2.0. THE UNION OF SOUL AND BODY: THE SUBJECT OF ANATOMY

A practicing physician might today label Harvey's work as functional anatomy or physiology, but this label will not do for the careful historian.[1] Harvey understood his subject matter in a rather different manner, one quite far removed from modern physiology. Anatomy for Harvey was an investigation into the soul-body union, characterized by the teleology of 'being for the sake of'. Anatomy for Harvey is an examination of 'what is *common* to body and soul,' as Aristotle describes his approach in the *De sensu*, and Harvey's work fits into a long tradition of philosophical and medical work done in the spirit of Aristotle's *Parva naturalia*.[2] The goal of this chapter is to examine and characterize how Harvey conceived of the subject matter of anatomy and the sorts of teleological explanations proper, focusing especially on two understudied texts: the *Prelectiones anatomie universalis* (1616-1626) and the *De motu locali animalium* (1627). This teleological conception of the anatomical subject is evident in Harvey's *De motu cordis* (1628), demonstrating the error of certain historical analyses that deny the importance of teleology in this work. Harvey's last treatise, the *De generatione animalium* (1651), merits its own discussion in the following chapter, as it involves not only the teleological explanations of body and soul detailed in this chapter, but also a further set of explanations concerning the coming to be of that soul and body union.

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[1] Of course, a great deal of Harveian historiography makes this mistake, seeing Harvey as modern, scientific, the

[2] Aristotle *De Sensu* Cap.1; The meaning of this phrase in Aristotle is complicated and obscure, but, according to Pierre-Marie Morel, it means something like 'states or properties of living beings,' such as youth, old age, sleep, etc., and to which I add the parts of animals. The connection of 'common to soul and body' to dissection is somewhat less clear in Aristotle than it is in Galen. However, it is interesting to note that, of the 27 references to the now lost 'Dissections' of Aristotle, 3 instances are to be found in the *Parva* (two in *De respiratione* and one in *De somnis*). The rest of the references are to *De historia animalium* (8), *De generatione animalium* (7), and *De partibus animalium* (9) (I thank James Lennox for this point; see also his unpublished work on this matter). While Harvey almost certainly had no more idea what exactly these references serve to indicate, it nonetheless seems suggestive that these references are to exactly those texts that Harvey wash most clearly influenced by. See: Morel, Pierre-Marie (2006), "'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, 121-122.

The organization will be as follows. The first section (**Section 2.1**) deals with how Harvey's philosophical predecessors conceptualized the subject matter of anatomy, that is, how these philosophers conceived of the ensouled bodies of animals. I discuss first the conception of Aristotle (**Section 2.1.1**), then that of Galen (**Section 2.1.1**), then those of a number of important Renaissance figures (**Section 2.1.3**), before moving on to discuss in detail Harvey's conception of soul and body (**Section 2.1.4**). In the second section (**Section 2.2**), I discuss Harvey's understanding of the meaning of a 'part' of the body, and in the third section (**Section 2.3**), I discuss his system of teleological terminology. I conclude the chapter by discussing in the fourth section (**Section 2.4**) how this teleology functions in Harvey's *De motu cordis.*

2.1. COMMON TO BODY AND SOUL

The distinctly *philosophical* import of and background to William Harvey's anatomical work[3] has often gone unrecognized by historians of philosophy and medicine.[4] There are two interacting

[3] Of course, I am not suggesting that philosophy and medicine were coextensive in Harvey's thought, or that, institutionally or epistemologically speaking, there are no lines to be drawn between the two disciplines. Rather, as has been stressed by many writing on the history of medicine and philosophy, there is a great deal of overlap and exchange between these traditions. Harvey himself is more explicitly philosophical than many among the *medici*, but all had some familiarity with philosophical doctrines. Though literature on the interaction between medicine and philosophy is vast, there is still much work to be done especially in the late Renaissance and early modern periods—exactly the period in which Harvey was trained and worked. Some highlights of the relevant literature, which focuses mostly on earlier periods, include: Bylebyl, Jerome (1990), "The Medical Meaning of *Physica*," *Osiris* 6, 16-41; Kristeller, Paul Oskar (1945), "The School of Salerno: Its Development and Contribution to the History of Learning," *Bulletin of the History of Medicine* 17, 138-194; MacKinney, Loren C. (1937), *Early Medieval Medicine, with Special Reference to France and Chartres*, Baltimore: Johns Hopkins Press; Amundsen, Darrel W. (1979), "Medicine and Surgery as Art or Craft: The Role of Schematic Literature in the Separation of Medicine and Surgery in the Late Middle Ages," *Transactions and Studies of the College of Physicians of Philadelphia* 5th Series (1), 43-57; and, of course, much of the work of Nancy Sirasai, including (1973), *Arts and Sciences at Padua: The Studium of Padua before 1350*, Toronto: Pontifical Institute of Mediaeval Studies; and (1977) "Taddeo Alderotti and Bartolomeo da Varignana on the Nature of Medical Learning," *Isis* 68, 27-39; and (1981), *Taddeo Alderotti and His Pupils: Two Generations of Italian Medical Learning*, Princeton: Princeton University Press. See also: Wear, French and Lonie (1985), *The Medical Renaissance of the Sixteenth Century*, Cambridge: Cambridge University Press, especially Charles Schmitt's "Aristotle Amongst the Physicians"; Schmitt, Charles (1981), *Studies in Renaissance Philosophy and Science,* Variorum Reprints.

[4] One recent exception to the lack of attention paid to this aspect of the history of philosophy is: Cheung, Tobias (2008), *Res vivens: Agentemodelle organischer Ordnung 1600-1800*, Freiburg: Rombach, Verlag. Cheung's concerns range much more broadly than ours here and thus much of this interesting work is only of tangential relevance to my task. For

philosophical traditions operating in the background: the Galenic and the Aristotelian.[5] Key to understanding this tradition is the role of final causality, of teleology. Though historians and philosophers as disparate as Walter Pagel and James Lennox have stressed that Harvey was a lifelong thinker about purpose,[6] there has not been a systematic attempt to understand exactly how teleology operates in the full range of his works. By understanding Harvey against this philosophical background, one comes to understand that the functionality of animal bodies was understood as the operation of soul (*anima*) in union with the body, soul being, of course, a deeply teleological concept. As James Lennox describes in the Aristotelian context, so central to Harvey and other anatomists, soul was considered[7] as a, "…set of goal-oriented capacities—nutritive, reproductive, locomotive, and cognitive."[8] These soul capacities are organized teleologically, that is, they are for the good of the animal.

Soul was a fundamental object of inquiry from the ancient to the early modern periods. Part of the project of Aristotelian Scholastic philosophers across Europe was, according to Dennis Des Chene, "…to establish the principles of a science of life,"[9] here following Aristotle, for whom the soul *just is* the principle of life.[10] In this tradition, the parts of animals, and, indeed, the organic bodies of animals in general, were understood as *instruments* by which the soul operates in living

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a review of Cheung, see: Smith, J.E.H. (2010). "Review of Tobias Cheung, *Res Vivens*." In: *Isis* 101(1): 190-191. Another important exception is to be found in the work of Dennis Des Chene, whose *Life's Form* contains a detailed and important discussion of Late Scholastic conceptions of the science of the soul as the background to Descartes, and which, importantly, included the science of living things, in addition to discussions concerning what one would consider today to be psychology, as well as the expected discussions of the immortality of the human soul. Des Chene, Dennis (2000), *Life's Form*, Ithaca: Cornell University Press. See also: Des Chene's *Physiologia.*

[5] Of course, in the early modern period, these two traditions were themselves rather eclectic, not to mention the hodgepodge of other important philosophical traditions including Platonism, humanism, corpuscularianism and so on. Still the background is usefully divided in this way.

[6] Pagel, Walter (1967), *William Harvey's Biological Ideas,* New York: S. Karger, 25, 211.

[7] Of course soul was considered in other ways, including as an eternal substance, the rational soul.

[8] Lennox, James (2001b), "Matter, Form, Kind (Introduction to Part II)," In: *Aristotle's Philosophy of Biology*, Cambridge: Cambridge University Press: 128. Cf. Pierre Pellegrin (1982), *La Classification des animaux chez Aristotle: statut de la biologie et unite de l'arisotelisme*, Paris; Pellegrin (1987), "Logical and biological difference: the unity of Aristotle's thought," In: *Philosophical Issues in Aristotle's Biology*, Eds. Allan Gotthelf and James Lennox, Cambridge: Cambridge University Press.

[9] Des Chene, Dennis (2000), *Life's Form, Ithaca: Cornell University Press,* 6. One should be careful, of course, not to read 'science of life' as being equivalent to modern conceptions of the life sciences.

[10] Aristotle, *De anima,* I.1.

bodies. This concept of instrumentality is characterized as a teleological relation where the body is 'for the sake of' that soul. Etymology is helpful here. The Latin words *instrumentum* and *organum*, like the Greek word, *organon*, mean 'tool, or instrument,' and thus the reason *organs* of the body are so called is because they were conceptualized as the tools or instruments by which the soul accomplished its ends in the body. These words recur throughout Harvey's work, and the philosophical traditions that influenced him. Thus the natural philosopher or physician can investigate—and indeed, as many would come to believe, *must* investigate—soul as it operates in the living animal body. In other words, the natural philosopher should attempt to understand soul by means of dissection.[11] This connection between body, soul, and anatomy, which is explicit in the Aristotelian context, is even more so in the Galenic one.[12]

There are two issues I must flag. The first concerns the extension of 'soul'—there was a debate, as ancient as Galen at least, about whether only animals had souls, or whether the term could be properly applied to plants as well, with Aristotle opting for the wider extension, and Galen (at least in some works[13]) opting to limit it to animals. Here I am only interested in the souls of animals, and I ignore the issue of plants, although Harvey does indicate he opted for the wider Aristotelian extension of soul.[14] The second issue is related, and concerns the rational soul. Of concern here were a number of issues, though perhaps most important was the issue of the immortality of the soul and the separability of the soul from the body.[15] I shall only discuss the rational aspect of the soul insofar as it relevant to the history of anatomy.

