Anatomy as a Science of Teleology: The Case of William Harvey

What do we mean when we describe the discoverer of the circulation, William Harvey, as an *anatomist*? A modern physician would interpret his work as physiology, but this will not do for the historian. Instead, Harvey's work must be understood as an investigation into *the teleological union of soul and body*, an inquiry into *'what is common to body and soul*,' as Aristotle describes his approach in *De sensu*.[1] R.A.H. King notes that this latter phrase,

> …refers to a central group of problems in ancient philosophical psychology, including not merely interaction between soul and body, but parallelism and teleological or functional relations. Furthermore, it marks the point where philosophy and more empirically minded approaches meet, including both those of Aristotle in *Parva Naturalia* and of medical writers.[2]

And what is soul in this tradition? James Lennox usefully summarizes it as a, "…set of goal-oriented capacities—nutritive, reproductive, locomotive, and cognitive;"[3] it is a fundamentally teleological concept. Though historians and philosophers from Walter Pagel on have noted that Harvey was a lifelong thinker about purpose,[4] what this means has not yet been fully interpreted. In this essay, I trace the development of these ideas in relation to Harvey's anatomy.

1. Body and Soul in Aristotle

[1] I cite and quote from the edition of Aristotle Harvey most likely used. Aristotle, *De sensu et sensibilibus*, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Vol. 5 (Venice, 1552), Cap.1. See: Pierre-Marie Morel, "'Common to Soul and Body' in the *Parva Naturalia*," In: *Common to Body and Soul*, Ed. R.A.H. King, (New York: Walter de Gruyter, 2006), 121-122.
[2] R.A.H. King, "Introduction," In: *Common to Body and Soul,* (New York: Walter de Gruyter, 2006), 3.
[3] James Lennox, "Matter, Form, Kind (Introduction to Part II)," In: *Aristotle's Philosophy of Biology* (Cambridge: Cambridge University Press, 2001), 128. Cf. Pierre Pellegrin, *La Classification des animaux chez Aristote: statut de la biologie et unite de l'arisotelisme*, (Paris: Pellegrin 1987).
[4] Walter Pagel, *William Harvey's Biological Ideas*, (Basel: S Karger, 1967), 25, 211.

For Aristotle, soul was the *principle of life.*[5] As noted above, it consisted of a number of goal-oriented capacities that allow for the different life functions necessary for a creature's existence, and Aristotle argued that souls were effectively 'enmattered structures.' That is, because affections of soul like anger always affect a particular part of the body (e.g., one's heart beats faster),[6] the soul must be ontologically inseparable from that body. Mariska Leunissen summarizes: "Form and matter cannot be separated in a definition of the affections of the soul, because if the affection is to be what it is, it needs to be realized in a particular kind of body…."[7] Aristotle's basic assumption was the teleological one that the body is for the sake of the soul: "…living beings have the kind of bodies and bodily parts they have *for the sake of* performing all their characteristic life functions."[8] Note the distinctive language of 'being for the sake of' which Aristotle used to describe the relation between a part and its function. This terminology of 'that for the sake of which' is the most literal translation of Aristotle's *to hou heneka,* what becomes known as the final cause.

Aristotle argued that in order to understand why a natural object comes into existence and exists the way that it does, one must understand the end towards which that thing acts.[9] It was obvious to Aristotle that natural change was purposeful when not interrupted: all natural objects act for the sake of something.[10] For Aristotle, the final cause was essential in accounting for the regularity and harmony of natural things, a prime example of which were the parts of animals:

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[5] Jan Bremmer, The *Early Greek Concept of the Soul* (Princeton: Princeton University Press, 1983). See also: Burnet, John, "The Socratic doctrine of the soul*," Proceedings of the British Academ*y 7 (1916), 235–259.
[6] With the exception of the organ for the faculty of reason.
[7] Leunissen, Mariska, *Explanation and Teleology in Aristotle's Science of Nature,* (Cambridge: Cambridge University Press, 2010), 52. My understanding of Aristotle's teleology is greatly indebted to Leunissen's work, as well as the work of, and conversations with, James Lennox and late, great, and greatly missed, Allen Gotthelf.
[8] Leunissen, *Explanation,* 53.
[9] Aristotle's most general defense of final causality is *Physica,* Lib.II, Cap.3 (pars secunda), In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Volume 4, (Venice, 1552), 36. Modern editions have this as *Physics* II.8.
[10] For instance, see Aristotle, *De partibus animalium,* Lib.I, Cap.1, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6, (Venice, 1552), 63v.

they come to be in certain regular ways, and their material natures are constructed in order to serve the harmonious functioning of the organism. Indeed, it is essential to understanding Aristotle's account of the final cause to understand that an end of this sort must be *for the good*: not all things that come last are truly ends.[11]

In book two of *De anima,* Aristotle argued that soul was the first actuality of a natural body having life potentially in it, when that body was instrumental or organic (that is, divided into functional parts). Let's unpack these notions. As Aristotle defined it, the first actuality of the body was a sort of potentiality. It was a capacity to do those things that are characteristic of living things: growing, moving, perceiving, etc. A first actuality would be, to use a common example, an adult who can speak (or understand) Urdu but who is currently silent. The second actuality would be an adult who is currently speaking Urdu (or understanding it). Meanwhile, the first potentiality would be a child who can speak no Urdu at all, but who could, in time, acquire the ability to do so. In a biological context, Aristotle wrote that if an eye were an animal, the soul of the eye would be seeing. In other words, the actuality (activity) of the eye would be sight, and thus the eye would have the power (potentiality, capacity) to see, though sometimes, when asleep for instance, this power is not activated.

Further, soul is related to substance and essence; it is the

> …substance [of the body] according to its definition [*rationem*]: moreover this is the essence [*quod quid erat esse*] of such a kind of body, just as if some instrument, like an axe, were a natural body: namely, this is the essence of the axe [*erat quidem enim dolabrae esse*], its very substance, and this soul having been separated from it, it would no longer be an axe, but rather only so equivocally...[12]

[11] Aristotle, *Physica,* Lib.II, Cap.3 (pars prima), 27-27v. Modern editions have this as *Physics* II.2.
[12] Aristotle, *De anima,* Lib.II, Cap.1, Volume 11, (Venice, 1552) 52. Note that '*quod quid erat esse*' and the shortened '*erat esse'* is the translation of '*to ti en einai*,' for which Latin translators invented the neologism of '*essentia*.' All translations are my own unless otherwise noted.

The soul, then, is what makes a living animal what it is, it is the substance of the body of the animal *qua logos*, its essence. Soul is the *form* of a living body; it is the formal nature of and source of change in the body: an animal without soul would no longer be able to perform its characteristic functions, and would not be the sort of creature it is.[13] In this way the soul is a principle of individuation, insofar as different sorts of living creatures are coextensive with different kinds of souls.[14] Of prime importance is the term *ratio,* meaning definition or account. The term reinforces the Aristotelian doctrine that what something *is,* is what it *does*: essence, definition, and function are tightly bound together, metaphysically and methodologically.

