptual structures of Glisson’s theory of the energetic nature of substance, seen from a purely logical and ontological point of view.”²⁰⁹ Also available is Glisson’s treatise on the stomach, *De ventriculo et intestinis* (1677), in which he uses his mature vitalism as a fundamental basis for his anatomical research.²¹⁰ Giglioni’s translations of Glisson’s work are extremely valuable material for an analysis of what medical vitalism was, but there are also some English

²⁰⁸ See Brian Garret, ‘Vitalism and teleology in the natural philosophy of Nehemiah Grew (1641-1712)’, *British Journal for the History of Science* 36. 1 (2003), 63-81. Garret discusses a similar vitalism proposed by Nehemiah Grew in the early eighteenth century, where life is the effect of an incorporeal principle upon matter, and relates it to the theories of Henry More.

²⁰⁹ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 32. We can recall here that Glisson’s teaching notes were produced between the end of the 1640s and the beginning of the 1660s (Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 104).

²¹⁰ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 35.

manuscripts of Glisson's, in particular a series of lectures on the stomach and the process of digestion given late in his career, which, like *De ventriculo*, presuppose and reiterate the system of vitalist philosophy published in 1672.²¹¹

Gigliani's study of the development of Glisson's work finds that there are only traces of his mature vitalism in *De rachitide*, primarily to be found in a general interest in:

the similar parts of the body (that is, the elementary components of the vital economy, prior to the more complex organic articulation) and the centrality of the natural constitution with respect to the vital and animal constitutions (that is, the pre-eminence of the vegetative functions).²¹²

The fact is that Glisson's vitalism grows out of his lifelong study of the properties of the body's matter rather than anatomy's traditional investigations of form. Gigliani summarises the philosophical audaciousness of Glisson's later work, noting that it proposes:

the primacy of matter with respect to form; the perpetuity and self-subsistence of matter; the re-evaluation of the theory of the education of forms as a thoroughly immanent process, [and] the attribution to matter of an autonomous causal power not distinguishable from its own being.²¹³

Glisson's vitalism, his hylozoic heresy, overturns the traditional relation of form and matter and suggests a theory of causality that rests in materiality itself. To explicate this, matter takes on a priority in vitalism that form cannot sustain: experimentally, matter is the constant, form in contrast is mutable. Matter is no longer seen as necessarily made existent by form and form emerges from the power of matter rather than matter being subject to the actualising power of form. Finally, this means that the material cause gains a certain precedence in significance (in the synchronic model of the four causes, for example), but also in sequence (their diachronic action in natural or bodily processes such as nutrition or conception): it precedes form as a fundamental initiating cause, being capable of autonomously impelling the beginning of life. Here we can recall Milton's re-ordering of the four causes in the *Art of Logic*, where the efficient and

²¹¹ *English Manuscripts of Francis Glisson: 2. Lectures and other papers*, ed. A. Cunningham (Cambridge: Cambridge Wellcome Unit, 1993).

²¹² Gigliani, 'Genesis of Francis Glisson's Philosophy of Life', 16.

²¹³ Gigliani, 'Anatomist Atheist', 126.

material cause are bracketed together as initial, prior causes, with formal and final causes following in sequence.

Vitalism that emerges from a focus on bodily substance and vegetative function is not, however, the vitalism described by Rogers. His description of the human soul, given as evidence of vitalism, calls upon the Aristotelian notion *anima est tota in toto, et tota in qualibet parte*, noting that the soul is given by Milton as “equally diffused throughout” the whole of the “organic body.”²¹⁴ This is, however, a standard description of animation and was normally taken to refer to the lower grades of soul. Milton’s materialism will emerge in his representation of active, perceptive, responsive matter at the lowest level of the scale of nature and its relation to traditionally purely abstract modes of soul at the top of that scale, rather than in this rather ordinary Aristotelian precept. With regard to Glisson’s medical development of vitalism, Rogers draws on *De rachitude*: his model of vitalism is given in a description of the distribution of blood (and the vital spirit) through the arteries to unspecified bodily parts that suck the blood into their substance. He describes it thus: “after a wilful sucking of spiritualised blood, these ‘said Parts,’ no longer the passive lumps of matter imagined by the mechanists, are forever ‘co-united with the... Nature of Life’.”²¹⁵ However in *De rachitude*, which deals with nourishment or malnourishment of the organs in the disease of Rickets, the parts of the body receiving the blood are the organs, already formed and therefore, in orthodox Aristotelian terms, capable of living and educing further form out of matter (in this example the simple stuff of the blood). While in his introduction Rogers draws upon the work of Christopher Hill to show the revolutionary political potential of Harvey’s new emphasis on the blood rather than the heart as source of life, he does not pick out the detail of the philosophical reversal that this change of emphasis (and in Harvey’s work it is only a change of emphasis, rather than a true shift of philosophical paradigm) implies.²¹⁶ It is the shift from the hylomorphic model in which form is the precondition for life (which led towards the mechanist solutions that

²¹⁴ Rogers, *Matter of Revolution*, 113.

²¹⁵ Rogers, *Matter of Revolution*, 106. Rogers cites the *Treatise of the Rickets*, 100.

²¹⁶ In his discussion of the form of the heart and the heat of the blood, Harvey shows some equivocation, stating: “the heart, with the veins and arteries and the blood they contain, is to be regarded as the beginning and the author, the fountain and original of all things in the body, the primary cause of life... But... I do not believe that the heart is the fashioner of the blood; neither do I imagine that the blood has powers, properties, motion or heat, as the gift of the heart” (*Works*, 137). Moreover, where Harvey ascribes body’s vitality to the heat of the blood rather than the form of the heart, he clearly states that this is as a thesis not yet experimentally proven, beginning this disquisition with the words, “Meantime, I shall only say, and, without pretending to demonstrate it, propound” and finishing it with the words “This, however, I do not mean to state absolutely, but only propose it by way of thesis” (*Works*, 137-138).

superseded Aristotelian theory) to the hylozoistic, that of living matter as itself a *cause of form*, that is the heretical, unorthodox, vitalist philosophical manoeuvre. The notion that ‘soul’ was in every part of the body and that of the distribution of the vital spirit to the bodily parts from the heart via the arterial blood were both parts of a system inherited from antiquity; they did not rely upon Harvey’s discovery of the circulation and were quite unremarkable in themselves.²¹⁷

It was not until 1654, with the publication of *Anatomia hepatis* and a theory of the blood’s innate activity, that Glisson’s work started to pose a genuine challenge to the Aristotelian orthodoxy of the necessity of form for the quality of active life to exist. While my project seeks to explore and illustrate the close similarity of model and the common sources of Milton’s vitalism with medical vitalism, rather than to propose a direct causal intertextual link between one man’s work and the other’s, the publication date of Glisson’s second major tract, *Anatomia hepatis* does mean that the ideas it contains (if not the developed model of natural perception) were in circulation in Milton’s milieu during the years through which *Paradise Lost* was written. Its publication in 1654 dates it four years after that of *De rachitude*, to which Nathan Paget contributed, and two years after Milton’s descent into complete blindness. The tract on the anatomy of the liver already shows radical early stages of Glisson’s trajectory into vitalist materialism in that it delineates a system whereby different elements of a substance might interact to produce life and form. It overturns classical Galenic anatomy in its denial of the liver as the source of blood and the venous system and centre of the ‘natural’ functions of nutrition and reproduction, instead arguing that the liver filters out the body’s bilious impurities.

In Aristotelian terms, the organ, since it has form, may be animated, whereas matter, or substance without structure, may not be animated or have the quality of life. This was certainly the prevalent paradigm inherited from Aristotle. The perceived necessity of form to support life and the corresponding exclusion of matter from ideas of life and value were also fundamental to many other schools of thought. John Henry quotes Cambridge Platonist Henry More, who, in his argument for an immaterial Spirit of Nature, claims that “particular Souls are, according to Aristotle, the Actings of an

²¹⁷ In fact, because of the experimental evidence of the necessity and power of the blood, the discovery of the blood’s circulation was not so challenging to the classical vitalising function ascribed to the arterial system, as to the blood formation and nutritional, vegetative function ascribed to the liver and veins.

organical Body. But the *Punctum saliens*, or Life point, discovers not any proper sense.”²¹⁸ The *punctum saliens* is the first trace of a beating heart – the first flicker of pulsation in the bloody matter of the egg, that so fascinated both Harvey and Glisson. It is not strictly an organ and in fact it exemplifies the curious moment when life seems to be emerging from the power of matter rather than that of form. More’s denial of “proper sense” is a direct rebuttal of the vitalist materialism implicit in Harvey’s research and the theory of natural perception explicit in Glisson’s.²¹⁹ This substance, being without structure, could have no perception, intention or motion; that seems fairly simple and clear but it leaves open the persistent question of how the foetus then develops at all. More and Cudworth’s solutions to the relation between the material and the spiritual was to be an intermediate incorporeal substance, a Spirit of Nature with plastic force, that is, the capacity to mould and form matter. Fallon notes, however, that “the Cambridge Platonists cannot make clear the manner in which spirit, whether conscious soul or unconscious plastic nature, interacts with bodies”; the proffered solutions were clearly unsatisfactory to Francis Glisson, too.²²⁰ In the opening address of his *Six Anatomical Lectures* (1677 but written and performed, he notes, in 1662), Glisson asks “who will expound to me – without natural perception – how the plastic force forms the chick in the egg?”²²¹ Indeed, it was the series of observations made by Harvey on this emergence of life out of matter in the development of the chick in *Generazione animalium*, which gave part of the basis for Glisson’s idiosyncratic and heretical solution of the perceptive, motive force of matter itself.

Pagel’s study of Glisson’s tract on the energetic nature of substance gives a definition that is carefully drawn from the source materials:

Nature, embracing substance and matter at large, organic as well as inorganic beings, ‘has therefore a claim to an even more eminent title, namely that of the Vital Principle of Function or of Life-Inherent-in-Substance.’ This life has no more than one aspect, and in it there can be no question of distinction of things physical and spiritual; it is therefore ‘simple’, and because it is simple it is perpetual; for decay is the separation of component parts, and only composite things are liable to corruption. This indissoluble unity of ‘substance’ and ‘life’

²¹⁸ More quoted in Henry, ‘Medicine and Pneumatology’, 25.

²¹⁹ Harvey had declared that the *punctum saliens* “when touched with a needle, a probe or finger... or subjected to any other molesting circumstance or thing, give[s] various indications of sensibility, in the variety, force and frequency of its pulsations” (*Works*, 239).

²²⁰ Fallon, *Milton Among the Philosophers*, 69.

²²¹ Glisson, *Six Anatomical Lectures*, in *English Manuscripts of Francis Glisson 2. Lectures and other papers*, ed. A. Cunningham (Cambridge: Wellcome Unit for the History of Medicine, 1998), 41-180, 41.

Glisson notes as *biouisia*. Its elementary functions, common to *all* objects in nature are: Perception, appetite and motion. ‘Substance’ first engenders a perception of what has to be done (‘opus aggrandendum’); the object perceived is then desired and the desired end consummated. Organic life develops by virtue of a ‘duplication’ or ‘triplication’ of these functions. ‘Simple’, ‘natural’ perception requires no specific organs, nor is it limited in distribution and scope by organisation.²²²

The Neo-Platonist critique does not account for the fact that the ‘perception’ of this matter should not be confused with sensory perception, which does indeed require organs (and thus form). Matter has primordial activity because vital motion is its own intrinsic quality, although different degrees of matter have different degrees of activity. Different degrees of matter form themselves because:

The specific act of constituting each substance in its individuality (‘*naturae confoederatio sibi soli*’), capable of discriminating what is one’s own from what is foreign, originates in the energetic nature of substance which is ultimately an inner ‘representative’ activity. The foundation of natural perception as an original vital function rests on the self-representative structure of substance: substance, as deeply adherent to its perceptive faculty, is the idea through which it knows itself... an idea that is coeval and coexisting with its being.²²³

Words (themselves inherently divided from the material) that try to describe the movement from a dualist norm into a monist paradigm often fall into traps of dualism or into tautology. The natural perception that Giglioni describes here is immanent like the intrinsic material form of Aristotle: the idea constitutes the very stuff that it is. However, rather than being fixed, as form is, the matter’s ‘ideas’ themselves *are process*, innately mobile and energetic: form emerges from the inherent ability of substance to transform itself.²²⁴ It is this materiality of the ‘ideas’ that differentiates Glisson’s vitalism from that of figures such as Van Helmont, and it is the identity of matter and energy that underpins this system: “*Vita primaeva* is simply the other side of

²²² Pagel, ‘Reaction to Aristotle’ 505. He continues “The simplest form of organic life i.e. of duplication of the primitive life of matter is seen in plants which are endowed with a ‘vis plastica’. Such organic life requires the co-operation of the vital functions that take place in the organs and tissues (‘vita insita’) with the action of the vital humours (‘vita influens’). Not merely contact, but the intimate union of these two ‘lives’ is necessary to bring about ‘duplicated’ i.e. organic life. For without the ‘vita influens’ the functions of the organs and tissues remain dormant, as it were, ‘fixed’ or ‘crystallised’ inside the rigid anatomical structures”(506).

²²³ Giglioni, ‘Anatomist Atheist’, 121. The translation and paraphrasing are taken from *De natura substantiae energetica*.

²²⁴ There is an obvious if anachronistic analogy with the popular imagination of DNA.

material prima.”²²⁵ The doubleness of this notion of matter, its physicality on the one hand and its vital formative motion on the other could be argued to be a residual dualism, but I would suggest that the problem is rather one of residual dualist terminology. When the theory is in the context of medical terms, the body’s substance will be imagined as having several thicker elements and more than one volatile, active element. The plurality of chymical anatomies of substance will give the basis of this diffusion and multiplicity, as we shall see in the discussion of the chymical anatomy of the blood and the chymical theory of conception below. The perceptive self-knowingness of living tissue, its ability to assimilate what is the same as itself and to exclude or excrete what is not, is clearly associated not only with Harvey’s work on foetal development, but also with one of Glisson’s favourite topics of research, the body’s digestive faculty. Digestion, of course, is one topos in which the physical and the mental coincide, particularly in *Paradise Lost*. Indeed, vital, perceptive matter in the body finds itself in something of the same theological paradox as that faced by devout seventeenth-century people: totally determined by divine command on the one hand, but endlessly engaged in the act of choosing and discriminating on the other.

As we have noted, Glisson’s theory of natural perception, or the intrinsically living and dynamic nature of substance, drew considerable negative criticism on religious grounds, but his description of this *biouisia* resonates dramatically with Milton’s famous ‘one first matter all’ speech given by Raphael. As Rumrich suggests, “Substance for Milton is thus not a static condition of being... it implies a process, the working out of God’s will in the stuff of existence.”²²⁶ Likewise, Glisson claims that it was God who:

assigned to the first and the most general rudiments of substances an adequate and proportionate energetic, that is, vital, nature; although he distinguished and adorned nature’s superimposed degrees with increasing perfection. In this way he showed the inexhaustible treasures of his munificence, when, beginning from such a noble basis of nature, he could nevertheless raise his own work from degree to

²²⁵Gigliani, ‘Anatomist Atheist’, 120. Pagel observes that “Van Helmont vehemently objected to ‘grades’ of soul and matter... [his] immediate target is the famous passage from the third chapter of the second book of *Generation of Animals*, on vital heat as the productive source in semen” (Pagel, *Van Helmont*, 41). This, of course, is precisely the passage that was the basis for much materialist speculation and theory.

²²⁶Rumrich *Matter of Glory*, 68.

degree to such an elevated fastigium, by adding from time to time a higher and higher dignity.²²⁷

This shows a profoundly devout attitude in Glisson's most 'heretical' work, and it also echoes his comparisons of a meritocratic social body with the transformations of spirits inside the body. In explaining the gradations of thicker, colder substance and more active, rarefied substance Glisson's model matches structurally the sort of meritocratic model that lies at the heart of Milton's scale of nature: the palpitating motion of the blood transforms natural spirits into vital spirits, and Glisson expresses the transformation thus: "When they rise to such a high rank, they gain the 'honor' of being called *vital spirits*."²²⁸ The most striking aspect of this passage, however, is its description of a dynamically vital but stratified ontological order, the work of which is to transform by degree the rudimentary material of life back towards an ever increasing perfection. It seems that God has, at the very beginning, imbued matter with motion, perception and appetite to grow, change and perfect itself more and more. In the *Christian Doctrine* Milton makes an equivalent statement, asserting that since God is also the material cause of all things:

It is a demonstration of supreme power and supreme goodness that such heterogeneous, multiform and inexhaustible virtue should exist in God and exist substantially (for that virtue cannot be accidental which admits various degrees and is, as it were, susceptible to augmentation and remission, according to his will)... It is, I say, a demonstration of God's supreme power and goodness that he should not shut up this heterogeneous and substantial virtue within himself, but should disperse, propagate and extend it as afar as, and in whatever way, he wills.²²⁹

Again, we meet God as the source of all matter (and its formative movement) in *Paradise Lost*. Famously, Raphael describes a remarkably similar philosophy of transformative substance to Adam, thus:

O Adam, one almighty is, from whom
All things proceed, and up to him return,
If not depraved from good, created all

²²⁷ Glisson quoted in Giglioli, 'Anatomist Atheist', 124. Giglioli concludes that "Glisson's theory of *biusia* is a tacit attack on the harmonious ladder of being, since the degrees of organisation do not mirror an immutable scale of eternal essences" ('Anatomist Atheist', 124).

²²⁸ Glisson quoted in Giglioli, 'Genesis of Francis Glisson's Philosophy of Life', 78-9. Giglioli translates from *Anatomia hepatis*, 325; 340-341.

²²⁹ *CPW* 6: 38.

Such to perfection, one first matter all,
 Indued with various forms, various degrees
 Of substance, and in things that live, of life;
 But more refined, more spirituous and pure,
 As nearer to him placed or nearer tending
 Each in their several active spheres assigned,
 Til body up to spirit work, in bounds
 Proportioned to each kind.
 (PL 5. 482-92)

The action of the ‘first and the most general rudiments of substance’ in Glisson’s work matches that of the “one first matter” in *Paradise Lost* and the ‘original matter’ of the *Christian Doctrine*. In Glisson’s hylozoic philosophy, basic substance is given the innate energy to transform itself degree by degree, yet this power to raise and perfect that vital substance originates in divine action, just as Raphael’s degrees of perfecting substance become more refined, spirituous and pure as they ascend, either by their own “tending” or more passively by being “placed” nearer to God. This process of active spirit-and-matter is represented poetically by Milton as it is theorised by Glisson, and in both cases the initial impulsion of God’s command charges matter with the ability to do this to itself, with a resulting plurality of substances emerging from the “one first matter.” It is clear, then, that the relation between Milton’s vitalism and Glisson’s is peculiarly subtle; *De rachitude* is not a sufficient source from which to take any precise account of vitalism, as we can see from Rogers’s reliance on the very ordinary notion of the activity of organs rather than Glisson’s truly radical theory of active substances.

Glisson’s theory of the palpitating, chemically composed blood seeks to explain blood flow and heart beat in the wake of Harvey’s discovery: the depiction of a struggle between thicker and more rarefied component elements of the blood uses a chymical analysis of substance alien to Harvey’s thought (although not to Milton’s), and it directly invokes the idea of fermentation to explain the process. The transformative action of ever more rarefying spirit matches precisely the picture of bodily spirit painted by Raphael in Book 5. It does not, however, describe a uniform infusion of energy in matter. This model, rather than proposing an indiscriminate, uniform vitalism, reflects and gives a basis of a real, contemporary natural philosophy to Milton’s dynamic version of the chain of being. Both his work and that of Glisson support a meritocratic system, in which some matters, substances, forms and spheres are more vital and active than others, and indeed in which there is sense of increased value about that which is most vital. Rogers has misunderstood the vitalism of the period, emphasising its

revolutionary potential at the expense of the order of value it retains: the best yearns upwards towards God and spiritual existence, the worst struggles against spiritual assimilation. There is no clash between this vitalism and the notion of hierarchy, for the system's innate justice relies upon its dynamism and mobility.

There is, however, a closer cohesion between the vitalism of Milton and his medical contemporary than that of this 'final solution.' Energetic matter answers problems of experimental anatomy and is theorised by Glisson in certain ways: through a reinterpretation of the Galenic notion of similiary attraction, through a chymical anatomy of the body's fluids (of blood in particular) and through a chymical reinterpretation of the Aristotelian notion of vital heat. These solutions to the questions of *how* similiary substance might act in the body match at every turn the actions of vital matter in *Paradise Lost* in function and terminology.

ii. Similiary Attraction

In medical terms, Glisson attributes to the (healthy) body's similiary substances the ability to gather and assimilate that which nourishes it and to exclude that which is harmful or extraneous. The concept with which he explains this movement of substance in the body is that of similiary attraction; not, at first glance, a very innovative move. Harvey's earliest experiments in his study of the blood's circulation had sought to give evidence of the heart as a pump, against the theory of the blood's faculty of 'attraction'.²³⁰ Moreover, Harvey had distinctly stated that the "attraction of the likes" was not a process by which the growth and nutrition functioned.²³¹ However, Glisson specialised in nutrition, and while he was at the forefront of public support for Harvey's thesis, he chose not to discard as ancient or arcane the notion of attraction in other areas and processes of the body, but to reinterpret it. In *Anatomia hepatis*, the similiary parts, the simple substances of the body, are endowed with a power of perception of that

²³⁰ French, *William Harvey's Natural Philosophy*, 108. French notes that "where attraction was denied in the body and in machines, it was replaced by impulsion. While Cartesians... relied on the notion of a circular thrust of displacement, others thought that the impulsion of the spring and weight of the air. What controlled the flow of impulsed motion in the body and machines were valves, highlighted by Harvey's doctrines and Renaissance technology" (356). Attributing agency to matter, the assertion of vitalism remains a libertarian response to the impulsions of mechanism.

²³¹ Giglioli, 'Genesis of Francis Glisson's Philosophy of Life', 66.

which is like itself, an attraction to it and an appetite to conjoin with other substance that is like itself, as well as a negative repulsion to that which is not. There are sound experimental reasons for Glisson's proposal: the body's fluids or humours do move, collect and congregate or excrete in different places:

When, more than once in the course of the *Anatomia Hepatis*, Glisson has to explain the puzzling mechanism of the secretion of humors, he resorts to the notion of *similiary attraction*, a vital process which does not occur through organs or organic parts, but 'derives from the similarity, familiarity, and affinity of the attracting body with the attracted body'. This similarity, Glisson goes on, 'is based on the *similiary*, not *organic* constitution of the parts'.²³²

It is the similarity (not pure identity) of one substance to another that causes attraction. In Glisson's version of this process the notion of similiary attraction must answer three requirements: that a relationship of "similarity, affinity, or familiarity" occurs between two or more bodies; that "a desire to be united to another body is aroused by at least one of them"; finally, that, "in order for this arousing to be advantageous, there must be a tendency to come together (*nixus coeundi*), or an actual endeavor (*actualis conatus*) through which the bodies join to each other."²³³ Traditionally, purgatives work through similiary attraction, since the purgative's acrid nature is similar to that of the bilious humour it seeks to remove and will draw it out as it passes through the body: "Purgative remedies attract specific humours because of 'some sort of substantial similarity' and a 'mutual tendency to union', like that between rhubarb and the bile."²³⁴ Originally the theory of attraction was Galenic and was not widely held to be of cutting edge medical significance; it was also associated with the mysterious excesses of hermetic alchemy as an "occult cause," emerging in such disreputable forms as that of the weapon salve debate.²³⁵ Characteristically, however, Glisson correlates the ancient with the new; in his theorising, "the similiary (also called sometimes magnetic, elective, or even electric)

²³² Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 63. Giglioni cites *Anatomia hepatis*, 190; 363.

²³³ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 64. Giglioni cites *Anatomia hepatis*, 188-189. Glisson hints that there is a subtler way to explain the process of similiary attraction than that of 'mechanical effluvia' but does not, at this stage, elaborate.

²³⁴ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 64. Giglioni cites MS Sloane 3309, ff. 235r-236r; also *De ventriculo*, 495; 500.

²³⁵ For the weapon salve debate in *Paradise Lost* see chapter 6, 210-211. For an account of the weapon salve debates see Allen G. Debus, *The Chemical Philosophy*, 246-8; 303-307.

attraction is based on the famous principle of ancient physics and medicine according to which likes are attracted to the likes”.²³⁶

It is in the collection of terms used to describe this attraction that its richness can begin to be seen. Occult qualities could be sneered at by the new philosophy, but occult causes had to be admitted while the evidence remained without final explanation. Magnetism was a force hotly debated if not understood; originating in the alchemical tradition, it finally became a focus for physicists of the ‘scientific revolution’.²³⁷ Indeed, it has been argued (not least by Leibniz) that Newton’s theory of gravitational force derived in part from a background of elective attraction, or action at a distance.²³⁸ The term ‘elective’, moreover, links this theory of the body back to the political arena of the body politic and the political scandal of vitalism with its democratic implications. Elective attraction is, in medical terms, part of the motion whereby the suitable parts of the blood are absorbed by or engrafted to the suitable parts of the body. If “reason is but choosing,” so is elective attraction. It orders the gathering of milk in the breast, the nourishing of the foetus and the placing of acidic humours in the correct area of the stomach for digestion.²³⁹ In the *Prolegomena to Anatomia hepatis* Glisson lists a number of methods for separating ‘mixt’ similiary substances and several of them rely upon chymical interpretations of the notion of attraction. He states that:

Parts mixed are severed *per magisterium*: that is, by casting in another ingredient which hath more familiarity with one element of the mixture than the other, by means whereof the parts before mixed are separated... Separations are made by congregation or attraction magnetical. Thus the loadstone separates iron mixed with dust, though this be an improper mixture. Thus parts of a like nature easily gather together leaving other parts with whom they had less affinity.²⁴⁰

Iron mixed with dust is an “improper mixture” because the two substances are not sufficiently absorbed into each other; in contemporary terms this mixture is a

²³⁶Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 63. One might compare this inclusiveness with Milton’s own in his representation of a chaos which bears the marks of atomism, Platonism, presocratic philosophies and Aristotelian natural philosophy.

²³⁷ John Henry charts some of Robert Boyle’s more exploratory speculations upon the issue of magnetism and the doctrine of attraction in ‘Boyle and Cosmical Qualities’, in *Robert Boyle Reconsidered*. ed. Michael Hunter (Cambridge: Cambridge University Press, 1994), 119-38.

²³⁸ Joan Hawes, ‘Newton’s Revival of the Aether Hypothesis and the Explanation of Gravitational Attraction’ *Notes and Records of the Royal Society of London* 23. 2 (1968), 200-212. For Leibniz’s attack upon this implication see H. G. Alexander (ed.) *The Leibniz-Clarke Correspondence*, Manchester 1956, ix-x.

²³⁹ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 65.

²⁴⁰ *Anatomia hepatis*, 69-71.

‘composition’ rather than the true ‘mixt’ that is so fundamental that it would equate more accurately to a chemical compound.²⁴¹ Nevertheless, Glisson lists occurrences of this attraction or congregation in the natural world as including “salt gathering into grains,” crystallising sugar, the generation of “minerals, the matter of metals gathering into mines which run in veins, leaving the next earth as common” as well as stony deposits and the formation of precious stones.²⁴²

His interpretation of this attraction incorporates both the ancient and the experimental accounts of such phenomena. He ponders:

This peculiar attraction, and consequently separation, is commonly ascribed to an occult quality magnetical, because of the subtlety and eminence of it, though perchance it be no more than the old proverb intimates *like will to like*. Certain it is that in creatures, which have life, this quality is most evident, and yet they have organs on purpose for it – which little favours the occultness of the action. But as yet I can determine nothing of this point.²⁴³

Glisson is some years away from his master work on the energetic nature of substance here; he is still puzzled at the difference between the rather evident attractions in the world of formed animals and the more mysterious magnetic interactions of inorganic, similiary matter such as iron. Giglioni states that in Glisson’s work “similiary attraction... will lose its animistic resonances and will become the originally and intrinsically teleological activity of living matter... Glisson will have to distinguish the operations of the senses (animal faculties) from those of natural perception and to regard perception as a universal property of matter.”²⁴⁴ Within the strict parameters of natural philosophy Giglioni is right; Glisson does indeed come to propose a theory of natural perception that does not rely upon organic structure – and he does this by redefining the notion of ‘perception’ as much as by redefining matter. Thus the complaints made by figures such as Ross and Cudworth, that matter cannot be sentient without organs of sense, break down in the face of the matter dynamically charged with energy and a blind urge toward formation described by Pagel in Glisson’s late work. However the suggestion that Glisson’s theory of natural perception becomes less animistic as well as more intrinsically teleological seems to me to de-vitalise Glisson’s vitalism, which at heart is a reformulation of the ensoulment of matter. This model of

²⁴¹ Newman, *Atoms and Alchemy*, ‘A Note on Terminology’, xii; 4.

²⁴² *Anatomia hepatis*, 71.

²⁴³ *Anatomia hepatis*, 71-3.

²⁴⁴ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 58.

the animation of substance involves a profound ideological correlation between the notion of elective attraction – that is, matter that perceives what is and is not like itself and moves, purging or congregating accordingly – and the theological formulation of free will. Indeed these echoes and correlations are part of the world view that forms when a genuinely monistic philosophy is adhered to, rather than described in still-dualist terms. The rich constellations of meaning in the act of eating, digesting, learning choosing and knowing the fruit of the Tree of Knowledge will be another such moment where the bodily reality is obviously fused with traditionally symbolic significance through the mediating notion of spirits that are both bodily and rational.

For our current purposes it is the similiary action of the blood that is most illuminating, for here we can see the same pattern of active substance as that which marks out Milton’s philosophy of matter and spirit. Giglioni states that, in his refutation of the liver’s role as sanguifying organ, “Glisson explains sanguification as a motion of increasing assimilation through which the active matter of the blood multiplies and expands itself like a spark that sets light the combustible material.”²⁴⁵ Spiritual exaltation is not just a religious state of mind, it is a theory of physiology: in his defence of the use of chemistry in physiology Glisson states that in the body (as well as in plants and other natural phenomena) “there are some qualities which are superadded to things by way of exaltation or eminence... perchance the natural spirits become vital, and the vital animal, by eminent impressions”.²⁴⁶ Cunningham glosses ‘eminence’ as “raising to a higher degree” and ‘exaltation’ as “rendering more powerful.”²⁴⁷ This exaltation, created through the interactions of spirit and substance, is at the heart of the vitalist heterodoxy of self-transforming substance, so next we shall investigate these interactions in a little more detail.

iii. Chymical blood

In *Anatomia hepatis* Glisson proposes a model of how the ‘mixt’ substance of the blood generates action and, eventually, form. The key to this notion of the active,

²⁴⁵ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 65. Giglioni cites *Anatomia hepatis*, 283; 287-288; also MS Sloane 3308, f. 281r.

²⁴⁶ *Anatomia hepatis*, 77.

²⁴⁷ *Anatomia hepatis*, 77n6.

self-producing blood (and indeed to contemporary medical vitalism) was in the re-evaluation and redefinition of the notion of ‘spirit’. Whilst Harvey’s experimental work had opened up the debates out of which vitalism (and indeed many aspects of mechanism) emerged, he did not theorise a *system* of vitalist spirit and matter. He had opened *Circulatio sanguinis* with a brief summary of the orthodox medical account of the blood and cardiovascular system, stating that:

no-one denies that the blood as such, even the portion of it which flows in the veins, is imbued with spirits... these spirits are inseparable from the blood... the blood and spirits constitute one body (like whey and butter in milk, or heat [and water] in hot water), with which the arteries are charged, and for the distribution of which from the heart they are provided, and that this body is nothing else than blood.²⁴⁸

In his later exchanges with Riolan, Harvey veered yet further towards an outright materialism, questioning the presence of spirits in the blood, but even then this was on the premise of spirits being “vapours or aerial” and he proposed instead pure heat as the vitalising principle of the blood, recalling “Aristotle’s example of gruel or milk upon the fire.”²⁴⁹

So what is the conventional Aristotelian relation of the body’s matter, spirit and vital heat? Pneuma, a notion that was developed by Stoic philosophers, is mentioned by Aristotle in his discussions of higher, rational agents as opposed to the lower forms of animate life (where vital heat is mentioned instead); nevertheless this is not a clearly maintained distinction in the Aristotelian corpus. Warm, airy “pneuma is precisely the substrate capable of carrying vital heat to all parts of the body. Connate pneuma in the semen contains generative heat and in the blood it acts as substratum to the vital heat: all pneuma, he [Aristotle] says, contains soul-heat.”²⁵⁰ However, Glisson, like Harvey, rejects the notion that there is airy substance in the blood, although he is clear that the vital spirit is the substrate of vital heat. When Glisson debated Van Helmont’s identification of vital spirit with his concept of *gas*, he drew on his anatomical expertise and experience to describe the vital spirit as substance which is

²⁴⁸ Harvey, *Works* 12.

²⁴⁹ Harvey, *Works*, 37.

²⁵⁰ Freudenthal, *Aristotle’s Theory of Material Substance*, 127. For the purposes of this discussion I will follow Freudenthal’s definition of the pneuma, which essentially gives it the same function as the Galenic vital spirit: that of substrate of vital heat. For a detailed consideration of this problem see chapter 3 ‘Soul, Vital Heat and Connate Pneuma’, 106-148. Like pneuma, spirit was often thought of as warm and airy: this is the supposition that Glisson denied on grounds of experimental evidence.

“intimately intermingled with the blood and does not produce bubbles or foam; rather, it blends the other elements of the blood in a homogeneous mixture, enlivens, expands, and contracts them uniformly in the course of its palpitating motion (*micatio*).”²⁵¹ What he does, therefore, is use the developments of chymical theory to resolve the problems of theory and experimental evidence that result from Harvey’s work.

Spirit for Glisson, rather than being airy or just ‘heat,’ like that in hot water, is a qualitatively different substance, both fluid and energetic, that has an effect, even a range of effects, upon other sorts of substance. Of the blood Glisson says:

Firstly, it is a corpus *mixtum*, for though it be esteemed a simple element... in its physical consideration it is truly mixed, and contains parts of a different kind. For there is no part found in man or beast which by chemistry... may not be further resolved.²⁵²

Thus when the mixt of the blood is anatomised further by use of chymistry, its constituent parts, whilst not ‘parts’ in the formal sense of organs, may be separated and analysed. The mixed body is made up of elements, an element being defined as: “*a substantial ingredient of natural mixture, prepared to unite with other elements... there are 2 [sic] kinds of these: intermediate and ultimate.*”²⁵³ The intermediate elements are the classical Aristotelian earth, air, fire and water, and the Galenic humours are also classified by Glisson as intermediate elements used by physicians for their practical applicability rather than philosophical purity.²⁵⁴ The “ultimate” elements, the *minima naturalia*, however, are those of chymistry, and thus the anatomising of substance becomes possible, as does self-active substance. Although he built his thesis upon Harvey’s experimental anatomy, the elusive bodily spirits proposed by Glisson are neither simple Aristotelian heat, nor are they more complex pneuma; they are those appropriated from the chymical sects.

In his opening definition of anatomy Glisson includes chymical processes since “the art of *chemistry* will also come under the title of *Anatomy*, in regard it separates and tries out the elements of mixture, as they call them: spirit, oil, water, salt and dead

²⁵¹ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 132. Giglioni translates this from *De ventriculo*, 514.

²⁵² *Anatomia hepatis*, 69.

²⁵³ *Anatomia hepatis*, 67.

²⁵⁴ *Anatomia hepatis*, 73-79.

earth.”²⁵⁵ The vitality of the blood is theorised as a naturally balanced process of attraction, repulsion and assimilation to the most active element. In *Anatomia hepatis*, Glisson explains:

Fermentation is heat which originates from within, due to a battle between spirits and the thicker parts; whereas the former endeavor (*conantur*) to expand and fly away, the latter oppose that exertion (*nisus*). Similarly, the vital heat comes from internal strife, from a conflict between the vital spirits of the blood and its thicker elements, and while these spirits unremittingly do this (so that both they and the rest of the blood dilate), the thicker elements struggle against this endeavor (*conatus*) with all their strength. Therefore, fermentation and vital heat have this in common, that in both cases the spirits strive (*nitantur*) to expand; but this cannot occur without some degree of volatility. Volatility means nothing other than the endeavor (*conatus*) of flying away if it is not restrained by something else.²⁵⁶

This is the vital blood in all its active glory, the vital heat being produced by the expansive, assimilative action of spiritual substance, just as fermentation expands substance through the interactions of the five chymical elements.

The breadth of this theory involves a rather graceful act of inclusion on Glisson’s part, given the severity and bile of the contemporary debates between different factions. Even Robert Boyle, who writes seven years later in 1661 with extremely careful ‘civility,’ marshals the chymical anatomy of the blood as an argument against the validity of the Aristotelian elements, stating: “the blood (and diverse other parts) of men and other animals... yield when analysed five distinct substances, phlegme, spirit, oile, salt, and earth, as experience has shewn us in distilling man’s blood.”²⁵⁷ Glisson in contrast makes an adjustment, identifying Aristotelian and chemical elements thus:

The best way... is, as it seems to me, to reduce the Aristotelian principles to the chemical and make both friends. For *Aristotle’s* element of fire holds near proportion with the chemical spirit, the air with oil, the water with phlegm, the earth with salt and caput mortuum together. For the Aristotelians in burning things, which they did to

²⁵⁵ *Anatomia hepatis*, 19. Unlike Boyle, Glisson does not here touch on the fact that while the Aristotelian system was that of ‘elements’, the chymical philosophers called their basic components of matter ‘principles’. Boyle chose, with some discomfort, to use the terms interchangeably (Boyle, *The Sceptical Chymist*, 16-27). The different etymologies, however, suggest that the term element described more easily the sort of upward movement characteristic of vitalism, while ‘principle’ reverses the emphasis back to a top-down movement.

²⁵⁶ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 78-9.

²⁵⁷ Boyle, *Sceptical Chymist*, 27.

show the 4 elements, they did not sever the salt from the earth, but accounted them both one element; and therefore [one] may extend their 4 elements to the Chemist's 5, by dividing the ashes, which indeed are two things (salt and earth), and not one.²⁵⁸

This correlation of one system with the other is immensely significant both ideologically and in relation to the bio-mechanics of Milton's body-soul composites. It was certainly not a conservative, backward Aristotelianism, indeed Glisson's use of this anatomy of the blood is extremely early, but far from unique; over the following decade it became a popular formulation. In his *Natural History of Nutrition* (1659), Glisson's colleague Walter Charleton describes a similar volatility in the bodily spirits, noting the emergence of vital heat out of volatile chymical spirit, the attempt of spirit to expand itself and the unwillingness of the thicker matter to be so overcome:

thus is the vital Flame kept alive, at no less expence, than a continual dissipation of the most volatile spirits of the blood. For, that vital Heat ariseth from within, and the most subtile spirits are the first Movers to the excitement thereof: the motion by which they do it, being their indeavour to expand themselves, and to dilate their bounds, while the other grosser elements, or ingredients of the blood, oppose them therein.²⁵⁹

The link we made earlier between Glisson's materialist vitalism of the blood and Milton's vitalist materialist Creation is echoed in Charleton's representation of the blood's most subtle spirits as 'first Movers' (a figure of speech which might well have inflamed those concerned with the atheism of the medical profession). It is worth noting that the more modern notion of the blood as feeding the body with nutrients is often in question and becomes eclipsed somewhat by a contemporary vision of blood as having a self-consuming nature, with spirits wasting themselves and struggling with each other in the vitalising process. Even the perfectly peaceful, unfallen Eve has animal spirits (the subtlest and most volatile) exhaling out from her blood, showing a tendency to 'fly away'. In the fallen world of seventeenth-century medicine it is this "*strife, or Counter-activity* of the spirits, on one part, and of the grosser ingredients of the blood, on the other" that causes the "*Mication or Rising and Falling* of the blood," and thus ultimately the dilation and contraction of the heart and the arteries.²⁶⁰

²⁵⁸ *Anatomia hepatis*, 79.

²⁵⁹ Walter Charleton, *Natural History of Nutrition*, 64-65. Charleton eventually subscribes to the mechanist philosophy, but in the next chapter this will provide some interesting correlations between medical vitalism and medical mechanism.

²⁶⁰ I am indebted to Giglioli for this correlation of Charleton's work with that of Glisson.