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[11] See Deer [Richardson], Linda (1980) *Academic Theories of Generation,* Dissertation presented to the Warburg Institute, 457-458. See also Park, Katherine "The Organic Soul," Ch.14, In: *The Cambridge History of Renaissance Philosophy*, Eds. Charles B. Schmitt, Quentin Skinner, Eckhard Kessler, Jill Kraye, Cambridge: Cambridge University Press.

[12] So, for instance, in a source important to Harvey (though not one he necessarily agrees with), Laurentius makes this claim in his (1600) *Historia anatomica*, Lib. I, Cap. V, "Quam sit utilis Anatome ad sui cognitionem."

[13] Galen is quite inconsistent on this subject matter. I discuss this below.

[14] This is obvious from his discussion of vegetative life in Harvey's (1651) *De generatione animalium,* Ex.17, 49ff.

[15] As for immortality, Harvey has very little to say, though some historians have argued that, by the time of the *De generatione animalium,* his doctrine of the blood being the direct instrument of soul flirts with the heresy of mortalism,

2.1.1. Body and Soul in Aristotle

In this section I elaborate those aspects central to Aristotle's understanding of the soul.[16] I emphasize that an investigation into soul is, of necessity, an investigation into matter as well, for body and soul are *unities* of matter and form, tied together by teleology.[17]

I start, naturally enough, with the first book of the *De anima.* As Mariska Leunissen succinctly describes it, Aristotle argues here that, "…living beings have the kind of bodies and bodily parts they have *for the sake of* performing all their characteristic life functions."[18] Note first the distinctive language of 'being for the sake of' used by Aristotle to describe the relation between part and function. Leunissen thus rightly notes that, "This conception of the soul is teleological, for it defines and explains the existence of each aspect of the soul in terms of the specific work it performs…"[19] The activity of these functions is the life of the creature in question, and the capacity to perform these functions is soul.

In the second book of *De anima,* Aristotle defines soul more carefully, asserting that soul should be defined as the first actuality of a natural body having life potentially in it, when that body is instrumental or organic. As Aristotle defines it, the first actuality of the body is a sort of potentiality, that is, it is a capacity to do those things that are characteristic of living things: growing, moving, perceiving, and so forth. A first actuality is, to use a common example, an adult

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or, weaker, that it at least shares some features with that doctrine. I don't think there is much evidence to support mortalism, and further, as I shall discuss below, Harvey fits into a line of natural philosophers that attempted to bypass the theological issue by confining themselves to the organic soul. Still, see: Hill, Christopher (1964), "William Harvey and the Idea of Monarchy," *Past and Present* 27, 54-72; and (1965), "William Harvey (No Parliamentarian, No Heretic) and the Idea of Monarchy," *Past and Present* 31, 97-103.

[16] In order to trace some terminological and philosophical relations between the Philosopher and Harvey, I use the edition of Aristotle that Harvey used, the Aristotle-Averroes Giunta edition from 1552

[17] In other words, the unity of body and soul is a *teleological* unity.

[18] Leunissen, Mariska (2010), *Explanation and Teleology in Aristotle's Science of Nature,* Cambridge: Cambridge University Press: 53, my emphasis.

[19] Leunissen 2010, 51.

who can speak (or understand) French but who is currently silent. The second actuality, to continue with the example, would be an adult who is currently speaking French (or understanding it); and the first potentiality would be a child who can speak no French at all, but who could, in time, acquire the ability to do so. Moving to a biological context, if an eye were an animal, the soul of the eye would be seeing, that is, the activity (actuality) 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. Aristotle thus argues that soul is the substance of the body according to *logos*. In the Latin translation of *De anima,* Aristotle writes that the soul 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, its very substance, and this soul having been separated from it, it would no longer be an axe, but rather only so in name...[20]

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 (*essentia*) as earlier translators called it. Thus the soul is, as Aristotle writes, the *form* of a natural body, the soul is the formal nature of the body, without which it would no longer be that thing.[21] In this way the soul is a principle of individuation, insofar as different sorts of living creatures are coextensive with different kinds of souls.[22] Note especially the terminology here, especially *rationem,* and that for Aristotle, what something is is what it does: essence,

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[20] I quote and translate from the edition of Aristotle that Harvey is known to have used, as in this way I can trace some linguistic connections between Aristotle and Harvey, as well as demonstrate that the text Harvey consulted supports the interpretation I offer. Aristotle 1552, *De anima…Michaele Sophiano interpretate,* Lib.II, Cap.1, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Volume 11, Venice, 52. "...est enim substantia quae secundum rationem: hoc autem est quod quid erat esse huiusmodi corporis sicut si aliquod organorum physicum esset corpus ut dolabra: erat quidem enim dolabrae esse, substantia ipsius & anima haec divisa autem haec non utique amplius dolabra erit, sed aut aequivoce…." Note that '*quod quid erat esse*' and the shortened '*erat esse'* is the translation of '*to ti en einai*,' a very difficult phrase and concept in Greek, and which gave the Latin translators much trouble, hence their neologism of '*essentia*.' Later, Humanist, translators, however, tended to avoid '*essentia*,' and instead one finds that translators as diverse as Melanchthon and Cardinal Bessarion understood '*quod quid erat esse*' as 'essence,' the 'what it is to be' of a thing. I choose here to use the term essence instead of this more literal and cumbersome phrase, though essence too is not without its semantic problems. All translations in this chapter are my own unless otherwise noted, though I have, of course, consulted modern translations when available.

[21] *De anima* II.1. See also Aquinas, *Quaestiones Disputatae de Potentia Dei*, Q.III.9.

[22] C.f. Leunissen 2010, 51.

definition and function are tightly bound together, ideas that will become important in Chapter 4 on Harvey's method.

One must understand this substance as a type of cause, for, as Aristotle writes, the soul is, "… the cause and principle of the living body…the soul is defined by the three ways something is called a cause: it is the cause of movement, it is the cause for the sake of which, and the soul is the cause of the living body, as its substance,"[23] that is, the soul is understood as the efficient, final, and formal cause of the body. Monte Johnson summarizes Aristotle's position and emphasizes especially the final cause, arguing that Aristotle understands the soul as the,

> …substance or existence, source of change, and that for the sake of which. The soul is a cause 'for the sake of which' because nature, like reason or art, creates things for the sake of something. And nature has generated or created the physical bodies of plants and animals. But physical bodies are instruments of souls, and so exist for the sake of them…To be more specific, the various bodily organs exist for the aim of…the various functions of the soul (roots for nutrition, feet for locomotion, eyes for perception)…[24]

So the organs exist for the sake of the soul and its functioning. For instance, take nutrition: in order to operate, this soul capacity needs certain organs: mouths for food to enter, teeth to mash the food, a stomach to concoct it, a liver to turn it into blood, and so on. The ultimate end of each of these parts is nutrition, what Renaissance physicians called the *use* or *utility* of that part, and each intermediate end (chewing, concocting, etc.) the *action* of that part.[25] The living body is a complicated hierarchical network of ends, powers, and parts, all of which maintain the organism and allow it to thrive in its environment. The relationship of instrumentality between body and soul

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[23] Aristotle 1552, *De anima,* Lib.II, Cap.4, 68. "Est autem anima viventis corporis causa & principium…anima secundum determinatos tres modos causa dicitur: etenim unde motus causa est & cuius causa & sicut substantia animatorum corporum anima causa." Or as Averroes wrote, "…the soul is a cause according to the three determined senses: it is the moving cause, it is the final cause, and it is the formal cause." Averroes commentary in Aristotle 1552, *De Anima* Lib.II, Cap.III, In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Vol.11, 68v. "…anima est causa secundum tres modos determinatos, scilicet causa movens, finalis, & formalis…"

[24] Johnson, Monte (2005), *Aristotle on Teleology*, Oxford: Clarendon Press, 75.

[25] In fact, it is a good deal more complicated, and, indeed, many authors use the words somewhat indiscriminately, as I will discuss below, but for now an oversimplification is more than adequate. Note that action is here both an end and an efficient cause—it is the end of the part to perform such actions as chewing, and these actions are the efficient causes of the ultimate end of the part, such as of nutrition.

is one governed by conditional necessity, wherein given a particular soul function (nutrition) certain bodily parts become conditionally necessary (mouths, stomachs, etc.), whose own structures are conditionally necessitated by the sub-function they are meant to accomplish.[26] Given this conception of souls and bodies, we find that, "…this means that at least the majority of bodily features a living being possesses will be explainable by reference to the life functions for which these features are instrumental (and hence conditionally necessary) and the possession of which constitutes the living being's substantial being."[27] Soul is thus the primary method of explaining living creatures for Aristotle, an explanatory framework preserved well into the early modern period. One cannot study living things without studying soul; and, as I show in Section 2.1.3, certain Renaissance philosophers thought that one could not study soul without also studying living things.

This is because, while in reason one can think of soul and body as separate, they are, in a more fundamental and ontological way, a unity. For Aristotle, body and soul, matter and form, cannot truly be understood apart from each other. (As discussed below in the section on the Renaissance, Section 2.1.3, this caused a great deal of problems for Christian commentators on Aristotle, for this unity implies that the soul is mortal.) Aristotle writes that

> If, then, something universal must be designated in every kind of soul, it must be that it is the first act of a natural organic body, from which we ought not question whether the body and soul are one: just as we ought not question whether the wax and its shape are one, nor whether the matter of a thing and that of which it is the matter are one.[28]

[26] At least when things are running normally and circumstances are conducive to their flourishing, so ignoring cases of monstrous births with malformed parts and ignoring disastrous occurrences such as volcanoes when few forms of life can survive.
[27] Leunissen 2010, 55.
[28] Aristotle (1552, *De anima libri tres…Michaele Sophiano interpretate,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 11, Venice, Lib.II, Cap.2., 51v. "Si autem aliquod comune in omni anima oportet dicere, erit utique actus primus corporis organici physici unde non oportet quaerere si unum est anima & corpus: sicut neque ceram & figuram, neque omnino uniuscuiusque materiam, & id cuius est materia…."