Aristotle's *Meteorology* also puts together definition, function, and essence.[15] *Meteorology* IV.12 puts function and form together in the specific case of the homogenous parts of animals:

> The homogenous parts are made from the same elements, and all works of nature are made from these as matter. All these bodies so described, as from matter, are [determined] according to their substance, their definition [*rationem*]. This is always clearer in those posterior things, and in whatsoever is like an instrument and is for the sake of something. It is most clear that a dead man is only equivocally a man. Thus a dead hand is said equivocally just as stone flutes might still be called flutes, for these seem to be instruments of some kind.[16]

Aristotle added that, "Moreover, everything is determined by its work [*opere*]: everything is itself when it can perform its function [*opus*]; an eye, for instance, when it can see."[17] For Aristotle, one thus understands a part when one knows its function. What something is, is what it

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[13] See also Aquinas, *Quaestiones Disputatae de Potentia Dei*, Q.III.9.
[14] C.f. Leunissen, *Explanation,* 51. This also comes out clearly in the first chapter of Galen's *De natura facultatibus*.
[15] This work was important for Renaissance physicians. Martin, Craig, "Francisco Valles and the Renaissance Reinterpretation of Aristotle's *Meteorologica* IV as a Medical Text," *Early Science and Medicine* 7.1 (2002).
[16] Aristotle, *Meteorologicorum*, Lib.IV, Cap.12, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Vol. 5, (Venice, 1552) 222.
[17] Aristotle, *Meteorologicorum,* Lib.IV, Cap.12, 223. Though it is not perhaps obvious, function is the best translation here for 'opere,' as 'work' was used, especially by physicians, to denote the product of a function and thus often used to denote the function itself. Harvey explicitly uses 'opere' in this way, for which see Harvey's *Prelectiones anatomie universalis,* ed. Gweneth Whittereidge (London: Royal College of Physicians, 1964 [1616-1627], 22. I cite from Whitteridge's edition for easy reference, but my translations and transcriptions of the notes stem from the original manuscript, found in the British Library (Sloane MS230a).

does—for this reason a dead man is not truly a man, in the same way that a stone flute, since it cannot be played, is not truly a flute. One can then explain that thing by making reference to its essence (its soul), for this accounts for its nature, including why it has the parts it has.

Where, in all of this soul-business, does anatomy enter? This is a difficult question to answer. Aristotle never directly discussed anatomy, though he did make numerous references to dissections, especially in the *Historia animalium,* where it is clear that he performed or witnessed them.[18] He noted there that the internal parts of mankind being unknown, one must look to similar animals in dissection to understand them, a line which Harvey quotes at the beginning of his lecture notes.[19] But the relation between Aristotle's concept of the soul and anatomy is found, not in anything he wrote about it, but rather in how his conception of soul shaped his and later conceptions of the appropriate method for investigation. While while Aristotle's account of soul and body was not specifically medical or anatomical, it was eminently suitable for such. Anatomy, on an Aristotelian model, must be understood as an investigation into those things *common to body and soul*: an attempt to define unities of form and matter, function and structure.

2. Body and Soul in Galen

Galen, following Herophilus and the Stoics, sometimes distinguished between soul and nature. The natural faculties were those activities common to animals and plants, namely growth and nutrition, what Aristotle called vegetative soul. [20] The faculties of soul properly speaking were restricted to those creatures possessing sensation and voluntary movement. However, over the course of his long career, Galen expressed his opinion on the soul in several different ways,

[18] For modern citations see: *De partibus animalium* II.7, III.4, III.5, IV.5 and *Historia animalium.* I.17. My thinking on these issues has benefited greatly from many discussions with James Lennox.
[19] Aristotle, *Historia animalium*, Lib.I, Cap.16, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Vol. 6, (Venice, 1552), 4v. Note that Harvey's quote does not quite match the original.
[20] Plato thought plants had souls; see: Plato, *Timaeus,* 77b.

and didn't always respect this distinction.[21] In fact, he says in *De propriis placitis* that he adapts his terminology based upon his audience: with philosophers he uses 'soul,' with physicians, 'nature.'[22]

For Galen, as for Aristotle, understanding soul requires understanding body, for here too body and soul are *unities*. The nature of the body is the foundational principle of medicine, understood so as to include both formal and material natures.[23] In a work of importance to Harvey and Renaissance physicians, *De usu partium*, Galen expresses a conception of soul very close to Aristotle's, in which the body is seen as the instrument of the soul: "The usefulness of all of them [the parts of the body] is of the soul. For the body is the instrument of the soul, and for this reason animals differ greatly from one another in respect to their parts because their souls also differ."[24] Here, as in Aristotle, the body is for the sake of the soul—teleology undergirds the system for understanding the body. Further, the soul is again a principle of individuation, and, as in Aristotle, instrumentality is central to understanding the relation between body and soul. Soul is here too the substantial being of the body.[25] Indeed, Galen praises Aristotle in the *De placitis Hippocratis et Platonis* for having argued that the substance, the 'being,' of the eye is *seeing*.[26]. Thus for Galen also, essence, definition, and function are linked. Galen thus argues that the proper starting place for natural philosophical investigations into animal bodies should be

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[21] I here cite the edition of Galen Harvey most likely consulted early in his career. See Galen, *De usu partium* Lib.IV, Cap.13, In: *Galeni Peragameni…opera quae nos extant omnia*, Vol. 1, (Basle, 1549) 520; and *In Hippocratis de Morbis Vulgaribus,* Lib.I, Cap.17, Vol.2 (Basle, 1549), 395.

[22] See: Galen, *De propriis placitis* (=*De sentiis*), III.3; this work is not contained in the 1549 edition of Galen. For the strange and interesting history of this work, see Vivian Nutton's translation, *On My Own Opinions*, Corpus Medicorum Graecorum 5.3.2. Galeni De Propriis Placitis (Berlin: Akademie Verlag, 1999); see also Pierluigi Donni, "Psychology," In: *Cambridge Companion to Galen,* Ed. R.J. Hankinson, (Cambridge: Cambridge Unviersity Press, 2008), 184-185.

[23] Galen, *Si quis optimus medicus est eundem esse philosophum*, Lib. I, In: *Galeni Peragameni…opera quae nos extant omnia*, Vol. 0 (Basle, 1549) 20.

[24] Galen, *De usu*, Lib.I. Cap.II, Vol.1, 418. See also: Margaret May, *On the Usefulness of the Parts,* Bk.I, Ch.2, (Ithaca: Cornell University Press, 1968), 68n.4.

[25] See also Galen's *De institutio Logica*, where, in the course of giving examples of valid arguments, Galen argues for a variety of positions that an Aristotelian would find amenable, such as the soul being better than the body.

[26] Galen, *De Placitis*, Lib.I, Cap.8, Vol.1.

definitions of their essence, statements about their souls.[27] Definition is central to the task of anatomy.