In *De rachitude* Glisson had delineated a picture of the blood palpitating with sexual delight, aggression and submission, a bodily unconscious, complete with death drive in the natural spirits' possible unwillingness to be assimilated into a higher level of vitality. What had then been seen as homogenous matter with an unexplained cargo of spirit is now, in *Anatomia hepatis*, treated as a mixed body with several different interacting elements in it, some grosser and 'natural,' some more volatile and 'vital'. It is this chemical reaction between elements that produces vital heat, which in turn incubates, stirs and warms the elements to further activity, expansion and struggle:

Vital heat is caused and maintained by a chemical reaction occurring continuously in the blood through its circulation and volatilization. At each cardiac contraction, the blood in the heart is kindled as it were and becomes arterial and vital. The saline and sulphureous components of the blood are extremely active and they are the main responsible for its volatilization. "When they rise to such a high rank, they gain the 'honor' of being called *vital spirits*."²⁶¹

The division between the natural and the vital is occluded here, since both modes of animation include active chymical components, which create a transformative motion from one degree to the next. The sulphurous and saline elements of the blood must stand in the place of the old Galenic natural spirits, since it is they which become volatilised into the higher levels of vital spirit. Vital heat is both the cause and – oddly – the effect of activity in this circular (and ascending) system where the blood exalts and consumes its own spirit and matter: it seems that the notions of soul as vital heat and vital spirit are perhaps more significant than that of form to both Glisson and Milton in their representations and theories of dynamic vitalist matter. Vital spirit is not simply analogous to energy; there is a circular motion in the body's fluids whereby the interactions of different chymical elements of the blood produce vital heat (within a substrate of vital spirit), but these interactions are also the result of the warming influence of vital heat. Within the body it flows out of and with the blood, an influx of vitality, provoking movement and action in both organs and substances.

This chymical revision is grounded in a careful reading of Aristotelian natural philosophy. Freudenthal's reading of Aristotle holds that vital heat is the informative impulsion that prevents the sublunar Aristotelian elements from flying off to their respective places (earth downwards, air upwards) and disintegrating form altogether in a

²⁶¹ Glisson quoted in Giglioni, 'Glisson's Philosophy', 78. Giglioni cites *Anatomia hepatis*, 325, 340-341; also MS Sloane 3309, ff. 370r-370v.

return to Presocratic chaos.²⁶² Thus vital heat is not the sole preserve of the body. The most famous comparison of the vital heat of the body's substances and the ethereal heat of the wider cosmos is given by Aristotle in *Generatione animalium*. He states:

The faculty of soul of every kind has to do with some physical substance which is different from the so-called 'elements' and more divine than they are; and as the varieties of soul differ from one another in the scale of value, so do the various substances concerned with them differ in their nature. In all cases the semen contains within itself that which causes it to be fertile – what is known as 'hot' substance, which is not fire nor any similar substance, but the pneuma which is enclosed within the semen or foam-like stuff, and the natural substance which is in the pneuma; and this substance is analogous to the element which belongs to the stars. That is why fire does not generate any animal... whereas the heat of the sun does effect generation, and so does the heat of animals.²⁶³

The designation of generation as a vegetative process is complicated by the eventual emergence of a formed, vital, and rational human being. Pneuma, brought in to explain this dramatic change of category, complicates the medical differential between the natural and the vital. Milton himself uses the formulation "animated, sensitive and rational," never mentioning natural spirits at all, although he does refer to a vegetative faculty. If we look again at Milton's representation of vital heat in the cosmology of *Paradise Lost* we can recall that the power of the sun is "arch-chemic" although its vital virtue is, according to Raphael, of no fertile power without the "solid good" of the more homely earth; the interaction of the sun, stars and planets is also proposed as a magnetic force.²⁶⁴ The traditional notions of cosmological ethereal influence and solar vital heat have been updated to include chymical concepts; contentious issues such as that of magnetism are touched upon lightly, but the 'scientific' re-evaluation is clearly there.

²⁶² Freudenthal, *Aristotle's Theory of Material Substance*, 12.

²⁶³ Aristotle quoted in Freudenthal, *Aristotle's Theory of Material Substance*, 107. Harvey quotes this passage in his *Generation of Animals* stating "whether we say, or do not say, that the vital principle (anima) inheres in the egg, it still plainly appears, from the circuit indicated, that there must be some principle influencing this revolution from the fowl to the egg and from the egg back to the fowl, which gives them perpetuity. Now this, according to Aristotle's views, is analogous to the element of the stars; and is that which makes parents engender, and gives fertility to their ova... For as the same intelligence or spirit which incessantly actuates the mighty mass of the universe, and compels the same sun from rising to setting, in his passage over the various regions of the earth, so is there a vis enthea, a divine principle inherent in our common poultry, showing itself now as the plastic, now as the nutritive, and now as the augmentative force" (Harvey, *Works*, 285-6).

²⁶⁴ See *Paradise Lost* 3. 583-6; 8. 90-97; 3. 591-612.

iv. The “kindly heat of various influence”: vital heat in *Paradise Lost*

If we return to Freudenthal’s assessment of vital heat as a formative force, which works somehow to keep the elements together in substantial forms, we can note that precisely this point is made about vital heat in the course of Adam’s answer to Eve as to why the stars (with their analogous vitalising power) shine through the night.²⁶⁵ He describes them thus:

Ministering light prepared, they set and rise;
Lest total darkness should by night regain
Her old possession, and extinguish life
In nature and all things, which these soft fires
Not only enlighten, but with kindly heat
Of various influence foment and warm,
Temper or nourish, or in part shed down
Their stellar virtue on all kinds that grow
On earth, made hereby apter to receive
Perfection from the sun’s more potent ray.
(*PL* 4. 664-673)²⁶⁶

The total darkness of night to which Adam refers can only be that of chaos (in which Night remains the ‘sable-vested’ consort of Chaos). Rogers terms this problem of natural philosophy an “ontologically absurd threat” and suggests that it may only make sense as a figure for the poet’s fear of encroaching political chaos during the last years of the republic.²⁶⁷ It may indeed hold such significance, but we should not forget that it is also a problem of Aristotelian natural philosophy of substance, and was thus a focus for the investigations of the ‘new science’. The “endemic strife” to which Freudenthal refers as the originary state of the Aristotelian elements (he refers here to *Meteorologica* and *Generatione et corruptione*) is in fact a necessary result of the elements’ differing movements, and there is a genuine philosophical problem as to why any of these elements sustain any form at all.²⁶⁸ This is a weakness that atomism could address, with the notion of atoms which were so shaped that certain of them clung together or slipped apart; in terms of the contemporary body politic, this is the Hobbesian thesis. All these ideas can be glimpsed in Milton’s chaos, where we have already encountered the threat

²⁶⁵ Marjara notes that Boyle made the same adjustment of adding magnetism to the “Aristotelian principle of starry influences” in his *The General History of the Air* (Marjara, *Contemplation of Created Things*, 127).

²⁶⁶ In his conversation with the disguised Satan Uriel describes the moon as having the same role of fending off Night which would otherwise “invade” paradise (*PL* 3. 724-732).

²⁶⁷ Rogers, *Matter of Revolution*, 142.

²⁶⁸ Freudenthal, *Aristotle’s Theory of Material Substance*, 13.

of incoherent, unformed matter; in Book 2 Satan surveys and traverses the wild abyss where “Hot, Cold, Moist, and Dry, four champions fierce / Strive here for mastery, and to battle bring / Their embryon atoms” (*PL*. 2. 898-900).

The immense mixed heritage of Milton’s wildly dark and fertile chaos cannot be dealt with here, but the figure of the threat of chaos held at bay by ethereal warmth proposed by Adam is almost a replica of that at the end of Book 2, where Satan emerges out of chaos to the borders of the Creation. Here the poet switches from the narrative past tense (“he with difficulty and labour hard / Moved on” (*PL* 2. 1021-2)) into the present tense as the first holy light becomes apparent:

But now at last the sacred influence
Of light appears, and from the walls of heaven
Shoots far into the bosom of dim Night
A glimmering dawn; here nature first begins
Her farthest verge, and Chaos to retire
As from her outmost works a broken foe.
(*PL* 2. 1034-9)

The shift from past into present tense at this moment of transition is significant. By fixing the moment not only as one of Satan’s journey, but also as the moment of writing and all the possible future moments of reading, the figure of the interaction between chaos and holy light is moved out of the sequential mode of time and eternalised: it becomes a synchronic model.²⁶⁹ It is on the border, the liminal meeting place of the dark materials and pregnant causes of chaos and the “sacred influence of light” that Nature originates as a grace and a blessing that overcomes the dark possibilities of Chaos, bringing calm ‘tumult less and... less hostile din’ and the beginnings of order (*PL* 2. 1040). The complex web of violent assimilation and fertile embrace between matter and spirit that characterises chaos and its final submission to holy light echoes the action of the rebellious saline and sulphurous substance and the seductiveness of the overcoming vital spirit in Glisson’s model of the vital blood.

²⁶⁹ One of the most famous examples of Milton’s slippage between tenses occurs shortly before this as Satan encounters an eternal vacuum in Chaos “and to this hour / Down had been falling” (*PL* 2. 934). As Marjara notes, Satan’s potentially endless fall though a vacuum in chaos cannot be supported by Aristotelian physics, which demand either contact with a motive force or air to sustain motion of a body. Contemporary physicists supported the possibility; it is Galileo, the only contemporary figure to appear in *Paradise Lost*, who speculates upon the possibility of such a motion and his Simplicio who defends the opposite thesis (*Contemplation of Created Things* 160-1). It is also significant for the purpose of this discussion that Aristotle rejected atomism, so this most Aristotelian moment is again disrupted with another theory that was proposed by figures in antiquity and was being redefined through the most progressive science of the seventeenth century.

In his answer to Eve's question Adam gives something very similar to the solution given by Freudenthal: he is emphatic that the aetherial heat acts in several different ways, to warm, balance and even nourish life on earth in the shadowy absence of the "more potent" "arch chemic" sun, holding chaos at bay.²⁷⁰ The conversation wanders on to cover the angel song they hear through the night, giving an increasingly Platonic note to the cosmology, but the description of the vital heat of the stars and its power to protect and enable the generation of life is distinctively Aristotelian. Freudenthal states that vital heat "is the physiological factor underlying all operations of soul – nutritive, perceptive, locomotive, imaginative, to a great extent even intellectual. Vital heat establishes the *scala naturae*, with more vital heat giving rise to more perfect forms – physical and psychical."²⁷¹ This explanation of the dynamic *scala naturae* matches those sketched by both Glisson and Raphael, although they both propose chymical philosophies of substance to explain the emergence and action of vital heat.

Freudenthal's argument and the concomitant one that vital heat involves an upward movement in its perfecting motion are criticised with considerable ire by Christopher Shields as missing Aristotle's philosophical significance, and of looking "quaint or worse," mainly because they rely on principles of heat that "no-one today will take seriously."²⁷² Freudenthal's thesis is also characterised by Shields as one which "stresses the physical and chemical character of Aristotle's theory in ways which... are partly contradictory and partly complimentary to more traditionally metaphysical interpretations presented in terms of soul and form."²⁷³ This concern stems from an approach to the history of science that was discussed in the introduction, in which only those theories that fit with and authenticate our own sense of scientific progress may be treated as valid or illuminating; Freudenthal is indeed studying Aristotelian science. Whilst Shields marks the lack of attention to Aristotle's metaphysical philosophy, Freudenthal uses *meteorologica*, *generatione et corruptione* and *generatione animalium* as primary sources and this depiction of vital heat resonates so strongly with that used by both Milton and Glisson, that it is clear that even now the divergence and debate between the 'scientific' Aristotle and the 'metaphysical' Aristotle

²⁷⁰ The action of this influence conforms structurally to the function of vital heat in the body, which acts to 'foment' and warm the gut, preparing the food for the chymical action of the acid ferment, or the incubating warmth of the hen, which stirs up and foments the action of the vital fluid in the egg, itself analogous to the brooding action of the spirit in the Creation sequence.

²⁷¹ Freudenthal, *Aristotle's Theory of Material Substance*, 74.

²⁷² Christopher Shields, Review of Freudenthal, *Aristotle's Theory of Material Substance* in *The Philosophical Review* 106. 4 (1997), 632-635, 633-4.

²⁷³ Shields, Review of Freudenthal, 633.

continue to play out in journals of the late twentieth century. Unlike the modern science to which Shields appeals, the seventeenth-century debate could in all seriousness re-evaluate Aristotelian vital heat in the light of the latest empirical, experimental theories and discoveries. The vital heat that impregnates chaos in Raphael's description of the Creation is Holy Spirit, but as we shall see it acts very much like the bodily spirits of conception.

Chapter 4

Creation and Conception

“It is not any more incredible that a bodily force should be able to issue from a spiritual substance, than that something spiritual should be able to arise from a body.”²⁷⁴

i. Body out of spirit

In his defence of matter in the *Christian Doctrine* Milton makes the idiosyncratic assertion that body can emerge out of spirit; he states that it did so at the point of Creation and that “that is what we hope will happen at the resurrection”.²⁷⁵ The structural emergence of body (which we can only imagine as organic form) from the action of spirit has no analogue as precise as that given by Harvey in his musings in *De generatione animalium* and extended by Glisson in the observational, experimental account of the earliest life of the foetus. Here the physicians are using their observation to work against Aristotelian orthodoxy, since the earliest observable traces of life are active fluids – first a pale clear fluid, then blood - which gradually coalesce into structure. The problem faced by physicians was the same Aristotelian assertion that form – a material form – must act upon matter in order for motion, alteration and transformation to occur. In this case, looking at Harvey’s observation of the development of the foetus out of liquid substance, or colliquament, there are some difficult questions:

if this juice first produces the blood... it must transform itself into the blood, but this seems it cannot happen at all. For nothing acts upon itself, nothing moves itself.²⁷⁶

²⁷⁴ CPW 6: 310.

²⁷⁵ CPW 6: 310

²⁷⁶ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 84. This is taken from Glisson’s notes for his students’ academic disputations at Cambridge in the early 1650s. Giglioli cites MS Sloane 3309, ff. 40r-41r.

Yet this is precisely the process that Harvey had observed. The problem is one of Aristotelian orthodoxy being faced with empirical observation. As Balme comments of Aristotle's theory of insemination, although the semen is supposed to contain movements which actualise form out of the matter of the menstrual blood, "in arguing for teleology and for some other theories, he does not speculate about how the theory works in physical terms... it is not a pictorial description, but a sort of algebraic analysis".²⁷⁷ Harvey's late work, *On generation*, had first proposed this problem of the disjunction between theory and evidence with a notorious lack of definite answer. Although Harvey discusses the Galenic humours and makes various points about thicker, darker elements of the blood, serum components, and the effects of heat, he gives no definitive anatomy of the blood and develops no system of active matter.

Before I continue, a brief word about the Galenic theory of conception is in order. It was not bound by the equations of form and matter, and often stood as an alternative medical theory, in conflict with the natural philosophy of the peripatetic tradition.²⁷⁸ There is undoubtedly a central thread of Galenism in the work of both Glisson and Milton, not least because Galenic physicians had theorised fluid seed from both male and female bodies coagulating in the womb to produce an embryo. Nevertheless, besides this central point of foetal emergence from fluid, there are some features of the theory that are wildly divergent from the parallel models of conception that we meet in *Paradise Lost* and Glisson and Harvey's medical work. The liver was imagined as the primary organ, and often as the first to appear, although a tripartite emergence of liver, heart and brain was also characteristic of Galenic theory and thus counter to the Aristotelian primacy of the heart.²⁷⁹ Unlike Aristotelian theory, Galenism provided models that were, to some extent, pictorial. Ambrose Paré describes the earliest stage thus:

In the sixe first dayes of conception the new vessels are thought to bee made and brought forth of the eminences or cotylidons of the mothers vessels, and dispersed into all the whole seede, as they were fibres or hairy strings. Those as they pierce the wombe, so do they equally and in like manner penetrate the tunicle Chorion. And it is carried this way, being a passage not only necessary for the nutriment and

²⁷⁷ Balme, 'Human Creates Human', 24.

²⁷⁸ For some entertaining descriptions of these sometimes fierce debates, see Vivian Nutton, 'The Anatomy of the Soul in Early Renaissance Medicine', in *The Human Embryo: Aristotle and the Arabic and European Traditions*, ed. G. R. Dunstan (Exeter: University of Exeter Press 1990), 136-157.

²⁷⁹ Nutton, 'Anatomy of the Soul' 141.

conformation of the parts, but also into the veines diversly woven and dispersed into the skin Chorion.²⁸⁰

Here the coagulating seed is supplied with ‘nutriment and conformation’ by fibrous strings that come from the mother and penetrate it and the walls of the womb, despite the fact that Vesalius had long before shown that these cotyledons were one of the features that Galen had drawn from animal anatomy, not that of a human.²⁸¹ Paré was a popular medical authority, even in the mid seventeenth century, but neither Milton nor Glisson’s Galenism is dated by such details. Moreover, when Paré describes the action of the fluids, it recalls rather the boiling milk of Harvey’s fermentation rather than the interacting spirit, saline and sulphur of the chymical revision. Paré attributes to the action of the cotyledons that

it commeth to passe that the seed it selfe boileth, and as it were fermenteth or swelleth, not onely through occasion of the place, but also of the bloud and vitall spirits that flow unto it, and then it riseth into the bubbles or bladders, like unto the bubbles which are occasioned by the raine falling into a river or channell full of water. These three bubbles or bladders, are certain rude or new formes or concretions of the three principall entrals, that is to say, of the liver, heart and braine.²⁸²

Paré mentions fermentation here, but he is not talking about the ferment of the chymists; this is rather the ‘ferment’ of baking bread and boiling milk. The seed is imagined as boiling and bubbling to create three bubbles or blisters that will become the three primary organs; this is caused by an influx of vital spirit and blood through the cotyledons and the warmth of the womb. Here we can see the influence of the notion of warm, airy pneuma, as well as Harvey’s version of fermentation, described with the image of boiling milk (and in fact Aristotle also uses the image of boiling milk to describe the presence of pneuma in the blood).²⁸³ The emergence of the organs relies upon the outdated notion of bodily spirit as airy and, despite the divergences from Aristotelian theories of form and matter, this is a pictorial description of the cooking-like concoction of antiquity.

Glisson’s solution of the vital blood with chymical constituent parts, however, makes possible an anatomy of the bodily fluids themselves, and thus an explanation of

²⁸⁰ Paré, *Workes*, 893. The Chorion is the early manifestation of the placenta.

²⁸¹ Nutton, ‘Anatomy of the Soul’, 149.

²⁸² Paré, *Workes*, 893.

²⁸³ Freudenthal, *Aristotle’s Theory of Material Substance*, 122.

the ‘warm, prolific humour’ of generation and creation. Arguing from the self-generation of blood in the foetus towards a theory of the blood as self-generating in the adult body, he states:

the blood which is produced is nobler than the previous pale juice and it does not differ from it as if it became vital from being not vital; indeed the blood is now imbued with a higher and more active degree of life. Furthermore, the blood does not act upon itself absolutely; rather, the elements of the same mixt struggle among each other and produce these changes.²⁸⁴

It is not, for Glisson, the homogenous matter of the blood acting upon itself, but various different modes of matter interacting. This struggle between the ‘elements of the mixt’ is that same one that we have seen compared to fermentation, whereby the spirituous components of the blood swell, effervesce and become volatile, only to be grounded by the thicker elements as they seduce, consume and assimilate them in their expansive motion. The sanguification of the foetus emerges from vital spirit and active matter and the blood of the developed human form can no longer be assumed as being produced in the organs, for the tiny foetus has no organs when it begins to produce blood; that is: “the blood is not generated in any parenchyma, but in the blood itself, through the blood”.²⁸⁵

In his development of Harvey’s investigations into the possibility of animate blood and the problem of the seemingly fluid, formless origin of a foetus, Glisson innovates freely. He diverges from the Aristotelian order of form and matter as well as the Galenic concoction of fluids, to describe the action of the seminal matter and vital spirit thus:

This vital fluid [also referred to as seminal matter], before it assumes the red colour characteristic of the blood, begins to set itself apart from the other parts of the egg (with which it is promiscuously mingled) and to run through some rivulets or ramifications which afterwards become the veins. These rivulets come together and meet in one point which is afterward called the leaping point (*punctum saliens*) and heart... As soon as these rivulets join together, the flow in them is restrained for a while and then it effervesces and needs a larger place. And since the flow cannot go back through the same path (because new streams are continually flowing), it necessarily has to

²⁸⁴ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 84. Giglioli cites MS Sloane 3309, ff. 40r-41r.

²⁸⁵ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 84. Giglioli cites MS Sloane 3309 f. 195r; Sloane 3310 f. 232v.

return to the seminal matter from which it had flowed forth after having formed new channels. Hence a circumgyration arises, and finally the first channels become the veins, the second the arteries; and in the point of their confluence, the heart is born.²⁸⁶

The action of this turbulent active fluid creates a very different version of the *punctum saliens* to that sketched by More. The first thing to note here is that effervescence is a primary characteristic of chymical fermentation;²⁸⁷ elements of the ‘mixt’ swell and rise, but there is no place here for the Aristotelian precept of conception as a simple concoction or ‘boiling,’ and neither are there any cotyledons or evidence of airy bubbles of pneuma from the Galenic tradition. The second point is that this effervescent vitalised fluid acts in a circumgyration (we might describe its action as circumfluous), the more solid matter gathering into the beginnings of a structure while streams or rivulets of vital fluid flow, flood and expand, joining those channels to each other in a circular motion and streaming out to make new ones. “In its “tendency to unite” (*congregandi nisus*), the primal fluid spread and branched out through rivulets and, as a result of the same tendency (*conatus*), it removed the thickest parts to the lateral sides of the channels which condensed into the venous and arterial vessels”.²⁸⁸ This process Glisson terms the ‘*vitae chorea*’, or the original dance of life. The efficient cause of the attractions, separations and effervescence of this original substance of the (soon to be) body is the vital spirit. “The vital spirit (which otherwise lies as it were asleep within the thicker matter), stimulated and animated by the external heat from the incubation,

²⁸⁶Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 83. Giglioli translates from *Anatomia hepatis*, 310-311; he also cites MS Sloane 3308, ff. 226r-228r. Five years after the publication of *Anatomia hepatis* Walter Charleton has obviously been influenced by Glisson’s work; he almost replicates the above passage, stating: “This *Vital Liquor*, before it assumes the colour and forme of Bloud, doth begin to separate it self from the other parts of the Egge (to which it is at first promiscuously admixed) and to runne its selfe out into certain slender rivulets, or branchings, which afterward become Veins. These rivolets concurring in a point, meet altogether at the centre of the *Colliquamentum*; which centre being the principal seat of the Plastique spirit, and acquiring a certain mication, or pulsation, is then called *Punctum Saliens*? And all this is done, before there is any the least appearance of bloud in the Egge. So soon, therefore, as these Rivulets are conjoyned, the Flux of the *Vital Liquor* is, for some time, so hindred by, and repressed in them, as that being indefinitely [sic] agitated by the *Spirit of Life*, it aestuath, and indeavours to expand it self and enlarge its bounds: and seeing that it cannot flow back againe toward the circumference, by the same passages, which brought it toward the centre, by reason of fresh supplies of *Vital Liquor* pressing it forward continually in the course begun; it is compelled to force it self again into the seminal matter, from whence at first it began its motion, through other slender conduits newly for that purpose formed, and then it begins to flow in a round. For, this appears to be the true reason of the *Circumgyration* of the *Vital Liquor*, from the very beginning. Soon after this, the Rivulets or pipes first made, and leading from the circumference to the Centre, become *Veins*; and the others made in the second place, and leading from the centre to the circumference, become *Arteries*: which yet others disallow, in respect of the fabrick of the valves) and then in the poynt of their concourse or confluence, the *Heart* is framed” (*Natural History of Nutrition*, 42-43).

²⁸⁷ Pagel, *Van Helmont*, 87.

²⁸⁸ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 85.

gradually heats the vital fluid in which it is lodged.”²⁸⁹ The stimulating warmth of incubation activates the vital spirit and initiates a process of similiary attraction: thicker fluid gathers together to that which is thick like itself, and is formed by the circular flowing movement of the more volatile component substance, which itself continues to effervesce and attempt to rarefy and expand; thus form emerges from fluid and spirit.

ii. The embryo earth

There is clearly a comparable discourse of conception ordering Milton’s representation of the Creation: in the Creation sequences of Book 7 alone the earth is described directly in terms of a womb or embryo four times, besides the proliferation of other less human images of pregnancy or birth such as hatching or calving.²⁹⁰ This itself is a critical commonplace and should be observed in the context of Milton’s recurrent use of images of birth and pregnancy, both positive and negative or monstrous, in his poetry and throughout the prose.²⁹¹ Nevertheless, the Creation of the visible world is literally a foundational event and its centrality is indicated in its position as one of the first images of the poem. The poet invokes the Holy Spirit for inspiration and the truth claim of *Paradise Lost* is implicit in the coincidence of this Spirit with that which inspired Moses to write the book of Genesis to show, “in the beginning how the heavens and the earth / Rose out of chaos” (*PL* 1. 9-10). Out of all the possible biblical sources for representation of the spirit he chooses that of the Creation: “thou from the first / Wast present, and with mighty wings outspread / Dovelike satst brooding on the vast abyss / And mad’st it pregnant” (*PL* 1. 19-22). In brooding and inseminating, the Holy Spirit enacts both male and female roles in generation and the circular section of infinite abyss that has been divided off with the golden compasses of “God’s eternal store” stands as the egg (*PL* 7. 226). The combination of brooding, or giving an incubating warmth and also inseminating matches perfectly the double function of vital heat in natural philosophy, to both incubate and vitalise through the interaction of spirit and thicker matter, ultimately causing movement and formation.

²⁸⁹ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 83.

²⁹⁰ The earth is a womb/embryo at *PL* 7. 276, 277, 281 and 454; other images at *PL* 7. 418-9 and *PL* 7. 463.

²⁹¹ The most obvious are, perhaps the monstrous fertility of Satan, Sin and Death as opposed to the glorified fertility of Adam, Eve and paradise itself. In the prose the divorce tracts use recurrent images of monstrous fertility as do some of Milton’s less savoury diatribes against Salmasius and More.

This is the first of several accounts of the Creation of the visible world: we will be investigating the representation of Holy Light as generative force in the invocation of Book 3, as well as Uriel's account in Book 2. The longest and most detailed, however, is that given by Raphael in Book 7. In Raphael's account the imagery clearly calls upon medical imagery drawn from contemporary sources. In the central passage describing the third day of the earth's creation, Raphael states that:

The earth was formed, but in the womb as yet
 Of waters, embryo immature involved,
 Appeared not: over all the face of earth
 Main ocean flowed, not idle, but with warm
 Prolific humour softening all her globe,
 Fermented the great mother to conceive,
 Sated with genial moisture, when God said,
 Be gathered now ye waters under heaven
 Into one place, and let dry land appear
 (PL 7. 276-84)

This warm, prolific humour is acting just as Glisson's vital fluid does. To clarify again, a ferment, in contemporary chymical medicine, was a spiritual impulsion which adjoined a body; it worked to make the object similar to itself, or to assimilate; it was thought to impregnate the body or substance seminally and multiply itself; it was thought to effervesce, expand and be acidic in nature.²⁹² This is the chymical tradition used by Glisson when he is talking about the 'effervescence' of the seminal fluid although, unlike the more Platonist Van Helmont, he is unequivocal about the fluid materiality of the impelling spirit. In Raphael's description we see the earth as an embryo that is still a globe of fermenting fluid, the form as yet imperceptible (as the forming *punctum saliens* was in the egg), but definitely within. As in Glisson's representation, there is no airy pneuma, although the air itself has already been "spun out" into creation; this genial moisture is clearly fluid and although it is richly active, it is neither bubbling nor boiling. Milton plays with the sense of scale, correlating the planetary immensity of "maine ocean" with the bodily "womb of waters;" this fluid is "not idle," it is "prolific," "genial" (in the sense of generative) and fermenting, just as Glisson's seminal matter and vital fluid are.

²⁹² Pagel, *Van Helmont*, 87.

There are two possible problems with this comparison. One is that the embryo earth is already “formed” in Raphael’s description; therefore the form still has sequential priority and the earth is not emerging out of similiary substance and spirit. The other is that posed by Rogers, that the vitalist matter of the Creation (like the vital matter of the physicians) informs itself without reference to the divinity of God, thus correlating with the orthodox contemporary argument that the theory of active matter implies atheism. Both of these issues can be answered by a closer examination of the sequence in its entirety, going back to the very beginning of the Creation process. By examining the Creation sequences through the lens of Aristotelian causality as it is used in the contemporary theory of conception, I will show that Milton’s God is not disproved, but justified by his materialism, which fits into an ordered, well informed natural philosophy that is itself coherent with theodicy.

To deal with the first question, the earth is already ‘formed’ at line 276 because this is not the beginning of Creation, and neither is it represented in terms of the earliest moments of conception. Danielson has pointed out that there are three stages of Creation in *Paradise Lost*, beginning with:

a first stage – not yet creation proper – in which prime matter is in some way ‘alienated from God, rendered external from him; a second stage in which some but not all of that matter is chosen to be the stuff of this visible world; and a third stage in which that stuff receives its actual forms. The result of the first stage is Chaos.²⁹³

The first stage is of profound theological consequence, since it is here that the divine origin of matter is asserted; as Danielson indicates, God makes the status of chaos clear just before the creation, saying:

thou my Word, begotten Son, by thee
This I perform, speak thou, and be it done:
My overshadowing spirit and might with thee
I send along, ride forth and bid the deep
Within appointed bounds be heaven and earth,
Boundless the deep, because I am who fill
Infinitude, nor vacuous the space.
Though I uncircumscribed myself retire,
And put not forth my goodness, which is free
To act or not, necessity and chance
Approach not me, and what I will is fate.

²⁹³ Danielson, *Milton’s Good God*, 45-6.

(PL 7. 163-173)

Despite its current abandonment to necessity and chance, this deep is still infinite, and this is because of its divine origin.²⁹⁴ Unlike the soon to be created visible world, it is boundless and although the chaotic stuff of it is of divine origin, God has retired himself; just as he chooses not to act upon Adam and Eve's will, he has chosen not to act upon this chaos – until the Creation.²⁹⁵ The abyss has divine origin and God the father is thus, in part, potential; as we noted in Chapter 2, if he is to act freely, if he is to create rather than being fixed in actuality, if he is to *move* then potential must exist in him. The Son, who is enactor of the Father's decree, is the Word (as well as being the image of the Father) and he is accompanied both by an "overshadowing spirit" and by a less defined divine power. This multiplication of divine powers and figures seems to suit Milton's thought better than the Trinitarian formulation, which we know he rejected forcefully. In the invocation to Urania in Book 7 there are other figures imagined at the brink of Creation: although Urania is circumscribed with the proviso "the meaning not the name" being called, she is "Heav'nlie borne, / Before the Hills appeared, or Fountain flow'd, / Thou with Eternal Wisdom didst converse, / Wisdom thy Sister, and with her didst play / In presence of th' Almighty Father, pleas'd / With thy Celestial Song" (PL 7. 7-12).

There are, then, a notable number of different modes of divinity in this passage and others of *Paradise Lost*; what is emphasised is the central doctrinal point that God the father is the cause of many causes, including the material. We are told in the *Christian Doctrine* that God "is the first, absolute and sole cause of all things [and] he unquestionably contains and comprehends within himself all these causes."²⁹⁶ In *Paradise Lost*, chaos is a representation of the material cause, the material potential of divinity to make manifest, visible, extended reality out of "dark materials" which are also already "pregnant causes." This is the relationship of chaos, the material cause to its origin, but what of the other divine causal modes of Creation? The material cause meets the efficient cause in the second stage of Creation, when the Son and the

²⁹⁴ Milton makes his position clear in his arguments against the Trinity that there can be only one infinity: that of the one God (CPW 6: 211).

²⁹⁵ This leaves it both morally and formally as pure potentiality. We see another glimpse of this quality of potentiality in the divine when Adam reassures Eve, "Evil into the mind of God or man / May come and go, so unapproved, and leave / No spot or blame behind" (PL 5. 117-119). As Danielson argues throughout *Milton's Good God*, the quality of *potential* in materiality reflects and substantiates the pure potential of free will in both the human and the divine.

²⁹⁶ CPW 6: 308.

“overshadowing spirit” ride into the abyss and the Word speaks, saying “Silence, ye troubled waves, and thou deep, peace” (*PL* 7. 216). The phrase “overshadowing spirit” echoes Gabriel’s words to Mary at the Annunciation, another opening moment of divine insemination: “The power of the highest shall overshadow thee” (Luke 1:35). The Holy Spirit is acting as vital spirit does in the body’s semen and blood. This overshadowing spirit is the efficient cause: likewise, in medical terms, Glisson states that “the vital spirit is the primary efficient cause and the real principle of sanguification.”²⁹⁷

The divine entry and command also correspond structurally to Milton’s definition of the efficient cause in the *Art of Logic*, being a primary initialising cause, but itself separate from the effect; the material cause, on the other hand, is retained within the Creation along with the ontological freedom it substantiates. However, the efficient cause seems to be working in more than one mode; Milton describes the system of four causes in the created world (too often called Nature) as the “efficacy of the divine voice which went forth in the beginning, and which all things have obeyed ever since as a perpetual command”.²⁹⁸ The divine voice is also an efficient cause and it works through the medium of the divine spirit. The process is imagined richly as a coincidence of abstract command, spiritual power and material force, all interacting within the same phenomenon. The coincidence of causes is nevertheless systematised: there is a structural relation between the relation of God’s command to his word and his spirit and the action of vital spirit and heat. *Spiritus*, or breath is the substratum of the Word, just as bodily spirit is the substratum of vital heat. Both Word and heat share a substratum of vital spirit. Vital heat is the warming vitalising power which acts upon the fertile good of matter (or on various grades of matter), awakening the latent movement and fecundity of spirit/matter in it. That fecundity, once awakened, functions by a similiary attraction, and thus a dynamic interaction of spirit and thicker stuff (figured through fermentation), to produce both form and more vital heat with a circular motion: as in human generation, the matter and spirit is endowed immediately with the power to multiply and transform.

²⁹⁷ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 85. Giglioni cites MS Sloane 3309, f. 43r.

²⁹⁸ *CPW* 6: 340.

Here, with this direct structural correlation of Word and heat, of vital and holy spirits, we should return to answer Rogers's charge of disparity between commands of the theological divinity and the action of vitalist materiality.

The vitalist process of material self-organisation is the direct result neither of God's command nor of his vigilant and ongoing manipulation of an inert substance... One of the most shocking instances of the complete transmission of divine power to the matter of creation generates an elaborate figural complex that lies at the heart of the political science of Milton's poem: the figure of self-creation.²⁹⁹

It is the designation of substance as "inert" that gives away the dualism underlying this argument, indeed this logic is also at the heart of the accusations of atheism faced by seventeenth-century vitalism: if matter is active then God must be defunct. However, rather than rejecting the correlation of bodily spirituality with divine spirituality, Milton positively invites it in these sequences. Of course his attribution of divine origin to the first matter of the abyss is one counter to such an accusation: thus the action of matter does not preclude God's power since it is a result of God's power. Nevertheless, Rogers' question about causal agency demands that we pay careful attention not only to the matter of creation, but also to how the multiple spiritual impulses of divinity actually function to produce the fermenting embryo of the visible world.

Rogers's reading of the Creation sequence uses Harvey's research to support itself; Harvey's theories in *Generazione Animalium* are described as "daring formulations of autonomous generation" and it is thus asserted that the Creation (and Harvey's thesis) represent a process of parthenogenesis: reproduction from an ovum without fertilisation.³⁰⁰ Self-creation is undoubtedly a Satanic notion in *Paradise Lost*. Rogers argues at some length that in *Paradise Lost* "[a] philosophy of self-creation lies at the heart of the poem's most striking and consequential bid for political authority";³⁰¹ by this he is referring to Satan's claim that the angels are "self-begot, self-rai'd / By... [their] own quickening power" and this he then correlates with the process of parthenogenesis in the Creation sequences (*PL* 5. 859-860). There is, Rogers says, a "threatening proximity of this official description [by Raphael] of Creation to the Satanic claim of self-raising".³⁰² Claiming that these theories of genesis are

²⁹⁹ Rogers, *Matter of Revolution*, 114.

³⁰⁰ Rogers, *Matter of Revolution*, 120.

³⁰¹ Rogers, *Matter of Revolution*, 122.

³⁰² Rogers, *Matter of Revolution*, 124.

characterised by a self-active materialism which can only preclude the active impulse of God the father, he thus reiterates in another register the claim made by Burton, Ross, Cudworth and even Giglioli, that materialism is akin to atheism. However, as we can see, Milton's organisation of the Creation process, with material and efficient causes preceding form, corresponds perfectly to the re-ordered version of causality adopted by Harvey and Glisson that we explored in Chapter 2. Moreover, through this relationship, we can see that the medical theories of genesis to which he refers are less atheistic than has been assumed.

Conception is in fact presented by all the authors concerned as an interaction of spirit and matter out of which form (or body) emerges. Rogers's assessment of Harvey's thesis relies too heavily on the rebuttal published by Alexander Ross, which caricatures it heavily; he claims Harvey's work as a "thesis of a self-sufficient and implicitly gynocentric generation," and claims Harvey's use of the "doctrine of the ferment... [has] its corollary theory of autonomous generation."³⁰³ In fact autonomous generation was widely seen as relevant only to insects and 'lower' species which were thought to be spontaneously generated out of mud, or rotting bodies and the vivifying power of sunlight.³⁰⁴ While there was a dramatic and lurid history of human attempts to create a 'homunculus' by comparable methods in alchemical medicine, mainstream physicians such as Harvey were rather more cautious, rational and concerned with genuine evidence than figures such as Paracelsus.³⁰⁵ What Harvey does do is to identify the vital heat of the body with the vital influence of the sun and stars by suggesting that spontaneous generation and the generation of animate life are effected by the same process: "all animal generation is effected in the same way... all animals, even the most perfect, are produced from worms... for [worms] acquire dimensions before they have any definite form."³⁰⁶ When discussing the process of insemination, Harvey himself makes in fact a finer point than to suggest autogeneration; he argues that the vitality of the semen works by exuding vital heat, to fertilise all the waiting eggs already in the body. His point in the following is that the semen does not render the hen's body or

³⁰³ Rogers, *Matter of Revolution*, 120. Ross expends a chapter refuting various sentences drawn from Harvey's work. See Alexander Ross, *Arcana microcosmi* (London, 1652), 224-235.

³⁰⁴ William Newman, *Promethean Ambitions: Alchemy and the Quest to Perfect Nature* (London: University of Chicago Press, 2005), 166.

³⁰⁵ Newman notes that in Paracelsus' tract *De homunculus* even semen which remains in the male body can start creating monstrous growths, that pederasty causes intestinal worms in children and that "the potential for producing intestinal homunculi is the real reason for St Paul's injunctions against the abusers of children" (*Promethean Ambitions*, 218).

³⁰⁶ Harvey, *Works*, 251.

later eggs fruitful beyond this. He states quite clearly that this is a physical process, which nevertheless relies upon the vitalising properties of the spirituous semen:

My opinion is that the semen of the cock thrown into the commencement of the uterus, produces an influence on the whole of the uterus, and at the same time renders fruitful the whole of the yelks, and finally of the perfect eggs which fall into it; and this the semen effects by its peculiar property or irradiative spirituous substance.³⁰⁷

This thesis may possibly bestow a metaphysical vital power on the semen, linking it again to the ethereal power of the stars and the sun in true Aristotelian fashion, but it cannot, even then, be a model for parthenogenesis as Rogers (and Ross) claim it is. When Harvey says that “it is certain that the chick is formed by a principle inherent in the egg, and that nothing accrues to a perfect egg from incubation,” this is said in reference to material additions such as nutrition.³⁰⁸ Harvey, as we have seen, is well aware that the egg has already been fertilised by the male spirituous substance. Nevertheless, the way in which the vital spirit acts ultimately remains a mysterious force for Harvey.

In Milton’s representation of Creation the overshadowing spirit both cloaks and enters the rude mass of chaos, incubating it externally in a feminine mode and vitalising it internally just as the spirituous semen of Harvey’s theory radiates into the uterus, fertilising the eggs within. It is with a double action that is typical of vital heat that the spirit both incubates and fertilises the matter of the “fluid mass,” itself yet dark and formless:

Thus God the heaven created, thus the earth,
Matter unformed and void: darkness profound
Covered the abyss: but on the watery calm
His brooding wings the spirit of God outspread,
And vital virtue infused, and vital warmth
Throughout the fluid mass, but downward purged
The black tartareous cold infernal dregs
Adverse to life: then founded, then conglobed
Like things to like, the rest to several place
Disparted, and between spun out the air,
And earth self-balanced on her centre hung.
(*PL* 7. 232-242)

³⁰⁷ Harvey, *Works*, 191.

³⁰⁸ Harvey, *Works*, 220.