The example Aristotle uses is most clear: in the same way that one does not ask if the shape of the wax is separate from the wax, one does not ask if the soul is separate from the body; the soul just is the actuality of the body, its form, as Aristotle notes immediately after the passage cited. Indeed it is a characteristic of living things that their bodies are unified, that is, all the functions of their parts serve the good of the animal, and they work together harmoniously: it is a *teleological* unity that ties body to soul.

Where, in all of this soul-business, is anatomy? The answer is, in many ways, difficult to answer, for Aristotle never directly discusses anatomy, though he does make numerous references to dissections, especially in the *Historia animalium,* and it is clear that he performed or witnessed such dissections.[29] He notes in the *Historia animalium* 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[30]). But the relation between Aristotle's concept of the soul and anatomy is found, not in anything he writes specifically on the matter, but rather in how his conception of soul shapes later conceptions of living bodies. Thus Aristotle argues in the *De partibus animalium* that the natural scientist must study ensouled things *qua* ensouled.[31] Indeed, in *De sensu,* the first treatise in the collection that became known as the *Parva naturalia,* begins with the following line:

> Moreover, having considered the soul as it is determined itself, and its several powers according to the parts of which they are, next we perform a survey of all animals, indeed of everything that has life, and determine which functions are had singular and which are common to them. What has been sad about the soul as the subject, and the rest of what we said, must especially come first.[32]

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[29] See, for instance, *De partibus animalium* II.7, III.4, III.5, IV.5 and *Historia animalium*. I.17. Lennox, James (Unpublished).

[30] *Historia animalium*, Lib.I, Cap.16, "Hominum partes interiors incertae et incognitae quamobrem ad caeterorum animalium partes quarum similes humanae referents eas contemplare."

[31] I shall discuss in more detail below the *De partibus animalium* in the section on Harvey on the organic soul, for one cannot understand what Harvey writes without understanding Aristotle's works, the *De partibus* in particular.

[32] Aristotle (1552), *De sensu et Sensibilibus,* Cap. 1, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Vol. 5, Venice, 187. "Quoniam autem de anima secundum seipsam determinatum est prius, & de virtutum qualibet secundum partem ipsius, consequies est facere considerationem de animalibus, & vitam habentibus

Fundamental to understanding animal bodies is to understand soul as argued for in *De anima,* and which is assumed in the *Parva*. These treatises, which as I argue below were the inspiration behind Harvey's teacher Fabricius ab Aquapendente's anatomical works, are an investigation into what is common to body and soul, and thus they require knowledge of the parts of the body, knowledge which can only be gained through performing anatomies. Body and soul must be understood together in physiological contexts, and especially in medical contexts.[33]

Aristotle's conception of at least the most basic aspects of soul, then, the nutritive or vegetative soul shared by all living things, is eminently suitable for anatomists interested in understanding the activity and functionality of animal bodies. Anatomy, on an Aristotelian model, must be understood as an investigation into the instruments of the soul, an investigation into these unities of form and matter. Vivisectional anatomy becomes especially important, for only by investigating the instrument in action can one come to understand what that instrument is for, and thus what its activity, its functionality is. Another work of Aristotle's is important here, one central to the Renaissance medical tradition: the *Meteorology*.[34] *Meteorology* IV.12 puts function and form together in the specific case of the homogenous parts of animals, and Aristotle writes:

> 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.[35]

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omnibus, quae sunt propriae, & quae communes operationes eorum. Quae igitur dicta sunt de anima subijciantur, de reliquis autem dicamus, & primum de primis."

[33] van der Eijk, Philip (2000), "Aristotle on the Soul-Body Relationship," In: *Psyche and Soma,* Eds. Paul Potter and John P. Wright, Oxford: Clarendon Press. Van der Eijk stresses especially the way in which Aristotle recognizes the importance of the soul-body relation in understanding psychosomatic phenomena, such as emotions like anger.

[34] Martin, Craig (2002), "Francisco Valles and the Renaissance Reinterpretation of Aristotle's *Meteorologica* IV as a Medical Text," *Early Science and Medicine* 7(1).

[35] Aristotle 1552, *Meteorologicorum*, Lib.IV, Cap.12, In: *Aristotelis libri omnes…cum Averrois Cordubensis variis in eosdem commentariis*, Vol. 5, Venice, 222. "Ex elementis enim ea, quae similarium partium: ex his autem, ut materia, omnia opera naturae. Sunt aut omnia, ut ex materia quidem, ex dictis: ut autem secundum substantiam, rationem.

Aristotle adds 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."[36] For Aristotle, one thus understands a part when one knows its function, for what something is, is what it does. Thus understanding the formal nature of part is essential to understanding that part.

Morbid anatomy is important, meanwhile, because it allows one to come to know the material nature and structure of the parts. As James Lennox has argued, understanding a function, the formal nature of a part, its soul, requires understanding that "…the actions of a substance's formal nature are severely constrained by its material nature."[37] So the matter, as a constraint on the formal nature, must be investigated, for the matter of a body affects the activity of that body. Aristotle understands this through hypothetical necessity: given this or that function, and given the constraints of the material available, a part is structured in this or that way and made of such and so material so as to accomplish its function. The matter must be suited to the purposes set by soul, but the soul cannot act beyond its material constraints: a man cannot fly, no matter how he flaps. Thus an investigation into animal bodies along Aristotelian lines must be an investigation into soul *and* body.[38] As I shall discuss in the following sections, it became increasingly obvious to medical writers that the best way to understand these complex relations between soul and body, form and matter, function and part, was to go and observe it, to cut open bodies; in other words, to practice anatomy.

Semper autem magis manifestum est in posterioribus, & omnino, quicunque ut instrumenta, & alicuius gratia. Magis enim manifestum est quam mortuus hominem aequivoce. Sic igitur & manus mortui aequivoce, quaemadmodum & si fistulae lapideae dictae fuerint ut enim & haec, instrumenta quaedam vident esse."

[36] Aristotle 1552, *Meteorologicorum,* Lib.IV, Cap.12, 223. "Omnia autem sunt terminata opere omnia enim quae possunt facere suum opus, vere sunt, ut oculus, si videt." 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 (1616-1626) *Prelectiones anatomie universalis,* Ed. Gweneth Whitteridge, London: Royal College of Physicians, 22.

[37] Lennox 2001b,183.

[38] See: Lennox, James G. (2001a), "Commentary," In: *Aristotle on the Parts of Animals*, Oxford: Clarendon Press, 141.

2.1.2 Body and Soul in Galen

Galen's conception of soul is, in some ways, deeply indebted to Aristotle's, as were many thinkers after the Peripatetic. However, Galen, following Herophilus and the Stoics, sometimes distinguishes between soul and nature: nature, as discussed in the opening chapter of the *De natura facultatibus,* concerns those activities common to animals and plants, namely growth and nutrition, what Aristotle called vegetative soul. Soul properly speaking should be restricted to animals, that is, to sensation and voluntary movement (and in the case of humans, reason). However, over the course of his long career and many written works, Galen expresses his opinion on the soul in several different ways, and he doesn't always respect the terminology of 'nature' vs. 'soul'.[39] In fact, he says in *De propriis placitis* that he adapts his terminology based upon his audience, with philosophers he uses 'soul' and with physicians 'nature.'[40] Galen, when he is at his most Platonic in *De placitis Hippocratis et Platonis,* seems to endorse a model of the soul and its powers where his characterization of the natural faculties is amalgamated to the capacity of soul seated in the liver.[41]

Again, starting with some etymology will prove helpful. The Greek word *dunamis,* translated as *facultas* in the Latin editions of Galen, is a word used also of course by Aristotle. Aristotle distinguishes a variety of senses of *dunameis*, and is generally translated as the more expansive *capacity* or *power*, whereas Galen's sense of the term is (often) more restricted, and (often) applies just to the proper functioning of the parts of the body (tissues, organs, etc.).[42] Furthermore, these terms and distinctions, if they are clear in Galen, are muddled by the early

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[39] See for instance Galen (1549) *De usu partium* Lib.IV, Cap.13, In: *Galeni Peragameni…opera quae nos extant omnia*, Vol. 1, Basle, 520; and *In Hippocratis de Morbis Vulgaribus,* Lib.I, Cap.17, Vol.2, 395.
[40] See: Galen, *De propriis placitis* (=*De sentiis*), Lib.III, Cap.3; this book is not contained in the 1549 edition of Galen. For the strange and interesting history of this work, see Vivian Nutton's (1999) translation, *On My Own Opinions*, Corpus Medicorum Graecorum 5.3.2. Galeni De Propriis Placitis, Berlin: Akademie Verlag; see also, Donni, Pierluigi (2008), "Psychology," In: *Cambridge Companion to Galen,* Ed. R.J. Hankinson, 184-185.
[41] Galen (1549), *De Placitis Hippocratis et Platonis,* Lib. 7, Cap.3, Vol.1, 1033.
[42] See also: von Staden (2000), "Body, Soul, and Nerves: Epicurus, Herophilus, Erasistratus, the Stoics, and Galen," In: *Psyche and Soma,* Eds. Paul Potter and John P. Wright, Oxford: Clarendon Press, 107.

modern period—both Galenists and Aristotelians refer to the operations of soul as the *faculties* of the soul, and the distinction between nature and soul is often not adhered to.