Galen's *De placitis,* newly available to Western physicians in Humanist translations around the start of the sixteenth century, was of fundamental importance in the renewal of anatomical practices by Vesalius and others.[28] This work explicitly linked body, soul, and anatomy together in a way not found in Aristotle: Galen argued that anatomy was the *primary method* for investigating the souls of animals. Anatomy's use comes in revealing the true nature of the organization, structure, and activities of the parts of the animal body. In a late Galenic work,[29] body and soul are related in a complex, interdependent way,[30] and thus Galen emphasized both the way in which the soul organizes the body through its powers, and the ways in which the body constrains the capacities of the soul.

Towards the end of his career, Galen became increasingly convinced of the deficiency of every theory of the soul and the functionality of the body. As Vivian Nutton remarks,

> His agnosticism is not entirely a fudge, but the result of his ability to see weaknesses in almost every position, including his own. He was convinced of the superiority of a vitalist over a mechanical explanation of life, and he constantly reiterated his conclusion that anatomical dissection revealed that the brain, rather than the heart, was the seat of what might be termed consciousness and will, but he was equally convinced that this was not the whole story.[31]

Nutton's remarks point to an important feature of Galen's philosophy: not only did he disagree with his contemporaries on *where the faculties of soul were localized*, but, more importantly, he disagreed with them on *how to localize these faculties*. Thus more relevant than the fact that in

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[27] Ben Morrison "Logic," In: *The Cambridge Companion to Galen*, (Cambridge: Cambridge University Press, 2008), 109-111.
[28] It is also the source for some of Galen's views on the heart, arteries, and veins, as well as his experiments relevant to those parts. Harvey cites this work in *De motu cordis* Cap.V (Frankfurt, 1628), 31.
[29] Namely Galen, *Quod Animi Mores Corporis Temperamenta Sequuntur*, In: *Galeni Peragameni…opera quae nos extant omnia*, Vol. 1 (Basle, 1549), 1217.
[30] Von Staden, "Body, Soul and Nerves," 106.
[31] Vivian Nutton, "Embodiments of Will," *Perspectives in Biology and Medicine* 53.2 (2010), 277.

the *De placitis Hippocratis et Platonis* Galen came down on the side of Plato in arguing that the soul is tripartite,[32] was the fact that Galen followed Herophilus and Erasistratus and attempted to understand the soul and its union with the body *in light of dissection*.[33]

Galen's anatomical research thus proves to be about what is common to body and soul. And, indeed, this way of conceptualizing the subject matter of anatomy was Galen's considered opinion on the matter in *De placitis Hippocratis et Platonis*. As Teun Tieleman has argued, the first seven chapters of this work, "…can be read as an extended demonstration of scientific procedure as applied to issues concerning the soul…," complemented by the ninth chapter which concerns the proper methodology for such endeavors.[34] Tieleman notes that the first few chapters of the *De placitis* contain Galen's argument to the effect that, "…his experiments decided the issue [of the soul] in favor of Plato's tripartite theory…."[35] Anatomical dissection is thus the *primary mode for investigating soul*.

Galen was a serious student of Aristotle's works, and part of Galen's criticism of the Peripatetics is just that some of their views on the soul (e.g., their cardiocentrism) are refuted by means of their own doctrines and methodologies:

> For Aristotle and Praxagoras merit censorship when they pronounce that the heart is the origin of the nerves, which goes beyond the evidence. For one can come to know from the books which they left behind that made many close observations of things, but when they wrote about the source of the nerves, the were either blind or talking to blind men….[36]

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[32] Both Galen and Aristotle think that soul is what differentiates living from non-living things. However, Galen follows Plato in thinking that the soul is spatially divided into parts, and not as a unified soul with different powers or capacities, as Aristotle does. C.f. Teun Tieleman, *Galen and Chrysippus on the Soul* (New York: E.J. Brill, 1996), 24-26.

[33] Though important, I do not have space here to further discuss the influence of Herophilus, Erasistratus and the Stoics on Galen's conception of anatomy. See: Heinrich von Staden, *Herophilus: the Art of Medicine in Early Alexandria,* Cambridge (Cambridge University Press, 1989); and James Longrigg, "Anatomy in Alexandria in the Third Century B.C.," *British Journal for the History of Science* 21 (1988), 455-488.

[34] Teun Tieleman, "Methodology," In: *The Cambridge Companion to Galen* (Cambridge: Cambridge University Press, 2008), 49.

[35] Tieleman, *Galen and Chryssipus,* xii.

[36] Galen, *De placitis,* Lib.I, Cap.3 (Cap.6 in modern editions), 883. It is clear from the context that Galen is talking about anatomical observations. See also: Tieleman, *Galen and Chryssipus,* 5.

But, though some of his doctrines were under assault, Aristotle was not the main target in Galen's *De placitis Hippocratis et Platonis*, but rather the Stoic Chrysippus. In his debate with Chrysippus on the nature of the soul in *De placitis Hippocratis et Platonis*, Galen argued that Chrysippus' argument for the heart containing the ruling part of the soul is based upon the wrong sort of premises: they were not properly *scientific*. Thus his conclusion cannot follow from them. Aristotle, meanwhile, had the right *kind* of scientific premises, but did not, at least on this matter, do a good enough job in his anatomical research, and his scientific premises were false.[37]

In Galen, then, one sees the beginnings of a method in which research into the soul necessitated empirical research into the body, given the teleological soul-body union. It was this conception of the subject matter of anatomy that became central to certain Renaissance philosophers and physicians.

3. Body and Soul in the Renaissance

I now turn to examine Renaissance discussions of body and soul.. Over the course of the Renaissance, [38] there was a shift whereby the natural philosophical aspects of investigation into soul became separated from some more overtly theological and metaphysical of aspects. It was specifically what one might call the *organic* soul, those most basic vegetative and sensitive aspects belonging to all animals, with its emphasis on the *unity* of soul with its instrumental (organic) body, that became central to the projects of certain philosophers and physicians.

[37] For a similar point, see: R.J. Hankinson, "Body and Soul in Galen," In: *Common to Body and Soul*, Ed. R.A.H. King, (New York: Walter de Gruyter, 2006), 234.

[38] I skip over the Medieval Scholastic psychological tradition, because, while certainly important, the work of later Renaissance thinkers is more directly relevant for understanding Harvey, though do see the work of Dennis Des Chene on the Scholastic psychological tradition. Of course, one can overemphasize the differences between post-Humanist scholars and Scholastics, as, in many ways from terminology to interpretation, the difference was often more rhetorical than substantial.