This is the process through which the earth is formed – the movement that spirit sparks off in the ‘fluid mass’ that has until now been “promiscuously mingled” is explicitly stated to be a separation of like substance to like substance. The first substances spin into place with a circular motion; the movement of like to like is a “conglobing,” a circling together that we might imagine as a gravitational spinning, and just as the vital fluid and seminal matter of the egg has a ‘circumgyration’ or circular movement, so is the prolific, genial fluid of the world’s embryo described as “circumfluous waters calm” (PL 7. 270).

We can tell that this confluence of matter and vital virtue is also separation through fermentation by the motion of the fluid, where like moves towards like with the tartar moving to the bottom and the lightest, most active elements flying to the top. Glisson describes chymical fermentation as a mode of separating mixed substances using the example of brewing: “Separations are made by fermentation; as we see in the working of beer or wine, the spume or barme gets up to the top, and the tartar is cast towards the bottom, and a clear liquor left purified in the midst.”³⁰⁹ The entry of the spirit’s vital virtue matches most clearly perhaps the similiary process of separation described by Glisson as made “*per magisterium*: that is, by casting in another ingredient which hath more familiarity with one element of the mixture than the other, by means whereof the parts before mixed are separated.”³¹⁰ This process corresponds to the addition of a chymical ferment to a substance, with the action of assimilating spirit, but it is also explained by Glisson in terms of magnetic action. The profound darkness of the calmed abyss shifts at line 234 with the word ‘but,’ as the incubation and insemination are begun; initially the agent is clearly God, albeit God working in various modes of causality. This becomes less clear at line 237, where the repetition of the word ‘but’ shifts the sense from a vitalising infusion to a downward purge of coldly recalcitrant tartareous dregs, which, being adverse to the vitalising principle, congregate together in a movement away from it. The word ‘purge’ is almost as rich and ubiquitous in contemporary medical and political discourses as ‘ferment’ and there are some problems of agency in the vitalism of this sequence that I will come to later. For now, we can note that agency is difficult to locate in one agent in these sequences amongst the multiple modes of cause that are at play; however, if we trace back to the beginning

³⁰⁹ *Anatomia hepatis*, 71.

³¹⁰ *Anatomia hepatis*, 69.

of the process the initiating cause, the origin of all causes is clearly God the father.³¹¹ Overall, this part of Raphael's account tends to imply the divine spirit as primary agent, although there are several accounts of the Creation with which to correlate it: we will investigate both that of Uriel and that in the invocation to light.

Uriel's narrative makes the similiary attraction even clearer, and while God's command is clearly the first agent of movement, the *prima materia* itself reacts to the command/spirit efficient cause by leaping and spinning into place, seeming indeed to be self-active:

I saw when at his word the formless mass,
 This world's material mould, came to a heap:
 Confusion heard his voice, and wild uproar
 Stood ruled, stood vast infinitude confined;
 Till at his second bidding darkness fled,
 Light shone, and order from disorder sprung:
 Swift to their several quarters hasted then
 The cumbrous elements, earth, flood, air, fire,
 And this ethereal quintessence of heaven
 Flew upward, spirited with various forms,
 That rolled orbicular and turned to stars
 (PL 3. 708-18)

Here again we can see evidence of Danielson's second stage of Creation: this command calms and sections off the circle of the 'vast infinitude' that will substantiate the visible world. The wilderness of chaos is still a formless mass, but it has some sort of perception, for it hears and is ruled and confined. Where Raphael's narrative stressed the act of the overshadowing spirit in brooding, infusing and warming the fluid mass, this narrative stresses the active responses of the elements of the still formless mass: it listens, darkness flees, light shines, and order springs from disorder. The fleeing of the darkness is echoed by the downward purging of the 'black tartareous cold infernal dregs' in the rushing movement of like to like. The movements of the elements, energy and atoms of chaos, so dangerous when unordered, become creative when stimulated and ruled by the Holy Spirit, the upward motion of the most volatile element leading directly to the circular formation of the stars. The Aristotelian character of the elements is not, we now know, a signal that other traditions and innovations of natural philosophy

³¹¹ "It is not surprising that such an improbable event should find its rhetorical expression in such a difficult passage of verse. The reason, I have to assume, that these lines have been paid such scant attention by critics, involves our difficulty in assigning agency to the central action" (Rogers, *Matter of Revolution*, 115).

are being excluded, since Milton is in fact typical of a number of contemporary medical scientists in his tendency to use an Aristotelian framework and elaborate his vitalism with chymical theories of substance. And while there are not, in Uriel's account, the references to chymical theory that characterise the other Creation sequences, the matter, here more clearly than at any other time, is responding independently to God's command.³¹² This is the response of substance itself to the perception of its own being (materiality) and the efficacy of God's Word and spirit, and the movement, again, is of like to like, a similiary attraction that works with a circular flow. The elements "haste" to their correct places, the heavier to the lower reaches of the universe, the most rarefied to the highest spinning patterns of stars in the skies.

The voice of God is a cause, the incubating and vitalising holy spirit is a cause, the fertile matter of the abyss is a cause, and it seems from Uriel's account that the light, first thing to be created, is a cause. Here a differentiation made by Milton in the *Art of Logic* may be helpful:

a *per se* efficient cause is one which causes efficiently through its own power, that is, one which produces an effect from an intrinsic principle... Elements, minerals, plants and animals are things which operate through their own nature.³¹³

This causal agency is genuine, but slightly compromised in comparison to the causal agency of a conscious agent: "Causes which act through nature do so out of necessity, while those which act through deliberation do so freely."³¹⁴ God does not – like natural perception – cause through natural necessity. He is, Milton emphasises repeatedly, free to act in any way he wishes within the limits of his own wholly good nature (Milton is no voluntarist) and the principle of non-contradiction. The voice of God, with its clear source in the Father's will, is the most free of necessity in this causal schema. The spirit that incubates and infuses vital virtue occupies a position between command and effect and the power of matter hovers, like the power of the light that acts upon it, between the necessity of its own intrinsic principle of movement and fertility given to it by God's command, and the fact of the agency and causal force with which that command paradoxically endows it.

³¹² Moreover, as he speaks Uriel stands upon the surface the sun, which has, in both form and power just been described in some of the most direct references to the chymical art that are to be found in the poem.

³¹³ *CPW* 8: 226.

³¹⁴ *CPW* 8: 226.

This paradoxical position of being subject to the goodness of God and at the same time endowed with creative agency is, again, reminiscent of the peculiar position of the rational human (or angel) created by God and living in a universe created by God, but endowed with free will. Nevertheless, the source of this creative power and agency is undoubtedly God. By the time the earth is ‘formed’ but still fermenting in the ‘womb of waters’ God has already sectioned off the part of Chaos to be used. He has already, by a spiritual entry and the concomitant command that light should exist, initiated a pattern of like moving to like in a series of separations; in the clumping together of the thickest matter, earth has come to hang “self balanced” on her centre, and the air has been “spun out” between; the firmament and the waters have been divided, and are moving with a “circumfluous” motion and two ‘days’ have passed. God’s agency is clear in his commanding, brooding and infusion; with the elements’ responses and the purging of the tartareous dregs the agency seems to be mutual, as in a medical fermentation or purge; the substance of chaos is clearly acting. Whereas Harvey had attributed to the semen an ‘irradiative’ spiritual power, Milton’s representation of the insemination of the world uses a version of fermentation that allies his Creation to the vital fluids and similiary attractions of conception proposed by Glisson. The spirit that enacts the efficient cause is not described as airy in the way, for example, angels are described as airy throughout the poem; it is one powerful element in a mixture which is busy composing itself into order. The spirit acts upon the ‘seeds of all good’ in the matter of the abyss, which itself responds in the mode of similiary attraction to effect order through separations and the independent, responsive movement of like to like. The power of the Holy Spirit acts, in fact, like a ferment, that is a spiritual impulsion, and its action seems to correspond to the process of separation *per magisterium* described by Glisson. This of course begs the question of what it is that enters into the abyss to start this process: what precisely is it that correlates with the spirituous semen of conception? Here we can add some detail from another representation of the Creation in *Paradise Lost*.

iii. Holy light and vital spirit

If we turn to the invocation to light at the beginning of Book 3 there is another brief representation of the Creation. Here, the poet calls upon precisely this light as the

“offspring of Heav’n firstborn” (*PL* 3. 1). The first offspring of heaven is of course also the Son, who is sent to do the work of the Creation when God tells him that his “overshadowing spirit and might with thee” is also sent (*PL* 7. 165-6). I suggest, however, remembering the ‘kindly heat of various influence’ that is vital heat in *Paradise Lost*, that we can correlate the holy light of the invocation with the vital virtue being infused into the fluid mass.³¹⁵ The poet of *Paradise Lost* declares that:

since God is light,
And never but in unapproached light
Dwelt from Eternitie, dwelt then in thee,
Bright effluence of bright essence increate.
Or hear'st thou rather pure Ethereal stream,
Whose Fountain who shall tell? before the Sun,
Before the Heavens thou wert, and at the voice
Of God, as with a Mantle didst invest
The rising world of waters dark and deep,
Won from the void and formless infinite.
(*PL* 3. 3-12)

This sequence correlates the brooding and inseminating spirit of Raphael’s account with holy light: the conception of the world is incubated by holy light, the first thing *created* in Genesis. In Raphael’s account God commands: “Let there be Light, said God, and forthwith Light /Ethereal, first of things, quintessence pure / Sprung from the Deep, and from her native east / To journey through the airy gloom began (*PL* 7. 243-6). Light responds to the voice of God by springing and exhaling out of the darkness of the abyss, and hovering in ‘her’ tabernacle until the creation of the form of the sun on the fourth day, when it is made “porous to receive / And drink the liquid light” (*PL* 7. 361-2). Like the rare spirits of creation, the light is – if anything – of a liquid consistency. Uriel’s narrative makes clear that the formative activity of the generating world is a response to the “second bidding” when “light shone and order from disorder sprung.” This light, which flows, an “effluence” from the uncreated spiritual essence of the divine, is of the same species as vital heat; indeed the poet goes on to address holy light and then to refer to the sun as “thy sovereign vital lamp” in his lament for his lost physical vision: the divine energy which incubates and vitalises is correlated directly with the known light of the sun (*PL* 3. 22). Like substance (and form), light is plural: it is the warm, physical

³¹⁵ McDowell correlates this first uncreated light with the spirit that infuses and broods in his comparison of Richard Overton’s materialism with that of Milton: “while in Raphael’s description of creation in Book 7 the infusion of God’s vital virtue into matter precedes the divine fiat, ‘Let there be light’, in the invocation that opens Book 3 it is the ‘pure ethereal stream’ of ‘increate’ light which itself ‘invests’ matter with life which generates the creation,” ‘Ideas of Creation’, 68.

stuff of physical vision, that is, sunlight; it is also, in the same address, ethereal light that specifically precedes the sun at the first moment of Creation, yet, as the “bright effluence of bright essence increate” it flows from God, possibly like a fountain with a flow that can be followed back to a singular divine origin.

There is, in the representation of the holy light of Creation, a coincidence of various different discourses into one event; the circulation of fluid, spirit and matter in this model must recall the socio-political readings made of the body politic and the circulating blood, especially in the light of Rogers’s attempt to appropriate Milton’s natural philosophy as an antecedent to modern neo-liberal economics.³¹⁶ Nevertheless, while the socio-political resonances of the notions of circulation that characterise this body are strong, they are themselves quite nascent and as yet unformed. One example of this is the delicate intersection of meanings in the process in which God applies vital heat to the calmed matter of chaos, the “womb of nature,” and “invests” it.³¹⁷ Fowler glosses the word ‘invest’ as “to cover or wrap,” but there are a number of contemporary implications that can be drawn out of the term (*PL.* 3. 9-12n). The OED offers various contemporary meanings among which are indeed, “to clothe, robe, or envelop (a person) in or with a garment or article of clothing”; however, the meaning also includes a transfer of power or attributes: “to clothe or endue with attributes, qualities or a character”; “to endow or furnish with power, authority, or privilege”; and “to clothe with or in the insignia of an office, hence, with the dignity itself.” Valerie Forman notes that “in contrast to economic investment in which any gain accrues to the investor, in early forms of investment, power is transferred from the agent to the object—as in the case of an archbishop investing a bishop.”³¹⁸ Nevertheless, Forman points to the emergence of the modern, financial meaning of investment in the context of the memoranda of the contemporary East India Company, and this rich combination of meanings can unfold the implications of the ‘investment’ of the abyss with the power of the Holy Spirit. The ‘clothing’ aspect of ‘invest’ is emphasised by the covering of the abyss with a mantel, and this covering relates to the brooding of the Spirit; the

³¹⁶ Rogers makes this explicit more than once, stating that “these new maps of physiological order constituted in some way a curious engagement of the first and most influential model of decentralised organisation: the economic paradigm of the self-regulating market that had been theorised for the first time in the 1620s to promote a nearly laissez-faire program of foreign trade” (*Matter of Revolution*, 22).

³¹⁷ For a detailed analysis of contemporary usage of the word ‘invest’ in both the earlier meaning of ‘envelope’ or ‘endow’ and the newer economic meanings see Valerie Forman, ‘Transformations of Value and the Production of “Investment” in the Early History of the East India Company’ in the *Journal of Medieval and Early Modern Studies* 34. 3 (2004), 611-64.

³¹⁸ Forman, ‘Transformations of Value’, 1.

investment of power and dignity corresponds to the vital virtue and warmth that is infused into the rising world of waters.³¹⁹ The circular motion of spirit and substance, the self-generating power of vital heat in the interplay between spirit and substance can, to some degree, be identified with the circulation of goods and money in the new body politic that Harvey's discovery echoed. The circulation of the blood in the body and the circulation of money and goods in the new economic climate of the seventeenth-century body politic are undoubtedly related in what Greenblatt terms "circulations of social energy" (a notion to which the former 'circulations' are antecedent), but this new economic meaning is, while not entirely absent, not the dominant form in Milton's poem.³²⁰

Despite the presence of this economic thread of logic in the newly imagined body politic (or, here, body divine), the position of God as holy source is clear. The power of holy light enacts this efficient cause, although it is the command of God that is the first and primary cause. My case, then, is that this representation of the fertilising power of God's spirit does not imply parthenogenesis any more than the medical theory from which it borrows its logic. It rather creates a series of representations of the formative interactions of energy, spirits and thicker, but still active, fluids, and these representations all illustrate a process of the emergence of body out of spirit. What Harvey had described as the semen's 'peculiar property or irradiative spirituous substance' corresponds to Milton's spirit's power to infuse vital virtue and warmth into the fertile, responsive matter awaiting it. The circular, flowing interactions of fermenting vital fluid and warming, incubating holy light, of inseminating spirit and active matter in the early stages of the Creation match precisely Glisson's development of Harvey's work on conception, drawing on Galenic theory, Aristotelian causality and chymical substance transformation, just as Glisson's work does. Milton's representation of the Holy Spirit matches perfectly the double motion of fertile bodily spirit; the earth was formed by this confluence of efficient and material causes, just as the foetus was imagined to be so formed in contemporary medical research. That formation becomes the active, formal cause as the dry land appears and the vegetation and 'living souls' emerge from the waters and the earth. It is only at the point of the emergence of life-forms from the earth that the figures of speech start to invoke birth.

³¹⁹ We might also compare the Son's clothing of Adam and Eve after the Fall.

³²⁰ Stephen Greenblatt, *Shakespearean Negotiations: The Circulation of Social Energy in Renaissance England* (Berkeley: University of California Press, 1989), 1-20.

Coda

The Creation sequence narrated by Raphael substantiates and imagines a Creation *ex deo* in terms of a vitalist conception in a remarkably coherent way. Nevertheless, Rogers asserts that the employment of the notion of fermentation in this narrative contains a flaw which ultimately deconstructs Milton's theodicy in the presence and purge of the tartareous dregs in the process of creation. It may seem startling that this process, with all its correlations with medical conception, should seem also to be a digestion, but the two processes are not, even on the eve of the scientific revolution, yet seen as distinct. The same powers and processes of the body that transform foodstuffs into the fluids and organs of the body are seen to transform the sexual fluids of the body into an altogether new body. Referring to the work of Paracelsus and Van Helmont, Rogers emphasises the seemingly anomalous position of the "tartareous dregs" which, "adverse to life," are purged downwards. Tartar and the agonising illnesses it causes are, according to Van Helmont, not of natural origin, but consequences of the Fall that "issue wholly from our error, and the corruption of nature."³²¹ Rogers interprets the relation of the presence of tartar at the Creation to Milton's theodicy thus:

If we extend the logic of Van Helmont's analysis of Paracelsus to our own reading of Milton's Creation, we can come closer to the terrible implications of Raphael's inclusion of the 'black tartareous cold Infernal dregs' as an externally generated, precreative substance that must be purged from the original matter... The presence of these dregs empties Milton's natural philosophy of its theodical force. The radical moral power of Milton's animist materialism quite simply evaporates if even a portion of the material universe cannot be shown to have derived from the intrinsically good substance of an intrinsically good God.³²²

This is an interesting point; nevertheless, there are two problems with it. First, the presence of the tartareous dregs adds nothing new to the debate on the origin of evil, which already exists in both potential and actuality at the point of Creation: the fact that

³²¹ Van Helmont quoted in Rogers, *Matter of Revolution*, 136.

³²² Rogers, *Matter of Revolution*, 137. Rogers goes on to make a political allegory, correlating the inassimilable dregs with the 'encroaching political chaos' of the period that lead up to the Restoration; his reading of the scale of nature alongside the proposed system of election in *The Readie and Easie Way* (1660) becomes yet more profound and illuminating once a clear perspective on the order of value in the scale of nature is restored.

God has withdrawn himself from the matter of chaos and the fact that Satan has already invented Sin and fallen are intrinsic to the poem's overall integrity, both literary and theodical. Secondly, it is unlikely that Milton would have drawn directly on the more exuberant theory of the Paracelsians, the focus of whose work was the alchemical reversal of the effects of the Fall.

The 'Tincture of the Philosophers' (that is the elixir of life) is described by Paracelsus as:

A Universal Medicine... [that] extends the life of the body beyond what is possible to its congenital nature... and consumes all diseases, by whatsoever name they are called... [it is] such purgation of the body, by means of which all superfluity is radically removed from it and transmuted... [it is] the regeneration of the nature, and the restoration of youth.³²³

Milton believed in the Fall and the compelling opening sequence of *Paradise Lost* states with some power that the only exit from fallenness is through the redemptive act of "that one man." To attempt one's own redemption through tampering with created substances would be blasphemy indeed. In fact this description recalls nothing in *Paradise Lost* so powerfully as Satan's description of the Tree of Knowledge to Eve on the day of the Fall as a "sacred, wise and wisdom-giving plant / Mother of science" which gives power "not only to discern / Things in their causes, but to trace the ways / Of highest agents" (*PL* 9. 679-683).³²⁴ He claims that Eve's "eyes that seem so clear, / Yet are but dim, shall perfectly be then / Opened and cleared, and ye shall be as gods" and supplements his argument with the comment that "what are gods that man may not become / As they, participating god-like food?" (*PL* 9. 706-717). Her response, as she begins to lose her judgement and to fall, is to look at the fruit through confusion as "the cure of all, this fruit divine" (*PL* 9. 776). We can also recall the equivocal representation of human efforts in transmutational alchemy in *Paradise Lost* that we touched on in Chapter 2; paradise may be a place of transformation but that transformation is the ongoing work of divinity in natural substance rather than a human art.

³²³ Paracelsus, 'The Tincture of the Philosophers' (1543), in *Hermetic and Alchemical Writings of Paracelsus: Part I*. I have used the 1910 edition, ed. A. E. Waite (Whitefish: Kessinger, 2009), 19-30, 30.

³²⁴ For an illuminating comparison of Satan's temptation with contemporary accounts of the Italian mountebank or medical trickster see Edwards, *Milton and the Natural World*, chapter 1, 'Corrupting experience: Satan and Eve', 15-39.

I propose that, rather than calling directly upon the Paracelsian meeting of Creation theory and alchemical transmutation, Milton is much more likely to be using the sort of medical alchemy that Newman terms chymistry, which was part of a coherent contemporary materialist vitalism and was relevant to his gradual descent into blindness and the painful gout of which he eventually died. We have only to look at the end of the invocation to the light that is both the vital, visible effluent of that 'vital lamp' the sun, as well as the celestial light beyond mortal comprehension, to encounter the poet's request that this light

Shine inward, and the mind through all her powers
Irradiate, there plant eyes, all mist from thence
Purge and disperse, that I may see and tell
Of things invisible to mortal sight.
(*PL* 3. 51-55)

Within this most central moment the light itself is invoked to act as a medicine for the poet's inner, spiritual eye and, with one of the disconcerting dualities of the poem, that medicine is like that offered to Eve in her disobedience, a purge to open and clear the eyes. Of course the fundamental difference is that one is prayed for as a gift of grace made in faith and obedience, the other is proposed by Satan as a justifiable theft from a jealous, manipulative God. This notion of the purge as medicine to which Milton appeals, and with which Eve is swindled, gives us the best way of approaching the spiritual purge that is part of the Creation. In the introduction, we examined the shifts in medical theory that concerned these diseases and happened amongst Milton's friends and their colleagues during the middle years of the seventeenth century, but let us revisit them again, briefly. Gout, or tartar formation in the joints was, like gutta serena, originally thought to be the result of excessive, often phlegmatic humours being produced in the stomach through bad digestion; they were then thought to exceed their bounds and flow out from their due places and collect, be it in the eyes or in the joints (this explains the etymological link between 'gutta serena' and 'gout'). However the work of Francis Glisson and other experimental physicians such as Walter Charleton developed another theory of tartar entirely based on the active, vital blood.

These theories cite a poisonous fermentation in the blood rather than poor concoction and wandering humours; the production of vinous tartareous substance may lead to a number of health problems, in particular gout of the joints and gutta serena of

the optic nerve. Giglioni explores this aspect of Glisson's anatomy of the bodily fluids in some detail and it is worth quoting in full. He states that:

The real cause [of tartareous deposits in the body] is a process of fermentation occurring in the blood, and especially in the serum, which brings the mass of the blood to a "vinous condition". This is also proven by excesses of wine and sex, which increase the disposition to arthritis by facilitating the fermentation of the blood and consequently the exaltation of the spirits. The result of this fermentation is a tartareous residue which takes the form of a calculous sedimentation in the joints. Fernel's humoral etiology of the gout, like his explanation of arthritis, because it presupposes a pervasive motion of phlegmatic humors outside the vessels, is rejected by Glisson. In this case, too, chemistry gives the anatomist both explanatory and experimental resources. Gout, in Glisson's view, depends on the faulty disposition of the blood, which is caused by its "vinous" character, increase of tartar, and the specific nature of the humors running in the bloodstream.³²⁵

This fermentation is a malignant version of the normal activity of the blood, but even the normal activity of the blood, in this schema, produces waste matter. The mication of the blood, that is the ceaseless production and consumption of spirit and vital heat, itself generates excrements of the body. When analysed, these substances:

separate according to the pattern of the five chemical principles: the "clotted part" which dissolves into the phlegm, the bitter part which enters the composition of the bile, the watery part which melts into the urine, the salty and earthy parts which form the tartar. As far as the ultimate elements of the blood are concerned, they are traced back to the five principles: mercury (which can be present in two forms, fatty and meager), sulphur, salt, water, and earth.³²⁶

Each element of the blood leaves its own waste product; each element of the blood can be identified in terms of the chymical elements. The tartar, like the tartar of Milton's *Creation*, which is cold and 'adverse' to life, corresponds to and produces 'dead earth'.³²⁷ Indeed, Thomas Willis's tract on fermentation states that:

³²⁵ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 149. Giglioni cites MS Sloane 3310 ("Arthritidis causa non est necessario frigid"), ff. 45r-50r; also ("Podagra est curabilis"), ff. 123r-124v, 127r-128v.

³²⁶ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 124. Giglioni cites MS Sloane 3309, f. 95r; also 3309, f. 99r; also ("Sanguis est fons catarrhorum"), ff. 360r-361r for the sources of his translation and paraphrase.

³²⁷ Incidentally, tartar and the production of tartar is a notion at the centre of considerable debate between Van Helmont and Glisson. "One detailed question concerns the origin of tartar, that is, the formation of stony precipitates in the body, but Glisson's attitude is critical all the same. In Glisson's opinion, Helmont tried hard (but vainly) to demonstrate that there is no tartareous sediment in urine," Glisson argues that

In Distillations, Earth ascends the Alembic, almost not at all, or but in a very little quantity: for the most part it is left, with a portion of Salt, for a *Caput Mortuum*, or Dead Head; therefore it is called *Terra Damnata*, or damned Earth: because, when the other Principles are freed, the Prison being as it were broken, this is still detained: besides Earth being deprived of the Company of the rest, is of no Use, nor capable of change, or exaltation.³²⁸

Here, in the work of a most careful experimental iatrochemist, we can see the residue of the mystical alchemy of figures such as Fludd and Paracelsus in the association of the dead earth with damnation. Milton, like Willis, makes this association, but it is part of a correlation between the spirits of the body and the Holy Spirit made in the light of an absolute commitment to free will; thus it is a delicate delineation of the problem of evil. The sources for the ‘fermentation’ of the beginning of the world are not those of mystical alchemy, but medical chymistry.

The purging of the tartareous dregs as process derived from vitalist physic must also be considered in terms of the wider literary and theological integrity of the poem; from this angle there are two significant factors. First, there are typological references to the Fall throughout the representation of the unfallen world. For example, a few lines later in the Creation sequence the flow of the newly created rivers will prefigure the tragedy of the human Fall with their “torrent rapture” which is shortly followed by “serpent error” (*PL* 7. 299-302). This need not signify a fatal inconsistency of theology, as Christopher Ricks showed many years ago.³²⁹ Moreover, the references to fallenness do not need to be confined to the figurative or pre-figurative and typological; as we have already noted, there is already at this point fallenness in both potential and in actuality in *Paradise Lost*. There is natural evil in the substance of chaos; the substance has already “gone out from God” and a careful reading of the geology of heaven, hell and earth quickly shows that the potential for natural evil is everywhere, just under the surfaces of all these places, profane or sacred. The ground of heaven itself yields materials that can be used to make infernal damage and mischief, as Satan notes during the war in heaven:

Van Helmont makes his mistakes because he lacks a detailed understanding of organic anatomy (Gigliani, ‘Genesis of Francis Glisson’s Philosophy of Life’, 129).

³²⁸ Willis, *Of Fermentation*, in *Dr. Willis’s practice of physick being the whole works of that renowned and famous physician*, trans. S. Pordage (London, 1684), 6.

³²⁹ Christopher Ricks, *Milton’s Grand Style* (London: Oxford University Press, 1963); see in particular chapter 3 ‘Enhancing Suggestions’, 78-117.

Which of us who beholds the bright surface
 Of this ethereous mould whereon we stand,
 This continent of spacious heav'n, adorned
 With plant, fruit, flower ambrosial, gems and gold,
 Whose eye so superficially surveys
 These things as not to mind from whence they grow
 Deep under ground, materials dark and crude,
 Of spirituous and fiery spume, till touched
 With heaven's ray, and tempered they shoot forth
 So beauteous, op'ning to the ambient light.
 These in their dark nativity the deep
 Shall yield us, pregnant with infernal flame
 (*PL* 6. 472-483)

The interaction of matter and spirit is intrinsic to the whole natural world; we have seen this interaction on the borders of chaos and nature, within the conception of the visible world, and in the natural philosophy of paradise and heaven as well. Satan's discovery is an example of matter that has gone out from God and become the property of another and he misappropriates it according to his free will and to its potential. There is no need to posit a pre-creative substance that must be purged from the Creation by God, for the matter of Chaos has already been divided from the divine influence; allegorical figures have set up court in it, Satan and his legions have fallen though it and Hell has been sectioned off out of it.³³⁰ The downward motion of these tartareous dregs (elements which originate in metaphysical evil and which substantiate natural evil in the universe of *Paradise Lost*), recalls poetically the downward plunge of Satan, personification of moral evil, and the other angels who have already been purged out of heaven: the dregs are adverse to life as Satan is "the adversary of God and man" (*PL* 2. 629).³³¹

The notion of purgation as Glisson conceives of it in terms of natural perception is particularly applicable in the context of this comparison, since Satan and his followers, like the animated stuff of Creation, respond to the holy might of God by throwing themselves into the ordered place ordained for them. They are not, in the end, pushed, nor do they fall accidentally: rather, like the inchoate substances of creation and the animated substances of the body, they leap to the place that suits them best, which is

³³⁰ For a compelling correlation of literary allegory and metaphysical evil see Fallon, *Milton Among the Philosophers*, Chapter 6 'Sin and Death: The Substance of Allegory,' 138-168.

³³¹ Danielson identifies natural evil as the seemingly senseless destruction effected by such causes as illness or natural disaster; moral evil exists in the cruel or destructive actions of rational agents, and metaphysical evil is defined as "the essential... finitude, imperfection and limitation of all created things" (*Milton's Good God*, 38-69).

ultimately designated by the all-informing will of God. There is no question that the apostate angels are driven out of heaven (“Pursue these sons of darkness, drive them out,” God the Father commands at 6. 715). However, like the naturally perceiving substances of Glisson’s natural philosophy, they refuse assimilation and choose to leap downward. Terrified of the Son’s might they look through the gap in the crystal wall of heaven

Into the wasteful deep; the monstrous sight
 Strook them with horror backward, but far worse
 Urged them from behind; headlong themselves they threw
 Down from the verge of heav’n, eternal wrath
 Burnt after them to the bottomless pit.
 (*PL* 6. 862-866)

It is not a pleasant or easy choice, but in the end it is their own; the Son has put on his face of terror and ridden towards them, his chariot flashing with lightning and “pernicious fire” but not a blow is struck (*PL* 6. 849). Unlike Adam and Eve, whose expulsion from paradise and back to the dust from whence they came might fruitfully be compared to this expulsion, they are not conscious of remorse or guilt. Thus the material reality of the level to which they have fallen is infinitely worse. If one is searching for an expulsion that is effected purely by a combination of divine energy and the free will of the expelled, this stands as a clear example.

We have explored in some detail the sources and implications of the representation of the emergence of body from spirit in *Paradise Lost*. It is clear that medical vitalism, with its revision of Aristotelian vital heat and similiary attraction, is a coherent structuring device in Milton’s representation of Creation. ‘Soul’ and animation clearly derive from the interaction of originally divine ontological categories, and monist vitalism, despite its reputation for atheism, can be and is employed in the service of theodicy. These circular motions of transformation work body out of spirit, but they also work spirit out of body. The next chapter will explore the implications of Milton’s natural philosophy for his human body-soul composites, examining his traducianism and showing how the emergence of the rational soul from material process can be structured by the same vitalist theories of body that we have encountered in the Creation. This process encompasses theories of nutrition and digestion and deals with God’s ordinary, rather than extraordinary providence.

Chapter 5

Body into spirit

i. Models of transformation in the animate body

Milton uses the language and concepts of the alchemical/hermetic tradition, but he uses them in a very particular way in his representation of the unfallen soul in paradise. From a fallen perspective the poem makes clear that the exit from fallenness is not through the consumption of magical medicines that are the “cure of all,” indeed the Fall itself illustrates that this is precisely the sort of thinking that leads away from God. Redemption is no more to be found in the promises of the medical charlatan who offers the cure of all than it is to be found in the laborious art of transmutation of metals practised by the alchemist in his laboratory. Nevertheless, despite the disjunction between the claims made by much of the alchemical tradition and its representation in *Paradise Lost*, transformation of substance is at the very heart of Milton’s theodicy and it is to be found, with another disturbing doubling of the poem, precisely through the ingestion of the fruit of paradise. One of the additions made to the accounts of paradise in Genesis is that of Adam and Eve’s option to rise, and become rarefied and closer to God given time and obedience:

And from these corporal nutriments perhaps
Your bodies may at last turn all to spirit,
Improved by tract of time, and winged ascend
Ethereal as we, or may at choice
Here or in heavenly paradises dwell;
If ye be found obedient, and retain
Unalterably firm his love entire
Whose progeny you are
(*PL* 5. 496-503)

As has often been noted, the conditions of this transformation are patience and obedience, but the mechanism by which it is imagined is that of diet and digestion; their bodies may turn to spirit in a process which starts biologically with corporal nutriments

and ends with the emergence of such a light, rare, active and ethereal body that flight to heaven is possible. A recent body of illuminating scholarship deals with the materialism of angelic digestion and the natural philosophy of the *scala naturae* to which it is related. Schoenfeldt has explored in detail the consonance between the moral choices of the mind and the tensions and choices in eating and digestion in Milton's work.³³² Both he and Fallon correlate the clear comparison made between the process of digestion and the "metabolic logic" of the wider natural philosophy in *Paradise Lost*; they both observe Galenic theories and influences in this use of digestion.³³³ There are, nevertheless, some additions that I would like to make to this line of debate.

Contemporary physic, like the ancient medicine that it relied upon, saw conception and generation as almost the same process as digestion and nutrition. Both bodily processes involved the transformation of one substance, body or fluid into another, therefore the model of vital, active and transformative fluid that we have charted in Milton's representation of the Creation can also open up and elaborate our reading of the scale of nature that Raphael describes and the various places of human and angelic characters upon that scale. The radical difference between the medical tradition that orders this transformation in *Paradise Lost* and the use to which Milton puts it is in the representation of the relationship between the spirits of the body and that (or those) of the rational soul. For Milton's unfallen humans, the transformation of one spirit into another continues into the traditionally immaterial realms of consciousness, rather than being of a fundamentally different character.

Although the final form of his vitalism suggests it, Glisson does not, in his earlier work, propose that his model of bodily transformation extends to the realm of the rational soul. Milton, on the other hand, takes the system of bodily spirit and matter to its logical conclusion – precisely that feared by religious critics of medicine. In the *Christian Doctrine* he states clearly that "the human soul is generated by the parents in the course of nature, and not created daily by the immediate act of God."³³⁴ In *Paradise Lost* such a statement is not made directly, but traducianism is an explicit result of the way the animate souls of paradise are represented, for their highest rational faculties are shown to be not just connected to, but a *production of* the lower faculties of body and

³³² See Schoenfeldt, *Bodies and Selves*, chapter 5 'Temperance and temptation: the alimental vision in *Paradise Lost*, 131-168.

³³³ Fallon, *Milton Among the Philosophers*, 102-107.

³³⁴ *CPW* 6: 319.

spirit. This was an unusual solution. Traducianism, like antinomian excess or atheism itself, seems to have a much stronger presence in the writings of those who inveigh against it than in the work of anyone endorsing it. Very few authors make an outright statement of support; Jakob Boehme is one and the English translation of his *Forty Question of the Soul* states clearly: “the Soul is *not* every time newly created and breathed in, but is humanely *propagated*, as a Branch groweth out of a Tree; or as I may better render it, as a Man setteth Grain or soweth Corn, and so a Spirit and Body groweth or sprouteth out of it”.³³⁵ This declaration is one that the orthodox medical profession made about the grades of soul up to and including the sensitive soul and its instrument, the animal spirit. Willis, as well as lesser authors such as Charleton and Henry Power, proposes just such a model; Descartes too proposes a similar model, which retains the animal spirits while dispensing with the notion of the sensitive soul.³³⁶ However, authors such as Henry More and Thomas Browne who treat traducianism as a reasonable theory (if not their own) are, just by doing this, taking arms against a sea of detractors.³³⁷

Browne’s rejection of traducianism is not religious, and he gently marks the excesses of the debates about generation, commenting: “I am not of *Paracelsus* minde, that boldly delivers a receipt to make a man without conjunction, yet cannot but wonder at the multitude of heads that doe deny traduction... either opinion will stand well enough with religion”.³³⁸ Even authors such as John Webster and Thomas Vaughan, who clearly have radical agendas and interests in chymical transmutation, deny the possibility of traducian generation on the grounds of the immateriality of the highest level of ‘soul’. Webster states:

Upon the supposition that the rational Soul be not ex traduce, but be infused after the bodily organs be fitted and prepared, which is the firm Tenent of all Divines Ancient, middle and Modern, and must upon the granting of it to be simply, and absolutely immaterial and incorporeal (which is indisputable) of necessity be infused, because no immaterial substance can be produced or generated by the motion of

³³⁵ Jacob Boehme. *Forty Questions of the Soul concerning its Original, Essence, Substance, Nature or Quality, and Property*, trans. John Sparrow (London, 1663), 182.

³³⁶ See Charleton, *Natural history of nutrition*, 63; 140; 186; Willis, *Two discourses*, 22-42; Power, *Experimental Philosophy*, 60-70; see also Woolhouse, Chapter 8 ‘Descartes, Spinoza and Liebniz, and Thinking Substance’, 150-163.

³³⁷ Browne, *Religio Medici* 69-70; Joseph Glanville *Lux Orientalis* (London, 1662), 26.

³³⁸ Browne, *Religio Medici*, 69-70.

any agent, that is meerly material, or forth of any material substance whatsoever.³³⁹

Vaughan (writing under the pseudonym Eugenius Philalethes) seems to allow for traducianism, in his meditation upon light in which he characteristically shifts between the notions of soul and holy light:

They who maintain, that the Soul of Man is derived *ex traduce*, hold withall that the Father in begetting the sons Soul looses none of his own, it being *tanquam Lumen de Lumine*, as one Light from another: nay, more then so, it is the very resemblance that the *Nicene Fathers* thought not unmeet to express the unexpressible Generation of the second Person in the *Trinity* from the First; who is therefore termed by the Apostle *The brightness of his Glory, Heb.1. 3.*³⁴⁰

However, he declares later that it is held by “both Divines and Philosophers, that the reasonable Soul of Man is not converted into him by his Parents, but infused immediately by the Creatour... [thus] the inequality and disparity of actions, which they produce, arise from the diverse temper of the matter which they informe, and by which, as by an instrument they work.”³⁴¹ In fact, as Michael Hunter has argued of atheism in the period, traducianism is constructed more by those who fear it and associate it with a number of political and theological implications, rather than by proponents of godless physic.³⁴²

Physic did, however, provide a certain weight of evidence for such heresies as traducianism and those who did propose it were often involved in medical practice, although Paracelsian doctors and empirics were often directly at odds with figures of university medicine such as Harvey, Glisson and Willis. Since transformation is given in *Paradise Lost* as digestion, I would like to begin by examining the way this process is underpinned by medical chymistry, which was, itself upon the brink of discovering acid digestion in the middle years of the seventeenth century. Using the model of vitalism that was developed in Chapter 3 I will re-read Milton’s body-soul composites and chart how the link between the lower grades of soul and the rational soul is represented, and how progressive contemporary medical theory is used to fulfil Milton’s traducian

³³⁹ John Webster, *The displaying of supposed witchcraft* (London, 1677), 319.

³⁴⁰ Eugenius Philalethes, *A brief natural history intermixed with variety of philosophical discourses and refutations of such vulgar errors as our modern authors have hitherto omitted* (London, 1669), 36.

³⁴¹ Vaughan, *Brief Natural History*, 95.

³⁴² Michael Hunter, ‘Science and heterodoxy: An early modern problem reconsidered’ in *Reappraisals of the Scientific Revolution*, ed. David C. Lindberg and Robert S. Westman (Cambridge, Cambridge University Press, 1990), 437-460.

statements in the *Christian Doctrine*. The rational soul, in Aristotelian terms the *nous*, drawn from the metaphysical Aristotelian tradition is, I argue, re-imagined as part of a system which derives from Aristotle's 'scientific' legacy. The same system of natural philosophy that substantiates the emergence of body out of spirit in Creation and conception is used to substantiate and order the emergence of sensitive and then rational spirit out of body. In this instance, the influence of chymical medicine is yet more apparent. The model of fermentation in medical vitalism that corresponds to and supports the natural philosophy of Creation can also embody and support the materiality of angelic digestion and the linkages between different degrees of spirit required by Milton's traducianism. In section two I will elaborate on some of the implications of the specifically medical terms that are uncovered in section one.

ii. Digestion and sublimation in the *scala naturae*

The vital heat of Aristotle has been reinterpreted by both Milton and Glisson to be identified as both the cause and the product of chymical spirit. This combination of Aristotelian structure and categories radicalised by chymical theories of substance creates a broadly comparable natural philosophy in the two men's work. Perhaps the most dramatic and prominent example of such a correlation in Milton's natural philosophy is the version of the scale of nature described by Raphael for his human hosts.