For Galen as for Aristotle, understanding soul requires understanding body, for here too body and soul are unified. The nature of the body is the foundational principle of medicine, understood broadly so as to include both formal and material natures.[43] What is more, in a work of importance to Harvey and his fellow physicians, the *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. Galen, here at his most philosophical, writes: "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."[44] So again soul is here a principle of individuation as in Aristotle. The word that Galen uses for 'instrument' in the original Greek is *organon*, and he defines this word in *De methodus medendi*, as "…a part of the animal that can produce a complete action, as the eye is of vision, the tongue of speech, the legs of walking; so too arteries, veins, and nerves are both instruments and parts of animals."[45] Thus the relation between body and soul is much as it is in Aristotle, insofar as the body serves as the instrument of the soul and allows the soul to perform the proper functions of living things.[46] Indeed, he praises Aristotle in the *De placitis Hippocratis et Platonis*, when he writes that, for Aristotle, the substance, the 'being' of the eye is seeing, that is, it is its soul, and that, "…Aristotle does not intend that the

[43] Galen (1549), *Si quis optimus medicus est eundem esse philosophum*, Lib. I,, Vol. 0, 20.
[44] Galen (1549), *De usu partium*, Lib.I. Cap.II, Vol.1, 418, "Utiles autem sunt hae omnes ipsi animae, quippe cuius organum corpus est & propterea multum differunt a se invicem particulae animalium quoniam ipsae animae differunt." The translator of the modern edition of the *De usu*, Margaret May, notes that Galen follows Aristotle in thinking that the soul is the efficient formal and final cause of the body. See: May, Margaret (1968), *On the Usefulness of the Parts,* Bk.I, Ch.2, Ithaca: Cornell University Press, 68n.4.
[45] Galen (1549), *De methodi medendi*, Lib.I, Cap.6, 21. "Instrumentum vero appello animalis partem, quae perfectam edere actionem possit: veluti oculus visionem, & lingua loquelam, & crura itionem. Ad eundem modum & arteria, & vena, & nervus, tum instrumenta, tum partes animalis sunt."
[46] See also Galen's *De institution 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, and that the soul is said to be just because its parts perform their characteristic functions.

formation of the eye from moist bodies and tunics and membranes and muscles, so many in number, of such and such kinds, and arranged in such and such a way, is the very 'essence' of the eye…."[47] This is the same picture as in Aristotle. The material nature of a part is important, of course, but in terms of material constraints and conditional necessities.[48] But overall, in Galen, as in Aristotle, the nature of the body is its form, its soul, and thus Galen finds the proper starting place of any scientific investigation into animal bodies to be definition of this essence, the soul, very much in keeping with Aristotle's strictures on the start of any scientific investigation.[49] The *De placitis* will be a central text for in this section (as well as in Chapter 4), as this work, 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.[50] Galen argues in this work that anatomy is the prime method for investigating the souls of animals, or more accurately, it is this conception of the soul in its union with a body that is the very subject matter of anatomy, for anatomy reveals the nature of the activities and parts of the animal body.[51]

Galen, as a physician often writing to other physicians, places much more emphasis on anatomy than does Aristotle, and, in so doing, he also concentrates directly on the union of soul and body. Most importantly, he emphasizes the way in which the body constrains the capacities of the soul (although, as noted above, Aristotle too recognizes this feature of the soul body relationship).

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[47] Galen, *De Placitis*, Lib.I, Cap.8.
[48] Although it must be noted that, following Plato in the *Timaeus,* Galen places a great deal more emphasis on the constraints placed upon the Demiurgos by the matter available to construct living bodies. This comes out clearly in *De usu partium* and in *De placitis Hippocratis et Platonis.*
[49] Morrison, Ben (2008), "Logic," In: *The Cambridge Companion to Galen*: Cambridge, Cambridge University Press: 109-111.
[50] 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. Indeed, Harvey cites this work in *De motu cordis* 1628, Cap.V, 31.
[51] Another text, recently rediscovered to be non-apocryphal, provides another glimpse at Galen's conception of anatomical methodology as it relates to the soul: Galen (2011), *On Problematical Movements*, Ed. and Trans. Vivian Nutton and Gerrit Bos, Cambridge: Cambridge Classical Texts. However, this text, known in the Renaissance as *De motibus dubiis* or *De motibus membrorum liquidis* was available to Harvey, but its influence on Harvey is unclear, and I won't discuss it, opting instead to focus on the much more clearly important text of *De placitis Hippocratis et Platonis.*

As Heinrich von Staden argues, in a late Galenic work,[52] the body and soul are fundamentally related to each other through the blend and balance of humors that make up the parts of the body, and which affect the capacities of the soul residing in those parts. Von Staden writes that

> …the humoral blend or temperament of, for example, the brain, the heart, and the liver will each have a profound effect on the capacities that reside in these organs, and this will in turn affect the corresponding activities. This interactive relation between humoral blend or temperament and the soul's capacities is a central feature of Galen's view of the body-soul relation.[53]

Thus Galen enjoins his audience to empirically study the soul as it is in the bodies of animals and in man (in so far as is possible).[54]

Fitting in with his empirical approach to investigations of soul, Galen evinces a cautious sort of pragmatism on the ontological status of soul. Though he cleaves to some of Plato's doctrines on the soul, Galen remains agnostic on its substance and immortality, saying only that one knows from its effects that it must exist, but not what its definite nature is.[55] Indeed, towards the end of his career, Galen was increasingly convinced of the deficiency of every theory of the soul and the functionality of the body. As Vivian Nutton recently summarized in a review article,

> 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.[56]

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[52] Namely Galen (1549), *Quod Animi Mores Corporis Temperamenta Sequuntur* (*Whether the faculties of the Soul Follow the Mixtures of the Body*), Vol.1, 1217.
[53] Von Staden 2000, 106.
[54] 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. Though do see: von Staden, Heinrich (1989), *Herophilus: the Art of Medicine in Early Alexandria,* Cambridge: Cambridge University Press; Longrigg, James (1988), "Anatomy in Alexandria in the Third Century B.C.," *British Journal for the History of Science* 21, 455-488.
[55] Galen (1549), *De placitis*, Lib.IX, Cap.9, 1093-1094.
[56] Nutton, Vivian (2010), "Embodiments of Will," *Perspectives in Biology and Medicine* 53(2), 277.

These points are relevant to my story, for they concern not only how Galen conceived of his subject matter (as the investigation into the body as a system teleologically organized by soul[57]), but also demonstrate that Galen disagrees with his contemporaries not just on the question of *where* the faculties of soul are localized and on whether or not the soul was tripartite, but, more importantly, on *how* to localize these faculties and determine which part is primary. Thus more relevant than the fact that in the *De placitis Hippocratis et Platonis* Galen comes down on the side of Plato and argues that the soul is tripartite,[58] is the fact that Galen follows Herophilus and Erasistratus and attempts to understand the soul and its union with the body *in light of dissection*.

Given this stance on the nature of the soul (and the limits of one's abilities to determine its nature through reason and argument), Galen stresses the need to study the soul as it is embodied, empirically, and so, at least in this way, Galen cleaves to the Aristotelian position and method expressed in the *Parva naturalia* and the animal books: anatomy studies what is common to soul and body. Galen was a serious student of Aristotle's works, and, as Teun Tieleman has argued, part of Galen's criticism of the Peripatetics was just that some of their views on the soul (e.g., their cardiocentrism) were refuted by means of their own doctrines and methodologies![59] As Galen writes,

> For Aristotle and Praxagoras merit censorship when they pronounce that the heart is the origin of the nerves, which goes beyond the [anatomical] evidence. For one can come to know from the books which they left behind that made many close observations of things,

[57] There are a number of ways one could understand 'organize' here. I intend the term to here signify what one might call explanatory organization, that is, the term refers to the ways in which the body is structured into different parts on the basis of functionality, the functions explaining the structure. One might also understand 'organize' in terms of the actual construction of the body and its parts during generation—I shall explore this conception in the following chapter.
[58] 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. Tieleman, Teun (1996), *Galen and Chrysippus on the Soul*, New York: E.J. Brill, 24-26. Relatedly, Galen argues that the faculties of the soul—*dunameis*—are particular causes that one posits to account for a specific activity, and are not actual things, which are inside substances. See: Donini (2008), 186-187.
[59] Tieleman 1996, 5. I should note that, there is very little evidence regarding them and their doctrines, Galen was highly influenced by contemporary schools of Peripatetics, even and especially on his methodological doctrines.

> but when they wrote about the source of the nerves, the were either blind or talking to blind men….[60]

But, though some of his doctrines are under assault, Aristotle is not the main target in Galen's *De placitis Hippocratis et Platonis*, but rather with the Stoic Chrysippus. In his debate with Chrysippus on the nature of the soul in *De placitis Hippocratis et Platonis*, Galen argues that Chrysippus' argument for the heart containing the ruling part of the soul is based upon the wrong sort of premises and thus his conclusion cannot follow from them: his premises are not properly *scientific*. (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.)

Galen states there that scientific arguments are those that deal with the essence or substance of a thing, and that these sorts of premises form the proper starting place and not the rhetorical or grammatical arguments put forward by Chrysippus.[61] As Galen writes, "The main thing is that the appropriate premises must be considered from the substance [*substantia*] of the business being investigated."[62] So, by stressing that knowledge of substance, or essence, as the proper starting point of scientific investigation, Galen recognizes that soul is the proper place to begin any investigation into living animal bodies, for the soul *just is* the substance and essence of the living animal body. In *De placitis,* Galen is interested in the commanding or primary soul, and he argues for the definition of soul as the principle of intellect and of perception and voluntary motion, and

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[60] 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. "At Aristoteli & Praxagorae merito quis hoc vitio verterit que praeter evidentiam, cor principium nervorum esse pronunciant. Nam quod alia multa circa reflectiones viderint, ex his libris quos reliquirunt cognoscere datur. Quod vero aut ipsa caecutientes, aut ad caecos verba facientes, de nervorum principio scripserint, non est opus multis verbis adstruere, sed ad ipsum sensum progredi oportet."

[61] Galen, *De placitis*, Lib.II, Cap.3, 896-897. Here Galen argues that Zeno and Chryssipus taught no method, and as a result they mix together different types of premises without regard to the proper forms of scientific argument, that is, they begin with a rhetorical argument, followed by gymnastic and dialectical one, followed by sophistry, never realizing that a scientific argument must refer to the essence of the subject.