I start by underlining that the importance of Aristotle's *De anima* in the philosophical curriculum was clear not only to Scholastic Aristotelians but also to anatomists and physicians from Mondino to Fernel to Fabricius and beyond. To take an example contemporary to Harvey, one sees in the *Historia anatomica* (1600) that the Galenist Laurentius made numerous references to *De anima,*[39] and though he sides with Galen on most issues, he clearly knew the doctrines of Aristotle. The *De anima* was a central text in the education of just about every philosopher and physician of the era, regardless of their ultimate philosophical allegiance.[40]

The term *psychologia* was itself created to designate the set of problems stemming from the *De anima* and the works of the *Parva Naturalia,* coined by the Humanist Joannes Thomas Freigius.[41] As Paul Mengal observed,

> La plupart des ouvrages où figurent les premières occurrences du mot psychologia sont des traités de philosophie naturelle ou physica. La physica est la science de la nature que l'on enseigne principalement dans les Facultés de médecine. Elle représente un vaste domaine d'étude qui englobe les phénomènes naturels au sens le plus large: la cosmologie, les phénomènes météorologiques, la description des végétaux et des animaux, la connaissance de l'homme. La physica repose essentiellement sur le commentaire des oeuvres d'Aristote: les huit livres de la *Physique* , les quatre livres *Du ciel* , *De la génération et de la corruption*, les *Météores*, *l'Histoire des animaux* , *De la génération des animaux*, *Des parties des animaux, De l'âme* et les *Parva naturalia*.[42]

As Katherine Park and Eckert Kessler have argued, these works of Aristotle, along with their Arabic and Latin commentators, formed the core set of texts for Renaissance Europeans writing on the soul.[43] Aristotle's works on animals also helped set the agenda for these psychological

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[39] For instance, see Laurentius, *Historia anatomica*, Lib. I, Cap. VIII (Paris, 1600), 13.
[40] Emily Michael, "Renaissance Theories of Soul," In: *Psyche and Soma,* Eds. Paul Potter and John P. Wright (Oxford: Clarendon Press, 2000), 148n.2.
[41] See Katherine Park and Eckhard Kessler, "The Concept of Psychology," In: *The Cambridge History of Renaissance Philosophy,* Eds. Charles Schmitt, Quentin Kessler, Eckhard Kessler (Cambridge: Cambridge University Press, 1988), 455. See: Joannes Thomas Freigius, *Ciceronianus,* (Basle, 1575).
[42] Paul Mengal, "La constitution de la psychologie comme domaine du savoir aux XVIème et XVIIème siècles," In: *Sciences Humaines* 2 (2000), 7
[43] See: Park and Kessler 1988 and Katherine Park "The Organic Soul," In: *The Cambridge History of Renaissance Philosophy,* Eds. Charles Schmitt, Quentin Kessler, Eckhard Kessler (Cambridge: Cambridge University Press, 1988).

investigations. Though Theodoro De Gaza's translations of the animal works were available from 1476 (the date of the *editio princeps*), it is not until the sixteenth century that one sees the start of a serious commentary tradition on these works, the first being that of Pietro Pomponazzi.[44]

Other Italian philosophers in the Renaissance quickly followed Pomponazzi's example and in the decades after his work there followed a number of important commentaries on Aristotle's biological works by Niccolo Tomeo, Agostino Nifo and others. These texts were of central importance to both philosophers and physicians.[45] And while these authors disagreed on many issues, from terminology to substantive doctrines, they were all engaged in a project to reevaluate and understand Aristotle's biological and psychological works in the wake of newly available texts and improved translations. One sees over the course of the sixteenth century a shift in terminology used to talk about the natural world and the soul, away from the Scholastic terminology of the medieval period and towards a more 'authentic' Aristotelian terminology based on the newly available texts.[46] New controversies arose around the question of the mortality of the soul, stemming in part from the recovery and translation of these texts, especially Alexander of Aphrodisias' commentary on *De anima.*[47]

Another key set of texts for those debating the soul were new Humanist translations of Galen's works, especially the *De usu partium,* a work that espoused a fundamentally teleological conception of the soul and its relation to the body. The medical tradition was an eclectic blend of

[44] Stefano Perfetti "Three Different Ways of Interpreting Aristotle's *De Partibus Animalium*: Pietro Pomponazzi, Niccolò Leonico Tomeo and Agostino Nifo," In: *Aristotle's Animals in the Middle Ages and Renaissance*, Eds. C. Steel, P. Beullens, and G. Guldentops (Leuven: Leuven University Press, 1999), 297.
[45] For instance, Caspar Bauhin's *Theatrum anatomicum* (Frankfurt, 1605), used by Harvey for parts of his lecture notes, makes almost constant reference to these two works of Aristotle.
[46] Thus, while Pomponazzi's commentary is filled with Scholastic terminology, Nifo's is much more highly influenced by the Arabic tradition (in Latin translation), especially the works of Averroes. Perfetti, "Three Different Ways," 304-305.
[47] Michael, "Renaissance Theories," 152.

Aristotelian and Galenic doctrines on the soul: for instance, writing at the start of the sixteenth century, the Paduan anatomist Gabriele de Zerbi, in his justification of anatomy, emphasized that dissection teaches the structure and function of the body, that is, about both body and soul, knowledge worthy of a philosopher. Roger French summarized de Zerbi's position as emphasizing that anatomy teaches, "…about the soul, both because the soul followed the complexions of the body [according to Galen]…and because the body was the expression of the soul [according to Aristotle]…The two things sound contradictory and neither is a specifically Christian doctrine…"[48] Yet, as a close analysis of these ideas demonstrates, these doctrines need not conflict, for the relation between soul and body is complex and interdependent: body is the instrument of the soul, as both Galen and Aristotle noted, but this does not undermine the fact that the body affects the soul, for, as noted above, the material nature of the body limits its activities. Renaissance physicians and philosophers of the became interested in living animal bodies in union with their souls, understood in this eclectic, hybridized Galenic-Aristotelian way. Central to this eclectic tradition, emphasized especially in Averroes and certain Arabic writers,[49] was the idea that soul can be understood through certain kinds of activities found in the bodies of living creatures, activities discoverable through observation and dissection.

Besides these textual traditions, there are two social-intellectual developments during this period important for understanding learned discussions of soul and body. The first is that, in the wake of the Pope's *Apostolici Regiminis* after the Lateran Council in 1513, there is a shift in commentaries and treatises discussing the soul. The edict targeted aspects of the work of the

[48] Roger French, *Dissection and Vivisection in the European Renaissance* (Aldershot: Ashgate 1999). 87.
[49] Two works relevant to Harvey's training at Padua were Averroes' *Commentarium magnum in Aristotelis De anima libros* and Avicenna's *Liber Canonis*.

Pomponazzi,[50] who argued that all of the activities of the soul depend upon the body and its organs according to Aristotle, and thus the soul is mortal and must perish when the body dies.[51] The decree banned mortalist arguments that the soul could perish, as well as Averroist arguments that it is one and the same soul that animates all men. As Emily Michael has argued, this demand necessitated that Renaissance philosophers find, "…a new strategy to prove the soul's immortality. In response to this challenge, a *non-Thomistic Aristotelian approach* gradually acquired popularity…."[52] Though the Pope's decree enjoined philosophers and theologians to demonstrate that the soul was immortal, the cat was out of the bag, so to speak; mortalism, of a sort, became a constant topic of discussion, if sometimes only to prove its falsehood. The option taken by many Aristotelians was,

> …to submit to the authority of the church but to continue to philosophise within the bounds set by the church through Bishop Barozzi… As Charles Lohr has shown, this option took for granted the fundamental difference between Aristotelian natural philosophy and the teaching of the Church, developing a purely Christian metaphysics and making Aristotle merely the empirical observer of natural phenomena…At the same time, however, it freed Aristotelian physics from metaphysical limitations and allowed for a truly empirical science of nature—that is to say, a science open to all kinds of new discoveries about the world and gradually gaining its own empirical methodology.[53]