O Adam, one almighty is, from whom
 All things proceed, and up to him return,
 If not depraved from good, created all
 Such to perfection, one first matter all,
 Indued with various forms, various degrees
 Of substance, and in things that live, of life;
 But more refined, more spirituous, and pure,
 As nearer to him placed, or nearer tending
 Each in their several active spheres assigned,
 Till body up to spirit work, in bounds
 Proportioned to each kind. So from the root
 Springs lighter the green stalk, from thence the leaves
 More airy, last the bright consummate flower
 Spirits odorous breathes: flowers and their fruit
 Man's nourishment, by gradual scale sublimed
 To vital spirits aspire, to animal,

To intellectual, give both life and sense,
 Fancy and understanding, whence the soul
 Reason receives, and reason is her being,
 Discursive, or intuitive; discourse
 Is ofttest yours, the latter most is ours
 Differing but in degree, of kind the same.
 (PL 5. 468-490)

It is a critical commonplace that this scale of nature described by Raphael is Aristotelian in origin, and we have already noted in Chapter 3 the profound similarity between this system and the system of vitalist natural philosophy developed by Francis Glisson. Rumrich, Fallon and, more recently, Diane McColley, all explore the material unity of this sequence, emphasising the dynamic, transformative character of this version of the *scala naturae*.³⁴³ The one first matter here is transformed upwardly through the heretofore fixed Aristotelian system of species, with matter, body and material form itself becoming ever more spirituous and perfect on a scale that links the unimaginable chaos of unformed matter with both the rational soul and their common divine origin and end. The simultaneous upwardness and circularity of this process is exquisitely rendered in Adam's response, with his immediate comprehension that Raphael has depicted a "scale of nature set / From centre to circumference, whereon / In contemplation of created things / By steps we may ascend to God" (PL 5. 509-12).

The sources and implications of the "one first matter all" sequence are many and complex and it has received much critical consideration. The focus of my proposal, however, is upon two particular questions, one of which concerns the precise nature or process of the new dynamism that Milton proposes: essentially, how does this transformation happen? While the demarcating bounds and spheres are Aristotelian, the dynamism noted and explored by critics is, as in contemporary medical theory, the chymical process of sublimation. These references to alchemical theory and practice have been noted before, as have Milton's silence on natural spirits and additional category of intellectual spirits, but I would like to examine the process of sublimation in the model of a vitalist body-soul composite (and, later, in the positioning of the angels in relation to humans) with its medical significance at the forefront of this analysis. The other question concerns the precise quality of the different levels of substance. Where we have found prime matter and the different ontological categories of the Creation

³⁴³ Rumrich, *Matter of Glory*, 61-69; Fallon, *Milton Among the Philosophers*, 102-7; McColley, *Poetry and Ecology in the Age of Milton*, 121-5.

(spirit, light, matter) to be responsive, to show activity, percipience and appetite, which are the defining features of vitalist matter in the Creation, Raphael seems to imply here that while the spheres are active, life is a quality of living things only. What then are the ‘degrees of substance’? Is this a vitalist model, or is it simply a model in which the lower orders of substance are active, rather than vital? Mechanist experimental philosophers and physicians of the period were not, as John Henry shows, averse to proposing *active* matter and they managed to navigate the potentially treacherous theological implications by declaring a voluntarist position (which itself neutralised some of the deist implications that were emerging from the mechanist hypothesis).³⁴⁴ However, voluntarism sits well neither with Milton’s Arminianism, nor with his fundamental concern with free will. Furthermore, mechanists also managed to combine their radical notions of active matter with a clear dualism between their theories of the body and the rational soul; Milton, on the contrary, takes a clear traducian position in which the rational soul is produced by the material interactions of the body’s fluids and spirits. For this chapter I will concentrate primarily upon the similarities of the body-soul models, observing only briefly some of the differences in what it is that transforms, while noting the similarities in the mode of transformation.

Raphael’s famous speech is undoubtedly a pivotal moment of learning for Adam and Eve; it paints a picture of the mind/body relation that is primarily biological in comparison to the one that Adam has already intuited, where, in the soul:

Are many lesser faculties that serve
Reason as chief; among these fancy next
Her office holds; of all external things,
Which the five watchful senses represent,
She forms imaginations, airy shapes,
Which reason joining or disjoining, frames
All what we affirm or what deny, and call
Our knowledge or opinion.
(*PL* 5. 101-8)

Not only does this process enable us to order sensory input, it incorporates moral ordering as well. Adam famously follows this meditation with the statement: “Evil into the mind of god or man / May come and go, so unapproved, and leave / No spot or blame behind” (*PL* 5. 117-9). Fowler notes the sequence on the faculties of the soul as

³⁴⁴John Henry, ‘Occult Qualities and the Experimental Philosophy: Active Principles in pre-Newtonian Matter Theory’, *History of Science*, 24 (1986), 335-81.

“common knowledge,” but it also corresponds to specialist medical knowledge of the period. Thomas Willis, Sedleian Professor of Natural Philosophy at Oxford (1660-75), is a significant figure in the history of neuro-anatomy. His *De anima brutorum* describes the relation between reason, the senses and the imagination thus:

The Knowing Faculty of the Corporeal Soul is Phantasie or Imagination, which being planted in the middle part of the Brain, receives the Sensible Species, first only impressed on the Organs of sense, and from thence by a most quick Irradiation of the spirits delivered inwards, and so apprehends all the several corporeal things, according to their Exterior Appearances.³⁴⁵

Willis is difficult to place in the context of contemporary medical factions; an iatrochemist, he also made use of the mechanical philosophy and declared a strident dualism between the rational soul and the sensitive soul.³⁴⁶ Nevertheless, his atomist theory of substance proposes active atoms, which have motion if not intention and appetite, and he even seems to imply a certain vitalism on occasion; we shall explore aspects of his model of the soul in more detail in the next section on fallenness and dualism. For now we can note that here the fancy is the first destination of sensory impressions, but these are unreliable, since: “we Imagine the Sun no bigger than a Bushel, the Horizon of the Heaven and the Sea to meet, and then the Stars not to be far distant from us in the Horizon” and the intellect must work these ‘airy shapes’ into order:

the Intellect presiding o're the Imagination, beholds all the Species deposited in it self, discerns and corrects their obliquities or hypocrisies the Phantasie there drawn forth sublimes, and divesting it from matter formes universal things from singulars; moreover, it frames out of these some other more sublime Thoughts, not Competent for the Corporeal Soul.³⁴⁷

The relation of the particular sensory information to the universal rational is a marker of the Aristotelian heritage that Willis shares with his contemporaries. This model clearly conforms to that offered by Adam to Eve before his lessons in natural philosophy from Raphael, where the imagination serves the intellect. However, Willis also touches upon

³⁴⁵ Willis, *Two discourses*, 38.

³⁴⁶ In the preface Willis declares: “the ends and bounds of the aforesaid Corporeal Soul being defined, the Rational Soul, Superior and Immaterial, may be sufficiently differenced from it; nor is that Argument admitted so easily, confounding them together, whereby some deserving very ill of themselves, have affirmed the Souls of Man and the Beasts only to differ in degrees of Perfection; and so that either alike must be either Mortal or Immortal, and alike propagated *ex traduce*” (*Two Discourses*, 1).

³⁴⁷ Willis, *Two discourses*, 38-9.

Raphael's addition given to this model when he imagines the information of the animal spirits to be 'sublimed' by the fantasy to the intellect. The intellect then 'frames out of these some other more sublime thoughts'. In Adam's model the link between the imagination and reason is simply one of service; in Raphael's model the bodily spirits give life (vital spirits), sense, fancy (animal spirits) and understanding (intellectual spirits), and it is *out of these material phenomena* that the soul receives reason itself, the traditionally immaterial aspect of soul. This is the basis and functional model of Milton's traducian heresy, since the rational soul is itself produced from the lower orders of spirit and substance. The connection between these levels is the process of sublimation. Willis's model describes something very similar in relational structure, with the proviso that the shift between the animal spirits of the sensitive soul and the ratiocination of the intellect is a meeting point of material and immaterial phenomena and reason itself acts upon the sensory information of the lower orders rather than being produced from them.

I suggest that in Willis's work this is one of the moments in which the notion of 'subliming' begins the shift from its chymical origin to its modern literary and psychological set of meanings. Willis is quite clear that the shift from the animal spirits to the rational soul must be a leap from the material to the immaterial, but in this process the terminology has to change its meaning, too. To 'sublime' begins to shift towards 'the sublime' of the Enlightenment and, more pointedly, toward the psychological 'sublimation' of Freud that will follow. Nevertheless, Willis's use of the notion of sublimation remains fundamentally chymical; his tract on fermentation of 1659 begins by declaring, "all Bodies... consist of Spirit, Sulphur, Salt, Water, and Earth, and from the diverse motion, and proportion of these, in mixt things, the beginnings and endings of things, and chiefly the reasons, and varieties of Fermentation, are to be sought".³⁴⁸ His account of the relation between the imagination and the rational faculty is structured similarly to that suggested by Adam; the detail that it adds in the action of the spirits matches the information that Raphael will add to the model intuited by Adam. Spirits act through a process of subliming.

³⁴⁸ Willis, *Of fermentation*, 2.

Sublimation is the central bio-mechanism offered by Raphael to Adam and Eve in his sketch of the transformative body-soul composite, but it is a slippery word.³⁴⁹ In chymical terms it means a process of purifying a compound substance through heat, whereby the purest element is extracted in the change from a solid state to a vaporous state, with distillation the comparable process for liquids or solids dissolved in solvents; the various different sediments are collected from the lower and upper portions of an alembic, the vessel designed for precisely this use. This is the process described by Boyle and Willis, as we shall see. Newman notes that while alchemists did make a distinction between distillation and sublimation, “they were not as fastidious as modern chemists... [and] frequently speak of liquids, such as mercury, subliming.”³⁵⁰ Indeed in *Anatomia hepatis* Glisson notes, “Separations of Elements are made by *distillation*, which may also be referred *sublimation*.”³⁵¹ Although today the notion of distilling may invoke more clearly than subliming ideas of purification and the extraction of a powerful essence (not least through the idea of the distillation of alcoholic spirits), in contemporary usage the terms are much closer.

Adam’s understanding of his body-soul composition shifts and grows through the poem. Raphael’s lessons are the main source for the first expansion of his comprehension, and one of the additions Raphael makes is that the linkage between the different levels is not simply that of service, but that of sublimation. Experimental work was being done through the years in which *Paradise Lost* was written to try to understand and perhaps even replicate in the laboratory the natural chymical motions of the blood. Boyle’s character Carneades notes of the artificial distillation of human blood that different strengths of fire cause differing separations. He continues:

If into a red-hot earthen or iron retort you cast the matter to be distilled, you may observe... that the predominant fire will carry up all the volatile elements confusedly in one fume, which will afterwards take their places in the receiver, either according to the degree of their gravity, or according to the exigency of their respective textures.³⁵²

³⁴⁹ The word “sublime” also retains in *Paradise Lost* its straightforward sense of raised height; as Satan emerges upwards from chaos and coasts the edge of heaven that is shadowed by night, he flies “In the dun air sublime” (*PL* 3. 72). Nevertheless, following an investigation of the OED I also suspect a Latin pun on the sense of being below heaven’s threshold, *sub-limen*, and maybe a further reference to Satan’s tendency to fly on the oblique angle in *limus*. This fits with the tendency Satan has to look initially impressive, but in actuality or detail (Satan’s sublime motion being also in relation to God’s immense Empyrean height) to be much less so.

³⁵⁰ Newman, *Atoms and Alchemy*, xiii. With Newman I adopt the contemporary usage.

³⁵¹ *Anatomia hepatis*, 69.

³⁵² Boyle, *The Sceptical Chymist*, 55.

Willis too notes that artificially applying the ‘philosophy of fire’ to the blood results in imperfect results. His search in this sequence is for the quality of the transformative agent that he imagines as a form of fire, but he, like many medical figures, concludes that the terrestrial fire familiar to us is not the generative heat of the body, but is more akin to chymical spirit:

neither by heat put to it [the blood], nor by reason of Salts and Sulphurs, which are Corrosives of a divers Kind being put together, can the blood be made to boyl; wherefore it follows, that it is inkindled like the spirit of Wine, and so as it were flames forth and boyls up. Further we shewed, that it is truly inkindled in hot living Creatures, because the proper Passions of Fire and Flame, are found only besides in the Life of the Blood; for in like manner both to this, and to them, there is need constantly of an Internal Sulphureous Food, together with the External nitrous... this is not visible and destructive as the common Flame, but as it is Subordinate to the Corporeal Soul, as to a Superiour Form, it admitting a proper Species, and serving to the uses of Nature, destinated by the Creator, silently burns with a gentle and friendly heat.³⁵³

This gentle and friendly heat is shortly afterwards identified with ethereal heat, and the animal spirits will be sublimed out of the vital as light is emitted from fire. Willis, like Glisson, combines his Aristotelian legacy with chymical transformation, imagining the brain as an alembic:

it seems to me that the Brain with Scull over it, and the appending Nerves, represent the little Head or Glassie Alembic, with a Spunge laid upon it, as we use to do for the highly rectifying of the Spirit of Wine: for truly the Blood when Rarified by Heat, is carried from the Chimny of the Heart, to the Head, even as the Spirit of Wine boyling in the Cucurbit, and being resolved into Vapour, is elevated into the Alembic; where the Spunge covering all the opening of the Hole, only transmits or suffers to pass though the more penetrating and very subtil Spirits, and carries them to the snout of the Alembic: in the mean time, the more thick Particles are stayed, and hindred from passing.³⁵⁴

The ‘subliming’ bodily substance was a popular notion among leading physicians and natural philosophers of the 1650s in a tradition of knowledge that was fast being radicalised by chymistry. The questions and questionable reputation that dogged practitioners of artificial transmutation compared to a perfect mysterious natural

³⁵³Willis, *Two discourses*, 22.

³⁵⁴Willis, *Of fermentation*, 12-13.

transmutation of the animate body clearly emerge in *Paradise Lost*, in which postlapsarian artifice is a shadowy type of the natural exaltations of body and spirit.

Processes of chymical transformation therefore characterise the living body/soul composites of unfallen paradise. Indeed the whole ‘ecosystem’ of paradise relies upon the logic of transformative substance; however, as Michael Lieb has pointed out, there is a distinct dichotomy between the treatment of artful and natural chymical transformation in *Paradise Lost*. Milton’s references to human attempts at alchemy are always qualified with scepticism if not with condemnation. The alembic is mentioned as part of the shadowy world of the alchemist in Book 3 of *Paradise Lost*, in which the search for the *lapis philosophorum* contrasts unfavourably with the magisterial natural chemical power of the sun. The stone found in abundance on the surface of the sun is:

that which here below
Philosophers in vain so long have sought,
In vain, though by their powerful Art they bind
Volatile Hermes, and call up unbound
In various shapes old Proteus from the Sea,
Drained through a Limbec to his Native form
(*PL* 3. 600-605)

The ‘limbec’ is the alembic here and ‘volatile Hermes’ and ‘old Proteus’ stand for volatile mercury and matter respectively. The native form of matter would be the first matter, as pure as that which God provided at the Creation (in Helmontian terms this would be water, in the Paracelsian tradition the *tri prima* of mercury, sulphur and salt; the prime matter of medical chymistry would be ‘perfect’ substances such as semen, nutritive juice or the colliquament of the egg).³⁵⁵ Despite the description of the art as powerful, the repetition of the phrase ‘in vain’ gives no doubt as to the poet’s unbelief in the power of earthly alchemy to discover the *lapis* thus far. Despite his extensive use of chymical research and concepts, Glisson too rejects the medical efficacy of those who claim to have discovered a universal agent of transmutation:

Chemists boast of being able to prepare the philosophical stone, says Glisson, and they claim that many philosophers, such as “Hermes, Raymond Lull, Paracelsus, and I know not who” were in possession of this stone. But then -- Glisson wonders using the classic argument -- how could it be that they themselves did not manage to keep immune

³⁵⁵ Pagel, *Van Helmont*, 49; Debus, *Chemical Philosophy*, 226-9.

from diseases, to delay old age, and prolong the natural limits of life?³⁵⁶

The argument for the efficacy of the *lapis* is discounted by both the doctor and the poet; for Milton, human attempts at alchemical art are distinctly fallen types of the endless natural transformations of unfallen paradise. The overarching natural chymical power of the sun contains on its surface something that equates to the stone itself and its influence is fundamental to all life; it is the light of sun and moon. These “two great sexes animate the world” in Raphael’s speech on the appetite for knowledge (*PL* 8. 151).

Lieb points out that in alchemical tradition this relation is mythologised between the sublunar and astral levels: “the sun (Sol), the natural alchemist, is traditionally an alchemical symbol of gold whose ‘marriage’ or cohabitation with the moon (Luna), the alchemical symbol of silver, generates the Philosopher’s Stone.”³⁵⁷ However, the human (and demonic) efforts to transform substance in *Paradise Lost* belie the mystical aspirations common in writers such as Fludd and Paracelsus, leaving them looking instead cheap, pallid or outright dangerous. When angelic digestion is described, the shadowy earthly type is that of alchemy, with its sooty coal fire and the labour of the ‘empiric alchemist’:

nor seemingly
The angel, nor in mist, the common gloss
Of theologians, but with keen dispatch
Of real hunger, and concoctive heate
To transubstantiate; what redounds, transpires
Through spirits with ease; nor wonder; if by fire
Of sooty coal the empiric alchemist
Can turn, or holds it possible to turn
Metals of drossiest ore to perfect gold
As from the mine.
(*PL*, 5, 435-443).

In 1633 Daniel Sennert had defended the transmutation of metals with the example of the bodily transmutation of substance in digestion.³⁵⁸ Milton makes the same comparison and although human effort is not dismissed, it is not given the unqualified validation accorded to the sublimation of the natural philosophy of unfallen paradise. Stanton J. Linden observes that the angel’s digestion is “imaged with great vividness

³⁵⁶Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 121-2 Giglioni cites MS Sloane 3310, f. 320v; Sloane 3310, f. 133r.

³⁵⁷Lieb, *Dialectics of Creation*, 234.

³⁵⁸Debus, *Chemical Philosophy*, 195.

and precision in the metaphor of alchemical transmutation.”³⁵⁹ I, however, follow Fallon, Lieb and Scheonfeldt in suggesting that this comparison is more than a metaphor; the relation between the two processes is closer than the metaphorical, or even the typological. It is, rather, a matter of degree.

Degree, in *Paradise Lost*, is what separates human substance from thought and ultimately from the angels. Fallon delineates clearly the difference between Milton’s angels and not only the traditionally immaterial scholastic angels, but the more equivocal ontological status of the angels of Henry More.³⁶⁰ These, like the angels of the Platonist tradition, are essentially “souls lodged in attenuated bodies”³⁶¹ unlike those of *Paradise Lost*, who clearly consist of active similiary substance, and are not reliant upon organs for their sensory experience:

All heart they live, all head, all eye, all ear,
 All intellect, all sense, and as they please,
 They limb themselves, and colour, shape or size
 Assume, as likes them best, condense or rare
 (PL 6. 350-353)

An important differentiation has been added to Fallon’s work by Phillip Donnelly, who notes that *material* and *corporeal* are in fact different ontological states.³⁶² Spirit can be material without having what we have been referring to as organic form, but the *corporeal* must refer to a material body that is, in some way formed. Thus, although the angels do seem to have a ‘proper shape’ it is not final or functional, like form: their ethereal substance can be material without being corporeal. Having a proper shape is not the same as relying upon the mechanism of organs for the processes of life. This differentiation is precisely that which is made in medical discourse between similiary and organic substances, and it is central to the question I am asking about *how* corporeal substance can ‘to incorporeal turn’. Milton’s consuming angels illustrate the necessity for digestion to work through the activity of inorganic substance.

Angelic biology is significant in part because it is (a higher) part of the same scale of nature that includes the visible creation and Adam and Eve themselves. Joad

³⁵⁹ Stanton J. Linden, “‘By Gradual Scale Sublim’d’: Jean D’Espagnet and the Ontological Tree in *Paradise Lost* Book V”, *Journal of the History of Ideas*, 52. 4 (1991), 603-615, 607.

³⁶⁰ See Fallon, *Milton Among the Philosophers*, chapter 5 ‘The Substance of Epic Angels’, 137-167.

³⁶¹ Fallon, *Milton Among the Philosophers*, 157.

³⁶² Phillip J. Donnelly “‘Matter’ versus Body: The Character of Milton’s Monism’ in *Milton Quarterly* 33. 3 (1999), 79-85.

Raymond has recently proposed that the use of angels in contemporary narrative (and particularly Milton's angels, given his concern with truth in his epic) enables the depiction of an imagined reality that occupies a nevertheless non-fictional position as opposed to literary modes such as allegory or metaphor.³⁶³ My study seeks to elaborate upon this intersection of imaginative representation with proposed literalism in the 'science' of angelic and human spirit. Milton takes considerable pains to emphasise the physical reality of the angel's need for food and the process of digestion, and he proposes the process in terms of comparable processes, rather than as a figurative comparison: no wonder the one thing can happen given that the other does. When talk of the art of alchemy comes up, Raphael has, of course, already made it clear that his digestion is a biological process rather than a mystery or a matter of illusory social graces, explaining to Adam that

food alike those pure
 Intelliential substances require
 As doth your rational; and both contain
 Within them every lower faculty
 Of sense, whereby they hear, see, smell, touch, taste,
 Tasting concoct, digest assimilate,
 And corporeal to incorporeal turn.
 (*PL* 5. 407-413)

Concoction is an Aristotelian concept, but the digestive transformation of the formed (corporeal) into the unformed (incorporeal) is not. The insistence on the part of both angel and poet that a transubstantiation is effected from fruit to spirit without digestive organs requires a closer examination. Through these references to alchemy and particularly through the use of some key words such as 'sublime' and 'odour', there are signs of exactly what sort of transformative power is imagined in *Paradise Lost* within the animate human and angelic beings and in the wider natural philosophy of the created world. We have a number of key facts about digestion: in humans it is a sublimation of food with lower levels of bodily spirit and matter joining and separating and ultimately effecting a transformation into lighter, more volatile and active degrees of matter. This process is matched by the transformations of natural philosophy that characterise unfallen paradise, where the motions of plants and flowers participate in this ascension. In angels it is a comparable process but, somewhat oddly, it is characterised twice by the more traditional Aristotelian notion of 'concoction'; finally, there are waste products

³⁶³Joad Raymond, *Milton's Angels: The Early-Modern Imagination* (Oxford: Oxford University Press, 2010), 169-88.

but they are easily excreted through a process of ‘transpiration’. Both processes have, at their summit, the transformation not of food into bodily organ (although this must constitute a lower level of human digestion) but a movement from body into spirit. The angel’s incorporeal body must use a purely similiary digestion to transform the corporeal directly into the incorporeal: the gradual scale of sublimation in the human process may – with obedience to God – turn their corporeal bodies, at last, all to incorporeal spirit.³⁶⁴

This system of biological transubstantiation is clearly Aristotelian in its “concoction” but it relies on the *action* of what can only, in the angel at least, be similiary, inorganic substance. Glisson’s writings on nutrition and digestion, as we shall see, focus upon the interactions of fluid and spirit within the body, giving a model amenable to the transformation of similiary substance. This model parallels precisely the accounts of natural transformation in *Paradise Lost*.

the inborn spirits which, irradiated by the vital heat, gradually strive to spread and extend the limits of their power by attracting, retaining, assimilating the food that is similar to them, by separating the excrements and finally placing what has been acquired in the appropriate places. This tendency (*nixus*), which is the essence of heat, since it is diffusive, dissipates and wastes the inborn spirits which, for this reason, are commonly said to be the original moisture in its being continuously fed upon by the heat.³⁶⁵

The actions of this process all take place among similiary spirit and thicker matter. Paré, in contrast, describes a traditional model of digestion whereby the emphasis is on the transformation of crude matter and bodily fluid into the organic parts of the body. In the section which deals with “the Naturall faculty which hath chosen its principall seate in the Liver” he subdivides nutrition into four “other faculties, which as servants attend upon the nourishing faculty; which are the Attractive, Retentive, Digestive, and Expulsive.”³⁶⁶ These faculties work thus:

The Attractive [faculty] drawes that juice which is fit to nourish the body, that I say which by application may be assimilated to the part. This is that faculty which in such as are hungry drawes downe the

³⁶⁴ The doctrinal implications are emphasised with the key work ‘transubstantiate’; the unfallen language of paradise may accommodate fallen words such as wanton, but the religious implications of transubstantiation cannot be taken as without significance. The Catholic mystery is a universal fact of the body in paradise. See Schoenfeldt, *Bodies and Selves*, 140.

³⁶⁵ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 78. Giglioli cites *De Rachitide*, 41-42; 92-93; also MS Sloane 3308, f. 278.

³⁶⁶ Paré, *Workes*, 22.

meat scarce chewed, and the drinke scarce tasted, into the gnawing and empty stromacke. The Rententive faculty is that which retains the nourishment once attracted untill it be fully laboured and perfectly concocted; And by that meanes it yeelds no small assistance to the Digestive faculty. For the naturall heat cannot performe the office of concoction, unlesse the meat be embraced by the part, and make some stay therein.³⁶⁷

We can pause to notice the attractive faculty here; this is the model which drew ire from mechanists such as Glanville and Charleton (in his later works) for the occult nature of its action. The simple correlation of the action of the organic body that gulps its food with ravenous hunger and the assimilative action of the organs to attract nutritious chyle within this body was no longer satisfactory to the experimental model of knowledge that had begun to prevail; it offered no comprehensible bio-mechanical schema that could be demonstrated. The digestion itself, that is, the transformation of swallowed food into the chyle, is imagined by Paré in terms of the action of simple heat:

The Digestive faculty assimilates the nourishment, being attracted and detained, into the substance of that part whose Faculty it is, by the force of the inbred heate & proper disposition or temper of the part. So the stomacke plainely changes all things which are eat and drunke into *Chylus*, & the Liver turnes the *Chylus* into blood... if it happen those faculties do rightly performe their duty, the nourishment is changed into the proper substance of the part, and is truly assimilated.³⁶⁸

We know that it is precisely this assertion that the liver sanguifies the chyle, making the venous blood, that Glisson overturned with anatomical, experimental evidence in *Anatomia hepatis*. It is therefore not surprising that there are some distinct differences between this model of digestion and that offered by Glisson. In an academic *determinatio*, Glisson seems to repeat the sort of model proposed by Paré, which associates assimilation and attraction: “The nutritive humors are drawn to the parts to be nourished in such a way that the humors are attracted to what is similar to them. Hence a part of the juice is carried to the fatty parts, another to the bones, another to the tendons and ligaments, another to the brain, another to the vitreous humor.”³⁶⁹ We should, however, remember that Glisson’s notion of attraction is that of the chymical philosophers; there *is* a bio-mechanism by which this attraction impels itself and it can be demonstrated by the action of substances in chymical transformations. Like Milton

³⁶⁷Paré, *Workes*, 22.

³⁶⁸Paré, *Workes*, 22-3.

³⁶⁹ Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 90. Giglioli cites MS Sloane 3309, f. 57r; also 3309, f. 246r.

he argues from the sensible evidence of the imperfect art of the laboratory to the theory of the body's natural transformations. The process is similiary and the impulsion relies upon the activity of material spirits, both those in food and those in the body already, and their reactions to each other.

In *Anatomia hepatis*, Glisson argues that the transformation of the chyle into blood arises not from a process of separation, as happens in excretory processes and the action of the liver, but from a process of volatilisation through which the natural spirit is changed into vital spirit.³⁷⁰ Giglioni summarises the vital economy of the body thus:

the transformation of the fixed spirits of food into the volatile spirits of the vital blood occurs through three main stages connected to the processes of nutrition and circulation of the blood: spirits are initially fixed (when they are closely entangled with the other elements [of the food]), then melted (through a process of ripening or fermentation) and, finally, they become volatile (when they are completely exalted) and transformed partly into the vital spirits of the blood and partly into the animal spirits of the nutritive juice. As a whole, the process of nutrition is described as a change of the nutriment from the state of undigested food (*cruditas*) to that of its digestion (*coctio*), that is, a process of increasing volatilization of the spirits toward a greater degree of activity.³⁷¹

The heart is the location of the chymical reaction which endows the blood with its vital power, but the reactions all happen within and between different degrees of matter and spirit in the 'mixt' of bodily substances. It is worth repeating here that it is an unusual and distinctively 'modern' materialism to have the active vitalising process located in the blood. Mechanist physicians such as Willis, Charleton and Power all relied heavily on this model of the active blood and, like the bodies they describe, Milton's Eve has animal spirits exhaling directly from her blood rather than the organic centres of the heart (Aristotle) or the *rete mirabile* (Galen). Later we will examine the mechanist versions of this chymical process, and its relevance to contemporary ideas of the soul, but for now we can differentiate clearly between the ancient version of digestion that had lasted for so long and the innovations brought about by chymical experimentalism.

³⁷⁰ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 124-5.

³⁷¹ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 125-6. Giglioni cites *Anatomia hepatis*, 287; 376; 326; 339-341; also *De ventriculo*, 233. Glisson spent much effort developing the notion first proposed by George Ent, that the pure and delicate substance of the nutritive juice must travel through the nerves with the animal spirits, rather than being part of the turbulent vital economy of the blood; the evidence is against Milton using this aspect of the model of the body, nevertheless, it belongs to the sort of radical revision of ontological categories that characterises vitalist materialism.

While Glisson was extremely heretical in his vitalist natural philosophy, his work in all areas is inclusive rather than engaging in the combat of different factions. In his lecture on the anatomy of the inner parts of the stomach, Glisson notes that “coction is made by means of fermentation.”³⁷² So when Raphael talks of concoction in his explanation of digestion, there is, as with Willis, a medical precedent for Milton’s inclusive terminology. Moreover, in this lecture Glisson also notes how fat in the stomach serves to “foment and warm the ventricle and the guts and so help their digestion” even while noting that the vital organs (heart and lungs) require a membrane to protect them from the “fumes of the meat and drink fermenting in the stomach.”³⁷³ The warmth that characterises Galenic concoction is still a factor in the newer theory of fermentation, so Milton’s use of both influences on the body’s digestion is genuinely medical. The differences between the old and new models are, however, clear. Where Paré proposed a Galenic bodily suction of hunger and associated it with the body’s suction of suitable nutrition in the organs, Glisson elaborates and revises the original thesis, reducing the ‘hunger’ of the organ down to the *mimina naturalia* of the chymistry of the body. Instead of the organic suction of the ventricle or stomach, Glisson argues for hunger as

suction such as may be made by the matter contained in the ventricle, towit for that raking or gnawing of the inner coat made by the acid humours it contains (which in some sort may be styled a suction, as being an endeavour to draw or suck out the tinctures of the said coat) then, I say, Galen’s sensus suctionis may so far be admitted. For acid humours are always predatory and apt to extract or suck out the tinctures of bodies next [to] them; wherefore there being nothing next [to] the acid relicts of the ventricle but its inner coat, these acid relicts must endeavour to draw out the tincture of that coat. Of this kind of suction (though it be improperly so called, and though, perchance it was not intended by Galen, yet there being no other in the ventricle), I say of this kind of suction we must understand him, or else totally reject this expression of his.³⁷⁴

This suction relies upon the active nature of the body’s fluids and spirits, rather than organic activity or mechanist logic; it can, without doubt, be a ‘scientific’ basis for the incorporeal spiritual assimilation of the eating angel. There is no doubt that Glisson has adopted the chymical theories of Van Helmont in his theory of digestion. The discovery

³⁷²Glisson, *Six Anatomical Lectures*, 81.

³⁷³Glisson, *Six Anatomical Lectures*, 73.

³⁷⁴Glisson, *Six Anatomical Lectures*, 95.

of the action of the acid quality of the stomach's digestion that replaced the ancient notions of heat and concoction emerged from his work: "it had escaped the Galenists that cooking fails to interfere with the ground-structure of the tissue, by contrast with digestion, which does: for the latter is transmutation, a profound change which heat even of the highest degree could never bring about."³⁷⁵ We already know that it is a feature of the chymical ferment to be acid in nature; it was, then, through the discrimination and volatilisation of active matter and degrees of spirit that we have examined already that a chymical ferment would do the transformative work of the digestion. This acid ferment will bring us back to Milton and the body-soul composites, for an acid ferment effects, in the works of the chymists, a sublimation of the most active elements of a substance. In medical chymistry, "gastric acid has to fulfil the vitally important task of separating the pure from the harmful in the stomach."³⁷⁶ The echoes between the activities of the contemporary conscience and the matter of the body are, again, clear and this process is a key to the genuinely monist combination of body and soul that Milton makes.

Let us then build a picture of precisely how the borrowings from chymistry contribute to the *scala naturae* described by Raphael. The most conspicuously chymical term is that of sublimation. Man's nourishment is transformed through sublimation of the bodily spirit, sublimation transforms the food we eat (in unfallen paradise there is fruit of sufficient variety to live and eat well) into vital spirit, about which we now have a lot of information. Vital spirit reproduces and expands itself in a motion through which the suitable natural spirits become more volatile and expansive; some thicker elements will not be assimilated and in this struggle the vital heat is produced.³⁷⁷ While the implication is that this transformative sublimation functions throughout the creation, the term itself is sited directly in the passage that deals with the transformations of the animate human body. The system of fermentation is one whereby solid, corporeal food

³⁷⁵ Pagel, *Van Helmont*, 130.

³⁷⁶ Pagel, *Van Helmont*, 136.

³⁷⁷ Vital spirit 'aspires' to the greater rarefaction and active perfection of animal spirit, but the word 'aspire' has both negative and positive connotation in Milton's work. Satan 'aspires' to raise himself further above his 'bad eminence' in Books 1 and 2: Adam criticises Nimrod for similar aspiration (*PL* 12. 64). Aspiration has a positive religious aspect, however, in *Comus*, (12) and in stanza 9 of *On the Death of a Fair Infant Dying of a Cough*. In *Paradise Regain'd* the dual aspect of 'aspiration' is interrogated as Satan questions Jesus as to how he will fulfil his kingship in a stratified world in which he is only a carpenter's son: "A Carpenter thy Father known, thy self / Bred up in poverty and streights at home; / Lost in a Desert here and hunger-bit: / Which way or from what hope dost thou aspire / To greatness?" (*PR* 2.414-418). Jesus' answer clarifies this oscillation of meaning, fixing holy aspiration to do God's will as the positive aspect and the aspiration to overcome God's will as the negative.

can be ingested and acted upon by superior levels of spirit; the form is broken down and the thicker substance and fixed spirits of the food are volatilised and assimilated to the higher order of vital spirit which acts upon it. The food is thus transformed into chyle, which can be volatilised further into either (sanguine) vital or (sensitive) animal spirits. This, I argue, is a system of bodily spirit that can substantiate Milton's assertion that the rational soul emerges from the individual body, rather than being infused by God into the foetus. If the power of the chymical ferment works to volatilise and perfect all different grades and degrees of matter up to and including the animal spirits of the sensitive soul, why, rather than stopping, or leaping mysteriously from material to immaterial realms, should it not continue with its "exaltation," especially since Milton has added to the system his own innovation of intellectual spirits?

The innovation in Raphael's system of subliming spirit and matter that immediately invites comment is the invention of a new sort of bodily spirit: intellectual spirits. Critics have noted that this is Milton's central connecting point between the lower faculties and the traditionally immaterial rational soul, but I am not aware of any critical explanation of *how* this process happens, beyond the observation that the process is one of digestion. The ongoing upward motion of transformative spirit sublimates into the realm of the *nous*, making, in Willis's work, a leap from one category to the next and in Milton's work, making a dynamic ontological scale. In this model of sublimation the higher, more volatile, active spirit tries to assimilate the next level down up to its own purer and more rarefied level. This is, in Glisson's early work, in part a seduction and in part an act of aggression; we have only to think the *Holy Sonnets* of Donne to remind us that spiritual life was regularly conceived as such, sometimes in the most dramatic of terms. Fallenness will bring a new set of relationships between subliming substances; as we shall see, that which does not assimilate has a different fate before the Fall than it does after, but for the time being I will focus on identifying the scientific basis of the process in the unfallen entity.

In order to make further sense of the conceptual leap that joins one dualist category to the other in *Paradise Lost*, I would like to turn from the upper reaches of the intellectual spirits (we will return to them) and draw attention to the initial stages of the process and another, rather less dramatic discrepancy from the traditional model: the exclusion of the lowest order of spirits, the natural or vegetative spirits. We cannot doubt the significance of the fact that Milton's angel proposes a new degree of bodily

spirit altogether, but neither should we underestimate the significance of the exclusion of the natural spirits, the very order of spirits that should indicate an interest in the early stages of medical vitalism. Glisson's early interest in the similiary substance of the body is expressed in *De rachitude* as a fascination with the natural constitution and the body's vegetative functions; however, natural spirits are precisely what have disappeared from the *scala naturae* described by Raphael. I suggest, in this case, that the vitalism represented in *Paradise Lost* is at a more sophisticated stage than that of Glisson's early work; indeed, it seems likely that this particular revision emerges directly out of the chymical tradition that was, in the work of Van Helmont, a dualist philosophy, but which gave so much to contemporary materialism.³⁷⁸ If we look again, there *are* spirits in the vegetation that Adam and Eve eat: they are not labelled 'natural' or 'vegetative', but they are present as the 'spirits odorous' breathed by the flowers shortly before they are eaten.

iii. A wilderness of sweets: odour in paradise

Odour is a significant concept in Helmontian natural philosophy and medicine.³⁷⁹ It is the active element of a medicine; that is, if the odour is gone from a herb or spice its efficacy will also be spent. From this, Van Helmont extrapolates odour as an element of a ferment; it predisposes matter to take on the new image (image being here something like a Platonised version of proper form) that is the other part of the ferment, the part which designates the new form that will emerge. The 'odour' of a natural object or entity is a herald, a preparation and a foretaste of the change that will be wrought:

the seeds of all living creatures also, must needs have their specifical odours whereby there are made suitings or fittings of the *Archeus* to the matter and the more Easie obedience for transchanging. For

³⁷⁸ Willis notes that 'odour' is a constituent part of a fermentation, but confines it to a discussion of putrefying fermentation (*Of fermentation*, 25).

³⁷⁹ It is not the work of this thesis to elucidate the theories of Van Helmont with any breadth, and I shall simply investigate the concepts that are already borrowed and elaborated by his later medical interpreters and that can also be seen in Milton's poetry. Nevertheless, I believe there is the potential for a study yet to be done upon the relationship between his vitalist dualism and Milton's vitalist materialism.

whence at length are made diversities of impressions into any bowels,
Organs, and powers, and in the strength and life.³⁸⁰

The fragrant flowers and fruits (and it is not often noted that flowers, although they were more commonly used as food then than they are today, are also nourishment in Milton's paradise) are awash with odorous spirits, which make them more easily assimilable to the bodies of those who eat them through their delightful scent.³⁸¹ Like medicinal odours they are beneficial to the body's generative and digestive ferments.³⁸² Willis notes that even in death spices are preservative through their power to initiate fermentation: "Spices, as they consist of very active Principles, stir up a new Ferment in the Subject, the dead Carcase; and the implanted Elements of this, joyn into the society of their motion, and retain many of their Particles flying away, yet longer in the Body."³⁸³ They enable and enact the fertility that characterises paradise. Van Helmont continues,

surely specificall odours do affect the matter and subdue it into their own protection: and an inclination and self-love ariseth from the specificall odour: Next, through custom, there is an easie receiving and a more perfect fitting: and at length a love-match into all desire of itself.³⁸⁴

This process parallels that in which Glisson imagines the fermenting elements of the blood in seductive, assimilative relationship. (Indeed, Giglioni charts the increasing influence of Van Helmont upon Glisson throughout his career and writings). The scent of the flowers is literally seductive, softening and opening the ontological barriers between one thing and another; from Van Helmont's perspective, as from Glisson's and Milton's, the very elements are as fertile and sexual as individuals of higher or self-consciousness.

³⁸⁰ Van Helmont, *Oriatrike, or, Physick refined. The common errors therein refuted, and the whole art reformed & rectified: being a new rise and progress of phylosophy and medicine for the destruction of diseases and prolongation of life* (London, 1662), 114. The Archeus is, in Helmontian medicine, essentially the ruling spirit/form of the entity. All things have an archeus, which constitutes causal impulsion and formative intention in it. Glisson is initially suspicious of the notion but it gradually comes to be an important antecedent of his materialist theory of natural perception. See Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 127-133.

³⁸¹ It is also relevant to the position of flowers in the scale of nature that throughout chymical writings from Albertus Magus through Paracelsus and to Boyle and Newton, the purified active elements separated by a sublimation are referred to as 'flowers' of the substance.

³⁸² Pagel, *Van Helmont*, 71.

³⁸³ Willis, *Of Fermentation*, 23.

³⁸⁴ Van Helmont, *Oriatrike*, 114.