[62] Galen, *De placitis*, Lib II, Cap.3, 896. "Ab ipsa quaesitae rei substantia accommodatas ad rem sumptiones esse ducendas...."

this definition serves as one of his premises. He then makes the following argument, as Teun Tieleman has characterized it:

> From this initial definition Galen infers that this function requires the existence of bodily tissues (which we may dub 'nerves', *neura*) that transmit the sensory and motor stimuli from and to the central organ in which the commanding part is located. This inference is expressed in the following general principle or axiom: 'Where the centre of the nerves is, there is the seat of the commanding part.' So far the argument is abstract, or 'logical'. Empirical research, that is to say, dissection, is needed for the following step: to establish which bodily organ satisfies this principle. This shows that the brain is the centre of the nervous system both structurally and functionally and hence the seat of the commanding part of the soul.[63]

So the subject matter of Galen's anatomical research here concerns the soul as it is in the bodies of animals,[64] it proves to be about what is common to body and soul.[65] As R.A.H. King notes in his introduction to a volume on body and soul in the ancient world,

> The phrase 'common to body and soul' 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.[66]

And, indeed, this way of conceptualizing the subject matter of anatomy is Galen's considered opinion on the matter as contained in his work *De placitis Hippocratis et Platonis*.[67] As Teun Tieleman argues, 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, and which will loom large in

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[63] Tieleman, Teun (2008), "Methodology," In: *The Cambridge Companion to Galen*: Cambridge, Cambridge University Press: 56.

[64] A very important caveat here is that anatomy cannot rely on dissection alone but must also employ vivisection in order to meet its epistemic goals. This will be discussed in the Chapter 4.

[65] For a modern edition, see: Plato (1997), "Philebus," 34a3-b8, In: *Complete Works*, Ed. John Cooper, Indianapolis: Hackett Publishing Company, 422. Although Harvey certainly knew some Plato, it is unclear how much he learned from Galen (especially the *De placitis*) and how much he learned directly from Latin translations of Plato. If the latter, I do not know what edition and translation he used; as such, I consulted a likely, or at least very common, translation to use as representative of the Latin tradition, namely that of Marsilio Ficino: Plato (1546), *Omnia divini Platonis opera translatio Marsilii Ficini,* Basel. (The *Philebus* starts on 81 of this edition.) This edition is roughly contemporaneous with the translation of Aristotle and Galen I know Harvey to have used.

[66] King, R.A.H. (2006), "Introduction," In: *Common to Body and Soul,* Berlin: Walter de Gruyter, 3.

[67] I will discuss this work of Galen's in some detail in the Chapter 4.

Chapter 4 on Harvey's method.[68] Tieleman notes in an earlier work 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…."[69] Anatomical dissection is thus the *primary mode of investigating soul*. Making a similar point, R.J. Hankinson quotes a passage where Galen takes Aristotle to task for not dissecting around the heart carefully enough to see that what he thought were nerves were not, in fact, nerves. Hankinson argues that,

> This passage encapsulates Galen's methodological predilections with regard to questions involving the soul: to the extent to which detailed physiological investigation can enable us to push forward the inquiry into the soul's nature, location, and modes of functioning, then such investigations are neglected at our peril: and any attempt to elaborate a theory of the soul and its relations with the body that does not make use of…the results of the best such investigations is scientifically unfounded and philosophically worthless.[70]

Thus, Hankinson argues, part of the motivation for Galen's detailed experiments, dissections, and vivisections, was this goal of understanding the operations of soul in its union with the animal body.

2.1.3. Body and Soul in the Renaissance

I now turn to examine certain late Medieval and Renaissance discussions of body and soul, including Harvey's teacher in Padua, Fabricius ab Aquapendente. In the wake of new Humanist translations and considerations of Aristotle and Galen, long after the work done by Constantinus Africanus at Salerno and by Modino at Bologna, one begins to see the revival of anatomy as core to investigation into the soul and as central to medical theory.[71] Over the course of the Renaissance

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[68] Tieleman 2008, 49.
[69] Tieleman 1996, xii.
[70] Hankinson, R.J. (2006), "Body and Soul in Galen," In: *Common to Body and Soul*, Ed. R.A.H. King, Walter de Gruyter: New York, 234.
[71] The role of Salerno and other Italian cities and universities, and the path of transmission and translation of various treatises and texts, is the subject of much scholarly discussion and debate. See: Glaze, F. E. (1995), *The perforated wall: The ownership and circulation of medical books, ca. 800–1200*, Dissertation at Duke University; Green, Monica (2001), *The Trotula*, Philadelphia: University of Pennsylvania Press; and O'Boyle, Cornelius (1999), *The art of medicine: Medical teaching at the University of Paris, 1250–1400*, Leiden: Brill. Further, a prominent place for

there is a shift whereby the natural philosophical aspects of investigation into soul became separated from the more overtly theological and metaphysical aspects. It is 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 project of certain philosophers and anatomists. This section should be taken as tracing the history of a set of philosophical ideas concerning body and soul, and not as an assessment of the import or value of the intervening period or any particular figure. Indeed, one aspect that must be mentioned is the transition in this period from Aristotle to Aristotelianism and from Galen to Galenism, that is, from an individual's philosophical corpus, with inconsistencies and idiosyncrasies, to the creation of a school and a dogma associated with some part of that philosophical corpus.

I start by noting that the importance of Aristotle's *De anima* was clear not only to traditional Scholastic Aristotelians, but also to anatomists and physicians from Mondino to Fernel to Fabricius and beyond. For instance, one sees in the *Historia anatomica* (1600) that the Galenist Laurentius makes numerous references to *De anima*[72], and though he sides with Galen on most issues, he clearly knew the doctrines of Aristotle well (if perhaps only to combat certain of the Peripatetic's doctrines). The *De anima* was a central text in the education of just about every philosopher and physician (and lawyer and priest) of the era, regardless of their ultimate philosophical allegiance (to Aristotle or Galen or whomever).[73] The soul was of central interest to the Scholastics from the mediaeval period onwards, and the study of and commentary on the *De anima* formed the core of their faculty psychology.

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anatomy in medical theory about illness should not be taken to imply that anatomy had any immediate practical ends in treating illnesses.

[72] For instance, see Laurentius (1600), *Historia anatomica*, Lib. I, Cap. VIII, 13.

[73] Michael, Emily (2000), "Renaissance Theories of Soul," In: *Psyche and Soma,* Eds. Paul Potter and John P. Wright, Oxford: Clarendon Press, 148n.2 and references therein.

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.[74] One must also include Aristotle's works on animals as setting the agenda for these psychological investigations, at least among certain natural philosophers. As Paul Mengal has 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*.[75]

As Katherine Park and Eckert Kessler argue, a these works of Aristotle, along with their Arabic and Latin commentators, formed the core set of texts for Renaissance thinkers writing on the soul.[76] 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 dating from 1521-1523.[77] 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. In this tradition, the *De partibus animalium* and the *De generatione animalium* loom large, works that contain extensive use of soul

[74] See Park and Kessler 1988, 455. See: Freigius, Joannes Thomas (1575). *Ciceronianus,* Basle. See also: Schuling, H. (1967). *Bibliographie der psychologischen Literatur des 16,* Jahrhunderts: Hildesheim

[75] Mengal, Paul (2000), "La constitution de la psychologie comme domaine du savoir aux XVIème et XVIIème siècles," In: *Sciences Humaines* 2, 7

[76] See: Park and Kessler 1988 and Park 1998.

[77] Perfetti, Stefano (1999), "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, 297. Note further that though Pomponazzi's books weren't published until the 1520s, he had been lecturing on them for some time, and his views were widely enough known to be of concern to the Catholic authorities.

in the explanation of living things. What is more, these texts were of central importance not just to the philosophers but also to the physicians as well in how they conceived of body and soul.[78] And while these authors disagreed on many issues, from stylistic choices to 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 these newly available texts and improved translations.

Over the course of the sixteenth century one sees 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.[79] Indeed, neither Harvey nor Fabricius ever use the term '*forma substantialis'* or any cognate. Early views on the soul in the fifteenth century and earlier were, as has been argued by Emily Michael, mostly Thomistic in their interpretation, in which every individual entity is composed of prime matter (which is pure potentiality) and a substantial form (actuality) inhering in the prime matter, and which determines the nature of the living thing and its various powers.[80] How to understand those powers and their organization was a matter of debate; Figure 1 below which represents Lambertus de Monte's late 15th century division of the powers of the soul.

[78] For instance, Caspar Bauhin's (1600) *Theatrum anatomicum*, used by Harvey for his lecture notes in part, makes almost constant reference to these two works of Aristotle.
[79] 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 1999, 304-305.
[80] Michael 2000, 151-152.

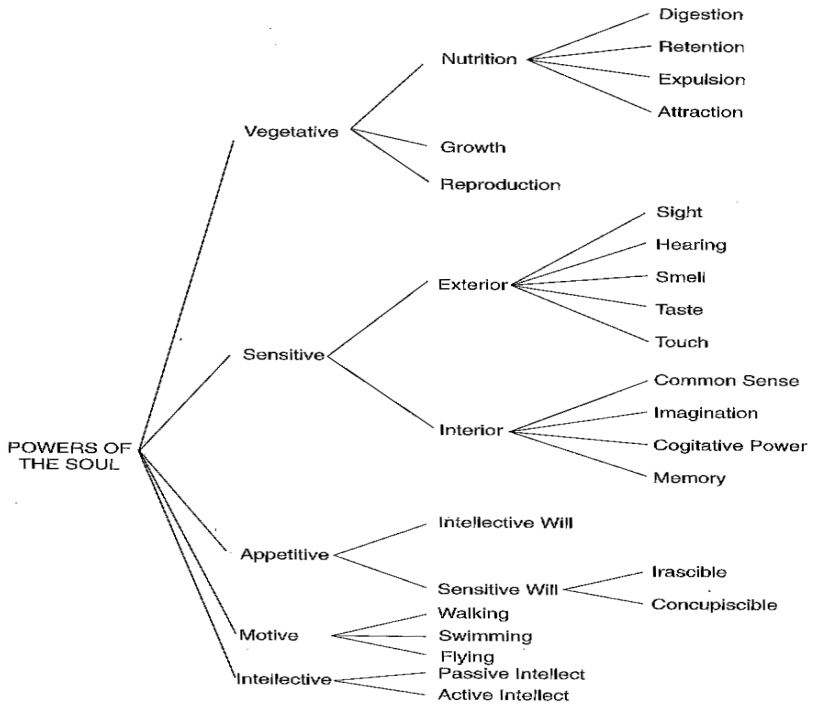

Figure 1. A Thomistic conception of the powers of soul according to Lambertus de Monte (taken from Michael 2000, 50).