Thus the response of physicians and philosophers to the Lateran council was to more clearly distinguish a certain form of mortalism from the kind banned by the Pope, namely a form of mortalism that did not assert the mortality of the *human* soul, but rather avoided that subject and instead concentrated upon those faculties of soul shared with animals. Thus investigation of soul along Aristotelian/Galenic lines became *by necessity* an empirical investigation! There was a

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[50] Pomponazzi clearly states that the mortality of the soul was *Aristotle's* considered opinion, not his, and he reaffirms his Catholic faith; his work was never banned. See: "Defensiorum," *Tractatus acutissimi utillimi et mere peripatetici* (Venice, 1525).
[51] Pietro Pomponazzi, *Tractatus de immortalite animae,* (Bologna, 1516), Cap.8. See also: M. Pine, *Pietro Pomponazzi, Radical Philosopher of the Renaissance* (Padua: Antenore, 1986). See also Michael, "Renaissance Theories," 154-155.
[52] Michael, "Renaissance Theories,"158.
[53] Eckhard Kessler, "The Transformation of Aristotelianism during the Renaissance," in: *New Perspectives on Renaissance Thought,* Eds. John Henry and Sarah Hutton (London: Duckworth, 1990), 141-142.

new emphasis on anatomical investigation of the soul, and a renewed emphasis on the metaphysical distinction between what we might call the *intellective* and the *organic* soul. The latter, consisting in the vegetative and sensitive aspects of the soul, was mortal insofar as it is the actuality of a living body. Thus, when the body dies, so too the soul must pass, though the intellective aspect lived forever. And though this distinction was present in earlier authors,[54] it became increasingly important in the Renaissance.[55]

Even Humanists and other anti-Aristotelians began to understand Aristotle as an *empirical* philosopher, setting aside some of his more purely metaphysical works for Christian metaphysics (often deeply influenced by increasingly important neo-Platonic philosophies). As Kessler noted, "…the Humanists did not question the general content and systematic coherence of Aristotle's teaching, but did question its a *priori* validity, [and so] the anti-Aristotelianism of the Humanists apparently turns out to have been a call for the transformation of Aristotle from a speculative into an empirical philosopher. In this way humanism can be seen to have anticipated the notion of Aristotle the empiricist…."[56] So the soul-body union was the topic of much debate, debates that were increasingly predicated on anatomical findings. Thus one finds theologians arguing, for instance, about where the soul was to be located in the body (heart, liver, brain?) and at which point in embryological development the rational soul (equated with the immortal soul) entered the fetus.[57]

Among the Humanists and reformers of the age, the import of new anatomical work for doctrines concerning soul was not lost, and experience and *a posteriori* reasoning came to be

[54] So, for instance, Gassendi in Lib. II of his 1658 *Syntagma* stated that this is found in Ockham's *Quodlibeta.*
[55] This conception of soul is deeply indebted to Aristotle's *De anima* II.4-5, where Aristotle argues that, since *nous* has no organ, it is thus separable from body in a way the other soul capacities are not.
[56] Kessler, "Transformation," 145.
[57] See: Vivian Nutton, "The anatomy of the soul in early Renaissance medicine," In: *The Human Embryo*, Ed. G.R. Dunstan, (Exeter: University of Exeter Press, 1990). These issues go back at least as far as Aquinas, who was himself reacting to the Arabic tradition, especially Averroes.

seen as central to the task of natural philosophers, even amongst the commentary tradition. Thus one finds Melanchthon incorporating such findings into his philosophical and theological account of the soul. Central here was the *De anima,* of course, but Mengal has observed that Melanchthon's commentary was a hybrid of traditional philosophical commentary and the most up to date anatomical knowledge:

> Dans son ouvrage, Melanchthon commente le *De anima* d'Aristote mais ne se contente pas de gloser le texte au fil de la lecture. Melanchthon a pris la mesure exacte des progrès de l'anatomie et il inscrit clairement son entreprise dans le cadre d'une Physica renouvelée et tout entière au service de la médecine. C'est pour cette raison que Melanchthon enrichit le texte aristotélicien d'un long traité d'anatomie qui expose les acquisitions les plus récentes de la discipline.[58]

If Melanchthon read *De anima* in the light of the new anatomy, aspiring physicians and anatomists could not help but do so. Indeed, in their treatises on the soul, some Renaissance Aristotelians, such as Gregor Reisch, were concerned not only with understanding the final and formal causes debated by the Scholastics, but also with the efficient and material causes, "…interpreted as the physical process[es] accounting for these phenomena and the organs in which they took place."[59] More radical Aristotelians, such Agostino Nifo, also included biological concerns in their investigations of soul, and thus Nifo wrote treatises on physiognomy and other psychological issues.[60]

The second relevant development was the publication of Vesalius' *De humani fabrica corporis* in 1543. This further strengthened the desire for anatomical knowledge in debates concerning soul, and it furthermore changed not only the grounds of the debate but also the nature of the debaters.[61] Katherine Park has argued that in the wake of Vesalius and his combination of critique of Galen's doctrines and embrace of Galen's methods, "…there are signs

[58] Mengal, "La constitution," 8.
[59] Park, "Organic Soul," 468. See: Gregor Reisch*, Margarita philosophica*, (Basle, 1517), 439-440.
[60] Park, "Organic Soul," 469. See: Agostino Nifo, *Parva naturalia* (Venice, 1523) 1r-22v.
[61] Obviously not all the debaters, or even a majority.

that anatomy and physiology were beginning to replace demonstrative Aristotelian natural philosophy, at least temporarily, as the prime models of scientific explanation."[62] Some philosophers and physicians began to approach the problem of the origin of the soul as a problem of embryology rather than of abstract metaphysics.[63] While this aspect of generation had long been noted, these new writers emphasized the empirical and anatomical aspects of their investigation.[64]

This conception of the body and soul was, in particular, central to the work of physicians and philosophers working in Padua. As Andrew Cunningham and others have argued, Fabricius ab Aquapendente's anatomical investigations revolved around those things common to body and soul, though Cunningham terms it the 'Aristotle Project': Fabricius explicitly conceived of his project as continuing in Aristotle's footsteps.[65] Fabricius' anatomy lectures revolved around his investigations into the faculties of the soul and their instruments, the parts of the body: locomotion (*De motu locali animalium, De musculis, De volatu*); generation (*De formato foetu*, *De formatione ovi et pulli*); nutrition (*De gula, De ventriculo, De omento, De intestenis*[66]); sensation (*De oculo, De aure*).[67] As Cynthia Klestinec has argued, these treatises were directly modeled on Aristotle's books on animals and the *Parva naturalia*.[68] The difference between Fabricius and Aristotle was that former's project was performed in a much more