The science of digestion in unfallen paradise engages with the substance vitalism and bodily subconscious that is central to medical monism, but, just as the Catholic mystery of transubstantiation is materialised into biological actuality, there is a theological aspect to the cleansing, life-giving power of these odours. Pagel observes that Van Helmont's assigning of such powers to odour has spiritual (in the traditional, dualist sense) significance as part of its material effect: "The sweet smell (euodia) of the heavenly worlds and the banishing of demons by the smell of the consecrated ointment are among specific gnostic doctrines relevant in this context."³⁸⁵ In dualist terms, the odours of paradise have both physical and spiritual power; Edwards has explored the life-giving properties ascribed to the 'balmy air' of paradise, focusing in particular upon the sweetness of Satan's first encounter with it.³⁸⁶ This increasingly pure air:

Meets his approach, and to the heart inspires
 Vernal delight and joy, able to drive
 All sadness but despair: now gentle gales
 Fanning their odiferous wings dispense
 Native perfumes, and whisper whence they stole
 Those balmy spoils. As when to them who sail
 Beyond the Cape of Hope, and now are past
 Mozámbeic, off at sea north-east winds blow
 Sabean odours from the spicy shore
 Of Arabie the blest, with such delay
 Well pleased they slack their course, and many a league
 Cheered with the grateful smell old Ocean smiles.
 So entertained those odorous sweets the fiend
 Who came their bane.
 (PL 4. 154-167)

Edwards observes that ultimately the balm and "balmy air" of paradise cannot be reduced to a commodity, an import, or a particular medicinal herb, resin or spice, precisely because the poem evokes a variety of different geographical, cultural and

³⁸⁵ Pagel, *Van Helmont*, 75. The *Catholic Online Encyclopaedia* defines Gnosticism: "A collective name for a large number of greatly-varying and pantheistic -idealistic sects, which flourished from some time before the Christian Era down to the fifth century, and which, while borrowing the phraseology and some of the tenets of the chief religions of the day, and especially of Christianity, held matter to be a deterioration of spirit, and the whole universe a deprivation of the Deity, and taught the ultimate end of all being to be the overcoming of the grossness of matter and the return to the Parent-Spirit, which return they held to be inaugurated and facilitated by the appearance of some God-sent Saviour"; it then comments somewhat acidly that "However unsatisfactory this definition may be, the obscurity, multiplicity, and wild confusion of Gnostic systems will hardly allow of another". It also states that "In Trismegistic literature... we find much that is strangely akin to Gnosticism" (<http://www.catholic.org/encyclopedia/view.php?id=5209> [09/04/10]).

³⁸⁶ For a comprehensive account of the medical significance of 'balm' in the period (as well as an account of the commercial charlatanism associated with it) see Edwards, *Milton and the Natural World*, 'The balm of life', 182-198.

botanical contexts for ‘balm’.³⁸⁷ This is compatible with the Helmontian concept of the odour as a universal ontological category, a constituent part of all living substance, as the active substrate and initial power of the life-giving ferment. The “odorous sweets” of the air of paradise are, like the other similiary substances we have encountered, active: they come to greet Satan, they are not simply breathed in, they *inspire*, acting to dissipate spiritual ills. Edwards notes that the balm of paradise has limitations – it cannot reverse despair, for, “To despair is to lose faith in God’s omnipotence, which is to mis-understand his deity, which is to fail to know that God is God. There can be no balm for despair, even in paradise; Satan, in despair, is always in hell.”³⁸⁸ Satan in this passage is a colonist and exploiter, enjoying the very beauty he comes to appropriate to his own paradigm with tragic results: “In his greed to possess the garden, he ends up poisoning the garden’s balmy air, one of its chief attractions for the infernal spirits.”³⁸⁹

However, the power of the odour is profound, even in the face of despair: in a graceful combination of spiritual and geographic state, the human sailors in the simile have passed *beyond* the Cape of Hope and continue to suffer winds from the north-east. The despair of demons may not respond to the overtures of balmy odour and the transformative power of the ferment, but humans who are past hope and still suffering adversity may, it is implied, still find relief. Thus the balmy air, like the sunshine, works as divine grace, free to all in Milton’s Arminian view.³⁹⁰ In Milton’s monist world spirit and body truly are on an interactive scale, when odour and sunshine may be varieties of divine grace, literally acting on the conscious body-soul composite that encounters them. Like the prayers of repentance, made as Adam and Eve struggle past despair, which are “sighs now breathed / Unutterable, which the spirit of prayer / Inspired and winged for heaven,” these odours work as incense in their spiritual efficacy (*PL* 11. 5-7). The prayers “passed / Dimensionless through heavenly doors; then clad / With incense, where the golden altar fumed, / By their great intercessor,” and Fowler notes that, along with associations with both Catholic ritual and Jewish temple, “the imagery may simply be related to Milton’s spiritual materialism” (*PL* 11. 16-9n). This spiritual/physical impact is, like the vivifying of the ‘mystery’ of transubstantiation in

³⁸⁷ Edwards, *Milton and the Natural World*, 196.

³⁸⁸ Edwards, *Milton and the Natural World*, 183.

³⁸⁹ Edwards, *Milton and the Natural World*, 194. Edwards relates this to the demon Belial’s desire for balmy air in Book 2.

³⁹⁰ Rumrich notes the problem of excessiveness in the fertility of paradise and in Eve’s beauty and the particular problem that this poses to a Platonic philosophy; he answers it by aligning this excessiveness with “the concept of grace: “undeniably good, undeniably excessive and undeniably irrational” (*Milton Unbound*, 140).

the Catholic Eucharist, a sign of Milton's monism; it is part of the materialisation, the endowing with living reality, of spiritual events and rituals which (particularly in the context of Catholicism) Milton regarded as dead outer actions.

As Edwards has noted, sweet fragrance is continually associated with the presence or voice of God, as foul smells are associated with the decay of sin.³⁹¹ Nevertheless, I suggest that 'odour' supports both this biblical tradition and, crucially, the Helmontian medical sense of the word. We meet floral, spicy and balmy odours at various times in paradise, but they seem to be a particular part of the initial encounter with paradise for the angels who visit, and in their responses we can read again, and more subtly, something of the relation between their inorganic consciousness and that of unfallen, human ontology. Raphael, upon landing, "shook his plumes, that heavenly fragrance filled the circuit wide," but when he enters paradise the scent of the "spicy forest" gives the impression of a different, purer and more active air than is anywhere else present. Raphael comes

Into the blissful field, through groves of myrrh,
And flowering odours, cassia, nard, and balm;
A wilderness of sweets; for nature here
Wantoned as in her prime, and played at will
Her virgin fancies, pouring forth more sweet,
Wild above rule or art; enormous bliss.
(*PL* 5. 292-7)

Myrrh, cassia, nard and balm all have biblical significance as well as well-documented medicinal value (particularly in the case of balm and myrrh).³⁹² However, I suggest that the syntactical positioning of "odours" as the subject of the sentence is more than a poetic flourish or a result of Milton's Latinate style. The odour is the active, preparatory element in the wild profusion of edenic fertility that Raphael is entering; it inspires in preparation for a fermentation that is responsible for digestive and generative transformation and which is blooming all around. At this moment Adam is sitting in the shade "while now the mounted sun / Shot down direct his fervid rays to warm / Earth's inmost womb, more warmth than Adam needs" (*PL* 5. 300-302). The glorious, passionate natural fecundity of this paradise exceeds that of its human inhabitants and

³⁹¹ Cf. God's speech on free will in Book 3 (*PL* 3. 95-135).

³⁹² Fowler gives them thus: myrrh as defence against devils (it is also the expensive embalming substance given at Jesus' birth); cassia as a cinnamon-like spice "used in the holy oil for anointing the Tabernacle (Exodus 30:24)"; nard as an "ointment poured over Jesus' head to anoint him 'to the burying' (Mark 14:3, 8)" (*PL* 5.292-4n).

its angelic guest; the sunlight and the odours literally stimulate and generate. Of course, for angels who do eat and make love, but do not have physical borders to overcome and who do not procreate, the effect is – I would suggest – almost overwhelming. The responses of the different angels are telling.

When Satan arrives on earth his first act is to confront himself in a tortured monologue in which he encounters his own despair (the only ill that the balmy odour cannot work on). His encounter with the glory of paradise culminates in vitriolic envy of Adam and Eve's blessed state and mutual love and a frenzy of frustrated desire (*PL* 5 505-511). Raphael's entry begins a meditation upon the natural sexuality of paradise that is, in the faint uneasiness of the repeated notion of unruly wantonness and wildness, a precursor to his warnings to Adam about his passion for Eve. Following Adam's paean to Eve's absolute grace and beauty in Book 8, Raphael warns that his love is too extreme and irrational, noting somewhat sourly that:

if the sense of touch whereby mankind
Is propagated seem such dear delight
Beyond all other, think the same vouchsafed
To cattle and to each beast; which would not be
To them made common and divulged, if aught
Therein enjoyed were worthy to subdue
The soul of man, or passion in him move.
What higher in her society thou findest
Attractive, human, rational, love still;
In loving thou dost well in passion not,
Wherein true love consists not; love refines
The thoughts and the heart enlarges, hath his seat
In reason, and is judicious, is the scale
By which to heavenly love thou mayst ascend,
Not sunk in carnal pleasure, for which cause
Among the beasts no mate for thee was found
(*PL* 8. 579-594)

Paradise seems excessive to the angels, as does human love, but Raphael has both exceeded his brief (which is not to provide marriage guidance at all, but to warn about Satan) and misunderstood this alien love. This is partially, I think, because as a creature of rarefied inorganic spirit he is convinced that angelic love is enjoyed "in eminence" to human love and he misses the difference between the animal pleasure which is "made common" to all and the physical aspect of married love which is, by definition, not. His lecture demands no response so much as the poet's meditation upon Adam and Eve's sexual love that declares:

Whatever hypocrites austerely talk
 Of purity and place and innocence,
 Defaming as impure what God declares
 Pure, and commands to some, leaves free to all.
 Our maker bids increase, who bids abstain
 But our destroyer, foe to God and man?
 Hail wedded love, mysterious law, true source
 Of human offspring, sole propriety,
 In Paradise of all things common else.
 By thee adulterous lust was driven from men
 Among the bestial herds to range, by thee
 Founded in reason, loyal, just and pure,
 Relations dear, and all the charities
 Of father, son and brother first were known.
 Far be it, that I should write thee sin or blame,
 Or think thee unbefitting holiest place,
 Perpetual fountain of domestic sweets,
 Whose bed is undefiled and chaste pronounced.
 (PL 4. 744-752)

Raphael is not a hypocrite because he cannot know the pleasures that are not for him ordained, but this meditation on love, that almost counters Raphael's concerns point for point, is precipitated by a vision of perfect human sexuality.³⁹³ That sexuality is not, as Raphael suggests in this most Platonic of moments, bestial: it *is* shared with the rest of the natural world (which is also commanded by God to go forth and multiply), but it is also profoundly different.³⁹⁴ Like Satan who despises the "man of clay," Raphael cannot quite accept that the whole of the visible world is feverishly generative and wildly beautiful while being utterly pure; neither has he accounted for the fact that Adam and Eve are rational animals and their love is wedded love; he sees only an animal otherness of organic, corporeal sexuality. The truth is that their marriage, designed and presided over by God, is both a creaturely and a rational state, as Adam attempts to explain, according to his sexual experience, "mysterious reverence," linking this to the "thousand decencies that daily flow / From all her words and actions, mixed with love / And sweet compliance, which declare unfeigned / Union of mind, or in us both one soul" (PL 8. 601-604). That he has to explain to the angel that their union is

³⁹³ Edwards has made a convincing case for the modelling of this relationship upon that of Milton and his friend Chales Diodati, who remained a virgin until his early death, in "Raphael, Diodati." In *Of Paradise and Light: Essays on Henry Vaughan and John Milton in Honor of Alan Rudrum*, ed. D. Dickson and H. Nelson (Newark: University of Delaware Press, 2004), 123-41.

³⁹⁴ As I noted in Chapter 1, Milton makes precisely this correlation between human fertility (and traducianism) and God's command to go forth and multiply in the *Christian Doctrine*: "the force of the divine blessing, that each creature should reproduce in its own likeness, is as fully applicable to man as it is to all other animals" (CPW 6: 320).

unfeigned shows a slight discomfort at the dualism that Raphael has implied (it is after all the gap between seeming and being that opens up in the fall of Satan); reason, he insists, is not subject to passion, whatever Raphael thinks: that will be an effect of the Fall.

It is Adam's questionable success in explaining the (unfallen) relation between human reason and sexual love that prompts him to ask about angelic love, and here we come to another scientific feature of Milton's monism. Angelic love relies upon the possibility of penetration of substances. Angels, Raphael declares,

obstacle find none
Of membrane joint or limb, exclusive bars:
Easier than air with air, if spirits embrace,
Total they mix, union of pure with pure
Desiring; nor restrained conveyance need
As flesh to mix with flesh, or soul with soul
(*PL* 8. 624-629)

As humans we may or may not question the value of a sexuality that lacks the restraint required by the overcoming of bodily borders and boundaries, and prefer the "sweet reluctant amorous delay" of human union, but then, these are not pleasures for us ordained (*PL* 4. 311). Raphael certainly does not pause to discuss the differences, but the information he gives us tells us a lot about the natural philosophy of body and spirit that is assumed in the poem, for the notion that substances could penetrate one another was, as Giglioli notes, a *monstrum*.³⁹⁵ This brings us back up the scale of nature, from the ubiquitous power of the odorous ferment in paradise to the upper reaches of consciousness, to examine the 'intelligential' spirits that are angels, in particular, raising some questions about angelic substance. Glisson's work gives us a chymical model of similiary transformation in the assimilative transformations of digestion, and the power of 'odour' stands in the place of the older notion of 'natural spirits', but I would also like to examine angelic substance in the light of the medical significance of both its penetrability, and its transpiration of excess food, both of which correlate with aspects of contemporary experimental medicine.

³⁹⁵ Giglioli, 'Genesis of Francis Glisson's Philosophy of Life', 139.

iv. Penetration of substances

The anomalousness of the penetration of angelic substance relies upon the fact that Milton's angels do not consist of an immaterial consciousness animating a body. One person who claimed that spirit could penetrate substance was Henry More, but, as is often the case, his natural philosophy seems initially like that of Milton, only to diverge into dualism as soon as it is looked at in detail. His definition of a created, finite spirit (that of a human or an angel) is characterised by penetrability, elasticity and, given its immaterial nature, indivisibility. He summarises his definition thus: "A substance Indiscerpible, that can move it self, that can penetrate, contract, and dilate it self, and can also penetrate, move, and alter the matter."³⁹⁶ Given that spirit is defined by its penetrable quality for More (along with indiscerpibility, or a quality of being indivisible) we might take the mutual penetration of two spirits to be the sort of process that Raphael describes, but a comparison between More's penetrable spirit and those in *Paradise Lost* immediately throws up problems. For More spirit must be penetrable in part because that is a logical consequence of its incorporeality, and in part because he uses it in binary opposition to matter, which retains the dull, lifeless intractability of the dualist system. Spirit must be penetrable because it is the dimensionless cause of movement and change in otherwise dead extended matter. One can sense the mechanist tendencies of the presumed reader in More's slightly defensive declaration:

there is such a thing as a Spirit in the world, from which activity is communicated to Matter. And indeed if Matter as Matter had motion, nothing would hold together but Flints, Adamant, Brass, Iron; yea this whole Earth would suddenly melt into a thinner Substance then the subtil Aire, or rather it never had been condensated together to this consistency we finde it.³⁹⁷

Active matter would cause a complete dissolution of all solid form.³⁹⁸ More's focus upon the 'seminal forms' as lower grades of bodily spirit seems to recall Milton's inclusiveness, as does his definition of the human soul:

³⁹⁶ More, *Immortality of the Soul*, 25.

³⁹⁷ More, *Immortality of the Soul*, 42-3.

³⁹⁸ This is a comment upon the proposal of active matter, rather than vital (and therefore active) matter. Where Cudworth had made a similar *reductio ad absurdum* in response to vital matter, More is probably responding to atomist theories that we will come to shortly. It may be fanciful to read this response to the

If we adde to Vegetation and Sensation Reason properly so called, we have then a settled notion of the Soule of Man; which we may more compleatly describe thus: A created Spirit indued with Sense and Reason, and a power of organizing terrestrial matter into humane shape by vital union therewith.³⁹⁹

The similarity to Milton's body-soul composite is, however, superficial. More's dualism is often pronounced, and poses such a problem that he never manages to answer the question of *how* spirit moves and controls matter: "The greatest difficulty is to fancy how this Spirit, being so incorporeall, can be able to move the matter, though it be in it" and he concludes by restating that "a firm union of *Spirit* and *Matter* is very possible, though we cannot conceive the manner thereof."⁴⁰⁰ Although he claims incorporeality as a feature of his notion of spirit it becomes clear in his discussion of Descartes and Hobbes that, for him, incorporeality is directly coincident with immateriality.⁴⁰¹

More's angels are immaterial consciousness actuating a body of air. Unlike Milton's angels, who are material spirits exalted beyond the corporeal to a higher and more active degree of sublimity, they retain a dualist nature: "herein alone, I conceive, does the Spirit or Soule of an Angel... differ from the Soule of a Man, in that the Soule of an Angel may vitally actuate an aëreal or aethereal body, but cannot be born into this world in a terrestrial one."⁴⁰² Milton's angels are not in terrestrial bodies, but, despite their liquid texture, they can metabolise terrestrial food. Moreover, they are not in the end, 'indiscernible' as Satan finds out during the war in heaven when he is cut by Michael's sword:

then Satan first knew pain,
And writhed him to and fro convolved; so sore
The griding sword with discontinuous wound
Passing through him, but the ethereal substance closed
Not long divisible, and from the gash
A stream of nectarous humour issuing flowed
Sanguine, such as celestial spirits may bleed
(*PL* 6. 327-333)

new dynamic body politic as a precursor to the famous Marxian comment that in a capitalist economy 'all that is solid will melt into air'.

³⁹⁹ More, *Immortality of the Soul*, 52.

⁴⁰⁰ More, *Immortality of the Soul*, 45; 47.

⁴⁰¹ More, *Immortality of the Soul*, 54-5.

⁴⁰² More, *Immortality of the Soul*, 52.

This substance is not divisible for long, but it *is* divisible. Like humans, angels have bodily fluid that issues from a division in that substance. That humour resembles both the sanguine humour of humankind and the “rubied nectar” of the angels’ feast, just as human blood is repeatedly compared to wine by Glisson, Willis and other physicians. Of course the damage sustained by Satan is not only attributable to the might of Michael; he is also starting to grow “gross through sinning” and his thickening substance is therefore growing more ‘discerpible’ as he shifts down the dynamic scale of nature.

Penetration of material substances is a *monstrum* because it complicates or disables dualist systems, but the dynamism of Milton’s monist natural philosophy requires it, as does Glisson’s. Milton’s angels are, of course, material intelligential spirit, but they are without the organic form of body, being constituted by pure, active similiary substance:

For spirits when they please
 Can either sex assume, or both; so soft
 And uncompounded is their essence pure,
 Not tied or manacled with joint or limb,
 Nor founded on the brittle strength of bones,
 Like cumbrous flesh; but in what shape they choose
 Dilated or condensed, bright or obscure,
 Can execute their airy purposes,
 And works of love or enmity fulfil.
 (*PL* 1. 423-431)

These angels are not compounded into form but they *are* composed of material spirit, which includes sensory faculties (in eminence) without the need for the mechanisms of organ; Milton’s angels are an outstanding example of active similiary substance, and we know that they can metabolise the fruits of paradise by the same similiary sublimation of matter as the human, organic body. The problem this poses, as Schoenfeldt has noted, is that of excretion; after all, the processes of sublimation and distillation tend to suppose that there will be some sort of residue of inassimilable matter, as there is in the ferment of the Creation and the medical ferment in general. The answer given is that of ‘transpiration’: “what redounds, transpires / Through spirits with ease” (*PL* 5. 438-9).⁴⁰³ The ferment of the lower orders of fixed natural spirits clearly volatilises them through

⁴⁰³ Schoenfeldt makes this point, but limits the meaning to sweating (*Bodies and Selves*, 141-2).

degrees up through the intellectual to the level of angelic intelligential spirit; there are elements that ‘redound’ but these ‘transpire’ – what does this mean?⁴⁰⁴

In a lecture probably given at the Royal Society, Glisson states that “one half of what a temperate man eats and drinks is spent by insensible transpiration, as is experimentally proven by Sanctorius in his *Medicina Statica*”.⁴⁰⁵ Transpiration is, it seems, a medical term for effluvia out of the bodily parts; in orthodox and mechanist accounts they are made through pores, for “if all parts have transpiration, then they must needs have pores by which transpiration is made.”⁴⁰⁶ There are natural pores and vital pores for the corresponding spirits and if these get blocked or mixed then illness ensues. Thomas Willis notes that transpiration is part of a cleansing process. In sleep:

the Blood is soon quieted, and passes more slowly thorow the place of inkindling, to wit, the Lungs; wherefore being there first more inkindled, it burns with a clearer Flame, and also more mildly, and so the smoak presently ceasing, and some Heterogenious Particles being burnt, all the rest extricating themselves from Confusion, what are profitable are employed in their designed Offices, and what are unprofitable, are bolted or sifted forth, partly by Breathing, Transpiration, or Sweat, and partly thorow the other Emunctories.⁴⁰⁷

Willis’s model of the transformative body is more Baconian than that of Glisson (or Milton) in the fieriness of the reactions, and his reactions are clearly those happening between atoms rather than between elements of a fluid substance. Transpiration, though, is clearly some sort of sweating, although not, it seems, precisely the same as sweating.

Glisson had commented upon transpiration and the penetration of substances together in the Prolegomena to *Anatomia hepatis* in 1654. Obstruction in the body causes illness, but Glisson dismissed the debate on the penetration of substances, initially on the pragmatic grounds of a practicing physician, stating that:

⁴⁰⁴ The term ‘redound’ is used by God to refer to the revenge that Satan attempts (*PL* 3. 85-6); one can see in this the rejection of Satan’s inassimilable evil, for that which cannot be sublimed or turned to good by God is excreted, with a brief echo of the Milton of *Colasterion*, upon Satan’s unfortunate head.

⁴⁰⁵ Francis Glisson, *Two Anatomical Lectures on the Stomach*, in *English Manuscripts of Francis Glisson 2. Lectures and other papers*, ed. Andrew Cunningham (Cambridge: Wellcome Unit for the History of Medicine, 1998), 5-40, 32. Glisson cites Sanctorius Sanctorius, *Ars... de Statica Medicina* (Venice 1614). See also Willis, *Two Discourses*, 48; also Power notes “those fuliginous effluvia which pass constantly out of us by insensible transpiration; which *Sanctorius* hath proved to exceed the bulk and weight of all our sensible evacuations whatsoever” (*Experimental Philosophy*, 67).

⁴⁰⁶ Glisson, *Two Anatomical Lectures*, 3.

⁴⁰⁷ Willis, *Two discourses*, 92.

whether the obstructions happen in the pores or in the very substance of the parts, will in no way upset [their] medical principles; nor will the mode of cure be greatly varied... one should enquire what kind of permeating *matter* it is: viz., whether it is an *exhalation* (like a breathing in or breathing out, which penetrate the skin by an insensible transpiration), or a *liquor* (like sweat, which also permeates the skin).⁴⁰⁸

Transpiration is an outward exhalation of a substance finer than liquid through pores, skin or substance itself; this is the definition of 1654 to which he refers in his lectures of the 1660s.⁴⁰⁹ By the 1660s he is less hesitant about and yet more defensive of his thesis; the outer layer of the body's skin may seem like a covering, but it participates in vitality, it "hath the last farewell of the vital spirits, which in their breathing out pass through it."⁴¹⁰ He has every reason in this lecture to sound defensive: Descartes had insisted that impenetrability was a result of the extension of material substance in dimensional existence.⁴¹¹ This insistence was shared by other mechanists for a very good reason: "unless bodies were mutually impenetrable they would not displace each other in the collisions and exchanges of motion which, according to the mechanical philosophy, are what lie at the basis of natural phenomena."⁴¹²

Glisson's medical experience persuaded him otherwise. He knows the potential difficulty with what he is saying, but insists:

It may be objected that this... seems to admit of penetration of bodies. I answer, that in some sort it does, but so as not to make two dimensions or two distinct bodies in one place. For in the very instant of penetration they are united and become one body and have one dimension. Indeed there are two kinds of this union, the one permanent, when bodies united rest in that union; the other transient, when the body entering the other rests not but continues on its motion till it pass through the same... some bodies can pierce each other, yet

⁴⁰⁸ Glisson, *Anatomia hepatis*, 101.

⁴⁰⁹ Glisson, *Six Anatomical Lectures*, 53.

⁴¹⁰ Glisson, *Six Anatomical Lectures*, 51

⁴¹¹ Woolhouse, *The Concept of Substance*, 80-81. Although he borrows heavily from Glisson, Charleton denies Glisson's thesis that the separations of the nutritious and the excrement are made by similar attraction: "Nor by *Spontaneous Coition, or A[...]*traction *Similar*; [Note: Nor that it is *Attracted* by the like Excrement contained in that part:] because in Nature there is no Motion by Attraction, but all from Impulsion". Instead he gives a mechanist solution, citing: "*the Correspondence of Magnitude and Figure betwixt the minute particles of this or that peculiar excrementitious humor to be separated from the blood, on one side; and the small passages leading into, and insensible pores in this or that part, peculiarly constituted for the separation thereof, on the other: together with the help of that particular Fermentation, which each humor doth suffer either neer unto; or in the place of its separation; to Nature nothing being more frequent, than to make use of a certain Fermentation, greater or lesser, where she intends a separation of various humors one from another*" (*Natural History of Nutrition*, 99-100).

⁴¹² Woolhouse, *The Concept of Substance*, 96.

so that in the transition they become one: as the elements are united in mixture, and the nourishment augmenting parts is taken into the part nourished, and the augmentation is uniform in the whole and not made by apposition of part to part, especially in living creatures.⁴¹³

Penetration of bodies is anathema to the mechanist philosophy, but it is also antithetical to much Aristotelian thought. Glisson picks up the weak point of the Aristotelian rebuttal by invoking the notion of the mixt. In Aristotelian terms, a substance was not simply equivalent to matter, but was “primary, that which can exist of itself,” that is, it was essential and to be opposed to accidents or secondary qualities.⁴¹⁴ The mixture of the elements (earth, air, fire, water) into a complete homogenous substance (Newman gives the example of a bird) could only be effected by the power of form. Nevertheless, even before the rejection of Aristotelian physics that founded the new philosophy, there were technical difficulties with this model (for example the question of why the elements do not fly off in their different natural directions). Medieval scholastic ‘pluralists’ argued for a plurality of possible forms in a given substance, and one of the innovations later wrought by chymical philosophy was the interpolation (or substitution) of the elements of chymistry into this system.⁴¹⁵ Glisson’s insistence upon penetration of bodies touches upon the old philosophical equivocation and relies in part upon the new, but it is also clearly drawn from his own work on nutrition.

It also underpins his vitalist materialism: “To Glisson, the penetration of substances was a crucial argument to demonstrate the intrinsic life of the material substratum.”⁴¹⁶ In his teaching notes Glisson states:

Nothing prevents substances from penetrating each other. In fact, the dimensions do not penetrate each other: what happens is that a new dimension immediately originates in substances that subdue each other. For the quantity and the determinate extension of a body is an accident and, accordingly, can change and be altered. When two bodies join up, they remain two as far as their potential nature is concerned, but they gain one dimension with respect to their actual nature.⁴¹⁷

⁴¹³ Glisson, *Six Anatomical Lectures*, 55.

⁴¹⁴ Newman, *Atoms and Alchemy*, 35.

⁴¹⁵ Newman, *Atoms and Alchemy*, 356.

⁴¹⁶ Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 139.

⁴¹⁷ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 139. Giglioni cites MS Sloane 3309 (“A simplici sanguinis transvasatione per habitum partium nulli inducuntur morbid”), ff. 317r, 318r-318v.

This perspective as a philosophy makes sense in the context of the laboratories of the alchemist, as it does in the study of nutrition. The process Glisson describes implies the action of the ferment, where one spirit, odour or active substance encounters another and assimilates and transforms it. It is, nevertheless, an unpopular solution to the phenomena there observed with both Aristotelian and mechanist thinkers. What Raphael describes in his sketch of angelic love and desire is clearly the penetration of substances, and the model of transpiration gives us a system whereby vital spirits exhale from the body through the skin, and therefore higher degrees of spirit exude from the angel's spiritual substance "with ease." His plastic, ethereal body is clearly using just the system of active, assimilative spirit described by Glisson to excrete "what redounds" from his food. Like Milton, Glisson's materialism relies upon this model of active spirit, for the body's fluids (chyle, blood, semen) and spirits must be able to interact, assimilate, vitalise and exalt one another.

v. Active matter

Inevitably, the debates and experiments of the chymical philosophy often imply some sort of penetration of substances; transmutation would seem to require it and this posed problems for contemporary iatro-mechanists. Boyle debates for some time in *The Sceptical Chymist* whether substances are created *de novo* out of chymical reactions, or whether the reactions reveal substances that were already present within the previous form.⁴¹⁸ To the mechanists, minute corpuscles were the solution; matter could interact and transmute, as we saw in the burning heterogeneous particles proposed by Willis, but they would still be impenetrable, because "These corpuscles have a definite position and size, and within their volume are solid and impenetrable. They are the ultimate atoms, since they cannot be broken up."⁴¹⁹ They are often treated as active, too. As we can see from More's rather defensive tone, active matter was not as unusual or heretical as has been assumed. Henry corrects the critical assumption that all seventeenth-century mechanical philosophers adhered to the Cartesian principle of inert matter. He also amends the corresponding position that, of the same natural philosophers, those who attributed activity to matter were "*ipso facto* held to be

⁴¹⁸ Boyle, *Sceptical Chymist*, 46.

⁴¹⁹ Ian J. Thompson, 'The Nature of Substance', *Cogito*, 2 (1988), 17-19.

subversive radicals.”⁴²⁰ The notion of active matter (which, as we shall see is not exactly the same as vital matter) was subjected to sustained scrutiny and was not rejected by many mechanists. Henry notes that figures in the Royal Society such as Thomas Willis and John Mayow

developed corpuscular systems of philosophy which assumed from the outset a hierarchy from active matter down to passive matter; from spirit and sulphur (Willis) or sulphur and mercury (Mayow) to earth. Different combinations of the various kinds of particle, Willis suggested, gave rise to ‘ferments’ which were responsible for initiating and conserving many vital processes and which, in adverse circumstances could cause pathological conditions. Neither Willis nor anyone else try to explain the operation of fermentation in strict mechanical terms, the motions of the ‘ferment’ are simply assumed.⁴²¹

The corpuscular interactions are normally explained by the differing shapes of the corpuscles; they might have hooks, indentations or be elastic. This sort of interaction does not, as Henry notes, formulate the motions of the ferment. So when we look at the systems of fermentation proffered by proponents of mechanism, we see something very similar to Glisson’s medical ferment.

Henry Power, at one time Glisson’s student, hovers on the border of mechanist and chymical models of substance, defining animal spirits as: “this aetherial substance or subtle particles” first created by Nature “to be the main (though invisible) Agent in all Natures three Kingdoms Mineral, Vegetal, and Animal.”⁴²² Like Glisson, he proposes a three-stage process of fermentation, consisting of fixation followed by fusion, and finally volatilisation. In the initial stage of fixation, the volatile spirits

are so complicated with the grosser parts of Matter, and locked therein so fast, that they can hardly be separated, and dis-imprisoned as in Minerals, but most especially in Gold... The state of Fusion, I call that, when the Spirits by any kind of help have so wrought themselves towards a Liberty, that they are in the middle way to Volatility, as in half-concocted Minerals, fermenting Vapours or Liquors, and half-ripened Fruits &c. Thirdly, The Spirits are in their third state of Volatility, when after a colluctancy with the grosser Particles they have so subjugated and overcome them, that they are just upon wings, and ready to fly away; as in Wine when it is in the height of its fermentation, and in some part of our arterial blood always.⁴²³

⁴²⁰ Henry, ‘Active Principles’, 357.

⁴²¹ Henry, ‘Active Principles’, 343.

⁴²² Power, *Experimental Philosophy*, 61.

⁴²³ Power, *Experimental Philosophy*, 61.

Power continues to observe that from this fermentation “there is a palpable and sensible heat produced” and to extend this process specifically to the development of minerals underground.⁴²⁴ This echoes Glisson’s formulation, simply substituting particles for similiary substance, but would seem to correlate the mechanist notion of fermenting matter with that we have found in *Paradise Lost*. Nevertheless, there are a number of problems with this association. To begin with, Milton mentions corpuscles not at all and assigns the only mention of atoms to the realm of Chaos; second, the concept of active, corpuscular matter held a very different (if perilously close) place to that of vital matter, not least because of the theological implications of the two theories. Henry notes that the “aggregation of concepts of animated and merely active matter was, to say the least, embarrassing for one or two of the leading mechanical philosophers. Certainly Boyle was always very careful to deny that matter could think or display percipience or appetite.”⁴²⁵

For the vitalist, God had endowed matter with active power: matter itself gave rise to basic percipience and motive force, whereas for the mechanists, matter was moved purely by the force of other matter in motion, the origin of all motion being God at the beginning of the world. The difference is subtle indeed, and to uncover the most substantial differentiation between the active atoms of the iatro-mechanists and the vital spirits of the chymical Galenists, one must, in the end, turn to the contemporary theological and political motivations and constraints in which they operated. The notion of active matter answered problems of evidence, particularly in the realm of physiology, but could be divided from the pantheistic implications of vitalism and supported by a devout, voluntarist theological stance. So, given that Milton’s natural philosophy is predicated upon the universal principle of fermentation, just as that of Willis and Power was, where are the differences? For Milton, as for the atomists, God is first cause, and nature is constituted by secondary causes. However, the mechanists saw the secondary causes as being external, and thus reduced down to efficient cause only, in the force of atoms upon one another, exchanging and circulating a set amount of motion imparted by God at the creation. The acts of creation are reduced to setting matter in motion.⁴²⁶

⁴²⁴ Power, *Experimental Philosophy*, 62.

⁴²⁵ Henry, ‘Active Principles’, 356.

⁴²⁶ For a detailed exploration of the translation of Aristotelian notions of final cause into elements of the mechanical philosophy, see Margaret J. Osler ‘Whose Ends? Teleology in Early Modern Natural Philosophy’, *Osiris* 16 (2001), 151-168, 162.

This is a transition from multiple modes of causality to a new form of explicit binary dualism.

Mechanist philosophies were theologically suspect: in the classical sources of atomist theory Epicurean philosophy posited an eternal world and a purely fortuitous conjunction of the atoms that made up that world. Mechanists such as Gassendi and Charleton Christianised Epicurean atomism, denying the eternal world and chance collisions of atoms of the classical authors and recasting atomism within a Christian metanarrative of God's intentional creation.⁴²⁷ Atoms had, at the beginning, been endowed with motion by the First Cause and Milton's Creation does not exclude this formula, but neither is his Creation so reduced. The risk of the resulting Creation posed by the mechanists is that of deism and an absent God, who made the world like a clock and departs, having set it running. Active principles, however, "were used to undermine the atheistic interpretation of the strict mechanism – that the universe may always have existed with the same amount of motion it now has... On the other hand, active principles provided a series of hypothetical physical entities which fulfilled a useful explanatory role and were susceptible to philosophical investigation. They therefore prevented the heterodox and blasphemous invocation of God as continual agent immanent in matter."⁴²⁸

Notions of active matter, as Henry has shown, could argue from a voluntarist perspective; after all, is it truly devout to state that God could not imbue atoms with active force? John Locke puts the voluntarist position on active matter: "I see no contradiction in it, that the first eternal thinking Being should, if he pleased, give to certain Systems of created senseless matter, put together as he sees fit, some degrees of sense, perception and thought."⁴²⁹ Lesser writers make the same point; Richard Baxter, a regular defender of Glisson's work, takes issue with both More and Glanville:

I confess I am too dull to be sure that God cannot endue matter itself with the formal Virtue of Perception: That you say the Cartesians hold the contrary, and that your Writings prove it, certifieth me not. O the marvellous difference of mens Conceptions! Such great Wits as Campanella, Dr. Glisson, &c. were confident that no Matter in the world was without the una-trina Virtus, viz. Perceptive, Appetitive, and Motive; I agree not with them... But that it is incapable of it; and

⁴²⁷ Osler 'Whose Ends? Teleology in Early Modern Natural Philosophy', 158.

⁴²⁸ Henry, 'Active Principles', 357.

⁴²⁹ Locke quoted in Henry, 'Active Principles', 359.

that Almighty God cannot make perceptive living Matter, and that by informing it without mixture, I cannot prove, nor I think you: Where is the Contradiction that makes it impossible? Nor do I believe that it giveth a man any more cause to doubt (as you add) of the Existence of God, or the Immortality of the Soul, than your Opinion that saith, *God cannot do this.*⁴³⁰

Baxter makes a simple but devastating critique of More's complex conceptual constructions, using a voluntarist perspective to throw open the field of scientific possibility; indeed voluntarism generally was a theological position that supported the new philosophy. An experimental approach to the workings of the world was justified if the only true structuring force was an unknowable God who was not subject to rationalist analysis. Voluntarism, as we have seen, supported dangerous theses like that of active matter, but Milton does not take refuge in this line of argument. As Danielson points out:

Voluntarism... plays havoc with the doctrine of Christ's divine sacrifice for sins, for if God is absolutely free to do whatever he wills, then the work of the atonement was not really necessary... God... in Milton's view, is absolutely free to exercise or refrain from exercising his creativity... but this freedom is quite compatible with necessity, given God's essential goodness.⁴³¹

The theological subtlety which counterpoints freedom and necessity in a perfect balance through a profound belief in the goodness of God matches again the delicate balance of active matter and substantial light, which are simultaneously ruled by God and yet ended *by the rule of God* with activity, percipience and power

John Henry states that Robert Boyle took refuge in a voluntarist religious position and maintained that although it was impossible to say that God could not imbue matter with activity and force, there was no evidence to prove that he had done so.⁴³² Likewise, Osler shows that Boyle's account of the origin of motion in matter entwines his religious imperatives subtly with his 'science', identifying God's providence with the system of secondary causes, just as Milton does:

⁴³⁰ Richard Baxter, *Of the immortality of mans soul, and the nature of it and other spirits* (London, 1682), 28-9. Baxter has a refreshing turn of phrase and comments, drily: "I marvel that when you have dealt with so many sorts of Dessenters you meddle not with so subtile a piece as that old Doctor's *de Vita Naturae*: I have talkt with divers high pretenders to Philosophy here of the new strain, and askt them their judgment of Dr. *Glissons* Book, and I found that none of them understood it, but neglected it as too hard for them, and yet contemned it" (6).

⁴³¹ Danielson, *Milton's Good God*, 153.

⁴³² Henry, 'Active Principles', 356.

[B]y his infinite wisdom and power, he did so guide and overrule the motions of these parts at the beginning of things, as that... they were finally disposed into that beautiful and orderly frame we call the world; among whose parts some were so curiously contrived as to be fit to become the seeds or seminal principles of plants and animals. And I further conceive that he settled such laws or rules of local motion among the parts of the universal matter, that by his ordinary and preserving concurrence the several parts of the universe, thus once completed, should be able to maintain the great construction or system and economy, of the mundane bodies and propagate the species of living creatures.⁴³³

The system of causes maintains itself through God's 'ordinary and preserving concurrence' of, we might say, ordinary providence. This echoes Milton's account of the Creation in a number of ways. Boyle's first matter here seems already to have motion that is overruled by divinity at the beginning of creation, to be made 'beautiful and orderly' just as Milton's first matter is disposed in the *Christian Doctrine*. The equation of the system of causes with God's ordinary providence is also shared. However, Boyle's secondary causes are profoundly mechanist in their reduction to 'laws or rules of local motion'; Catherine Gimelli Martin notes:

By limiting the deity's role to the necessary yet automatic functions of creating and imparting motion to matter he grants God the entire operation of the machine of the world only to reduce him to the role of first atom, rather than First Cause... Thus like the eighteenth century deists inspired by Newton, Boyle's schema merely creates a clockmaker, not the personal God he had intended to conserve.⁴³⁴

In Milton's Creation, as we have seen, the atoms of chaos are more than active. They are already "the seeds of all subsequent good" that is, they have vital fertility, being already "embryon atoms" (*PL* 2. 900).⁴³⁵ Moreover, God endues chaos with much more than motion. Aristotelian final causes are retained in a system which gives matter percipience and appetite as well as motive force, as shown in the vitalising matter of creation, odours of paradise and living qualities of mineral and vegetable life on the Sun, in Heaven and in paradise on Earth.