Neither Harvey nor his Paduan forbearers distinguishes between the various faculties of the soul as per Figure 1 above, rather referring loosely to the nutritive or vegetative soul in the way that Aristotle most often does, their efforts rather focused instead on distinguishing the organic parts that carry out soul functions. Thus, over the course of the Renaissance, one sees these sorts of conceptions of soul and powers gradually fade from view. Instead, new controversies arose around the question of the mortality of the soul, stemming in part from the recovery and Humanist translation of these texts, especially Alexander of Aphrodisias' commentary on *De anima.*[81]

Another key set of texts for these philosophers and physicians debating the soul were new Humanist translations of Galen's works, especially the *De usu partium,* which concerns not only the soul explicitly as it is organized in living animals, but is also his most Aristotelian work, and which espouses a fundamentally Aristotelian teleological conception of the soul and its relation to the

[81] Michael 2000, 152.

body.[82] What is seen in the medical tradition is an eclectic blend of Aristotelian and Galenic doctrines on the soul, and occasionally this leads to some views that seem (at least at first) to be contradictory. So, for instance, the Paduan anatomist Gabriele de Zerbi writing at the start of the sixteenth century, in his justification of anatomy, emphasized that dissection teaches the structure and function of the body, that is, about both body and soul, and that this knowledge is worthy of a philosopher. Roger French summaries De Zerbi's position as emphasizing that anatomy teaches, "…one 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…"[83] Yet, as a close analysis of the work of these medical writers shows, these doctrines need not conflict, for the relation between soul and body is complex: soul is affected by the body, as both Galen and Aristotle noted, but this does not undermine the body as the instrument of soul, for as noted above the material nature of the body limits its activities. Both the physician and the philosopher are interested in living animal bodies in union with their souls, understood in an increasingly eclectic, hybrid Galenic-Aristotelian way. Central to this eclectic philosophical tradition, emphasized especially in Averroes and certain Arabic writers,[84] is the idea that soul can be understood through certain kinds of activities found in the bodies of living creatures.

Besides these textual traditions, there are two developments in this period important for understanding learned discussion of soul and body. The first is that, in the wake of the Pope's *Apostolici Regiminis* of the Lateran Council in 1513, there is a shift in learned commentaries and

[82] Importantly, the *De juvementis membrorum*, a rather strange Galenic work that was central to the Renaissance medical curriculum, seems to be a summary of *De usu partium.* See: French, Roger (1979), "*De juvementis membrorum* and the reception of Galenic physiological anatomy," *Isis* 70, 96-109.
[83] French, Roger (1999), *Dissection and Vivisection in the European Renaissance,* Aldershot: Ashgate, 87.
[84] Two works relevant to Harvey's training at Padua are Averroes' *Commentarium magnum in Aristotelis De anima libros* and Avicenna's *Liber Canonis*.

treatises discussing soul. It targeted aspects of the work of the Aristotelian Pietro Pomponazzi,[85] 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.[86] The decree banned two sorts of arguments on the nature of the soul: first, it outlawed mortalist arguments that the soul could perish, and, second, it barred Averroist arguments that it is one and the same soul that animates all men. As Emily Michael argues, 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…."[87] 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 falsity. The option taken by many Aristotelians, and certainly those that are of most interest here was

> …to submit to the authority of the church but to continue to philosophise within the bounds set by the church through Bishop Barozzi at the beginning of the sixteenth century at the Lateran Council. 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.[88]

Thus part of 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

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[85] 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 his (1516) *De immortalitate animae.* Also see: Pomponazzi (1525), "Defensiorum," *Tractatus acutissimi utillimi et mere peripatetici,* Venice. This sort of interpretation and attitude towards Aristotle is sometimes referred to as 'radical Aristotelianism.'

[86] Pomponazzi, Pietro (1516), *Tractatus de immortalite animae,* Bologna, Cap.8. See also: Pine, M (1986), *Pietro Pomponazzi, Radical Philosopher of the Renaissance,* Padua. See also Michael 2000, 154-155.

[87] Michael 2000, 158.

[88] Kessler, Eckhard (1990), "The Transformation of Aristotelianism during the Renaissance," in: *New Perspectives on Renaissance Thought,* Eds. John Henry and Sarah Hutton, London: Duckworth, 141-142.

instead concentrated upon those faculties of soul shared with animals. Thus investigation of soul along Aristotelian lines became *by necessity* an empirical investigation! A form of mortalism, closely linked with a more naturalistic understanding of the soul and its role in living creatures, became widely disputed and held, especially amongst the physicians. By asserting that the rational part of the soul is separable from the body, and thus from those aspects of the mortal soul which regulates it, philosophers could at once assert that the soul of animals was mortal, yet also hold that the soul of interest to a Pope, the intellective soul, was still immortal.[89] Thus there was a new emphasis on empirical—and especially anatomical—investigation of the soul, and a renewed (but not new) 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, is mortal insofar as the organic soul is the actuality of a living body and thus, when it dies, so too the soul must pass, though the intellective aspect lives forever. And though this distinction was present in earlier authors,[90] it became increasingly important in the Renaissance.[91]

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 notes, "…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

[89] Another option, favored by Pomponazzi and the so called 'radical' Aristotelians, was to claim that, as an interpreter of Aristotle, one had to follow what the Master actually wrote in one's commentary regardless of the (Christian) truth of the matter. Thus, for instance, one sees Zabarella, writing after the Lateran Council, in his commentary on *De anima,* doesn't quite assert the mortality of the soul—rather, in his role as a commentator on Aristotle he takes time to counter the arguments that the soul must be immortal. He seems to acknowledge that Aristotle thought the soul mortal, but he never fails to mention that Aristotle also asserted the separability of the intellective part of the soul from the organic part, thus interpreting him in at least minimal accordance to the *Apostolici Regiminis.* See: Mitrovic, Branko (2009), "Defending Alexander of Aphrodisias in the Age of the Counter-Reformation: Iacopo Zabarella on the Mortality of the Soul according to Aristotle," *Archiv für Geschichte der Philosophie* 91: 330-354.

[90] So, for instance, Gassendi in Lib. II of his (1658) *Syntagma* stated that this is found in Ockham's *Quodlibeta.*

[91] 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.

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…."[92] This distinction is especially important in natural philosophical works. For example, in the case of the Paduan Aristotelian Zabarella, one finds that this distinction between organic and intellective soul is found especially in his natural philosophical works, of which he considered his commentary on *De anima* to be—for Zabarella conceived of this project as part of the natural science of soul.[93]

The soul and body union was the topic of much debate, not only amongst the physicians, but also the theologians and philosophers (never mind the Pope!), and these debates became increasingly predicated on anatomical findings. Thus one finds that theologians argued, for instance, on 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.[94] Among the Humanists and reformers of the Renaissance, the import of new anatomical work for doctrines concerning soul was not lost, and experience and *a posteriori* reasoning came to be seen as central to the task of natural philosophers, even amongst the commentary tradition.[95] Thus one finds the Protestant theologian and educational reformer Melanchthon incorporating such findings into his philosophical and theological account of the soul. Central here is the *De anima,* of course, but Mengal notes that Melanchthon's commentary was a hybrid of traditional philosophical commentary and the most up to date anatomical knowledge:

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[92] Kessler 1990, 145.
[93] Mitrovic 2009, 331. Mitrovic points to Zabarella's (1590) *De rebus naturalibus,* his incomplete (1605) commentary on *De anima,* and three manuscripts in the Ambrosiana library in Milan.
[94] For an overview of some of these issues in the Renaissance, see: Nutton, Vivian (1990), "The anatomy of the soul in early Renaissance medicine," In: *The Human Embryo*, Ed. G.R. Dunstan, Exeter: University of Exeter Press. Note, too, that these issues go back at least as far as Aquinas, who was, I note, himself reacting to the Arabic tradition and especially to Averroes.
[95] For instance, Pomponazzi attempts to use experience to invalidate the opinion of Albertus Magnus on the nictating membrane of birds: see the discussion in Perfetti 1999, 309-310. See also: Pomponazzi, Pietro, (2004), *Expositio super primo et secundo De partibus animalium*, Ed. Stefano Perfetti, Florence: Olschki.

> 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.[96]

If a philosopher and theologian like 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 endlessly debated by the Scholastics, but also with the efficient and material causes, "…which they interpreted as the physical process accounting for these phenomena and the organs in which they took place."[97] More radical Aristotelians, such Agostino Nifo, also included biological concerns in their investigations of soul, and so it should be no surprise that Nifo wrote treatises on physiognomy and other psychological issues.[98] Indeed, Nifo is interesting on the topic of natural philosophy and souls, for he criticizes Aristotle on the prevalence of material causes in his natural works and his interpretation of Aristotle places an even greater emphasis on teleology than the Master himself![99]

There is a second development relevant here: the publication of Vesalius' *De fabrica* in 1543. This development further strengthened the anatomical focus of debates concerning soul, and, what is more, it changed not only the nature of the debate but also the nature of the debaters.[100] As Katherine Park has argued, in the wake of Vesalius and his combination of critique of Galen's doctrines and embrace of Galen's methods, "…there are signs that anatomy and physiology were beginning to replace demonstrative Aristotelian natural philosophy, at least temporarily, as the

[96] Mengal 2000, 8.
[97] Park 1988, 468. See: Reisch, Gregor (1517*), Margarita philosophica*, Basle, 439-440.
[98] Park 1988, 469. See: Nifo, Agostino (1523), *Parva naturalia*, Venice, 1r-22v.
[99] Perfetti 1999, 311.
[100] Obviously not all the debaters, or even a majority necessarily.

prime models of scientific explanation."[101] Vesalius' argument that anatomy leads to *scientia,* then, should be seen against this background, as part of a shift in the nature of the debate over the soul in the Renaissance.[102] As Andrew Cunningham has noted,

> Vesalius too writes of the contribution that anatomy can make towards knowledge of the body and mind, and of the divine power arising from their harmony, 'indeed about ourselves, that which in truth is the study of man'. Anatomy is the study of the temporary lodging and the instrument of the immortal soul, a dwelling that in many respects corresponds admirably to the universe, and has great value in attesting the wisdom of the Creator.[103]