[62] Park, "Organic Soul," 482. This claim is a bit unclear. What I take Park to be saying here is rather that the prime models of good natural philosophical explanations began to be taken from the work of anatomists.
[63] Pagel, "Harvey's Ideas" 233-247.
[64] See: Aquinas, *De Potentia*, Q.3, A.9-12.
[65] Andrew Cunningham, "Fabricius and the 'Aristotle project' in anatomical teaching and research at Padua," In: *The Medical Renaissance of the Sixteenth Century*, Eds. A. Wear, R.K. French, and I.M. Lonie (Cambridge: Cambridge University Press, 1985).
[66] Furthermore, one can see Fabricius' *De venarum ostiolis* as part of the nutritive system, since, as Cunningham notes, "…Fabricius quite naturally starts from understanding that the veins are a system for distributing nutriment to the whole body…" (Cunnigham, "Aristotle Project," 207).
[67] See, for instance, Cynthia Klestinec, "A History of Anatomy Theaters in Sixteenth-Century Padua." *Journal of the History of Medicine and Allied Sciences*, 59.1 (2004), 374-412; and Klestinec, "Civility, Comportment, and the Anatomy Theater: Girolamo Fabrici and His Medical Students in Renaissance Padua," *Renaissance Quarterly*, 60.2 (2007), 434-463. See also: Cunningham "Aristotle Project."
[68] Klestinec, "Civility," 440-441.

straightforwardly anatomical way.[69] Though Fabricius (and Harvey following him) thought of himself as a natural philosopher, he was a distinctly *medical*—and *eclectic*—one. His debt to Galen and other medical writers, though sometimes unacknowledged, was both deep and obvious from a study of his treatises. For instance, in his dedication to Leonardo Donato in the *De visione, voce, et auditu*, Fabricius made note of his methods and his philosophical forbearers, most important of which was Aristotle. But, in keeping with the distinctly eclectic context in which he was operating, Fabricius also makes reference to many works of Galen, such as the *De usu partium*.[70]

Fabricius explicitly understood his anatomical investigations to be investigations into soul. He states in his treatise *De formatione ovi, et pulli* that his study relies upon two principles or foundations, one corporeal, the physical foundation upon which generation occurs, the liver and the heart, the other incorporeal, nature or soul.[71] Fabricius described the latter as a principle that governs the process of formation, which

> ... rules and governs the animal body. Now if there are two degrees of soul, the vegetative and the sensitive, and the vegetative is prior both in time and Nature because it is common to the very plants, doubtless the organs subservient to the vegetative soul should be engendered and formed before those that are adapted to the sensitive and motive faculties, and this is especially true of the principal organs, which have the office of governing.[72]

This is the same picture as in Aristotle, even down to the priority of the vegetative soul.

Fabricius' method of understanding animal bodies meant understanding them *causally*, that is, understanding the soul as the final, formal, and efficient cause of the living animal body,

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[69] This is a matter of degree, not kind. Aristotle in his works on animals often makes references to dissections.
[70] Though the original was published in 1600, I have not been able to access this version, and thus I gather this information from a later *opera omnia,* where the dedication is contained in the front matter, having been removed from the treatises to which they were originally appended (in this case, the *De visione*). See: Fabricius, *Opera anatomica et physiologica* (Leiden, 1738).
[71] Fabricius, *De formation ovi, et Pulli*, Trans. Howard Adelmann (Ithaca: Cornell University Press, 1621 [1942]), 43 [200]).
[72] Fabricius, *De formatione,* 44 [202]. This is a reiteration of the conclusions of Aristotle's *De generatione animalium* II.6.

its substance. But, again following in Aristotle and Galen's footsteps, Fabricius argues that to understand the soul, one must understand the matter as well: the structure and composition of the parts that are its instruments. Fabricius' goes about this task by a certain inferential method: moving from structure (the matter) to action (the efficient and final cause) and to the use and utility (the final and formal cause[73]) of the part.[74] Note, further, that the order of explanation is the reverse of the order of inference: one explains structure and matter by reference to action and use. Understanding the causes of the parts was, according to Fabricius, essential to doing the job of an anatomist, one could not be satisfied, as Fabricius accused Vesalius of being, with the structure and material make up (the *fabrica*) of the parts. Fabricius wrote that, "…I can assert this truly: they [the causes of parts] are of such consequence that the person who knows these exactly can claim unhesitatingly that he has now learnt the whole anatomic business and that he is master of it…."[75] Harvey, too, adopts this fundamentally conception of anatomy.

4. Body and Soul in Harvey

Harvey's philosophy, as it is represented especially in the *Prelectiones anatomie universalis* (1616-1627) and the *De motu locali animalium* (1627), reflect the hybrid conception described in the previous sections.[76] Harvey's Galenism is hard to detect, for Harvey rarely referenced Galen,especially in comparison with Aristotle). When he does do so, it is often on matters of fact and not method or theory.[77] Though Harvey's allegiance to the medical writers is difficult to detect, he is deeply familiarity with and indebted to these works.

[73] For, as Aristotle notes, the final and formal cause are identical in natural things. C.f. *Physica* Lib.II, Cap.7.
[74] See: Cunningham, "Aristotle Project," 201-202. See also the dedications contained in the front of Fabricius' 1738 *Opera anatomica*.
[75] Fabricius 1600, *De larynge*, quoted and translated in Cunningham, "Aristotle Project," 202.
[76] See especially: Andrew Wear, "William Harvey and 'the Way of the Anatomists'," *History of Science* xxi (1983).
[77] For instance, in Harvey, *Prelectiones,* 38, he cites Galen as arguing that the skin is the medium by which we appreciate the qualities of all things that may be touched.

For instance, Harvey studied very carefully his friend Theodore Goulston's 1640 edition of Galen's *Opuscula varia*. Vivian Nutton noted that, "…he made some form of comment on almost every page, usually an underlining but, especially in the last three tracts, taking serious issue with what Galen said."[78] That Harvey took issue with Galen on specific points does not in any way undermine the point being made here, since, again, Harvey's Galenism is reflected more by his methods than by his substantive claims. A further complication, of course, is that on many issues, Galen agreed with (or even followed) Aristotle—such as, importantly, on the teleology of the soul-body relation. On this point, at least, Galen and Aristotle stood firm against those who attempt to understand nature, and especially animal bodies, by purely material means—formal and final causes take precedence. Harvey's Galenism then, in contradistinction to some of his fellow Physicians, was subtle, more an attitude and an approach than a matter of doctrine.[79] This should not, perhaps, be a surprise, given that, in many ways, this was also Harvey's attitude towards Aristotle, though he tended to find himself in agreement with the Peripatetic more often. Harvey took both to be suggesting the same basic methodology: discovering teleological explanations of the parts through dissection and observation. Harvey saw the necessity of dissection as both part of the Galenic background and as a proper part of Aristotelian methodology.

Harvey understood *anatomia* as a cutting up of the body, and he was much concerned with how best to divide the body into parts, a question of great antiquity, and of great concern amongst his contemporaries.[80] Importantly, he noted that, "…Anatomy must divide no further

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[78] Vivian Nutton, "Harvey, Goulston, Galen," Ch.14 in: *From Democedes to Harvey,* (London: Variorum Reprints, 1988), 115.