There is, therefore, more detail held in common between the natural philosophy of Milton's *Paradise Lost* and the theories of the new philosophy than has

⁴³³ Boyle quoted in Osler, 'Whose Ends? Teleology in Early Modern Natural Philosophy', 165.

⁴³⁴ Catherine Gimelli Martin, 'Boundless the Deep': Milton, Pascal, and the Theology of Relative Space', *ELH*, 63. 1 (1996), 45-78, 59.

⁴³⁵ *CPW* 6: 308.

been commonly noted. Active principles in matter often behave very much like vital matter, particularly in the representation of fermentation of substances. Nevertheless the fundamental feature through which the philosophies are differentiated is Milton's retention of vitalist animism, which extends rather a version of percipience and choice into the natural, and makes of free will a natural principle, refusing the extreme voluntarist position. Milton's inclusion of atoms in chaos but not elsewhere clearly consigns atomism to the realm of God's lack of influence without consigning it to non-existence. Milton's chaos is, among other things, an atomist chaos – it has “embryon atoms,” which recall the seminal principles of Gassendi and it is ruled by chance; in fact Milton emphasises the blind fury of fortune by giving a peculiarly dramatic horror in Satan's journey through the abyss, when he only avoids an eternal vacuum by a chance explosion of fire and nitre.

Through this chapter I have observed the close parallels between medical theories of digestion (themselves closely related to the ferment of conception) and the natural philosophy that Adam learns from Raphael. I have explored some of the key notions of ‘sublimation’ and ‘odour’ that are shared by the poem and the medical theory and extrapolated from this a more nuanced account of transformative prelapsarian ontology. Finally, I have placed Milton's peculiarly medical natural philosophy in relation to more dualist systems (in particular that of Henry More) through an exploration of angelic bodies and their digestion, their excretion through transpiration and their coincident materiality and penetrability. When angels make love they penetrate each other wholly, but they are shown not to understand the sexuality of God's earthly Creation. Adam and Eve are imagined in a biological form from which exalting vital and animal spirits are exhaled through the skin. Interestingly, penetration of substance is more evident in unfallen digestive transformation and angelic sex than in the model of Satan's attempt upon Eve, which corresponds to the Aristotelian model of the intelligential act in one mode and to a sort of infection of the animal spirits in another. The question of what happens to Eve when Satan attempts to penetrate her animal spirits could be considered here, but that particular penetration will instead be revisited in the next section which charts the process and effects of falling and fallenness.

Chapter 6

The corrupted monism of the fallen soul

i. Discordance in the vitae chorea

We have explored the functional similarities of the medical ferment in iatro-mechanist and vitalist models, and marked some of the differences of theology that the two models involved. Milton's commitment to free will matches his vitalist natural philosophy, avoiding the determinism and voluntarism that so often characterised materialist and mechanist paradigms. It is not surprising then, that despite the similarity of function between the atomist or corpuscular ideas of fermentation and the active fluids of vitalist fermentation, there are distinct differences between the body and soul envisioned by Willis and those envisioned by Milton in *Paradise Lost*. The work of Harvey and Glisson had proposed a vitalist materialist generation but, unlike Milton, they stop short of making a causal connection between this (and the corresponding vitality of the body's substance), and the source of the rational soul. Willis and Charleton both proposed active corpuscular matter, but also propounded a clear dualism, not simply of soul and body, but in the technical detail of the relation of the corporeal sensitive soul to the immaterial, rational soul. Through this chapter I will compare the dualist model of the soul and the active matter that constitutes it proposed by the iatro-mechanists with the fragmenting and turbulent falling soul of paradise, asking if and how Milton maintains his monism through the drama of the Fall.

For Willis, the body is an instrument, activated by the rational soul: "the rational Soul, sustains the part of the Musitian playing on it, which governing and directing the animal spirits, disposes and orders at its pleasure, the Faculties of the Inferior Soul."⁴³⁶ He meditates upon the analogy, noting that it is the workmanship rather than the material that creates the extraordinary power of a musical instrument. The instrument works thus:

⁴³⁶ Willis, *Two Discourses*, 34.

Wind sent into musical Organs, and that being carryed variously thorow manifold openings of Doors, into these or those pipes... create[s] a most grateful Harmony, and Composed Measures of every Kind; this I say deservedly amazes us, and we acknowledg this Effect, far to Excel both the matter of the Instrument, and of the hand of the Musitian striking it. Further, altho the Musical Organ very much requires the labour of him playing on it, by whose direction, the spirit or wind being admitted, now into these, anon into those, and into other Pipes, causes the manifold harmony, and almost infinite Varieties of Tunes; yet sometimes I have seen such an Instrument so prepared, that without any Musitian directing, the little doors being shut up, by a certain law and order, by the mere Course of a Water, almost the same harmony is made, and the same tunes, equal with those Composed by Art.⁴³⁷

The creative agency or efficient cause of the instrument is given prime place here, beyond the hand of the musician or the material qualities of the metal; the choice of instrument both recalls Satan's attempts upon the organs of Eve's fancy and is appropriate to represent the body into which 'spirit or wind' is blown to activate it. Willis is also trying to extend the analogy to the animal soul, imagining the model without the guiding hand of the musician/rational soul. The debate touched upon is the Cartesian mechanist position that the animal is effectively a machine, subject only to the efficient causality of the maker and then of matter in motion, as the instrument with a rationally conscious player is compared to a mechanised instrument, propelled not by intention but by flowing water, itself propelled 'by a certain law and order' in nature.⁴³⁸ With regard to the human set of inter-relating spirits he is making a clear case for the sensitive soul itself as the bodily instrument of the rational. Milton uses the same analogy of the animate self as musical instrument in a subtler and less explicit manner in *Paradise Lost*, and it gives a very different sense of the relation between the different orders of body and spirit in humans and animals.

There is, in fact, no doubt that Adam experiences himself as the whole instrument rather than its player; arguing for his need for human companionship, he expresses himself thus:

⁴³⁷ Willis, *Two Discourses*, 33-34. Charleton replicates the use of this analogy in *Natural History of the Passions*, 37-8. This use of the figure of the musical organ is also reminiscent of the creation of Pandemonium in Book 1 of *Paradise Lost*.

⁴³⁸ Willis does go on to criticise this model with a number of examples of animal capacities; his use of this analogy is clearly in line with the Cartesian thesis, but he specifies that it should apply to 'lower' orders of animals (*Two Discourses*, 34-38).

Among unequals what society
 Can sort, what harmony or true delight?
 Which must be mutual, in proportion due
 Giv'n and receiv'd; but in disparity
 The one intense, the other still remiss
 Cannot well suit with either, but soon prove
 Tedious alike: of fellowship I speak
 Such as I seek, fit to participate
 All rational delight, wherein the brute
 Cannot be human consort; they rejoice
 Each with their kind.
 (PL 8. 379-393)

Fowler notes that musical analogies with human society originated with Plato's *Republic* and were a well-known trope: "Adam's argument is that for true harmony there must be the right mathematical proportion – here punningly described as reciprocal. In a stringed instrument the strings should be in the right ratio of length and frequency. But the human string is intense (strained and high in pitch); the animal string too remiss and low" (PL 8. 384-9n). Adam is here using the same analogy as Willis but, unlike Willis's model, in which the consciousness is of a different order from the instrument, he senses himself as musical instrument, resonating as a string, seeking proper experiential harmony with another rather than instrumentally controlling an objectified lower self. Willis differentiates the models, noting the pure mechanist impulsion ascribed by Descartes to animal consciousness as opposed to the deliberate activation of an instrument by a rationally conscious agent. This model may fit with that of Satan's attempts upon the organs of Eve's fancy, but it is contradictory to Adam's use of the analogy; Adam differentiates animal fellowship as a lower (and therefore inharmonious) frequency compared to that of human "rational delight," but the difference is only that of degree. It is, in *Paradise Lost*, a satanic mode to overcome lower consciousnesses and treat them as object/instruments. Adam's use of the analogy shows that the rational soul is a living and intrinsic part of what, for Willis, is an instrument to be manipulated, but of course this is in unfallen paradise; the question remains as to what effect the Fall will have upon the ideal monism that characterises paradise thus far.

The originally Platonic notion of ontological musical harmony, figured in this instance through the trope of the self as musical instrument, is ubiquitous in *Paradise Lost* and throughout the intellectual environment in which Milton was writing. We meet

it in the ‘starry dance’ of Milton’s cosmology and, more prosaically, in *Of Education* with the prescription of musical activities to assist and cherish nature in her first concoction” after eating.⁴³⁹ The harmonious musicality of the unfallen world is explicit in the morning of prayers in which Adam and Eve have both “various style” and “holy rapture” and throughout which every aspect of the natural world of paradise seems to take a part (*PL* 5. 146-7). But the microcosmic world is also imagined in these terms: it is no coincidence that Glisson terms the interactions of spirit and grosser matter subliming in the blood the ‘*vitae chorea*’ or the ‘dance of life’. Concurrently, the lack of harmony inherent in God’s absence is figured as discord, both in the realm of chaos and within the human body-soul and the fallen natural world that surrounds it. In chaos the allegorical persona of Discord has “a thousand various mouths” (*PL* 2. 967); discord emerges in the fallen body-soul with the uprising of terrible passions (*PL* 9. 1124), and in the fallen natural world it appears in the change to a seasonal climate of extremes and the new ‘antipathy’ between the animals (*PL* 9. 1123-4). This motif is clearly related to the ‘barbarous dissonance’ of the Bacchic revellers who tear Orpheus to pieces in the invocation to Urania at the beginning of Book 7: distance from God is figured as physically destructive and chaotic discordance. Writing on *At A Solemn Music* Mattison states that Milton alludes to

the Pythagorean theory of harmony, in which the perfect intervals are created by mathematically elegant ratios between the lengths of equally tense plucked strings, and the more dissonant an interval, the more arithmetically complicated the ratio. What matters here is the simile: sin acts on the moral harmony of the world as a discordant note upon a triad.⁴⁴⁰

This clearly corresponds to the place of music in unfallen paradise, but although in Milton’s earlier work this relation may be that of simile, I argue that at the end of *Paradise Lost* the relation of moral discordance and physical discordance becomes explicitly self-identical, perhaps even uncomfortably so in the overlapping of natural evil with moral evil. Just as in a fallen world the body’s most mundane functions

⁴³⁹ *CPW* 2: 411.

⁴⁴⁰ Andrew Mattison ‘Sweet Imperfection: Milton and the Troubled Metaphor of Harmony’ in *Modern Philology* 106. 4 (2009), 617-647. 643. Mattison is referring to the prayer of the following sequence:

That we on Earth with undiscording voice
 May rightly answer that melodious noise;
 As once we did, till disproportion’d sin
 Jarr’d against natures chime, and with harsh din
 Broke the fair musick that all creatures made
 To their great Lord, whose love their motion sway’d (17–22).

respond to the ordering influence of music, at the disaster of the Fall the functional order and activity of those spirits and thicker matters are thrown into corruption and the *vitae chorea* shifts into discord, opening up the possibility of a notion of disease that hovers between the contained inner discordances of Galenic distemper and the still-developing notions of corruption as infection by an outside agent.

The vitalist materialism of Francis Glisson is a precise analogue for the vitalist natural philosophy of unfallen paradise, but the Fall clearly changes everything, from the position of the sun and stars to the relationships between animals, the quality of the air and, of course, the minds and bodies of Adam and Eve. The upward motions of ever-more-perfect ontology are expressed in Raphael's 'one first matter all' speech as sublimation, which fits with a natural philosophy that is characterised by a ubiquitous underlying process of fertile fermentation. When, however, the downward movement of the scale begins, we must ask how this model of natural philosophy might underlie and substantiate it. I suggest that it is in the work of Glisson and Willis that we find the best analogues for the bodily/spiritual corruption that the Fall constitutes. The consumption of the fruit brings 'death into the world, and all our woe' but, as Adam and Eve struggle to understand during the first hours that follow the disaster, death does not simply mean the death of the body. Rather, as in the *Christian Doctrine*, the sentence of death includes a proliferation of various effects in the body, mind and natural world, with physical death taking the place of a merciful release.

In this chapter I will argue that one way the discords of fallenness are represented is in the corruption of the perfect sublimations of spirit and matter that characterised the natural philosophy of unfallen paradise. Corruption, Glisson notes, is a natural separation of the constituent elements of the mixt, and the body and spirit described by Willis are constituted by ontologically separate and antagonistic modes of spirit and matter, their relations based upon a model of sublimation as burning particles. Willis in particular focuses upon the highest levels of spirit (in his schema the animal spirit) where Glisson's slightly earlier work specialises in the motions of bodily substance at all levels. In the works of both doctors there are central examinations of the power of toxic, febrile fermentation in the body. This chapter will show that what Milton terms "all man's component parts" are subject to a particular degree of death

after the Fall and this dissolution is a partial undoing of the perfect monist system of prelapsarian ontology.⁴⁴¹

ii. Vital heat and toxic fermentation

As might be expected of a practising doctor, Glisson spends much of his effort upon differentiating the peaceful motions of the healthy body from the troubled motions of the diseased.

The elements of the mixt are the struggling parts. Once this motion arises, the parts of the mixt, which before dwelt together united and peacefully, disagree and break into factions. This motion is as it were a civil war aroused among the elements of the mixt. The external cause, that is to say the cause that excites this sedition, is a ferment mingled with the other elements or a part of the mixt which takes the ferment's place. Both causes drive the spirits of the mixt to a greater activity than that which fits well with the thicker parts of it. Hence a disagreement quickly starts, and the spirits strive to fly away and abandon the thickest elements; these, in turn, resist and provoke riots and factions.⁴⁴²

The body politic at war with itself is clearly in evidence here, as it so often is in seventeenth-century representations of disease. In this political reading of the diseased body we might note that it is a seditious addition, a new ferment, which provokes the higher orders of spirit into extra energetic activity. They abandon their lower cohorts and chaotic conflict follows; the riots and faction of the lower orders are caused by the unhealthy upward aspiration in the upper orders. What is also significant, however, is the impact that the theories of fermentation are having upon the Galenic notion of distemper: this disorder may be caused by elements that are already there, in Galenic style, but it may also be caused by an outside influence, figured as a poisonous ferment.

Both Willis and Glisson identify different kinds of fermentation. For Glisson they are “the one *perfectiva et exaltativa*, the other *degradativa*,” and the perfecting, exalting ferment is the “natural enkindling (*accensio*) of the vital spirits” that is the

⁴⁴¹ CPW 6: 404.

⁴⁴² Glisson quoted in Giglioli, ‘Genesis of Francis Glisson’s Philosophy of Life’, 162. Giglioli cites MS Sloane 3308 (“Probabile est Lienem fermentationi sanguinis inservire”), ff. 303r-304r.

natural motion of the spirit and matter of the blood, perfecting and exalting the lower spirits and matter of the food, assimilating it and imbuing it with “nobler qualities.” This model is familiar from the last two chapters. The ferment of degradation is, in contrast, an *unnatural* “enkindling” of the spirits, which arises from impurities present in the blood. The dual aspect of this process means that “life and death, the enkindling of the spirits and putrefaction dwell close to each other.”⁴⁴³ Willis too identifies two comparable types of fermentation: one is a pure exaltation, where even the *caput mortuum* or dead earth can be volatilised by repeated distillation: “Chymists, in Distilling, that the Liquor may be made better, separate the subtile and spirituous parts, from the *Caput Mortuum*, and then pour them on it again; and this work they so often repeat, till the *Caput Mortuum*... is by frequent Distillation Volatilized, and the Liquor rightly exalted, even in all its Particles.”⁴⁴⁴ This process of repeated distillation is hesitantly suggested as the province of the still-mysterious spleen. The other is a fermentation which brings dissolution and putrefaction. Although Willis’s model is one of active corpuscular matter subject to the laws of motion and Glisson’s proposes instead the model of vitally self-active substance, both doctors give a parallel account of these different ferments, adding them as new explanations of the originally Galenic temperate or distempered body. The perfecting and exalting ferment is that in which the highest order of spirit is most active, energetically struggling to fly upwards, expanding but still assimilating. The putrefying ferment, in contrast, is characterised by the flying away of the highest orders of spirit and results in the dominant activity of the lower order of substance in the blood, the sulphurous component.

The power of the poisonous ferment will finally give a basis in natural philosophy for the second attempt Satan makes upon Eve while she sleeps. We know that Satan’s attempts upon the ‘organs of her fancy’ recall mechanist and dualist models of consciousness in various ways, but Milton’s other descriptor of Satan’s work is rooted firmly in the similiary workings of vital and animal spirit. So, if her mental organs are not to be manipulated, he hopes that,

inspiring venom, he might taint
Th’ animal spirits that from pure blood arise
Like gentle breaths from rivers pure, thence raise
At least distempered, discontented thoughts,

⁴⁴³ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 162. Giglioni cites MS Sloane 3310, ff. 103r-104r.

⁴⁴⁴ Willis, *Of Fermentation*, 13.

Vain hopes, vain aims, inordinate desires
 Blown up with high conceits engendering pride
 (*PL* 4. 804-09)

This is a rather scientific representation of the well-established contemporary subject of demonic possession. As Stuart Clark observes, the medical establishment were generally in accordance with the notion that the devil could interfere with human spirits and affect the body and the mind.⁴⁴⁵ In this particular instance, however, Eve is subject to an invasion that stands on the cusp between demonic possession and newly developing notions of medical infection. In his work on contagious fever, Willis describes the effect that the poisonous ferment has upon the body if it attacks the blood and animal spirits first:

When a Pestilential Breath or Vapour, hath invaded any one, and that Poyson hath first laid hold on the Animal Spirits, or those of the Bloud, or both of them at once... the taint is quickly derived from the subtil and more thin substance of these, into a more thick matter: because it quickly ferments the whole Mass of Bloud, or of the Nervous Juice, and the Excrementitious Humors, every where abounding, and from thence is deduced into the solid parts, and fixes the evil in them. If this Disease, first possesses the Animal Spirits, presently the hurt is communicated to the Brain, and the Nervous stock... [causing] Phrensies, Deliriums, or pertinacious Watchings.⁴⁴⁶

This infection, should it gain access, spreads and breeds, primarily affecting the mind, although a putrid fever quickly commences. Satan, of course, describes himself as “wrapped in mist / Of midnight vapour,” although the natural dews and exhalations of paradise will not become pestilent until after the Fall, of which more later (*PL* 9. 158-9). The transition of the Helmontian ferment, with its vital properties, sense of intention and relation to the Paracelsian spirit, into the inanimate corpuscular ferment of the iatrochymists occurred through the 1650s and 1660s and Milton’s Satan with this attempt upon Eve’s blood and spirits is clearly located in this period of transition.⁴⁴⁷

The attack on Eve corresponds to the ferment that for Willis causes pestilent brain fever, but in contemporary medicine the toxic ferment has a number of effects on

⁴⁴⁵ Stuart Clark, *Thinking with Demons: The Idea of Witchcraft in Early Modern Europe* (Oxford, OUP, 1997), 188.

⁴⁴⁶ Willis, *Of Feavers*, in *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*, trans. S. Pordage (London, 1684), 103.

⁴⁴⁷ For a detailed examination of the transition of the notion of spirit during this period (and the place of Glisson, Charlton and Willis in that transition) see Clericuzio, ‘The Internal Laboratory: The Chemical Reinterpretation of Medical Spirits in England (1650-1680)’ in *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*, ed. P. Rattansi and A. Clericuzio (London: Kluwer, 1994), 51-84.

man's component parts. In the toxic ferment described by Glisson the highest level of spirit is over-stimulated and flies away; then the riots and factions of the lowest levels of sulphur in the blood result in it becoming "impure and corrupted by fumes of sulphur instead of being imbued with vital spirits," and the resulting ferment gives rise to a "preternatural and febrile heat."⁴⁴⁸ Likewise, Willis notes that "if the Blood becomes too luxuriant, and apt to grow turgid, by reason of plenty of Sulphur being carried forth... either its Accension or Fermentation in the Heart, is very much increased, so that from thence a Feverish heat, and greater effervescencies than usual, are stirred up in the whole."⁴⁴⁹ In both writers this ascension of the lower order of sulphurous matter is characteristic of rotting rather than ripening, so disease can be seen as a rotting of the living body. Willis, with a classical pragmatism, places the two processes in one overarching system of natural philosophy.⁴⁵⁰ The following passage illustrates a process of upward chymical transformation similar to the one described by Raphael in the perfecting motion of the one first matter:

it behoves Nature to perfect her Work, and to Cook and ripen the substance, as yet rude and undigested; wherefore the active Principles leisurely extricate themselves from the more thick, and creep forwards towards the top, there being placed with a mutual increase, they are formed into Flowers and Blossoms, from which at length (for that they are of a soft and light texture) spirit and sulphur easily evaporate and the frame of the mixture quickly decays.⁴⁵¹

This is a fallen scale of nature: the spirit and sulphur fly away altogether at the culmination of ripening, leaving the lowest remnants to decay. The freedom from death and corruption in Milton's unfallen paradise drew upon the utopian enthusiasm of alchemist theory (without legitimating the claims for an alchemical purification of the fallen world) in the vision of a perfectly pure, yet transformative natural philosophy and human ontology. However, medical chymistry also offers a perfect paradigm for the fall of the natural world into corruption.

⁴⁴⁸ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 163. Giglioni cites MS Sloane 3310, f. 177r; also *De Ventriculo*, 478-479.

⁴⁴⁹ Willis, *Of Feavers*, 55.

⁴⁵⁰ Giglioni notes that Glisson criticised Willis for using the notion of fermentation in numerous contexts with a resulting lack of precision (Giglioni, 'Genesis of Francis Glisson's Philosophy of Life'), 164.

⁴⁵¹ Willis, *Of Fermentation*, 11.

Willis superimposes a chymical interpretation on to the old classical notion of generation and corruption as part of the same ripening/rotting movement of natural and living things. All natural bodies, including that of man,

tend from Crudity and Confusion towards Perfection, for the sake of which, when they have reach'd the height, they are able to come to, they are not quiet in this point; but from thence they make hast towards the dissolution of that thing. Those which are more volatile do first of all break forth from the loosened bond of the mixture; then the rest separate into parts, until the form of the mixture wholly perishes: The Spirit being carried forth to the top, flies away first with the water, and the more pure Sulphur, and by its expiration, diffuses a very grateful odour; afterwards the more thick Sulphur, with the Salt, being loosened from the band wherewith they were tyed, and having gotten a flux, by degrees evaporate, and together disperse a very stinking smell: together with these, the watery parts flow forth, and the frame of the subject breaks, or falls down into Earth, or a *Caput Mortuum*.⁴⁵²

The natural philosophy of unfallen paradise had been imagined as a system where this process culminates in perfection without the constituent spirits, odours and matter continuing into dissolution. In this sequence, Willis has purged the Helmontian odour of its mysterious active vitality, and maintains a natural continuity between the generative ferment and the decay that follows it. Glisson, despite his fascination with the close relation of the different processes (one of the production of vital heat, the other of the corrupt ferment), differentiates more carefully their qualities, demarcating with more precision the fine lines between healthy fermentation, diseased fermentation and the corruptions that follow death.

Like any other kind of putrefaction, febrile putrefaction is 'a preternatural motion aroused in the mass of the blood'. It may also be seen as a form of heat, but unlike vital heat, 'it arises from mutual conflict and hatred among the elementary parts of the blood' and it differs from the putrefaction that occurs in corpses (*cadaverosa putredo*). Whereas vital heat is a placid and uniform motion, putrefaction represents a riotous and violent alteration of that motion.⁴⁵³

The animism of this description enables a more powerful political allegory to be made, and avoids the naturalising of Willis's classical inclusiveness. Glisson's more

⁴⁵² Willis, *Of Fermentation*, 22.

⁴⁵³ Glisson quoted in Giglioli, 'Genesis of Francis Glisson's Philosophy of Life', 155. Giglioli cites MS Sloane 3310, f. 233r; also 3309, f. 107r; 3309, f. 183.

differentiated approach is thus closer to Milton's own, since for Milton, the shift from one mode to the other is part of the tragic ontological trajectory of the Fall. "Glisson conjectured that, within the spectrum of the different degrees of vital heat, fever could be seen as a transformation of the 'friendly and gentle' motion of life into the 'tumultuous and seditious' motions of fermentation, putrefaction, and illness."⁴⁵⁴ The transition from perfect bodily sublimation to a corrupted and diseased fermentation characterises, as we shall see, the physiological changes in Adam and Eve at the Fall.

For Glisson, in the healthy body "The spirits which are the cause of the vital motion enjoy dwelling together with the thicker parts of the blood," and, in contrast, in the diseased body "the fermenting spirits are provoked to motion by a sort of nausea resulting from their having to dwell with the thicker matter." Differentiating between the two, he notes that the production of "the vital heat tends to secure and maintain the tone and continuity of the parts" whereas the febrile ferment "heavily contributes to the scattering and dissolution of the bodies with which it is mixed."⁴⁵⁵ The repulsion of the higher and more rarefied spirit toward the lower and more solid matter in the body echoes the aristocratic repulsion of Satan towards the "creature formed of earth" who is,

Exalted from so base original,
 With heavenly spoils, our spoils: what he decreed
 He effected; man he made, and for him built
 Magnificent this world, and earth his seat,
 Him lord pronounced, and, oh indignity!
 Subjected to his service angel wings,
 And flaming ministers to watch and tend
 Their earthy charge
 (*PL* 9. 150-6)

Seeing the scale of nature only in terms of power and domination, Satan is jealous and repulsed. This error (which again inverts the order of service that Milton's unfallen ethereal spirits work within) is equivalent to the nausea of the highest spirits in the effects of the poisonous ferment on the diseased body, which likewise inverts or disrupts the corresponding healthy assimilation of the lower orders of bodily substance to the higher. In all these models of corrupted bodily spirit and matter, there is a fundamental motion of the excessive upward aspiration and flight of the higher spirits,

⁴⁵⁴ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 156. Giglioni cites MS Sloane 3308, f. 304v.

⁴⁵⁵ Glisson quoted in Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 163. Giglioni cites MS Sloane 3310, f. 235r; also 3309, f. 107r.

the neglect of the lower orders of sulphurous spirit in particular, and their corresponding riotous disorder and dissolution into foulness and chaotic shapelessness. Illness or diseases occur when the putrefying ferment invades or is produced in the healthy body. Let us compare this to the effects of the ‘fallacious fruit’ on Adam and Eve, focusing first upon the bodily spirits, then upon the shifts of mental and emotional perspective that follow.

iii. Effects of the fruit

How can eating the fruit cause the array of effects of the Fall? The immediate effect of sin is to open up a space between what *seems* and what *is*. Thus there are two ways in which to read the physiological effects of the fruit: one is through what Adam and Eve believe they are experiencing and the other is to take a wider and more careful approach to the narrative as a whole, to give what we might call a diagnosis of their symptoms. When Eve makes her momentous decision to disobey God and eat the fruit, the immediate effect is intoxication:

such delight till then, as seemed,
In fruit she never tasted, whether true
Or fancied so, through expectation high
Of knowledge, nor was godhead from her thought.
Greedily she engorged without restraint,
And knew not eating death: satiate at length,
And heightened as with wine, jocund and boon
(*PL* 9. 787-793)

The seeming delightfulness of the fruit’s taste is suspicious and the poet emphasises this immediately. When she describes the effects to the horrified Adam as: “opener mine eyes, / Dim erst, dilated spirits, ampler heart, / And growing up to godhead” we cannot take this as an accurate account of the true effects (*PL* 9. 875-877). Rather, they emerge out of the grandiose sensations and reduced ontological reality of drunkenness. Nevertheless, the fancied sense of height and the sense of the spirits’ dilation are repeated in the more reliable description given by the poet following Adam’s decision to eat:

As with new wine intoxicated both
 They swim in mirth, and fancy that they feel
 Divinity within them breeding wings
 Wherewith to scorn the earth: but that false fruit
 Far other operation first displayed,
 Carnal desire inflaming, he on Eve
 Began to cast lascivious eyes, she him
 As wantonly repaid; in lust they burn.
 (PL 9. 1008-1015)

The fruit causes a fallacious expansion of spirits, and their highest faculties engage in a false spiritual ascent that “scorns” the earth, just as the highest orders of bodily spirit are revolted by the lowest and fly away at the beginning of the toxic ferment of the diseased body. Satan’s attempt to inspire vain hopes and aims and inordinate desires has finally worked. Later the poet notes the effect as “the force of that fallacious fruit, / That with exhilarating vapour bland / About their spirits had played, and inmost powers / Made err” (PL 9. 1046-9). In this instance the power of the fruit’s ‘vapour’ or the spirit that it exhales is clearly shown to have exhilarated their bodily spirits and created error in their inner powers, which could refer to all and any of their internal faculties.

This shift into a diseased ontology that characterises the responses of Adam and Eve’s body-soul composites to the ingestion of the fruit is the physiological foundation of the Fall as a fall into corruption. The sentence for disobedience is death, but death, even within a mortalist framework, is, as noted above, more than the departure of bodily life.⁴⁵⁶ In the *Christian Doctrine* Milton’s main polemical concern is with the mortalism that corresponds logically with his materialism and traducianism. He delineates four degrees of death to which we are subject following the Fall. These degrees can be productively compared to the degrees of substance in the dynamic scale of nature: the degrees by which we move down the scale and further from God. He notes that “physical death, as it is called, did not follow on the same day as Adam’s sin” and distinguishes the four degrees of death beneath the heading of “all evils which tend to death and which, it is agreed, came into the world as soon as man fell.”⁴⁵⁷ The first degree is that of guilt, but this degree of death is not the first in terms of sequence.⁴⁵⁸

⁴⁵⁶ For a close examination of Milton’s mortalism in a theological context, see Nicholas McDowell, ‘Dead Souls and Modern Minds? Mortalism and the Early Modern Imagination, from Marlowe to Milton’, *Journal of Medieval and Renaissance Studies*, 40.3 (2010), 559-592.

⁴⁵⁷ CPW 6: 393.

⁴⁵⁸ It is described as “a sort of partial death or prelude to death in us, by which we are fettered to condemnation and punishment as by some actual bond” (CPW 6: 393). It is, “accompanied or followed by terrors of conscience... [and] also by the loss of divine protection and favour, which results in the

Instead, the second degree described, that of spiritual death, is, in accordance with Milton's materialist view of human spirit, simultaneous with the first moment of disobedience: "The second degree of death is called spiritual death... this death took place at the same moment as the fall of man, not merely on the same day."⁴⁵⁹

Theologically, it matches the medical pattern of events we have charted, with the first effect being the flying away (or darkening) of human rationality: "This death consists, first, in the loss or at least the extensive darkening of that right reason, whose function it was to discern the chief good, and which was, as it were, the life of understanding."⁴⁶⁰

The linkages between this mode of death and the imagining of bodily spirits illustrate the power of the religious determinants that still order the experiments and theories of contemporary medicine, and nowhere is this more clear than in the 'darkening' of the mind.

This is then a loss of rationality expressed in part through medical terms; what feels like flight is actually a deprivation, for the highest powers of the rational have flown the body-soul composite. This loss is immediately obvious in Eve's increasingly confused meditation on the fruit and its significance, when she looks forward to growing "mature / In knowledge, as the gods who all things know; / Though others envy what they cannot give; / For had the gift been theirs, it had not here / Thus grown" (*PL* 9. 803-807). As Fowler observes, this is a muddled version of the serpent's arguments (*PL* 9. 803n). The exhilarated flight of the highest powers of the human rational faculty (and their concurrent partial loss) leads to a number of further effects. Adam and Eve will encounter an inner alienation, at first unnoticed because of their encounter with the more seductive effects of riotous burning that follow the exhilarating flight of the highest spirits. Eve's muddled thinking is accompanied by the wondering thought of how (and if) she is going to tell Adam about her new state:

to Adam in what sort
 Shall I appear? Shall I to him make known
 As yet my change, and give him to partake
 Full happiness with me, or rather not,
 But keep the odds of knowledge in my power
 Without co-partner? So to add what wants
 In female sex, the more to draw his love,
 And render me more equal, and perhaps,

lessening of the majesty of the countenance and the degradation of the mind" (*CPW* 6: 394). A result it brings shame and 'defilement'.

⁴⁵⁹ *CPW* 6: 395.

⁴⁶⁰ *CPW* 6: 395.

A thing not undesirable, sometime
 Superior; for inferior who is free?
 (PL 9. 816-25)

Eve's mistake is by now a familiar one: she takes the position of being lower down the scale as a denigration of her value, much as Raphael had implied it was in the lecture he gave Adam. The vitalist materialist natural philosophy of unfallen paradise, as well as the relation of earth and sun in Raphael's earlier lessons, however, declare this to be untrue: it is not the position on the scale that matters as much as the direction of travel. The satanic confusion of the meaning of liberty is also here – as a creation of God humanity must always be inferior to something, despite the possibility of rarefaction and flight to heaven that had been there in the unfallen world. To understand being free as being superior is a truly satanic position. However, what concerns me most of all here is Eve's question of how she should "appear" since this fracture between her exterior and her own authentic sense of herself has not been present until now. Adam too encounters an inner alienation that is evident before he actually realises it.

Adam's first words after his Fall are flirtatious, ironic wordplays on the notion of sapience: the word *sapience* is derived from the Latin word *sapientia*, meaning wisdom. Related to this word is the Latin verb *sapere*, which means "to taste, to be wise, to know," and Adam makes full use of this rich constellation of meanings. His speech, which ends in seduction, begins thus:

Eve, now I see thou art exact of taste,
 And elegant, of sapience no small part,
 Since to each meaning savour we apply,
 And palate call judicious
 (PL 9. 1017-1020)

Just as Eve wonders how she should appear to Adam upon ingesting the fruit, Adam's words indicate a new internal division; hovering between alternative meanings of "sapience" Adam's words in fact signify that the integration between mind and body that preceded the Fall is broken. The pun would not work if the pleasures of taste and the development of the mind to wisdom were not suddenly divergent, only to be wittily (and fallaciously) conjoined again. Where Raphael had combined pleasure and wisdom, in that the pleasure of eating fruit of paradise was fuel to actualise spiritual ascension, tasting and knowing are now separate from understanding. Sexual knowing is just about to suffer the same fracture; sex is clearly pleasurable, but is no longer mysterious, holy

and begun with lingering foreplay, but immediate, inflamed and impersonal. Just as Eve is prey to jealousy and power play, Adam no longer sees her as a sexual agent: as an object of desire, she and his enjoyment of her are instead “bounty of this virtuous tree” (*PL* 9. 1033).

This alienation of the sensory from the rational will become the basis for the internal warfare that Adam and Eve will suffer after their first, wild intoxication. Jumping ahead to see how this inner fracture looks the following morning, we find that:

They sat them down to weep, nor only tears
 Rained at their eyes, but high winds worse within
 Began to rise, high passions, anger, hate,
 Mistrust, suspicion, discord, and shook sore
 Their inward state of mind, calm region once
 And full of peace, now tossed and turbulent:
 For understanding ruled not, and the will
 Heard not her lore, both in subjection now
 To sensual appetite, who from beneath
 Usurping over sovereign reason claimed
 Superior sway: from thus distempered breast,
 Adam, estranged in look and altered style,
 Speech intermitted thus to Eve renewed
 (*PL* 9. 1121-1133)

This makes explicit what was implicit in Adam’s earlier, seductive speech: his estranged look and altered style are focused upon Eve, but they also emerge from the process that has estranged him from himself, separating sensual knowing from rational understanding. Their inner alterity and estrangement mean that different aspects of their beings are now in discord, in contrast to the monist harmonious mutual resonance they had before the Fall. We will explore more thoroughly the resonances between this new order of body-soul and the representation of the realm of chaos later. For now we can note that the first death (guilt) emerges here, in the inner alterity, with the shame and self-rejection that are to come; this new distempered relation between the lower orders of sensuality and what is left of human rationale now begins to look like the more orthodox Pauline body and soul, where the spirit and the flesh are in constant conflict.

This orthodox mode of spirit and flesh also finds itself represented in contemporary medical research. The commitment to dualism in Charleton’s work of the 1670s is inspired in part by Willis’s work of the decades before, which he often comes

close to replicating. He describes the relation between the corporeal, sensitive soul and the immaterial rational soul thus:

this intestine War, seeing it cannot arise from one and the same thing possessed with affections mutually repugnant, and inclining us two contrary waies at once; argues a Duumvirate of Rulers reciprocally clashing, and contending for superiority; and such too that are as remote in their natures, as different in the modes of their subsistence. Upon this War depend all the Passions by which the restless Mind of Man is so variously, and many times also violently agitated, to his almost perpetual disquiet and vexation.⁴⁶¹

What is very difficult to find in these texts, however, is a corpuscular model of how this war between the highest ontological levels works. We know that the animal spirits are sublimed into the immaterial realm of the rational soul, but there is no model for the downward impact of the rational upon the sensitive system. The omission is significant because the animated body that these doctors are proposing relies entirely upon models of sublimation and fermentation for its functioning. It is, perhaps, part of the ubiquitous problem of how the immaterial can be linked to the material and in both the poetry and the medical texts this particular division remains within the older discursive mode. The corruption of the blood, however, is progressively theorised and re-theorised during the period and in Milton's model, where the intellectual spirits are a material distillation of the animal, there is no ontological abyss to cross from the senses to the rational soul. Thus, in this theory of corruption we can find not only how the intellectual spirits are supposed to fly away, but also how they are imagined as being darkened.

Despite the more orthodox implications of this fracture between the animate body and the rational soul, the medical patterns of meaning in the process of the Fall continue to correspond to the newest available models of corruption and disease. While Adam and Eve are still what we might describe as 'high', their fancy also suggests that their divine ascent is 'breeding' wings in their bodies; this hallucination covers the fact that – as Adam later finds out – what is actually breeding in the body is a film over the eyes. When he prepares Adam for his divine visions, Michael "from Adam's eyes the film removed / Which that false fruit that promised clearer sight / Had bred" (*PL* 11. 412-4). The hallucination of new organs 'breeding' in the body, and the reality of breeding substances in the body (and particularly the breeding of this barrier over the eyes) suggest again a poisonous fermentation, which charges the higher powers to fly

⁴⁶¹ Charleton, *Natural History of the Passions*, 54.

away and the sulphurous elements to burn up, and which produces effluvioms or excreta in the wrong bodily place, in particular the eyes. This is a good moment to pause and note again that Glisson diagnosed gout as caused by a poisonous ferment in the blood similar to that which, in the new iatro-chemical medicine, caused gutta serena: one that brought the blood to a “vinous condition” and produced tartareous residues.⁴⁶² In Glisson’s view,

This is also proven by excesses of wine and sex, which increase the disposition to arthritis by facilitating the fermentation of the blood and consequently the exaltation of the spirits. The result of this fermentation is a tartareous residue which takes the form of a calculous sedimentation in the joints.⁴⁶³

Drunkness and overindulgence in sex are two of the causal factors invoked repeatedly by doctors who write about the unhealthy ferment in the blood that leads to deposits of stone or waste matter. As Adam and Eve initially explore the new passions of fallenness, they promptly discover the self-generating nature of sin and the natural evil of disease, for intoxication and sexual indulgence in a fallen world will lead to a sight further darkened and a literal build up of ‘the stone’ in the body that may indeed be mortal. In a theological mode, Milton remarks that “sin is its own punishment... As sins increase so they bind the sinners to death more surely.”⁴⁶⁴ The concurrent medical theory underlying the Fall substantiates this statement with precision, but in an entirely different mode. Critics have often noted the consonance between the darkened sight brought on by the Fall and the blindness suffered by Milton himself. I propose that these linkages are in fact part of a more coherent understanding of contemporary medical notions of fermentation in the animate body than has yet been established.

If we explore a little further the pattern of the toxic bodily fermentation that has featured in the physiology of the Fall so far, it becomes clear that the flying away of the intellectual spirits is part of the same process that darkens them. Adam and Eve “play” until they are exhausted and the less pleasant effects of the fruit start to emerge:

⁴⁶² Willis concurs, but wonders why gout does not bring a fever, if “impurities falling off from the heated Blood, and received by the joints, is the material cause of the *Goutish* pain,” but he then designates the impurities of gout as particularly saline in nature, which apparently accounts for the difference (*Two Discourses*, 214).

⁴⁶³ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 162. Giglioni cites MS Sloane 3310 (“Arthritidis causa non est necessario frigida”), ff. 45r-50r.