The anatomist becomes (in some ways) the paradigmatic philosopher in his understanding and investigation of the soul, which knowledge is not only important for philosophical reasons, but, as Cunningham notes, was used to reinforce Christian ideas about God, Nature, and the place of human beings and their bodies in the universe, a goal that became increasingly pressing to anatomists and philosophers after the Lateran council. But what I stress in this development is its empirical mode of investigation. For instance, as Walter Pagel argued, 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.[104] While this aspect of generation had long been noted, these new writers emphasized especially the empirical aspect of their investigation.[105]

This conception of the body and soul was, in particular, central to the work of physicians and philosophers working in Padua. Indeed, as has been argued by Andrew Cunningham and others, Fabricius ab Aquapendente's work exemplifies this conception of the body and soul and his anatomical investigations revolve around the soul faculties—Cunningham has named this the

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[101] Park 1998, 482. This claim is a bit unclear, for, as James Lennox has pointed out to me, anatomy, on an Aristotelian conception, is the way to the principles, for Aristotle always opposes demonstrative deduction and induction. What I take Park to be saying here is rather that the prime models of good natural philosophical explanations (demonstrations) began to be taken from the work of anatomists, and not, say, the explanations offered by Aristotle in the *Meteorology.*
[102] See, for instance, Vesalius (1543), *Fabrica*, Lib. I Cap. 6, 29. I thank Evan Ragland for this point and reference. See also, Sirasai, Nancy (1994), "Vesalius and Human Diversity in *De humani corporis fabrica*," *Journal of the Warburg and Courtald Institutes* 57, 60-88.
[103] Cunningham, Andrew (1975), "The Kinds of Anatomy," *Medical History* 19, 6.
[104] Pagel, Walter (1967), *Harvey's Biological Ideas*, New York: Hafner, 233-247.
[105] See: Aquinas, *De Potentia*, Q.3, A.9-12.

'Aristotle Project'.[106] Fabricius explicitly conceived of his project as continuing in Aristotle's footsteps, retracing and, in some cases, correcting the Philosopher's views on soul and body. Thus Fabricius' anatomy lectures revolved around his particular research interests, which, although it is not perhaps immediately obvious, were all based directly around the faculties of the soul and their instruments, that is, 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*[107]); sensation (*De oculo, De aure*), [108] noting that as Cynthia Klestinec has argued, these treatises were modeled on Aristotle's books on animals and the *Parva naturalia*.[109] The difference between Fabricius and Aristotle was that Fabricius' project is performed in a much more straightforwardly anatomical way,[110] and though Fabricius (and Harvey following him) thought of himself as a natural philosopher, he was a distinctly *medical* kind of natural philosopher. His debt to Galen and other medical writers, though often unacknowledged, is both deep and obvious from a study of his treatises. Thus one finds that, in his dedication to Leonardo Donato in the *De visione, voce, et auditu*, Fabricius makes note of his methods and his philosophical forbearers, most important of which is Aristotle, but, in keeping with the distinctly medical-philosophical context in which he was operating, Fabricius also makes reference to a number of works of Galen, such as the *De usu partium*.[111]

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[106] Cunningham Andrew (1985), "Fabricius and the 'Aristotle Project': Anatomical teaching and research at Padova," *The Medical Renaissance of the Sixteenth Century*, Eds: Andrew Wear, Roger French, I.M. Lonie IM, editors, Cambridge: Cambridge University Press: 195–222

[107] Furthermore, one can see Fabricius' *De venarum ostiolis* as part of the nutritive system, since, as Cunningham (1985) notes, "…Fabricius quite naturally starts from understanding that the veins are a system for distributing nutriment to the whole body…" (207).

[108] See, for instance, Klestinec, Cynthia (2004). "A History of Anatomy Theaters in Sixteenth-Century Padua." *Journal of the History of Medicine and Allied Sciences*, 59(1): 374-412; and Klestinec (2007), "Civility, Comportment, and the Anatomy Theater: Girolamo Fabrici and His Medical Students in Renaissance Padua," *Renaissance Quarterly*, 60(2): 434-463. See also: Cunningham 1985.

[109] Klestinec 2007, 440-441.

[110] This is a matter of degree, not kind. Aristotle in his works on animals often makes references to dissections.

[111] 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 (1738), *Opera*

Fabricius 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)—just as I have been discussing.[112] Fabricius describes the latter as a principle that governs the process of formation, and 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.[113]

This is the same picture noted 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. But, again following in Aristotle and Galen's footsteps, Fabricius notes that, to understand this organic soul, one must understand the matter as well, that is, the very structure and composition of the parts that are its instruments. Thus Fabricius' goes about his task by a certain inferential method: moving from structure (the matter) to action (the efficient cause) and, finally, to the use and utility (the final and formal cause[114]) of the part.[115] Note, further, that the order of explanation is the reverse of the order of inference: one explains structure 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 accuses Vesalius of being, with the structure and material make up (often called the *fabrica*) of the parts. Fabricius writes 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

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anatomica et physiologica, Leiden. Furthermore, as Cunningham has noted, one should not see Fabricius project as *against* Galen in favor of Aristotle, at least not in general. For, especially on certain methodological matters such as the importance of teleology, Galen and Aristotle are in much agreement.

[112] Fabricius 1621 [1942], *De formation ovi, et Pulli*, Trans. Howard Adelmann, 43 [200]).

[113] Fabricius 1621, [1942], 44 [202]. James Lennox has pointed out to me that this is simply a reiteration of the conclusions of Aristotle's *De generatione animalium* II.6.

[114] For, as Aristotle notes, the final and formal cause are identical in natural things. C.f. *Physica* Lib.II, Cap.7.

[115] Cunningham 1985, 201-202. See also the dedications contained in the front of Fabricius 1738 *Opera anatomica*.

that he has now learnt the whole anatomic business and that he is master of it…."[116] And, as I lay out in the following section, Harvey, too, adopts this fundamentally causal picture of the goals of anatomy.

2.1.4. Body and Soul in Harvey

I now turn finally to discuss how Harvey conceives of the subject matter of anatomy. In particular, I show that he conceives of anatomy as directed towards understanding the capacities and goals of the parts as the *instruments* of soul.

Harvey's philosophy, as it is represented especially in the *Prelectiones anatomie universalis* (1616-1627) and the *De motu locali animalium* (1627), reflects the hybrid conception described in the previous sections, taking both elements of Aristotle, as has been noted by Walter Pagel,[117] as well as Galen and the medical writers, as noted by Andrew Wear.[118] Much of Harvey's Galenism is hard to detect, for Harvey rarely quotes from or references Galen (especially in comparison with Aristotle), and when he does do so, it is often on matters of fact and not method or theory.[119] Though Harvey's allegiance to the medical writers is difficult to detect, his deep familiarity and indebtedness to their works is obvious from a close study of Harvey's texts.

One can tell from the content of the lectures and those references that Harvey does make that he knew his Galen quite well, along with other medical writers such as Hippocrates. Harvey studied very carefully his friend Theodore Goulston's 1640 edition of Galen's *Opuscula varia*, and as Vivian Nutton notes, "…he made some form of comment on almost every page, usually an

[116] Fabricius (1600), *De larynge*, quoted and translated in Cunningham 1985, 202.
[117] Pagel 1967. This is a common theme in Harvey scholarship since Pagel's work, of course.
[118] Wear, Andrew (1983), "William Harvey and 'the Way of the Anatomists'," *History of Science* xxi, 223-249.
[119] For instance, in Harvey 1616, 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.

underlining but, especially in the last three tracts, taking serious issue with what Galen said."[120] That Harvey takes 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 agrees with (or even follows) Aristotle—such as, importantly, on the teleology of the soul body relation. On this point, at least, Galen and Aristotle stand firm against those who attempt to understand nature, and especially animal bodies, by purely material means—formal and final causes take precedence, though matter is of course extremely important.[121] Harvey's Galenism then, in contradistinction to some of his fellow Physicians, is subtle, more an attitude and an approach than a matter of doctrine.[122] This should not, perhaps, surprise one unduly, given that, in many ways, this is also Harvey's attitude towards Aristotle, though he tends to find himself in agreement with the Peripatetic much more often. But Harvey's preference isn't that one follow Aristotle in place of Galen, but be rather takes them both to be suggesting the same basic methodology: anatomical investigation through dissection and observation will reveal the matter of a part (whether it is homogenous or heterogeneous, what sort of matter it is (blood, flesh), etc.) and its structure (how it is shaped, where it is located, how it is connected to other parts, etc.), and, especially when combined with vivisectional investigation of the motions of the body, this knowledge allows one to discover the action and use of the part. Harvey saw the necessity of dissection as both part of the Galenic background and as a proper part of Aristotelian methodology, called in both traditions *historia* (and whose importance in the Renaissance and in Harvey will be discussed in Chapter 4).

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[120] Nutton, Vivian (1988), "Harvey, Goulston, Galen," Ch.14 in: *From Democedes to Harvey,* 115. With this in mind, one should not perhaps wonder overly much at how Harvey could remain an Aristotelian after his own epoch making discoveries

[121] Though it must be admitted that Galen is much more prone to make use of certain material/elemental explanations in situations where Aristotle would be loathe to do so.

[122] So often when Harvey quotes or refers to Galen, he does so in order to disagree about a point of fact or conclusion. But Harvey does so on a case-by-case basis, and what he is interested in is the truth in each situation. Thus Galen often 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 1616, 262).

Turning now to anatomy, Harvey understands *anatomia* as a cutting up of the body: he is quite literally concerned with division.[123] Harvey is much concerned with how best to divide the body into parts, a question of great antiquity, and one of great concern amongst his contemporary anatomists, and which I will consider in the following section.[124] Importantly, he notes that, "…Anatomy must divide no further than Nature has devised."[125] In other words, while performing an anatomy, one must be careful to quite *literally* carve nature at the joints! Thus understanding how soul organizes the body is fundamental if one wishes, with Harvey, to make no divisions beyond what Nature has devised. For Harvey, anatomy is an investigation that ends in causal knowledge of the parts of the body. Understanding is achieved by knowledge of the relations between a part's end and the means by which that end is accomplished, or, to use the terminology of Harvey's era, it means determining the *usus* and *actiones* of the parts.