[79] So when Harvey quotes or refers to Galen, he often does so in order to disagree about a point of fact or conclusion. But he does so on a case-by-case basis, and what he is interested in is the truth in each situation. Thus Galen sometimes comes in for praise, for example in connection with *De usu partium*, XV, Harvey writes that: "Galenis optime explicavit priores neoterici sicco pede preterierunt" (Harvey, *Prelectiones,* 262).

[80] See, for instance, Laurentius' discussion in *Historia anatomica*, Q.1-2, 31-34.

than Nature has devised [*devisit*];"[81] one must quite *literally* carve nature at the joints! Understanding how soul organizes the body is fundamental to the task of the anatomist.

Key for Harvey was the *De partibus animalium*, which was one of the Aristotelian works central to Renaissance discussions of soul noted above. Harvey paraphrased this work:

> Indeed, since the works and activities [*operationes et actiones*] of Nature are many and distinct, for that reason the parts are many and distinct. That is to say, the body is the instrument of the soul.[82] Or better, a man and his parts are like an instrument having a power such as a saw if it could cut of its own will [*Vel potius homo et pars ut organum potentiam habens ut serra si sponte secare potuisset*].[83]

This quote reveals the basic teleological picture that undergirds Harvey's conception of anatomy: functionality precedes materiality. Soul and body are unified, and one understands and explains the parts through their functioning, their end. Note Harvey's use of the word '*potentiam*,' rendered here as power. Powers, for Harvey, are a function of an object being able to complete an organic goal, and in anatomy these goals achieve some sort of good for the animal, often some necessary function for life, e.g., nutrition or cooling.

The body is *organized* around these powers: because there are many goals that must be fulfilled in a living being, that is, there are many sorts of *functions*, there are, as a result, many different parts that together accomplish those functions. The variety of/variation in parts is explained by the variety of life functions that need to be accomplished, the variety of sub-functions that accomplish those overall functions, plus constraints placed upon them by the matter of the body. Thus the importance of dividing not beyond what Nature has devised should be understood in light of the fact that the body is organized around the set of life functions, each part an instrument. The word for instrument ('*organa*' or *'instrumentum'*) is thus key: each part,

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[81] Harvey, *Prelectiones,* 4.
[82] In the manuscript (British Library, Sloane MS230a), the line about the body being the instrument of the soul is on a new line, and so it should be rendered as a new sentence, and not, as Whitteridge has done, by adding it to the end of the previous sentence.
[83] Harvey, *Prelectiones,* 4.

by virtue of its powers, is an instrument through which the relevant goal is accomplished. In order to understand these complicated interrelations among the parts, Harvey employed the concept of instrumentality to explain how, for instance, the parts of the digestive system work together to accomplish the overall goal of nutrition.[84] As in Fabricius, the order here is logical, or better, explanatory: what explains a part existing in the way that it does is the fact that the part is for the sake of accomplishing that function.

Anatomy is thus about the parts of the body and how they are 'for the sake of' some soul function (or sub-function). I mentioned above that the quote from Harvey is a clear reference to *De partibus animalium*, where Aristotle emphasized that ends come before means, or as he puts it, 'the cutting is not for the sake of the saw, but the saw is for the sake of cutting.'[85] Here Aristotle connected essence and explanation:

> The unity of matter and form in animals is to be understood as the unity of an instrumental structure and its functional capacity. The various features of a part are to be explained by reference to the function or action for-the-sake-of-which that part came to be and exists; the physical features of the animal as a whole are to be understood by reference to the animal's complex, yet integrated, way of life. The definition of a part that corresponds to such an explanation will necessarily make reference to the part's structure, but only in so far as that structure exists for the sake of performing its function or functions....[86]

These functions, these powers, are *formal features of the animal*. They are aspects of its soul, its substance: they are what make it what it is, and allow the philosopher to explain the parts and their activities: Definition, function, and essence are tightly bound together.[87] It was clear to Harvey that the body was naturally organized into parts on the basis of a set of powers for certain necessary functions. These functions then serve to explain the presence of these parts, and thus

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[84] Harvey, *Prelectiones*, 12, 22.
[85] Aristotle, *De Partibus animalium*, Lib.I, Cap.V, 67.
[86] James Lennox "Form, Essence, and Explanation in Aristotle's Biology," In: *A Companion to Aristotle,* Ed. Georgios Anagnostopoulos (London: Blackwell Publishing, 2009), 352.
[87] Lennox, "Form, Essence, and Explanation," 353. See also: Lennox, "Divide and Explain: The Posterior Analytics in Practice," In: *Aristotle's Philosophy of Biology* (Cambridge: Cambridge University Press, 2001), 175-176.

the animal body's organization is founded upon a set of 'being for the sake of' relations with respect to the soul faculties, and which make up the definitions of the parts and, *in toto,* the definition of the animal.

These relations were further elaborated in terms of the means-end structure of hypothetical necessity. The sorts of craft metaphors used to describe this subject matter are revealing, and it was fundamental to this picture, in Harvey as well as in Aristotle, that Nature was like a craftsman: bodies were designed according to the goals which such bodies must accomplish, just as a house is designed according to the goals that a house, in order to be a house, must accomplish (providing shelter, etc). Thus parts were understood by hypothetical necessity: given their function, they must be made in such and so a way given the materials available. This was the hallmark of instruments since, just as a saw, by dint of its function, necessitates that it be designed with sharp serrations, must be made of a material harder than what one is trying to saw, etc., so too must the parts of the body be designed in order to accomplish their functions.

Indeed, Aristotle suggested this method in *De partibus animalium*:

> There is absolute and simple necessity from reason, as in eternal things, but there is also a mortal[88] necessity granted by supposition, and which manifested in all things generated as in art, such as a house and whatsoever is produced in this way. For if a house or whatever other final thing is to be made, it is necessary that a material of such a kind shall be present, and then first this and then that should be produced and moved, and so on following these in succession until the end is reached, for the sake of which each thing is produced [*cuius gratia res quaeque & efficitur*]…[89]

[88] The verb here used adjectively, cado, literally means 'to fall,' an echo of Christian metaphysics not found in the original Greek.

[89] Aristotle, *De partibus animalium*, Lib. I, Cap. I, 63, The Latin here, unlike the Greek, does not make it clear that both eternal things and generated things are natural.