⁴⁶⁴ CPW 6: 395.

till dewy sleep
 Oppressed them, wearied with their amorous play.
 Soon as the force of that fallacious fruit,
 That with exhilarating vapour bland
 About their spirits had played, and inmost powers
 Made err, was now exhaled, and grosser sleep
 Bred of unkindly fumes, with conscious dreams
 Encumbered, now had left them, up they rose
 As from unrest, and each the other viewing,
 Soon found their eyes how opened, and their minds
 How darkened.
 (*PL* 9. 1044-1054)

We know that the vapour of the fruit has exhilarated their spirits, but I would like to extend this analysis to the darkened minds and the burning of lust that they encounter. In Willis's model, as in Glisson's, one level of spirit is distilled, or sublimed out of the lower level, therefore the exhalations of the blood are the animal spirits. We have already noted that in the highest levels of sublimation, Willis's theory diverges from the chymical model of animate, seductive and struggling similiary substance in that corpuscular animal spirits are sublimed into the immaterial realm of the rational soul, and that the imagined conflict between the rational and the sensitive actually work better in Milton's materialist paradigm. In representing the reactions between the levels Willis also emphasises the burning of particles. Thus he ends with a model whereby the vital spirits of the blood are 'flamy' and the animal spirits that emerge from these flames are in fact like nothing so much as light itself: "the Animal Spirits... we say are most subtil Bodies, and highly active, instilled from the inkindled Blood into the Brain, and its Appendix... they are lucid and aerial."⁴⁶⁵

The darkening of the mind takes on a new, material resonance if the animal spirits themselves are made of light sublimed out of the 'flamy' vital spirit of the blood, particularly if we imagine the intellectual spirits as the next level of distilled purity. Willis describes the effect of the disposition of the blood upon the mind in his re-evaluation of mental disorders such as melancholy:

when as they [the animal spirits] ought to be transparent, subtle, and lucid, become in Melancholy obscure, thick, and dark, so that they represent the Images of things, as it were in a shadow, or covered with darkness... we have already shewed, that the Animal Spirits flowing forth from the inkindled Blood, go forth after a manner, as the rays of

⁴⁶⁵ Willis, *Two Discourses*, 24.

light from a flame. And it sufficiently appears, that the light shews and illustrates it self diversly, according as it proceeds from the burning of bodies, flaming forth after a various manner; as of Spirits of Wine, Oyl, Fat, Mineral Sulphur, Nitre, and others: in like manner the Animal Spirits, forasmuch as stilled forth from the Blood, having got this or that, or some other disposition, they are either subtil, clear, or dull, thick, and as it were sooty, they variously pass thorow and irradiate the organs of the Animal Functions, and so for that reason, diversly pervert their actions.⁴⁶⁶

Quite literally, the light of the mind is darkened by the burning in the blood. And Adam and Eve do, indeed, burn with contagious fire. We might then attribute the burning of lust that follows the initial effects as the riotous burning of the lower, sulphurous elements of the blood. The inflammation of the burning of lust is an ontological mode so steeped in Pauline theology that it is not necessarily obvious that one might interrogate it further, but the subtle interlinking of medical theory and theological narrative gives the burning body multiple resonances. Adam and Eve's desire is most clearly evident in their eyes, which "darted contagious fire"; this is clearly a real, physiological event, rather than the result of 'high expectation' (*PL* 9. 1036). Indeed, according to Willis it is passion that lights the spirits of the eyes up in this way, since from the iris there is "a certain vigor, and mighty conflux of Animal Spirits, by the Exertion of which, the Eye seems to beam forth, and to cast forth outwardly certain darts like Lightning, according to the Instinct of the Passions."⁴⁶⁷ The perversely darkening effect of this flame recalls the "darkness visible" of the flames of Milton's Hell, adding to the already consonant notions of burning sulphur in the body and traditional representations of the brimstone of Hell. It is important to remember that, even when research was not deliberately mingling the theological notion of spirit with the medical, as the work of Paracelsus or Fludd did, medical theories of chymical reaction still functioned in a religious paradigm. This common origin gives a root from which multiple meanings can diverge and interrelate, and Milton's poetry is richly inclusive in its weaving of different medical theories with their religious counterparts.

⁴⁶⁶ Willis, *Two Discourses*, 189.

⁴⁶⁷ Willis, *Two Discourses*, 85. The word instinct does not of course carry its modern meaning here; we should rather think of it as inflamed or intrinsically charged, as in the moment in chaos when Satan is carried aloft by a cloud that is "Instinct with fire and nitre" (*PL* 2. 937).

iv. Sulphur and nitre in *Paradise Lost*

At this point we can again employ the wider natural philosophy of the poem to illuminate Milton's rather brief representation of human physiology. Some of the most well known lines in *Paradise Lost* make explicit correlations between landscape and physiology: Satan's jealous leer at Adam and Eve being "Imparadised in one another's arms" (*PL* 4. 506) is substantiated later by Michael's promise that on leaving paradise they will find a happier "paradise within" (*PL* 12. 587). There is also of course the famous revelation that Satan's

horror and doubt distract
His troubled thoughts, and from the bottom stir
The hell within him, for within him hell
He brings, and round about him, nor from hell
One step no more than from himself can fly
By change of place.
(*PL* 4. 18-23)

These are telling moments, but they are also open to interpretation: these versions of paradise and hell within may refer to states of mind rather than states of body-soul that involve physiological systems. What, in contrast, is *not* metaphorical is the information we have from Raphael about the scale of nature. Raphael has explicitly placed all conscious creatures in the same scale of nature, and that scale includes the animal, vegetable and mineral levels of creation, too. Moreover he explains his own (and Adam and Eve's) physiology through precisely the same set of processes of transformation that characterise the rest of the scale. The correlation between natural philosophy and physiology (both human and angelic) is made in various shades of metaphor throughout the poem, but it is also shown to be literal. We can also note Satan's cry, "I to hell am thrust, / Where neither joy nor love, but fierce desire, / Among our other torments not the least, / Still unfulfilled with pain of longing pines," which illustrates a material suffering and a burning that crosses the boundaries between the livid, sulphurous flames of hell, the burning of desire and the agonised mind that all occur in descriptions of ontological fallenness (*PL* 4. 508-11).

We have already noted that hell is characterised by motifs of industrial alchemy; it is also true that, although body imagery abounds in the landscapes of

Paradise Lost, hell is the most bodily of them all. It has veins, ribs, entrails, a womb, and a mouth and it both swallows the demons and cries out in horror at their tumultuous approach. It can seem that burning sulphur is hell's most antiquated attribute. Satan's description of his own suffering quoted above is clearly linked to the poet's earliest description of hell where "torture without end / Still urges, and the fiery deluge, fed / With ever-burning sulphur unconsumed" (*PL* 1. 67-9). However, as we have seen, sulphurous burning was also a topic of contemporary developments in natural philosophy and medicine. The weapons proposed by Moloch for a second military attempt on heaven are the "Tartarean sulphur, and strange fire" of hell, and I suggest that the 'strange fire' added here to the more traditional Tartarean sulphur (which clearly nods to biblical and classical legacies) is informed by the newer model of the sulphur and nitre mix (*PL* 2. 69). Marjara notes that Milton's use of the sulphur/nitre theory of substance rather than the *tria prima* of the Paracelsians shows a close engagement with contemporary developments in natural philosophy.⁴⁶⁸ Guerlac argues further that the sulphurous fire of hell in *Paradise Lost* is related to Mayow's sulphur/nitre theory of earthquakes and thunder, but he also notes that this iatrochemistry was a popular model borrowed by contemporary physiology.⁴⁶⁹ Willis in particular represents the sublimations of the body's substances as being based on the reactions of sulphur and nitre. In his tract *The Ascension of the Blood*, Willis compares the reactions in the blood to other natural examples of sublunary fire, describing the vital spirit as a burning reaction between the sulphurous elements of the blood and the nitrous 'food' inhaled in the air:

there is need of a free and undiscontinued access of Air, and that not only, that the vaporous Effluvia's, threatning the suffocation of the flame, may be carried away, and always depart, but much rather, that the nitrous food necessarily requisite for the burning of any thing, may be supplied by the Air. For indeed every sublunary fire, and especially flame, is compounded or made up altogether of sulphureous Particles, breaking out in heaps from a combustible Body, and of nitrous Bodies, which every where flow in the Air, meeting with them.⁴⁷⁰

This is a model in which the blood literally burns. However, the natural philosophy of hell also involves sublimation: the ground of hell

⁴⁶⁸ Marjara, *Contemplation of Created Things*, 173-4.

⁴⁶⁹ Henry Guerlac, 'The Poets' Nitre', *Isis* 45. 3 (1954), 243-255, 251; 255.

⁴⁷⁰ Willis, *The Ascension of the Blood*, in *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*, trans. S. Pordage (London, 1684), 22.

appeared in hue, as when the force
 Of subterranean wind transports a hill
 Torn from Pelorus, or the shattered side
 Of thundering Ætna, whose combustible
 And fuelled entrails thence conceiving fire,
 Sublimed with mineral fury, aid the winds,
 And leave a singèd bottom all involved
 With stench and smoke: such resting found the sole
 Of unblest feet.
 (*PL* 1. 230-8)

The simile is given astonishing perspective and immediacy by the suddenly intruding vision of the unblest feet that step into it. In this instance hell is described as a half destroyed volcanic landscape through the meteorological theory of subterranean sulphur and nitre that is exhaled into the atmosphere before exploding into storms. This sublimation is burning fiercely, however, with a ‘mineral fury’ that implies that (as in the fevered body) the sulphur itself is enraged, and is quite unlike the gentle sublimations of precisely the same substances in heaven and earth.

The parallels and divergences between the sublimations of hell and those of heaven can, I suggest, illuminate the differences between the sublimation of the healthy body-soul composite and its diseased counterpart. Significantly, the geology of earth, heaven and hell is all constituted by this sulphur/nitre mixture, just as all elements of the creation derive from the same first matter. Chaos, that turbulent but morally neutral zone of uncreated matter, includes exploding clouds of fire and nitre that are dramatically foregrounded in the moment that Satan is blown out of an eternal vacuum by one (*PL* 2. 935-8). Like the first matter, the ‘entrails’ of the different areas of the creation are the same, so in heaven, when the fallen angels open up the surface of heaven, “The originals of nature in their crude / Conception; sulphurous and nitrous foam / They found” (*PL* 6. 509-11). Despite its long-standing associations with hell, sulphur (along with nitre) also constitutes the grounds of heaven and earth and thus does not hold any intrinsic moral significance whatsoever.

What, then, is the difference between the chymical processes of these different landscapes if they are fundamentally constituted by the same elements? The answer is that although they all have sulphur and nitre at their most basic level, their sublimation also relies upon other levels of spirit. Raphael recounts Satan’s discovery thus:

This continent of spacious heav'n, adorned
 With plant, fruit, flower ambrosial, gems and gold,
 Whose eye so superficially surveys
 These things, as not to mind from whence they grow
 Deep under ground, materials dark and crude,
 Of spirituous and fiery spume, till touched
 With heaven's ray, and tempered they shoot forth
 So beauteous, op'ning to the ambient light.
 These in their dark nativity the deep
 Shall yield us, pregnant with infernal flame.
 (PL 6. 474-83)

In heaven the sulphur and nitre is in the ground and always already has the potential to yield "infernal flame" but, crucially, this sulphur and nitre is constantly being gently touched and tempered by heavenly light and thus stimulated into healthy, living activity. This process is equivalent to the gentle upward assimilations imagined in the animate body-soul composites of the poem and their own realm of earth. The explosive power of fiery sulphur and spirituous nitre parallels the first, active matter in its intrinsic energy and moral potential for either good or bad, depending on the intention of the higher agent that interacts with it. The matter of chaos contains these ingredients (God's "dark materials") and at the edge of the visible world the situation is the same; the boiling gulf meets the borders of that which is created, shaped and formed through nature, when,

now at last the sacred influence
 Of light appears, and from the walls of heaven
 Shoots far into the bosom of dim Night
 A glimmering dawn; here nature first begins
 Her farthest verge.
 (PL 2. 1034-8)

The parallel 'science' of these representations coheres perfectly with the theology of God as light, and can be fruitfully compared to such instances as the poet's request to the holy spirit, "what in me is dark / Illumine, what is low raise and support" (PL 1. 22-3), or the later invocation to celestial light to "Shine inward, and the mind through all her powers / Irradiate, there plant eyes, all mist from thence / Purge and disperse" (PL 3. 51-4). The request that the mind be touched, raised and clarified by the holy light also, however, requests a partial, temporary undoing of the darkening effects of fallenness, the natural philosophy of which is precisely coherent with contemporary medical theory.

Unlike heaven and earth, the grounds of hell burn without the influence of any higher light or spirit; the fallen angels are, in their first awakening after their fall “o’erwhelmed / With floods and whirlwinds of tempestuous fire” (*PL* 1. 76-7). Like the sick body studied by the physiologists, the lower, darkening fires of sulphur are burning without the assimilating influence of the highest levels of the scale, whether subliming animal spirits, rational spirits or holy light. The misuse of hell’s still neutral geological properties is a feature of Milton’s representation of industrial alchemy that we have already noted:

sulphurous and nitrous foam
They found, they mingled, and with subtle art,
Concocted and adusted they reduced
To blackest grain.
(*PL* 6. 512-15)

This artful concoction burns the materials and thereby *reduces* them to gunpowder, an agent of death and violent dissolution. This transformation, through concocting and making adusted, or burnt, also characterises accounts of feverously fermenting blood. Willis describes the transformations of the body that suffers a mortal fever, following the crisis point:

From a bad Crisis... the Liquor of the Bloud (like Wine too much Fermented) degenerates, almost into a vappidness, or lifelessness; its Spirit is greatly diminished; the Reliques which remain, are intricated, and, as it were, overwhelmed, with the Particles of Adust Matter, from whence there is yet a continual growing hot remaining in the Bloud, yet without concoction, or assimilation, of the Alible Juice, or separation of the profitable, from the unprofitable... from the Adust Recrements, and also the Salt, and Earth being too much carried forth, it perpetually burns in the Vessels, with thirst and heat. And because it is dayly depauperated, the Spirit and benign Sulphur being waste... and more infected, with the Salt, and Earthy dregs being too much exalted, its Liquor in a short time becomes tastless, and is made unfit for circulation, and for the inkindling in the Heart, for the sustaining the Vital fire: wherefore there is a necessity that life be lost, even as the flame of a Lamp is extinguished, when instead of the wasted Oil, a Salt and Muddy Liquor only supplies it.⁴⁷¹

The deathly fermentation in the blood has wasted the spirit and the highest level of sulphur, leaving excess “adust matter” that, like its hellish counterpart concocted by the fallen angels, continues to provoke disproportionate heat and burning. This burning

⁴⁷¹ Willis, *Of Feavers*, 82.

does not succeed, however, in the upward assimilation that the spirit had effected. The morally significant digestive motion is disordered, so the profitable cannot be separated from the unprofitable and the salty and earthy tartareous dregs are multiplied. This increase finally ends the ability of the blood to vitalise the body's parts or sublime animal spirits to the higher levels, and the patient dies. This deathly process can be marked out as the reductive burning and concoction practised by the fallen angels, where the good and the bad can no longer be differentiated, and the ingredients of life itself are mixed and compounded to bring death and destruction.

v. Curse and contagion

Poisonous fermentation is responsible for illnesses that involve a build up of tartareous matter, or stone in the body, but the burning of the sulphurous components of the blood is also characteristic of what Willis called putrid fever, which can also stem from the digestive system when, “by the deprivation, or rather corruption of the alible Juice, fresh carried into the blood, the various fits, inequalities, and critical motions arise.”⁴⁷² The fundamental sulphurous burning is described thus:

if the Sulphureous, or Oily part of the Blood, grows hot, beyond its Natural disposition, presently it becomes fierce, and impropionate with the rest, so that, almost the whole being acted, as it were into a flame, by the Ferment of the Heart, compels the mass of Blood to grow immoderately hot, and to boil up.⁴⁷³

This upward motion matches the rise of the passions and sensuality in Adam and Eve when they awaken from their first sleep after the Fall. This fundamental shift in the ontological status of their body-soul composites from purest sublimation to burning is the source of contagion for the corruption that will affect the rest of the human race. Sickness, and the corrupted will that indulges appetite and causes it, are, Michael says (with another bout of angelic misogyny), “Inductive mainly to the sin of Eve” (*PL* 11. 519). Michael invites Adam to open his eyes and

⁴⁷² Willis, *Of Feavers*, 75.

⁴⁷³ Willis, *Of Feavers* 74.

first behold
 The effects which thy original crime hath wrought
 In some to spring from thee, who never touched
 The excepted tree, nor with the snake conspired,
 Nor sinned thy sin, yet from that sin derive
 Corruption to bring forth more violent deeds.
 (*PL* 11. 423-428)

The poem faces head-on the problem of why it is that, although the actual sin was committed by Adam and Eve, their descendents will also suffer from corruption and death. Although his first vision of death horrifies Adam, it is actually the corruptions of the first two deaths that are given as the worst effect of sin. Physical death will ultimately be represented as a mercy both by God's direct words and in the visions that Michael shows Adam. Death is the remedy of the corruption that sin brings. The violent death of Abel, who "fell, and deadly pale / Groaned out his soul with gushing blood effused," shocks Adam (*PL* 11. 446-7). Michael, however, directs his horror away from the death itself, which "Will be avenged, and the other's faith approved," and towards the corruption of human mind and body that is the result of the Fall (*PL*. 11 458).

In one of the most famous visions of Book 11 Adam sees:

A lazar-house it seemed, wherein were laid
 Numbers of all diseased, all maladies
 Of ghastly spasm, or racking torture, qualms
 Of heart-sick agony, all feverous kinds,
 Convulsions, epilepsies, fierce catarrhs,
 Intestine stone and ulcer, colic pangs,
 Demoniac frenzy, moping melancholy
 And moon-struck madness, pining atrophy,
 Marasmus, and wide-wasting pestilence,
 Dropsies and asthmas, and joint-racking rheums.
 Dire was the tossing, deep the groans, despair
 Tended the sick busiest from couch to couch;
 And over them triumphant death his dart
 Shook, but delayed to strike, though oft invoked
 With vows, as their chief good, and final hope.
 (*PL* 11. 479-493)

Adam wants to know how this degradation of humanity, bearers of the image of God, can happen and Michael's answer conforms to his role as the teacher of moral lessons. He explains that the divine image

Forsook them, when themselves they vilified
 To serve ungoverned appetite, and took
 His image who they served, a brutish vice,
 Inductive mainly to the sin of Eve
 (*PL* 11. 516-9)

The sick in the vision of the lazar-house have succumbed to the ‘brutish vice’ of ‘ungoverned appetite’ and now bear that image, in the deformities of disease, rather than that of their maker. It seems that the ethically difficult position of blaming the sick for their own suffering is given by Michael as the central explanation of the sufferings caused by natural evil, and we may not be inclined to “yield it just” as Adam does. However, we should remember that this is a moral and didactic interaction between Michael and Adam. The vision serves first and foremost as a warning and a teaching: not least conspicuous is the representation of death as a blessed release from the corruptions of fallenness. Secondly, an inductive investigation into the causal history of this suffering brings us back to the first human fall, that of Eve, so it is also an explication of the origin of sickness that leads to a moral reproof. It is a mark of the enormity of the choice that Adam and Eve have made that this contagion is not only inherited by their offspring, but it spreads, like the infectious ferment, throughout the whole of the visible creation.

While it is clear that the corruption of fallenness has had profound effects throughout the natural world, the monistic system does not collapse in the face of the Fall, and this will have profound consequences for the human regeneration that is to come. We can see monism functioning, in fact, through the very processes of the Fall. God has ordered (in what Rogers would term a “theocentric mode”) the shift in the sun’s angle to the earth, so the sun “Had first his precept so to move, so shine, / As might affect the earth with cold and heat / Scarce tolerable” (*PL* 10. 652-4). However, the sun also acts with what we might term its own similiary repulsion, since “At that tasted fruit / The sun, as from Thyéstean banquet, turned / His course intended” (*PL* 10. 688-9). The effects of this turn will bring a natural corruption that is dangerous to human health:

These changes in the heavens, though slow, produced
 Like change on sea and land, sidereal blast,
 Vapour and mist, and exhalation hot,
 Corrupt and pestilent.
 (*PL* 10. 692-5)

Despite the actual discordance that is introduced into what was a perfect system of natural philosophy, there is a wider monism that remains. God orders the shift in the angle of the sun, but the sun itself retains the natural intention of the first light of the Creation when it is figured as turning away in disgust at the tragic horror of the Fall. The reduced and now erratic influence of the sun matches the reduced and erratic powers of the highest order of human spirit following the Fall, and the body's warring elements and poisonous vapours are replicated in the discords of the natural world. The distempered meteorological environment is one aspect of this, as is the violence of the animal world, which also seems to erupt spontaneously, when, "Discord first, / Daughter of Sin, among the irrational / Death introduced through fierce antipathy: / Beast now with beast gan war" (*PL* 10. 707-10).

So how is the intervention of a poisonous ferment related to these changes? Ideas on contagion, as such, had been present in the public consciousness in the calamitous form of the outbreaks of plague as well as lesser epidemics throughout the century, and Milton's intersection of natural evil and moral evil was hardly unusual, as Neill's study of the rhetoric of theatre closures testifies.⁴⁷⁴ What the swift development of the notion of fermenting natural substance offered to this, however, was an organised theory of *external* cause that was beginning to lead towards modern notions of infection. Giglioni notes that the "peccant matter" that causes plague has, like a leaven, the ability "to multiply almost endlessly in a predisposed matter," that is, to stimulate in another body, "a motion that is similar to itself, in the same way as we see a ferment multiply."⁴⁷⁵ But the ferment in contemporary poetry and prose is still far from the sort of entity that can be compared to modern knowledge of bacteria; it may still emerge simply from the distempered bodily constituents (Galenic or chymical). Its animistic resonances also mark it as being within the context of demonic interventions in the human body-soul. "What multiplies," according to Glisson, "is supposed to put new matter under its own yoke and somehow to impress its own poisonous form on it," but

⁴⁷⁴ Michael Neill, *Issues of Death: Mortality and Identity in English Renaissance Tragedy* (Oxford: Oxford University Press, 1998), 22-26.

⁴⁷⁵ Giglioni, 'Genesis of Francis Glisson's Philosophy of Life', 160. Giglioni cites MS Sloane 3309 ("Fumus Nicotianae tubulo haustus grassanti peste est conveniens *profylaktikon*"), f. 48r. The term peccant is particularly rich in this context; its Latin origin is *peccare*, to sin or commit a fault, but through the seventeenth century it begins to take on the meaning of causing disease. Milton's God terms the fallen angels as "peccant" (*PL* 11. 70).

Gigliani also notes that this may happen “because man's body itself has a certain ability to produce poisons and a receptivity to them.”⁴⁷⁶ In the impression of a new and poisonous form we can hear echoes of the chosen new image of brutish vice that Michael points to in the vision of the lazar house. The poisonous ferment may also stem from and proliferate through a body's own natural depravity. The natural philosophy of fermentation thus stands, sometimes precariously, upon the intersection of these different religious, classical and proto-scientific conceptions of motive life and destructive disease. Its delicate relations with them give a unity and coherence that is invaluable in a poem of universality like *Paradise Lost*. Indeed, although Glisson criticised the ubiquity of the theory of fermentation in the work of both Helmont and Willis, it is precisely this ubiquity that makes the infection of paradise by Adam and Eve a logical possibility.

God explores this aspect of the human fall in his response to the Son's intercession on behalf of Adam and Eve, offering the requested mercy, but stating:

longer in that paradise to dwell,
The law I gave to nature him forbids:
Those pure immortal elements that know
No gross, no unharmonious mixture foul,
Eject him tainted now, and purge him off
As a distemper, gross to air as gross,
And mortal food, as may dispose him best
For dissolution wrought by sin, that first
Distempered all things, and of incorrupt
Corrupted. (*PL* 11. 48-57)

The intense purity of the air of paradise, and the profusion of balmy odours emanating from the flowers and fruit, are aspects of its natural philosophy that we have looked at in some detail. It is one of the fears that Eve voices when she cries out, “Must I thus leave thee Paradise? Thus leave / Thee native soil” and continues, asking how “shall I part, and whither wander down / Into a lower world, to this obscure / And wild, how shall we breathe in other air / Less pure, accustomed to immortal fruits?” (*PL* 11. 269-85). What she has not yet absorbed is the reality that they are now corrupted, as her blunder, crying for “immortal fruits,” shows. This tainted distemper, increasing grossness, inharmonious mixt and ultimate dissolution can only endanger the fertile

⁴⁷⁶ Glisson quoted in Gigliani, ‘Genesis of Francis Glisson's Philosophy of Life’, 160. Gigliani cites MS Sloane 3309, f. 90r.

balm of paradise if it functions as a poisonous ferment, for then it can spread and infect the rest of the natural world, as it has already begun to do.

To summarise the physiology of the Fall: we have two body-soul composites whose highest spirits, in Milton's schema the intellectual spirits, have partly deserted the rest of the composite body-soul through the hallucinatory exhilaration of these spirits by the vapours of the fruit. The resulting lack of upward sublimation and assimilation of the lower orders of spirit and matter in their blood has led to a sulphurous burning, which is partially connected to lust, and part of a cycle of corruption and disease in the body-soul. On one level this corruption emerges as illness or susceptibility to illness, but it also emerges in mental distemper, in chaotic passions that overwhelm the mind and in a partial alienation of different elements of the self. Their remaining understanding is quite literally darkened by the 'adust' effluvia of the newly disordered activity of the blood, which process gives a medical basis for the traditional loss of rationality that the Fall brings. Their inner alienation is represented as dividing Eve's sense of seeming and being; in Adam's case we see a fracture between sensory knowing and the mind's understanding. As in the rest of the poem, these differences reverberate between human physiology and the natural philosophy of the angels and the rest of creation. In fact, once they are fallen and these effects start to mount up, their ontological condition is like nothing so much as chaos itself.

vi. Fallen physiology and the atoms of chaos

One central question that emerges from the reading of the Fall as the infection of a poisonous ferment is whether or not it is just coincidence that the fallen animate body is ontologically most similar to that described by atomist and corpuscular theorists such as Willis and Charleton. The only sequence in which atomism is referred to directly is in the description of chaos in Book 2. The Aristotelian qualities of heat, cold, wet and dry employ, at the microscopic level,

Their embryon atoms; they around the flag
Of each his faction, in their several clans,
Light-armed or heavy, sharp, smooth, swift or slow,
Swarm populous, unnumbered as the sands

Of Barca or Cyrenë's torrid soil,
 Levied to side with warring winds, and poise
 Their lighter wings. To whom these most adhere,
 He rules a moment. (*PL* 2. 900-07)

This representation of atomic chaos works as both an assertion and a critique of atomism. Atoms are here the materials out of which Creation is made. The different shapes and powers of atoms were an important aspect of how they were thought to fit together or react to each other and motive force generally, and the comment on the differing qualities of the 'several clans' is therefore a significant accuracy. Their warring state and position in chaos, however, recalls criticisms of deist mechanism and Hobbesian materialism; in short, atoms there may well be at the smallest level of existence, but without the tempering touch of God's creative virtue nothing can come of them. Chaos is

The womb of nature and perhaps her grave,
 Of neither sea, nor shore, nor air, nor fire,
 But all these in their pregnant causes mixed
 Confusedly, and which thus must ever fight,
 Unless the almighty maker them ordain
 His dark materials to create more worlds
 (*PL* 2. 911-16)

We have looked in some detail at how chaos may be the womb of nature, or involved as material cause in the creation of the visible world. It is also true that chaos is given as nature's grave, and thus chaos must also be an effect of un-creation, dissolution and death. Indeed the allegorical figure of Chaos claims directly: "Havoc and spoil and ruin are my gain" (*PL* 2. 1009).⁴⁷⁷ This ontological position of chaos as grave as well as womb of nature has prompted arguments that it is in direct opposition to the creative work of God. However, a clearer example of active 'uncreation' (rather than being in a state of uncreation) can be attributed to the allegorical narrative in which Sin and Death construct the bridge over the 'vexed abyss' which until now has provided a barrier between hell and earth.⁴⁷⁸

⁴⁷⁷ For a reading of chaos that emphasises its fundamental opposition to God to the point of being evil, see Regina Schwartz, *Remembering and Repeating: On Milton's Theology and Poetics* (London: University of Chicago Press, 1988).

⁴⁷⁸ Here I rely on – and to some extent repeat – the assertions made by Fallon and Rumrich on this topic, particularly that "evil in Milton is a principle of inverted order, not of chaotic indeterminacy" Rumrich paraphrased in Fallon, *Milton Among the Philosophers*, 191n.

Chaos is once again subject to forces which educe form out of its wildly formless matter; Sin and Death

Flew diverse, and with power (their power was great)
 Hovering upon the waters; what they met
 Solid or slimy as in a raging sea
 Tossed up and down, together crowded drove
 From each side shoaling towards the mouth of hell
 (*PL* 10. 284-8)

It is a critical commonplace that “hovering upon the waters” recalls the brooding of the Holy Spirit on the waters of Creation and thus signals an infernal anti-creation in this sequence. The more precise model of vitalism that we developed in examining the creation, however, gives a richer context to this process. Sin and Death precisely reverse the process of creation, pushing matter into shape, with a mechanist force, rather than calling up vital action in it. It is Death who with his mace transforms the uncreated matter into cold, dry stone, the agent of death in the body:

The aggregated soil
 Death with his mace petrific, cold and dry,
 As with a trident smote, and fixed as firm
 As Delos floating once; the rest his look
 Bound with Gorgonian rigour not to move
 (*PL* 10.293-7)

Significantly, Sin believes herself to be subject to the force of sympathetic attraction in the urge she feels to enact this anti-creative act:

Methinks I feel new strength within me rise,
 Wings growing, and dominion given me large
 Beyond this deep; whatever draws me on,
 Or sympathy, or some connatural force
 Powerful at greatest distance to unite
 With secret amity things of like kind
 By secretes conveyance
 (*PL* 10. 243-9)

Where the spirit, light and matter of creation were vital and responsive to the voice of God and the power of the sun and stars are given as magnetic, this version of sympathetic attraction shows instead the tradition of occult causes and mystical speculation. The “connatural force” works by sympathy, or likeness; drawing like things together, it works over distance, as the weapon salve was supposed to do. The force

itself, the “amity,” and the process of conveyance are all described as secret. The weapon salve controversy, introduced to England by Robert Fludd and promoted later by Kenelm Digby, was central ground on which the conflicts about natural magic were fought. According to Pagel, Van Helmont concurred with the view that

Magnetic effects... may be wrought in dead-looking metal, or through the ‘will of nature’ intrinsic in flesh and blood; they may act by touch as in the shock dealt by the electric fish, or at long distance as by the destructive stare of the basilisk. In all instances they are perfectly legitimate and natural, nature being the magician by virtue of universal sense and sympathy.⁴⁷⁹

Helmont’s choices of magnetism, electric fish, and even the basilisk as explanatory figures illustrate his focus upon natural philosophy as an explanatory system for sympathetic attraction; Milton’s corresponding attribution of “Gorgonian rigour” to the action of Death roots the natural magic of the un-creation in the effect of an explicitly fabulous beast with richer mythic associations and less claim to actuality. Attributing to her actions a secret mystical knowledge, Sin places her own actions in the midst of the contemporary controversy, and specifically with proponents such as Fludd, rather than with the more cautious experimentalism of Harvey, Boyle and Glisson. The speculative mysticism of the proponents of the weapon salve is not treated by Milton as a natural force; indeed the attribution of sympathetic attraction to the “will of nature” brings us back to Milton’s statement in the *Christian Doctrine* that the natural law set up by God at the creation is “too often called nature”. Later in the poem, God adds the explanation, “I called and drew them thither / My hell-hounds, to lick up the draff and filth / Which man’s polluting sin with taint hath shed / On what was pure” (*PL* 10. 629-32). The natural magicians of the un-creation do not know that they enact only the natural law of God’s will.

This narrative of uncreation is allegorical. Chaos is peopled with allegorical figures who personify the new forces at work in Adam and Eve (for example, Confusion, Chance, Rumour, Tumult and Discord), just as the disordered matter and anarchic misrule figure their new ontological fractures. Fallon’s study of *Paradise Lost* still gives the finest account of how allegory functions in the poem. Arguing in essence that allegory is used to represent ontological deficiency (a position based upon the Augustinian notion of evil as privation), he focuses primarily on Sin and Death. They

⁴⁷⁹ Pagel, *Van Helmont*, 11.

are “not substances; they are ‘accidents in a substance’ and that substance is Satan and his devils.”⁴⁸⁰ I suggest that the allegorical figures of chaos are directly related to the chaotic results of eating the fruit. The reduction of created perfection within human ontology is expressed through the same tropes of storm, confusion and political misrule that characterise chaos:

high winds worse within
 Began to rise, high passions, anger, hate,
 Mistrust, suspicion, discord, and shook sore
 Their inward state of mind, calm region once
 And full of peace, now tossed and turbulent:
 For understanding ruled not, and the will
 Heard not her lore, both in subjection now
 To sensual appetite, who from beneath
 Usurping over sovereign reason claimed
 Superior sway (*PL* 9. 1120-1129)

What chaos lacks, however, are the defining features of the poisonous ferment that characterise hell and, in particular, the satanic misuse of matter and spirit. Like humanity and everything else, chaos is made up of matter that is originally good, although susceptible to misuse. God’s human creations are created originally righteous; in the *Christian Doctrine* Milton states that the term original sin is “too narrow, because this evil desire, this law of sin, was not only inbred in us, but also took possession of Adam after his fall, and from this point of view it could not be called *original*.”⁴⁸¹ Chaos is characterised by wild uprising storms, and is subject to mistrust, uncertainty, anarchy and political “misrule.” These tropes are precisely those used by Willis in the representation of the disordered relation between mind and body. He compares the natural philosophy of storms with that of mental disorder, proposing, in fact, the same causal mechanism. When the air is

imbued with Sulphureous, and other Elastick Bodies, being become presently raging, they often break forth into Meteors, viz. Winds, Hurricanes, and horrid Thunder. After the same manner, the Animal Spirits, whilst pure, are carried in the open spaces of the Head, and its Appendixes remain quiet enough; but they... being mixed with Sulphureous Particles from the Blood, and sometimes in other places, with an heterogeneous matter, become very impetuous.⁴⁸²

⁴⁸⁰ Fallon, *Milton Among the Philosophers* 185; see also 168-193.

⁴⁸¹ *CPW* 6: 389.

⁴⁸² Willis, *Two Discourses*, 23-4.

The relation of the human microcosm to the macrocosmic world is imagined by Milton as it is by Willis, both in terms of metaphor, and, crucially, in terms of the natural philosophy of substance.

This dissertation is not primarily a political reading of Milton's poem, and neither is it an in-depth study of metaphorical motifs; it is rather a study of the literalism of the poem's representation of the soul.⁴⁸³ Nevertheless, the clear parallels between the political metaphors used by both the doctors and the poet can illustrate not only the sickness of the fallen body-soul composite, but also something of the cures that might be offered in a fallen world. Just as sensual appetite is a usurper in the fallen body-soul of *Paradise Lost*, the sensitive soul is represented as a seditious rebel in Willis's study of animation: "the lower Soul, growing weary of the yolk of the Other, if occasion serves, frees it self from its Bonds, affecting a License or Dominion... This Kind of Intestine Strife, does not truly cease, till this or that Champion becoming Superior, leads the other away clearly Captive."⁴⁸⁴ The point of moral philosophy is to maintain the power of the rational soul over the lower orders: "to the Establishing the Empire of the Rational Soul, also for the Vindicating of its Right and Principality, from the Usurpation of the Sensitive Soul, the Precepts of Philosophers, and Moral Institutes are framed".⁴⁸⁵ In Willis's schema, then, the healing process for the different levels of soul works through the development of the highest spiritual faculties, through the intervention of rational thought and, finally and most potently, "Sacred Religion gives far more potent helps, whose Laws and Precepts being rightly observed, are able to carry Man, not only beyond the Brutes, but himself, to wit, above his Natural State".⁴⁸⁶ This model of healing has for its theological counterpart the Pauline struggle between the spirit and the flesh. Paul's exhortations to the Romans state that "the carnal mind is enmity against God: for it is not subject to the law of God, neither indeed can be," likewise in Galatians he states, "the flesh lusteth against the Spirit, and the Spirit against the flesh."⁴⁸⁷ This is a model that emerges repeatedly in the works of Paul, but the working of grace in *Paradise Lost* is neither so cerebral nor so controlling; it does not divide the body and the spirit in this way; rather it works to re-combine them properly.

⁴⁸³ Although as Rogers has shown, the natural philosophy of the body and soul is of vital political significance in contemporary culture, so the evidence I have gathered of how Milton's vitalism works could certainly contribute to a study of the politics of *Paradise Lost*.

⁴⁸⁴ Willis, *Two Discourses*, 43.

⁴⁸⁵ Willis, *Two Discourses*, 43.

⁴⁸⁶ Willis, *Two Discourses*, 43.

⁴⁸⁷ Romans 8: 7; Galatians 5: 17.

vii. Regeneration and mercy

The descent of the Son, the descent of God's prevenient grace and the descent of the angels (as higher spirits) and their re-ordering of Adam and Eve's position – spiritually, mentally and physically – enacts not only God's decree, but also the motion of curative action of the highest spirits in the body after fever strikes. The recovery of the diseased body has theological resonances. The highest ontological category, the spirit, is not entirely flown away or extinguished, and manages to overcome the toxic ferment, expelling it and instituting again a healthy sublimation from a functional digestive process:

From a good Crisis, the Spirit, tho' made weaker, yet gets the upper hand, wherefore, what is left of the Feaverish matter, it by degrees overcomes, and expels; and concocts, and assimilates (so what is brought be thin or slender) the Nutritious Juice: from thence, the mass of Bloud is amended anew, with Spirit and Sulphur; and the Bloud which now being Salt and sharp, did continually grow hot, acquires at length a Sweet and Balsamic Nature, and being quickned with a lively motion and heat, rightly performs the offices of life and sense.⁴⁸⁸

Recovery relies upon the reinstatement of the higher bodily spirit that should assimilate and order the lower levels, leading to the blood's renewed "sweet and balsamic nature." Rogers unaccountably claims that the natural philosophy of the substance of paradise is at odds with the "theocentric narrative." He claims that the difference in mode between the representation of vital substance in paradise and the corresponding decrees given by God to Michael are "rather more than an inconsequential poetic blunder. The confusion reflects in an acute form some of the poem's profoundest contradictions in the philosophy... of agency and organisation".⁴⁸⁹ The different narrative modes of the expulsion from paradise work perfectly in harmony, however, if one accepts in monist terms the descending powers of heaven as the highest orders of spirit in the universe of *Paradise Lost*.

In the action of prevenient grace there is a rich intersection of the medical concern with the effects of tartarous deposits of stony matter and the biblical tradition of the removal of stone from the heart. As Adam and Eve finally pray with repentance, the

⁴⁸⁸ Willis, *Of Feavers*, 82.

⁴⁸⁹ Rogers, *Matter of Revolution*, 152.

(PL 11. 22-36)⁴⁹¹

The physiology of the Fall and its effects were expressed through sulphurous burning that recalled hell and stormy confusion that recalled chaos; the pictures of redeemed humanity that emerge are, however, those of the fertile “earthy” body cultivated. These correspondences do not have a contemporary medical model ordering them as do other processes represented in *Paradise Lost* such as Creation, the scale of nature and the Fall. These, as we have seen, correspond precisely to models of conception, digestion and venomous fermentation, respectively. However, the removal of stone from a bodily organ and the vegetative basis for major biblical themes like implanting and engrafting can only work to support the distinctively vitalist natural philosophy that orders and enriches those other processes. Grace works on the fallen heart as the Holy Spirit works on the turbulent and ontologically deficient matter of chaos during the Creation. Indeed Milton makes the connection explicitly in the *Christian Doctrine* in his argument that the human soul should not be treated as an anomaly in the created world. He states “God breathed the breath of life... and when he had breathed it, he mixed it with matter in a very fundamental way, so that the human form, like all other forms, should be propagated and produced as a result of that power which God had implanted in matter.”⁴⁹² The implanting of fertile power in matter at the Creation and the implanting of prevenient grace in the fallen human heart work on precisely the same, vitalist logic. Moreover, the descent of the Son, of prevenient grace, and of the angels reverses the ‘scornful’ attempted ascent of Satan and the hallucinatory ascent of the fallen pair, paradoxically ennobling those who descend, just as the attempted ascents of the fallen paradoxically reduce them. These fertile spiritual descents will find their finest (and final) form in the incarnation of Christ, who is repeatedly termed “the seed of the woman” in the later books of *Paradise Lost*. In the mean time the higher spiritual agencies work to re-order the infected body of creation, calming some of the burning and divisive disorders of fallenness, although the Creation remains corrupted. Following the natural philosophy of corruption that has infected the creation at the Fall, immortality would indeed bring endless suffering, and physical death is given as part of the remedy to the infected world.

⁴⁹¹ The Feast of First Fruits delineates required sacrifice at harvest and can be found in Leviticus 23:9-14. The Pauline expression of incorporation in Christ as engrafting can be found in Romans 11.

⁴⁹² CPW 6: 325.

In his final lesson in *Paradise Lost* Adam is thus offered a route to death other than that of succumbing to the fermentation *degradativa*: Michael offers an alternative death whereby his body will ripen, rather than rot. This death follows a temperate life, when “like ripe fruit thou drop / Into thy mother’s lap, or be with ease / Gathered, not harshly plucked, for death mature” (*PL* 11. 535-7). This explanation answers and adds to some of the questions that had run through Adam’s tortured mind as he tried to understand what death would be. He fears “deathless pain” (*PL* 10. 775) and contemplates with horror the notion that “in the grave, / Or in some other dismal place, who knows / But I shall die a living death” (*PL* 10. 786). Adam’s examination of death deserves more attention than can be given to it here, particularly in the light of Milton’s theology of mortalism; however, what *is* directly relevant to this study of vitalism in *Paradise Lost* is the final explication given by Michael. Already corrupted, but only beginning to know what that means, Adam cries, “How gladly would I meet / Mortality, my sentence, and be earth / Insensible, how glad would lay me down / As in my mother’s lap” (*PL* 10. 775-8). Michael’s alternative to succumbing to corruption echoes and elaborates this wish; not only will he drop into his mother’s lap, the process that brings him there will be that of ripening.

Again the work of Francis Glisson is the best analogue for Milton’s natural philosophy and the physiology that it orders. The key to the differentiation between one death and the other is in the difference between degrading corruption and the ripening motion of vital heat. Giglioni paraphrases from Glisson’s late work, explaining that in Glisson’s schema,

Vital heat, in particular, is a motion which is “much nobler” than that of fermentation. Glisson... differentiates fermentation from ripening. Fermentation starts where ripening ceases. The latter is not a quick motion of fusion and dissolution, but it is a slow process of coagulation that needs a certain amount of time to reach the appointed goal. Likewise, all functions of life, nutrition, and growth belong to the process of ripening rather than to fermentation: nutrition is “constantly calm and self-pleasing; it does not expect to be irritated by the action of some ferment, nor does it suffer the tumult that originates from fermentation.”⁴⁹³

⁴⁹³ Glisson quoted in Giglioni, ‘Genesis of Francis Glisson’s Philosophy of Life’, 165-6. Giglioni cites *De Ventrículo*, 571-574.

This calm, gentle process mirrors the temperate life that Michael offers, where life is growth and death is a culmination and almost a fulfilment.

So mayst thou live, til like ripe fruit thou drop
 Into thy mother's lap, or be with ease
 Gathered, not harshly plucked, for death mature:
 This is old age; but then thou must outlive
 Thy youth, thy strength, thy beauty, which will change
 To withered weak and grey; thy senses then
 Obtuse, all taste of pleasure must forego,
 To what thou hast, and for the air of youth
 Hopeful and cheerful, in thy blood will reign
 A melancholy damp of cold and dry
 To weigh thy spirits down and last consume
 The balm of life.
 (*PL* 11. 535-46)

This may not seem comforting. We live in a culture with medical resources that are incomparable with any other time and most other places; a brief flick through the works of the best doctor contemporary with Milton will leave a modern reader sick with fear at the amputations without anaesthetic, the chemical medicines and the lack of understanding of infection and sanitation. Disease still strikes us, but we have morphine when all else fails. We also, however, live in a predominantly secular society; perhaps this vision of death as a welcome release can open a window of meaning into a world of the past where life was more painful, diseases more dire and death less frightening.

Conclusion

The early sections of this dissertation set up a number of antinomies and questions that emerge out of the materiality of the soul in the *Christian Doctrine* and *Paradise Lost*. Initially, the coherence of Aristotelian monism posed a problem, but of course the Aristotelian inheritance of the seventeenth century was heterogeneous, and medical and biological scientists, like Milton, adjusted and revised the ‘scientific’ legacy with which they worked, rather than engaging in outright dismissal. Milton’s science is Aristotelian, but as we have seen more than once, his Aristotelianism is modified to give a vital primacy to matter and the power of matter by the integration of chymical concepts and categories. The integration of chymical spirit with pneuma, or vital heat is central to this process. Matter and material forms can be more spirituous or more gross, but the scale of nature in *Paradise Lost* gives multiple forms and degrees of spirit-matter that – crucially – interact, move, shift, change, perfect and corrupt. Likewise, the chymical anatomy of the body’s spirits and fluids shifts the paradigm from a dualist imposition of form on matter to multiple, interacting elements with differing qualities, specifically, spirit, oil, water, salt and dead earth. In both cases the most powerful vitalising category is that of spirit. The chymical spirit, for Glisson and Milton, works as vital heat or pneuma in the Aristotelian tradition, but it offers itself as a distinctively material category. In both the healthy body and the unfallen Creation the motion is an upward assimilation of rougher, less perfected matter or material forms to their highest possible perfection. God remains both the source and the ultimate culmination of this process. Like vital heat, God’s spirit (and matter) effects an upward movement that is simultaneously circular. It is this dynamic order that, for Milton, makes the traducian emergence of the rational soul from the procreating human body-soul composite a literal truth. Traducianism, despite its position as heresy, is a cornerstone of theodicy in the *Christian Doctrine*. Thus vitalist natural philosophy, exemplified in the work of Glisson, supports Milton’s theodicy.

Traducianism, in the *Christian Doctrine* is the theodical manoeuvre that ensures that the fallen soul cannot originate from God in its fallen state; it demands that from the corporeal body must come the abstract faculty of the rational soul. The

perfecting motion of spirit-matter turns the corporeal to the incorporeal through a process of sublimation that is a literal truth within the scientific discourse of experimental medicine. The discovery of acid digestion was part of a revision in anatomy that attributed the power of sublimation to the similiary parts, the fluids and spirits of the animate body. This process, imagined as progressive purification, continues in Milton's schema through all orders of the body-soul composite, so from the food is sublimed the vital blood, from which sublimes the animal spirit and from the animal spirits sublime intellectual spirits, which constitute reason itself. The sublimations of transformative spirit correlate with Milton's rehabilitated holy matter, giving scientific credence to the assertion of theological materialism. The shifting meaning of sublimation makes possible the insertion of the traditionally immaterial nous or abstract intelligence, into the transformative materiality ascribed to the lower levels of the created world by orthodox Aristotelian natural philosophy. This sublimating spirit and matter does indeed reconcile immanent soul with transcendent soul in the animate bodies of paradise and in the fundamental system of causality upon which creation and regeneration stand in *Paradise Lost*.

Sublimation, like the fermentation with which it was compared in physiological study, was not the sole preserve of vitalism. It was also borrowed by the iatro-mechanist physic of doctors such as Willis, Power and Charleton, but mechanist physic supposed a different theology to that of Milton. Relying upon a voluntarist stance to justify investigative experiment, the mechanists still risked the deist *Deus absconditus*, as opposed to Milton, who represents, "a conception of the deity surprisingly similar to that of his French contemporary [Pascale]: no longer a mere first mover in some Thomistic version of the big bang theory, but a central and functional force at work in the interstices of the infinite universe."⁴⁹⁴ Moreover, the active matter of the iatro-mechanists was subordinated in a system which retained an orthodox dualism of body and soul. This dualism, like the Aristotelian dualism of intelligential act and subordinate animal consciousness that characterises Satan's intrusion into the serpent, is present in the falling and fallen soul, rather than the perfect *anatomia animata* of unfallen paradise. The fragmenting and corrupted soul in *Paradise Lost* borrows from the warring, Pauline model elaborated in particular by Willis, and the physiology of the Fall itself matches the medical processes of the putrid, corrupting ferment that was already leading away from the orthodox Galenic notion of disease as

⁴⁹⁴ Martin, 'Milton, Pascale and the Theology of Relative Space', 52.

imbalance and towards the concept of infection by an outside agent. Healing in both vitalist physic and mechanist physic retains, however, primary religious determinants; the replenishment of higher orders of spirit act to reinstitute healthy sublimation in the blood, just as the descent of angelic spirits, the Son and prevenient grace initiate regeneration in the fallen humans of *Paradise Lost*.

Perhaps the most urgent contemporary question that could be asked of Milton's natural philosophy of the body and soul is that of the religious significance of vital matter, and Milton's work does contain answers and solutions to such questions. The notion that matter is vital causes an epistemological shift. Matter, rather than suffering ontological deprivation, is prior to form, it is perpetual and self-existent; it has an intrinsic causal power that gives rise to form, and that power has its own, self-determining teleological force. Commentators such as Cudworth argue that this envisioning of matter precludes any necessity for God's intervention; all the traditional acts of the divine are already attributed to corruptible, changeable matter, and thus ultimately to nothing at all. However, as Fallon has shown, Milton's materialism functions within an Augustinian paradigm in which evil lies in the reduction of ontological status, and materiality and the material are in positive opposition to this lack, reduction and ultimate corruption. What Milton's peculiarly medical version of vitalism does, is to take just such a heretical model of matter and place it within a theological system in which the power of that matter originates with God and continues to urge towards its own highest possible perfection unless corrupted by the free will of another agent. This vital matter shares the active attributes of a version of the iatro-mechanist corpuscular theory of matter, which likewise stems from chymical theory. Like Boyle and like Locke, Milton sees no reason to limit the power of God to imbue matter with life and intention; unlike them, he proposes that God did so. Balancing this voluntarist position, however, Milton places matter in the same liminal, paradoxical position as light, spirit and human agency: animate, but simultaneously subject to the terrible goodness of God.

As critics like Schwarz and Rogers point out, Milton does not solve the problem of evil. What his poem does do, however, is use a delicate and complementary fusion of discourses to represent the intrinsic paradoxes of free will, determinism and the origin of evil as literally encoded into all levels of being. Thus matter, spirit, light and bodily fluid all act with some level of autonomy and intrinsic creative power, but

they, like the free human beings that they constitute, do not set the terms of the paradigm in which they work, and thus they do not control the final consequences of their activity. All that has ontological presence has some degree of agency, but the ultimate order (both moral and – crucially – natural) is set from the beginning by God. Thus there is freedom to slide further away from God, down the scale of nature, refusing spiritual assimilation into higher orders of being

For traditional theology, to be in hell is to fall out of the hands of God by deliberately spurning his love... In this sense, hell is the most florid compliment to human freedom one could imagine. If one can even reject the blandishments of one's Creator, one must be powerful indeed. But... there can be no life outside God, who is the source of all vitality... a terrorist of love, whose implacable forgiveness is bound to seem like an intolerable affront to those who cannot let go of themselves.⁴⁹⁵

Satan's claim to autonomy rests upon his claim to be self-caused, and thus denies the implacable forgiveness of God because it denies God as Creator. The ontological autonomy claimed by Milton for intelligences of heaven, humans and vital matter itself relies not upon self-creation, but upon the liberty to transform or destroy oneself, to accept life on God's terms or to reject it in favour of a static and fantasmatic power. The self-determination of a material body-soul composite, generated out of vital matter and spirit, does not preclude the causal agency of divinity because, as we have seen in chapter four, the generation of the visible world is clearly the result of God's efficient causality. The origin of life is securely sited in the commands of the Creation, but once the visible world is constituted, it has intrinsic power to generate, multiply and metamorphose. The fundamental differential between spirit and matter turns out to be fictitious, although it is a mark of the entrenchment of dualist thought that even monist writers continue to make a convenient verbal expression in talking about causality and creation. Once we have explored the medical sources and systems of vital matter that were available to Milton and that are congruent with and supportive of his theodicy of free will, there are then deeper layers of coherence to be found within the poem itself as a work of art.

⁴⁹⁵ Terry Eagleton, *On Evil* (London: Yale University Press, 2010), 24-5.

Bibliography

Primary Sources

ARISTOTLE. *Physics*. Ed. D. Bostock and R. Waterfield. Oxford: Oxford University Press, 2008.

BALEY, WALTER. *Two treatises concerning the preservation of eie-sight. The first written by Doctor Baily sometimes of Oxford: the other collected out of those two famous phisicians Fernelius and Riolanus*. London, 1616.

BAXTER, RICHARD. *Of the immortality of mans soul, and the nature of it and other spirits* London, 1682.

BOEHME, JACOB. *Forty Questions of the Soul concerning its Original, Essence, Substance, Nature or Quality, and Property*. Trans. John Sparrow. London, 1663.

Bibliotheca Medica, Viri Clarissimi Nathanis Paget, M. D. London, 1681.

BOYLE, ROBERT. *The Sceptical Chymist*. [1661] New York: Dover, 2003.

---. *A Free Enquiry into the Vulgarly Received Notion of Nature*. Ed. E. B. Davis and Michael Hunter. Cambridge: Cambridge University Press, 1996.

BROWNE, THOMAS. *Religio Medici*. London, 1642.

BURTON, ROBERT, 1652 *Anatomy of Melancholy*.
<http://www.psypexus.com/burton/6.htm> [16/03/08].

CALVIN, JOHN. *Psychopannychia: Or, the Soul's Imaginary Sleep between Death and Judgement*, in *Tracts on the Council of Trent*. [1534] Trans. Henry Beveridge. Edinburgh: The Calvin Translation Society, 1851, 413-490.

CASTLE, GEORGE. *The Chymical Galenist: A Treatise, wherein the Prectise of the Ancients is Reconcil'd to the New Discoveries in the Theory of Physick*. London, 1667.

CHARLETON, WALTER. *Physiologia Epicuro-Gassendo-Charltoniana: Or a Fabrick of Science Natural, upon the Hypothesis of Atoms*. London, 1654.

---. *Natural History of Nutrition, Life, and Voluntary Motion*. London, 1659.

---. *Natural History of the Passions*. London, 1674.

CUDWORTH, RALPH. *The True Intellectual System of the Universe: wherein all the Reason and Philosophy of Atheism is Confuted*. [1678] Whitefish: Kessinger Reprints, 2009.

NICHOLAS CULPEPER. *A physicall directory, or, A translation of the London dispensatory made by the Colledge of Physicians in London*. London, 1649.

GLANVILL, JOSEPH. *Lux orientalis, or, An enquiry into the opinion of the Eastern sages concerning the praeexistence of souls*. London, 1662.

GLISSON, FRANCIS. *A Treatise of the Rickets*. Trans. Philip Armin. London, 1651.

---. *Anatomia hepatis*. In *English Manuscripts of Francis Glisson: 1. From Anatomia hepatis (The Anatomy of the Liver) 1654*. Ed. A. Cunningham. Cambridge: Cambridge Wellcome Unit, 1993.

---. *Two Anatomical Lectures on the Stomach*. In *English Manuscripts of Francis Glisson 2. Lectures and other papers*. Ed. A. Cunningham. Cambridge: Wellcome Unit for the History of Medicine, 1998, 5-40.

---. *Six Anatomical Lectures*. In *English Manuscripts of Francis Glisson 2. Lectures and other papers*. Ed. A. Cunningham. Cambridge: Wellcome Unit for the History of Medicine, 1998, 41-180.

GREGORY OF NYSSA. *The Soul and the Resurrection*. Trans. Catharine P. Roth. New York: St. Vladimir's Seminary Press, 1993.

HARVEY, WILLIAM. *The Works of William Harvey: Physician to the King, Professor of Anatomy and Surgery to the College of Physicians* [1847]. Ed. R. Willis. Whitefish: Kessinger reprints 2009.

LOCKE, JOHN. *An Essay Concerning Human Understanding*. London, 1706.

MILTON, JOHN. *Paradise Lost*. Ed. Alastair Fowler. 2nd edn. Harlow: Longman, 1998.

---. *Complete Prose Works of John Milton*. 8 vols. Ed. Don M. Wolfe et al. New Haven: Yale University Press, 1953-1982.

MORE, HENRY. *The Immortality of the Soul, so farre forth as it is demonstrable from the Knowledge of Nature and the Light of Reason*. London, 1659.

---. 'Letter to a Learned Psychopyrist'. In *Saducismus Triumphatus: Or Full and Plain Evidence concerning Witches and Apparitions*. By Joseph Glanville. 2nd edn. London, 1682, 217-41.

---. *Annotations upon the two foregoing treatises, Lux orientalis, or, An enquiry into the opinion of the Eastern sages concerning the prae-existence of soul*. London, 1682.

NEDHAM, MARCHMONT. *Medela Medicinae, A Plea for the Free Profession, and a Renovation of the Art of Physic*. London, 1665.

OVERTON, RICHARD. *Mans Mortalitie*, London, 1644.

PHILALETHES, EUGENIUS. [THOMAS VAUGHAN]. *A brief natural history intermixed with variety of philosophical discourses and refutations of such vulgar errors as our modern authors have hitherto omitted*. London, 1669.

POWER, HENRY. *Experimental Philosophy, in Three Books: Containing New Microscopical, Mercurial, Magnetical Experiments*. London, 1664.

ROSS, ALEXANDER. *Medicus Medicatus: or the physicians religion cured, by a lenitive or gentle potion*. London, 1645.

---. *Arcana microcosmi*. London, 1652.

STUBBE, HENRY. *The Plus Ultra Reduced to A Non Plus; Or, A Specimen of Some Animadversions upon the Plus Ultra of Mr. Glanvill*. London, 1670.

VAN HELMONT, JOAN BAPTISTA. *Oriatrike, or, Physick refined. The common errors therein refuted, and the whole art reformed & rectified: being a new rise and progress of phylosophy and medicine for the destruction of diseases and prolongation of life*. London, 1662.

WEBSTER, JOHN. *The displaying of supposed witchcraft*. London, 1677

WILLIS, THOMAS. *Two discourses concerning the soul of brutes which is that of the vital and sensitive of man*. Trans. S. Pordage. London, 1683.

---. *The Ascension of the Blood*, in *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*. Trans. S. Pordage. London, 1684.

---. *Of Feavers* in *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*. Trans. S. Pordage. London, 1684.

---. *Of Fermentation*, in *Dr. Willis's practice of physick being the whole works of that renowned and famous physician*. Trans. S. Pordage. London, 1684.

Secondary Sources

- ABRAHAM, LYNDY. 'Milton's *Paradise Lost* and "The Sounding Alchymie."' *Renaissance Studies* 12. 2 (1998), 261-276.
- ALEXANDER, H. G. (Ed.) *The Leibniz-Clarke Correspondence*. Manchester: Manchester University Press, 1956.
- BALME, D. M. 'Human is Generated by Human'. In *The Human Embryo: Aristotle and the Arabic and European Traditions*. Ed. G. R. Dunstan. Exeter: University of Exeter Press, 1990, 20-31.
- BEMBROSE, STEPHEN. 'Come d'animal diveгна fante': the Animation of the Human Embryo in Dante'. In *The Human Embryo: Aristotle and the Arabic and European Traditions*. Ed. G.R. Dunstan. Exeter: University of Exeter Press, 1990, 123-135.
- BIANCHI, M. L. 1994. 'The Visible and the Invisible. From Alchemy to Paracelsus'. In *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*. Ed. P. Rattansi and A. Cleruzio. London: Kluwer, 1994, 17-50.
- BOOTH, EMILY. "A Subtle and Mysterious Machine": *The Medical World of Walter Charleton (1619-1707)*. Dordrecht: Springer, 2005.
- BROOKS-DAVIES, DOUGLAS. *The Mercurial Monarch: Magical Politics from Spenser to Pope*. Manchester: Manchester University Press, 1983.
- BURNS, NORMAN T. *Christian Mortalism from Tyndale to Milton*. Cambridge, MA: Harvard University Press, 1972.
- CATHOLIC ONLINE ENCYCLOPAEDIA.
<http://www.catholic.org/encyclopedia/view.php?id=5209> [09/04/10].
- CLARK, STUART. *Thinking with Demons: The Idea of Witchcraft in Early Modern Europe*. Oxford: Oxford University Press, 1997.
- CLERICUZIO, ANTONIO. 'From van Helmont to Boyle: A Study of the Transmission of Helmontian Chemical and Medical Theories in Seventeenth-Century England'. *British Journal for the History of Science* 26.3 (1993), 303-334.

---. 'The Internal Laboratory: The Chemical Reinterpretation of Medical Spirits in England (1650-1680)'. In *Alchemy and Chemistry in the 16th and 17th Centuries*. Ed. P. Rattansi and A. Clericuzio. London: Kluwer, 1994, 51-84.

COOK, HAROLD J. *Decline of the Old Medical Regime in Seventeenth-Century London*. Ithaca: Cornell University Press, 1986.

---. 'Institutional Structures and Personal Belief in the London College of Physicians'. In *Religio Medici: Medicine and Religion in Seventeenth-Century England*. Ed. O. P. Grell and A. Cunningham. Aldershot: Scolar, 1996, 91-114.

---. 'Body and Passions: Materialism and the Early Modern State'. *Osiris* 17 (2002), 25-48

---. 'The New Philosophy and Medicine in Seventeenth-Century England'. In *Reappraisals of the Scientific Revolution*. Ed. R. Westman and D. Lindberg. Cambridge: Cambridge University Press, 1991, 397-436.

DANIELSON, DENNIS. *Milton's Good God: A Study in Literary Theodicy*. Cambridge: Cambridge University Press, 1982.

DARBISHIRE, HELEN, ed. *The Early Lives of Milton*. London: Constable & Co., 1932.

DEBUS, A. G. *The English Paracelsians*. London: Oldbourne, 1965.

---. *The Chemical Philosophy: Paracelsian Science and Medicine in the Sixteenth and Seventeenth Centuries*. 2 vols. New York: Dover, 2002.

DONNELLY, PHILLIP. "'Matter" versus Body: The Character of Milton's Monism'. *Milton Quarterly* 33.3 (1999), 79-85.

EAGLETON, TERRY. *On Evil*. London: Yale University Press, 2010.

EDWARDS, KAREN L. *Milton and the Natural World: Science and Poetry in Paradise Lost*. Cambridge: Cambridge University Press, 1999.

---. 'Raphael, Diodati'. In *Of Paradise and Light: Essays on Henry Vaughan and John Milton in Honor of Alan Rudrum*. Ed. D. Dickson and H. Nelson. Newark: University of Delaware Press, 2004, 123-141.

EMERTON, NORMA E. 'Creation in the Thought of J. B. Van Helmon and Robert Fludd'. In *Alchemy and Chemistry in the Sixteenth and Seventeenth Centuries*. Ed. P. Rattansi and A. Clercuzio. London: Kluwer, 1994.

- FALLON, STEPHEN. *Milton Among the Philosophers: Poetry and Materialism in Seventeenth-Century England*. Ithaca: Cornell University Press, 1991.
- FISCH, HAROLD. *Jerusalem and Albion: The Hebraic Factor in Seventeenth-Century Literature*. London: Routledge, 1964.
- FORMAN, VALERIE. 'Transformations of Value and the Production of "Investment" in the Early History of the East India Company'. *Journal of Medieval and Early Modern Studies* 34.3 (2004), 611-64.
- FRENCH, ROGER. *William Harvey's Natural Philosophy*. Cambridge: Cambridge University Press, 1994.
- FREUDENTHAL, GAD. *Aristotle's Theory of Material Substance: Heat and Pneuma, Form and Soul*. Oxford: Clarendon, 1999.
- GARRET, BRIAN. 'Vitalism and Teleology in the Natural Philosophy of Nehemiah Grew (1641-1712)'. *British Journal for the History of Science* 36. 1 (2003), 63-81.
- GIGLIONI, GUIDO. 'The Genesis of Francis Glisson's Philosophy of Life'. Ph.D. thesis. John Hopkins University, 2002.
- 1996. 'Anatomist Atheist? The "Hylozoistic" Foundations of Francis Glisson's Anatomical Research'. In *Religio Medici: Medicine and Religion in Seventeenth-Century England*. Ed. O. P. Grell and A. Cunningham. Aldershot: Scolar Press, 115-135.
- GREENBLATT, STEPHEN. *Shakespearean Negotiations: The Circulation of Social Energy in Renaissance England*. Berkeley: University of California Press, 1989.
- GREGERSON, LINDA. 'Anatomising Death'. In *Imagining Death in Spenser and Milton*. Ed. E. Bellamy, P. Cheney and M. Schoenfeldt. Basingstoke: Palgrave, 2003, 95-115.
- GUERLAC, HENRY. 'The Poets' Nitre'. *Isis* 45.3 (1954), 243-255.
- HANFORD, JAMES H. 'Milton Forswears Physic'. *Bulletin of the Medical Library Association* 32.1 (1944), 23-34.
- . 'Dr. Paget's Library'. *Bulletin of the Medical Library Association* 33.1 (1945), 90-99.
- HART, F. D. 'William Harvey and his Gout'. *Annals of the Rheumatic Diseases* 43 (1984), 125-127.

HENRY, JOHN. 'Occult Qualities and the Experimental Philosophy: Active Principles in Pre-Newtonian Matter Theory'. *History of Science* 24 (1986), 335-381.

---. 'Medicine and Pneumatology: Henry More, Richard Baxter and Francis Glisson's Treatise on the Energetic Nature of Substance'. *Medical History* 31 (1987), 15-40.

---. 'The Matter of Souls: Medical Theory and Theology in Seventeenth-Century England'. In *The Medical Revolution of the Seventeenth Century*. Ed. French and Wear. Cambridge: Cambridge University Press, 1989, 87-113.

---. 'Boyle and Cosmical Qualities'. In *Robert Boyle Reconsidered*. Ed. M. Hunter. Cambridge: Cambridge University Press, 1994, 119-38.

HAWES, JOAN. 'Newton's Revival of the Aether Hypothesis and the Explanation of Gravitational Attraction'. *Notes and Records of the Royal Society of London*, 23.2 (1968), 200-212.

HASKIN, DAYTON. *Milton's Burden of Interpretation*. Philadelphia: University of Pennsylvania Press, 1994.

HILL, CHRISTOPHER. 'William Harvey and the Idea of Monarchy'. *Past and Present* No. 27 (April, 1964), 54-72.

---. *Milton and the English Revolution*. London: Faber & Faber, 1977.

---. *Intellectual Origins of the English Revolution Revisited*. Oxford: Clarendon, 1997.

HILLAR, MARIAN. 'The Problem of the Soul in Aristotle's *De Anima*'. In *Contributors to the Philosophy of Humanism*. Ed. M. Hillar and F. Prahl. Houston: Humanists of Houston, 1994, 51-82.

HUBY, PAMELA, 1990. 'Soul, Life, Intellect: Some Thirteenth Century Problems'. In *The Human Embryo: Aristotle and the Arabic and European Traditions*. Ed. G. R. Dunstan. Exeter: University of Exeter Press, 1990, 113-157.

HUNTER, MICHAEL. 'Science and Heterodoxy: An Early Modern Problem Reconsidered'. In *Reappraisals of the Scientific Revolution*. Ed. R. Westman and D. Lindberg. Cambridge: Cambridge University Press, 1990, 437-460.

HUNTER, WILLIAM B. 'Milton's Power of Matter'. *Journal of the History of Ideas*. 13.4 (1952), 551-562.

HUTTON, SARAH. 'Of Physic and Philosophy: Anne Conway, F.M. Van Helmont and Seventeenth-Century Medicine'. In *Religio Medici: Medicine and Religion in*

Seventeenth-Century England. Ed. O. P. Grell and A. Cunningham. Aldershot: Scolar Press, 1996, 228-246.

JEWISH ENCYCLOPEDIA.

<http://www.jewishencyclopedia.com/view.jsp?letter=A&artid=2101> [30.12.08].

JOHNSON, MONTE RANSOME. *Aristotle on Teleology*. Oxford: Oxford University Press, 2005.

KERRIGAN, WILLIAM. *The Sacred Complex: On the Psychogenesis of Paradise Lost*. London: Harvard University Press, 1983.

KIRKUP, JOHN. *The Evolution of Surgical Instruments*. San Francisco: Norman Publishing, 2006.

KNOX, DILWYN. 'Ficino and Corpernicus'. In *Marsilio Ficino: His Theology, His Philosophy, His Legacy*. Ed. Michael J. B. Allen, Valerie Rees. Leiden: Brill, 2002, 399-418.

LARSON, MARTIN A. 'Milton and Servetus: A Study in the Sources of Milton's Theology'. *PMLA* 41.4 (1926), 891-934.

LEWALSKI, BARBARA. *The Life of John Milton*. Oxford: Blackwell, 2003.

LIEB, MICHAEL. *Dialectics of Creation: Patterns of Birth and Regeneration in Paradise Lost*. Amherst: University of Massachusetts Press, 1970.

---. *The Sinews of Ulysses: Form and Convention in Milton's Works*. Pittsburgh: Duquesne University Press, 1989.

---. 'Milton and the Metaphysics of Form'. *Studies in Philology* 71 (1974), 206-24.

LINDEN, STANTON J. "By Gradual Scale Sublim'd": Jean D'Espagnet and the Ontological Tree in *Paradise Lost* Book V'. *Journal of the History of Ideas* 52. 4 (1991), 603-615.

MCCOLLEY, DIANE KELSEY. *Poetry and Ecology in the Age of Milton and Marvell*. Farnham: Ashgate, 2007.

MACDONALD, MICHAEL. 'Religion, Social Change and Psychological Healing in England 1600-1800'. In *The Church and Healing*. Ed. W. J. Shields. Studies in Church History. Oxford: The Ecclesiastical History Society, 1982.

MCDOWELL, NICHOLAS. 'Ideas of Creation in the Writings of Richard Overton the Leveller and *Paradise Lost*'. *Journal of the History of Ideas* 66.1 (2005), 59-78.

---. 'Dead Souls and Modern Minds? Mortalism and the Early Modern Imagination, from Marlowe to Milton'. *Journal of Medieval and Early Modern Studies* 40.3 (2010), 559-592.

MCKIE, DOUGLAS. 1953. 'Fire and the Flamma Vitalis: Boyle, Hooker and Mayow'. In *Science, Medicine and History*. 2 vols. Ed. E. A. Underwood. Oxford: Oxford University Press, 1953, 1: 469-88.

MADSEN, WILLIAM G. 'Earth the Shadow of Heaven: Typological Symbolism in *Paradise Lost*'. *PMLA* 75 (1960), 519-36.

MARJARA, HARINDA SINGH. *Contemplation of Created Things: Science in Paradise Lost*. London: University of Toronto Press, 1992.

MARTIN, CATHERINE GIMELLI. "'Boundless the Deep": Milton, Pascal, and the Theology of Relative Space'. *ELH* 63.1 (1996), 45-78.

---. "'Pregnant Causes Mixt": The Wages of Sin and the Laws of Entropy in Milton's Chaos'. In *Arenas of Conflict: Milton and the Unfettered Mind*. Ed. Kristin Pruitt, McColgan and Charles W. Durham. London: Associated University Presses, 1997, 161-182.

---. "'What If the Sun Be Centre to the World?": Milton's Epistemology, Cosmology, and Paradise of Fools Reconsidered'. *Modern Philology* 99.2 (2001), 231-265.

MATTISON, ANDREW. 'Sweet Imperfection: Milton and the Troubled Metaphor of Harmony'. *Modern Philology* 106.4 (2009), 617-647.

MENDELSON, J. ANDREW. 'Alchemy and Politics in England 1649-1665'. *Past & Present*, No. 135 (May, 1992), 30-78.

MILES, MARGARET R. 'Theology, Anthropology, and the Human Body in Calvin's "Institutes of the Christian Religion"'. *Harvard Theological Review* 74.3 (1981), 303-323.

MILNES WALKER, R. 'Francis Glisson and His Capsule'. *Annals of the Royal College of Surgeons of England* 38 (1966), 71-91.

NEWMAN, WILLIAM. *Promethean Ambitions: Alchemy and the Quest to Perfect Nature*. London: University of Chicago Press, 2004.

---. *Atoms and Alchemy: Chymistry and the Experimental Origins of the Scientific Revolution*. London: University of Chicago Press, 2006.

NORTON, MARY F. “‘The Rising World of Waters Dark and Deep’”: Chaos Theory and *Paradise Lost*. In *Arenas of Conflict: Milton and the Unfettered Mind*. Ed. Kristin Pruitt McColgan and Charles W. Durham. London: Associated University Presses, 1997, 140-160.

NUTTON, VIVIAN. ‘The Anatomy of the Soul in Early Renaissance Medicine’. In *The Human Embryo: Aristotle and the Arabic and European Traditions*. Ed. G. R. Dunstan. Exeter: University of Exeter Press, 1990.

O’CONNOR, JAMES P. ‘Thomas Willis and the Background to *Cerebri Anatome*’. *Journal of the Royal Society of Medicine* 96.3 (2003), 139-143.

O’MALLEY, CHARLES DONALD. *Michael Servetus*. London: American Philosophical Society, 1953.

OSLER, MARGARET J. ‘Descartes and Charleton on Nature and God’. *Journal of the History of Ideas* 40.3 (1979), 445-456.

---. ‘Providence and Divine Will in Gassendi’s Views on Scientific Knowledge’. *Journal of the History of Ideas* 44.4 (1983), 549-560.

---. ‘Baptizing Epicurean Atomism: Pierre Gassendi on the Immortality of the Soul’. In *Religion, Science and Worldview*. Cambridge: Cambridge University Press, 1985, 163-83.

PAGEL, WALTER. ‘The Reaction to Aristotle in Seventeenth-Century Biological Thought’. In *Science, Medicine and History: Essays on the Evolution of Scientific Thought and Medical Practice Written in Honour of Charles Singer*. 2 vols. Ed. E. A. Underwood. Oxford: Oxford University Press, 1953, 1: 489-509.

---. ‘Medieval and Renaissance Contributions to Knowledge of the Brain and its Functions’. In *The History of the Brain and its Functions*. Ed. F. N. L. Pointer. Oxford: Oxford University Press, 1958, 95-114.

---. *Paracelsus: Introduction to Philosophical Medicine in the Era of the Renaissance*. 2nd edn. Basel: Karger, 1982.

---. *Joan Baptista Van Helmont: Reformer of Science and Medicine*. Cambridge: Cambridge University Press, 2002.

PARKER, WILLIAM RILEY. *John Milton: A Biography*. 2 vols. Oxford: Clarendon, 1968.

PASTER, GAIL KERN. ‘Nervous Tension: Networks of Blood and Spirit in the Early Modern Body’. In *The Body in Parts: Fantasies of Corporeality in Early Modern Europe*. Ed. D. Hillman and C. Mazzio. London: Routledge, 1997, 107-125.

- QUINT, DAVID. 'Fear of Falling: Icarus, Phaethon, and Lucretius in *Paradise Lost*'. *Renaissance Quarterly* 57.3 (2004), 847-881.
- RADZINOWICZ, MARY ANNE. *Towards Samson Agonistes: The Growth of Milton's Mind*. New Jersey: Princeton University Press, 1978.
- RAJAN, BALACHANDRA. *Milton and the Climates of Reading*. London: University of Toronto Press, 2007.
- RAYMOND, JOAD. "'With the tongues of angels": Angelic Conversations in *Paradise Lost* and Seventeenth Century England'. In *Angels in the Early Modern World*. Ed. P. Marshall and A. Walsham. Cambridge: Cambridge University Press, 2006, 256-281.
- . *Milton's Angels: The Early-Modern Imagination*. Oxford: Oxford University Press, 2010.
- REES, GRAHAM. 'Matter Theory: A Unifying Factor in Bacon's Natural Philosophy?' *Ambix* 24 (1977), 110-25.
- RICKS, CHRISTOPHER. *Milton's Grand Style*. Oxford: Oxford University Press, 1963.
- ROGERS, JOHN. *The Matter of Revolution: Science, Poetry and Politics in the Age of Milton*. Ithaca: Cornell University Press, 1996.
- RUMRICH, JOHN. *Matter of Glory: A New Preface to Paradise Lost*. London: University of Pittsburgh Press, 1987.
- . 'Uninventing Milton'. *Modern Philology* 87.3 (1990), 249-265.
- . *Milton Unbound: Controversy and Reinterpretation*. Cambridge: Cambridge University Press, 1996.
- RUMRICH, JOHN, and CATHERINE GIMELLI MARTIN. 'Milton's Chaos'. *PMLA* 111.3 (1996), 468-470.
- SARGENT, ROSE-MARY. *The Diffident Naturalist: Robert Boyle and the Philosophy of Experiment*. London: University of Chicago Press, 1995.
- SAWDAY, JONATHAN. *The Body Emblazoned. Dissection and the Human Body in Renaissance Culture*. London: Routledge, 1995.

SCHOENFELDT, MICHAEL. *Bodies and Selves in Early Modern England: Physiology and Inwardness in Spenser, Shakespeare, Herbert and Milton*. Cambridge: Cambridge University Press, 1999.

----. 'Fables of the Belly in Early Modern England'. In *The Body in Parts: Fantasies of Corporeality in Early Modern Europe*. Ed. D. Hillman and C. Mazzio. London: Routledge, 1997, 243-262.

SCHWARTZ, LOUIS. "'Conscious Terrors": Seventeenth-Century Obstetrics and Milton's Allegory of Common Sin in *Paradise Lost*, Book 2'. In *Arenas of Conflict: Milton and the Unfettered Mind*. Ed. Kristin Pruitt McColgan and Charles W. Durham. London: Associated University Presses, 1997, 212-226.

SCHWARTZ, REGINA. *Remembering and Repeating: On Milton's Theology and Poetics*. London: University of Chicago Press, 1988.

SHAPIN, STEPHEN, and SIMON SCHAFFER. *Leviathan and the Air Pump: Hobbes, Boyle and the Experimental Life*. Princeton: Princeton University Press, 1985.

SHAPIN, STEVEN. 'Descartes the Doctor: Rationalism and Its Therapies'. *British Journal for the History of Science* 33.2 (2000), 131-154.

SHIELDS, CHRISTOPHER. Review of Gad Freudenthal, *Aristotle's Theory of Material Substance*. *The Philosophical Review* 106.4 (1997), 632-635.

SORESBY, ARNOLD. 'The Nature of Milton's Blindness'. *British Journal of Ophthalmology* 14.7 (1930), 339-354.

STEADMAN, JOHN M. 'Man's First Disobedience: The Causal Structure of the Fall'. *Journal of the History of Ideas* 21 (1960), 180-97.

---. 'Faithful Champion: The Theological Basis of Milton's Hero of Faith' in *Anglia* 77 (1959), 12-28.

SUMMERS, JOSEPH. 'The Two Great Sexes in *Paradise Lost*'. *Studies in English Literature 1500-1900* 2.1 (1962), 1-26.

SVENDSEN, KESTER. *Milton and Science*. Cambridge, Mass.: Harvard University Press, 1956.

THOMSON, ANN. *Bodies of Thought: Science, Religion and the Soul in the Early Enlightenment*. Oxford: Oxford University Press, 2008.

THOMPSON, IAN J. 'The Nature of Substance'. *Cogito* 2 (1988), 17-19.

UNDERDOWN, DAVID. *Pride's Purge: Politics in the Puritan Revolution*. London: George Allen & Unwin, 1985.

WALKER, DANIEL. P. 'The Astral Body in Renaissance Medicine'. *Journal of the Warburg and Courtauld Institutes* 21 (1958), 119-33.

---. *The Decline of Hell: Seventeenth-Century Discussions of Eternal Torment*. London: Routledge, 1964.

---. 'Francis Bacon and Spiritus'. In *Science, Medicine and Society in the Renaissance*. 2 vols. Ed. A. G. Debus. London: Heineman, 1972, 2: 121-30.

---. *Unclean Spirits: Possession and Exorcism in France and England in the Late Sixteenth and Early Seventeenth Centuries*. Philadelphia: University of Pennsylvania Press, 1981.

---. 'Medical Spirits in Philosophy and Theology from Ficino to Newton'. In *Music, Spirit and Language in the Renaissance*. Ed. Penelope Gouk. London: Variorum Reprints, 1985, 263-292.

WEBSTER, CHARLES. *The Great Instauration: Science, Medicine and Reform 1626-1660*. New York: Holmes & Meier, 1976.

---. *From Paracelsus to Newton: Magic and the Making of Modern Science*. Cambridge: Cambridge University Press, 1982.

WHITE, MICHAEL. *Isaac Newton: The Last Sorcerer*. London: Fourth Estate, 1997.

WOOLHOUSE, R. S. *Descartes, Spinoza, Leibniz: The Concept of Substance in Seventeenth-Century Metaphysics*. London: Routledge, 1993.

WRIGHT, JOHN P. 'Hysteria and Mechanical Man'. *Journal of the History of Ideas* 41.2 (1980), 233-247.

YOLTON, JOHN W. *Thinking Matter: Materialism in Eighteenth-Century Britain*. Oxford: Blackwell, 1984.