Harvey's anatomy investigated the structure of the parts, which revealed the actions and uses of the parts, as I've argued elsewhere.[90] The term that Harvey and other anatomists often use to designate this structure and construction recalls Aristotle's craft metaphors: *fabrica.* In early modern Latin, *fabrica* connoted art and craftsmanship, and was often used in situations that implied that the structure, composition, etc. are as they are in order to accomplish certain ends—structural integrity, the ability to cut, and so on. For example, if the muscles were for the sake of movement, they must have the strength and structure need for such agoal. In his discussion of muscles in *De motu locali animalium*, Harvey wrote:

> …Nature in the construction of the muscles [*in fabrica musculorum*] is concerned with two things, with their actions and their functions, or with the perfecting of action. Therefore, in muscle there are two things to be considered, namely the composition of the muscle for the sake of its action and its mechanical construction for the sake of its strength and power [*compositio gratia actionis, arteficium mechanicum gratia roburis et virium*].[91]

So, given a function and a part, Harvey attempted to, in a sense, 'reverse engineer' the design of the muscles in order to figure out what aspects of them are for the sake of those specific ends to which muscles are put. So while all muscles have the overall function of contraction, other muscles have other, more specific sub-functions and so must be constructed differently so as to accomplish those ends. Harvey later says as much*:* "Nature has no regard for shape, position and size of muscle as such, but only *for the sake of strength and for the benefit of those parts which protect or which are indispensible* [*gratia roboris et ad melius tutelandum vel sine qua non*]"[92] Natural objects have ends and they have means by which those ends are accomplished, and the variation in those means is explained through hypothetical necessity with respect to those ends.

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[90] Benjamin Goldberg, "William Harvey on Anatomy and Experience," "*Perspectives on Science* 24:3 (forthcoming).
[91] Harvey William Harvey, *De motu locali animalium*, Ed. and Trans. Gweneth Whitteridge (Cambridge: Cambridge University Press, 1627 [1959]), 126.
[92] Harvey, *De motu locali,* 128. My emphasis.

Given this system of ends and means, there are a variety of 'engineering' questions that remain concerning how exactly the part accomplishes its end through its structural and material nature. For example, in discussing the layout and distribution of the veins, Harvey argued that "…since it is necessary that the veins should be distributed into tiny branches for the sake of concoction, lest they should be injured, twined and intertangled, each organ packs them, supports them and spreads them out with soft parenchyma, and warms them with gentle heat and promotes concoction"[93] This then connects with the conception of the soul and its functionality discussed above: the soul organizes the body into parts which are the right instruments for accomplishing the soul's ends, and just as a craftsman's hammer helps him complete his goals by being designed in a certain sort of way (made of a hard material, with a large flat surface for hammering, etc.), so too does the soul's body complete its goals by being designed in certain sorts of ways (being made of certain materials, having heat, etc.).

5. Conclusion

As the form of the body, the soul is also the (formal) *nature* of the body. Nature, to recall the definition of the *Physics*, is an internal source of change or rest, and this, too, was Harvey's conception of a nature.[94] Later in that work he defines the soul in just this manner, as the principle or nature of the body,

> In all local movement there is a source of movement…Because all the aforesaid movements of the parts of the whole pertain to man and to most animals, and Nature is the principle of motion in the thing in which the movement occurs, and because Nature is in all things one and the same principle of movement and is both the living soul and form

[93] Harvey, *Prelectones,* 142.
[94] William Harvey, *De motu locali animalium*, Ed. and Trans. Gweneth Whitteridge (Cambridge: Cambridge University Press, 1627 [1959]). 15. "De motu cognoscere est maxime Naturam cognoscere quia Natura principium motus."

> [*et Anima animante et forma*], or WH what is divine and corresponds to the fiery element of the stars.[95]

Note that this basic picture is common to the Ancients and their Renaissance descendants: an emphasis on the soul being the essential form of the living creature, its nature, and thus the source of its motions. Indeed, Harvey explicitly defines these three as one of the sources of movement: "On the different sources of movement: (1) Natura forma anima…."[96] So insofar as the soul is the source of movement, and insofar as the anatomist is interested in the movements and actions of the parts, then the anatomists' subject matter is deeply concerned with the soul as an efficient cause. Importantly, one must see the *De motu cordis* in this light: it is an investigation into soul insofar as the soul is responsible for the motions of the parts, including the heart. And in fact, Harvey noted exactly this in the *De motu locali animlaium*: "Likewise, all movement is derived from the soul. For in every plant, nay, in every created thing movement inheres. See *De motu cordis* as to whether there is movement of the vital spirits." Harvey here references Chapter XV of his own *De motu cordis*, where he argues that the heart is the source of the motion of the blood, it is its source and origin, and this due to the forceful systole and not to the vital spirits.

In sum, Harvey, following in a long tradition of natural philosophical writers, understood anatomy to investigate *what is common to body and soul*. This implies two things: first, every organ needs a reason to explain its existence, the reason being its function (to oversimplify the terminology). Second, as a result of the necessity to accomplish that function, there are certain material consequences in the way the organ is structured and constructed. In other words, the function accomplished by an organ determines how the organ is arranged, what it must be made

[95] Harvey, *De motu locali,* 32. Harvey is referencing the definition of a nature from Aristotle's *Physica* II.1. The 'fiery element of the stars' is a reference to Aristotle's *De generatione animalium* II.4.
[96] Harvey, *De motu locali,* 39.

out of, etc. The first determines the logical order of explanation: functions explain the existence of organs. The second adds to this explanatory system the fact that functions also explain not only *why* the organ exists, but also *how* it exists. This becomes especially important when doing comparative anatomies, for these hypothetical necessities are essential for understanding functionality and the variation in functional parts across different animals.

I want to conclude with a passage from the *Prelectiones*, where Harvey discusses what he calls the 'philosophical' division of the parts. Harvey wrote: "The philosophical division of the parts is that which is according to the instrument of the soul, according to the divisions of the soul or according to the faculties: by the final cause [*secundum divisiones animae vel secundum facultates: a finali causa*]"[97] The philosopher divides the parts according to those ends which are accomplished through the capacities afforded by the instruments of the soul. Below this line are a series of five sections that elaborate this division. Harvey presents a number of alternative formulations of such a philosophical division that have been articulated by others, both by the ancients and by some of his contemporaries. Thus he mentions again Hippocrates' division of containing and contained parts, and Fernel's division of the parts according to locations (private vs. public regions).[98] Most relevant, however, are the third and fourth, which offer insights into some important terminology: action, use, and usefulness. I discuss these terms elsewhere,[99] but what is important here is what these terms reveal about how Harvey conceives of the parts of the living body and the task of the anatomist:

> [We can divide the parts by their] Actions and uses: [that is as] organic [or] instrumental, [that is, those which] have been fashioned, which bring about an action; or as formless parts having a broad use… for, as they are a sign of soul [*signum animae*], nothing is a part which has not some action, nor are there any limbs that have not a function. Whence

[97] Harvey, *Prelectiones,* 12.
[98] Fernel, Jean, *Therapeutices universalis, se medendi rationis libri septem*, Lib. II, Cap. 1, In: *Universa Medicina* (Paris, 1567), 359.
[99] Goldberg, "William Harvey."

> the instrumental parts are not opposed to the uniform parts, but (since all the parts are in some way fashioned parts) are mostly for the purpose of bringing about some particular action.[100]

Harvey here states that parts are quite literally 'signs of soul'; Whitteridge's translation here is enormously evocative and instructive: she says that the parts are 'manifestations of the soul.'[101] This is an excellent summary for how we should understand Harvey's anatomy: as a search into the soul made manifest, form and matter unified, a teleological science that investigates the parts of animals.

[100] Harvey, *Prelectiones*, 12.
[101] Harvey, *Prelectiones,* 13.