Key here is the *De partibus animalium*, one of the Aristotelian works central to Renaissance discussions of soul noted above. Paraphrasing this work, Harvey writes,

> Indeed, since the operations and actions 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.[126] 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.[127]

Harvey here follows Aristotle in thinking of the operations of the parts of the body as having to do with soul. The quote is a clear reference to *De partibus* animalium, and one that resonates throughout the Aristotelian and Galenic corpuses. This quote reveals some important foundational assumptions for Harvey, and it sets up the basic teleological picture that undergirds his conception

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[123] We shall look at Harvey's conception of anatomy in great detail in Chapter 4.
[124] See, for instance, Laurentius discussion of the meaning of part in his *Historia anatomica,* (1600), Q.1-2, 31-34.
[125] Harvey 1616, 4. "…Anatomia non ulterius dividere quam Natura devisit."
[126] In the manuscript (British Library, Sloane MS230a), the line about the body being the instrument of the soul is on a new line, and the best way to render this is as a new sentence, and not, as Whitteridge has done, by adding it to the end of the previous sentence.
[127] Harvey 1616, 4. "Quoniam enim operationes et actiones Naturae plurimae et distinctae, ideo plures et distinctas partes; corpus enim animae organum. Vel potius homo et pars ut organum potentiam habens ut serra si sponte secare potuisset."

of anatomy. The idea is this: functionality precedes materiality. Soul and body are unified, and one understands and explains the parts by way of reference to their functioning, to 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 a goal, and for anatomy, the goal one is interested in is some sort of good for the animal, often some necessary function for life, e.g., nutrition or cooling. Remember that, for Aristotle, the soul is the actuality of the body in the sense that it is the soul that gives the body its unique capacities, and that *potentia* is the Latin word used in *De anima* when Aristotle describes the soul as an actuality with the potential for life within it. Harvey clearly has this conception of body and soul in mind when he distinguishes the various senses that body (*corpus*) has in relation to the whole, and he notes that, "[Body] as differentiated from a composite, because there is no part [of an animal] which is not living by this criterion, even including the marrow."[128] That is, all the parts of the body have some function, a role to play, and thus all are ensouled and have life. This is just Aristotle's understanding of the soul as the final and efficient cause of the body.

Thus the body is *organized* around these potentialities or capacities: 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, a number of different parts that together accomplish those various functions. The variety of parts is explained by the variety of life functions that need to be accomplished, plus the constraints placed upon them by the matter of the body and by the animal's way of life.[129] Thus the importance

[128] Harvey 1616, 6. "Ad differentiam misti secundum quod tale nulla pars non vivens, sic contenta medulla."
[129] Aristotle distinguishes between *natural* ends, and *incidental* ones, though Harvey doesn't discuss anything along these lines. Monte Johnson notes that, "For anything that naturally has an end, it is possible to determine incidental ends. The eye exists for the sake of seeing, but also for the sake of a cow, who naturally has eyes, and benefits from being able to see with them. But notice the existence of other possible uses of an eye, which are incidental to these functions. The difficulty is that there are many, perhaps an infinite number of uses of an eye, and so how do I know which correspond to the scientific explanation of what an eye is? The solution is to come up with a means of distinguishing between uses (i.e. ends) of an eye that are natural from those that are incidental. Thus Aristotle makes a distinction between the intrinsic-natural uses of an eye, and the extrinsic-incidental uses of an eye. The former feature in a scientific explanation of the organ, but the latter do not. For that an eye is for seeing helps us to understand why it has

of dividing not beyond what Nature has devised is understood in light of the fact that the body is organized around the set of life functions. As mentioned above, the word for instrument ('*organa*' or *'instrumentum'*) is thus central to understanding what is going on in this passage, as each part, by virtue of its potentialities, is an instrument by which the relevant goal is accomplished. Further, in order to understand the complicated interrelations among the parts, Harvey employs the concept of instrumentality to explain how, for instance, the parts of the digestive system work together to accomplish the overall goal of nutrition, with each part contributing some instrumental sub function to this goal.[130] Notice again, 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, and is related to other parts by virtue of the instrumental contribution of 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). Anatomy concerns the relations between the ends (functions) of the parts and their means (their motions and actions that accomplish those functions). I mentioned above that the quote from Harvey is a clear reference to *De partibus animalium*, where Aristotle writes that:

> Because every instrument is the for the sake of something, and the parts of the body are for the sake of something, we see that, indeed, a thing is itself for the sake of something, it is for some action only, for the entire body is well known to be constituted for the sake of some complete action. For cutting does not happen for the sake of the saw, but the saw is for the sake of cutting, since cutting is a certain use. Wherefore the entire body is made for the sake of the soul, and the parts are constituted for the sake of their functions, and their offices, to which each are fitted.[131]

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the various parts that it does, how it was formed, and how it benefits that which naturally has it" (Johnson 2005, 61). Furthermore, Harvey doesn't often consider a creature's way of life, its *bios,* at least not as consistently as does Aristotle.

[130] See, for instance, Harvey 1616, 12; 22.

[131] Aristotle (1552), *De Partibus animalium libri Quatuor, Theodoro interprete,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6, Venice, Lib.I, Cap.V., 67. Note also that I have eliminated the abbreviations from the Latin as an aid to clarity and readability (thus '*scilicet'* and not '.s,' '*esse*' and not 'ee,' and so forth). "Cum autem instrumentum omne rei alicuius gratia sit, & partes corporis quasquae gratia esse alicuius videamus: id autem ipsum esse alicuius gratia, non nisi pro aliqua actione sit: patet iam totum etiam corpus constare alicuius gratia actionis plenioris. Nonenim sectio serrae gratia facta est, sed serra

Harvey, following Aristotle here, emphasizes the 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.' It is here that Aristotle connects essence and explanation together, as James Lennox has argued:

> The connection between essence and explanation here is as intimate as it was in the *Posterior Analytics*. 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...To be the heart of a certain kind of animal is to be an instrument structured (and located) appropriately for the nutritive and perceptive functions of that (kind of) animal.[132]

These functions, these activities and capacities, are *formal features of the animal*—that is, they are aspects of its soul, its very substance, what makes it what it is.[133] The conception of functionality in the *De partibus animalium* has been aptly summarized by James Lennox in his commentary to the *PA*, where he writes, commenting on the above passage, that,

> This paragraph brilliantly ties two threads of *PA* I together…Aristotle views the *psuche* or soul, not as a distinct sort of substance 'animating' the body, but simply as the special capabilities of a body with organs. Each organ develops and exists to perform a specific function and the organism as a whole develops with the ability to perform the unified set of functions that we call the organism's life…Certain natural objects exist in part *because of* the actions or functions they perform. To say that an animal has eyes for the sake of sight means that sight is one fundamental reason why that animal's development included the formation of eyes.[134]

By citing Aristotle in this context, it is obvious that it was very clear to Harvey, as well as his ancient sources, that the body was naturally organized around a set of capacities for certain

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sectionis gratia, cum sectio quaedam usio sit. Qua propter corpus etiam totum animae gratia conditum est, & membra officiorum gratia constant, & munerum, ad quae singula accomodantur."

[132] Lennox, James (2009), "Form, Essence, and Explanation in Aristotle's Biology," In: *A Companion to Aristotle,* Ed. Georgios Anagnostopoulos, London: Blackwell Publishing, 348-67, 352.

[133] Lennox 2009, 353.

[134] Lennox 2001a,175-176

functions. The animal body, then, expresses a set of 'being for the sake of' relations, and these relations are elaborated in terms of the means-end structure of hypothetical necessity.

The sorts of craft metaphors that Aristotle uses to describe this subject matter are extremely telling, and it is fundamental to this picture, in Harvey as well as in Aristotle, that Nature is like a craftsman: bodies are designed according to the goals which animal bodies must accomplish, just as a house is designed according to the goals which a house, in order to be a house, must accomplish (to provide shelter and so on). Thus, as noted above, parts are understood in terms of conditional (or hypothetical) necessities: given their function, they must be made in such and so a way given the materials available. This is 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 do the parts of the body need to be designed in order to accomplish their functions. For instance, due to its function of protecting the brain, the skull needs to be hard, durable, must surround the brain, and so forth.

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, is Harvey's conception of a nature, for as he says in the *De motu locali animalium,* "To learn about movement is very largely to learn about Nature, for Nature has been defined as the 'principle of motion'."[135] 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, or WH what is divine and corresponds to the fiery element of the stars.[136]

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

[136] Harvey 1627, 32. "In omni motu locali est movens…Cum omnes antedicti motus et partium et totius in homine et plurimis animalibus insunt, et Natura principium motus in quo inest, quod idem principium omnium [motuum] in omnibus Natura est, et Anima animante et forma vel WH quod est divinum respondens element stellarum". Here

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 actions and functions. Indeed, Harvey explicitly defines these three as one of the sources of movement: "On the different sources of movement: (1) Natura forma anima…."[137] Note first that Harvey here equates nature, form and soul, in a way that is distinctly Aristotelian (and against Galen's position in the *De natura facultatibus*). So insofar as the soul is the source of movement, and insofar as the anatomist is interested in the movements—or better, the *actions*—of the parts, then the anatomists' subject matter is deeply concerned with the soul as an efficient cause. Indeed, 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 writes 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 around the body, it is its source and origin, and this due to the forceful systole and not to the vital spirits.

Harvey in the quote above concerning nature and soul makes a reference to the conception of the immediate instrument of the soul as a sort of fire, akin to the element of the stars. The *locus classicus* for this view is in Aristotle's *De generatione animalium,* a work that was central to Renaissance discussions of soul, as has been stressed by L.A. Deer (now Richardson), especially in the embryological context.[138] But this idea, and the notion of instrumentality, has a much wider import than discussions of generation, for it is necessary for understanding the parts as well. The

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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.

[137] Harvey 1627, 39.

[138] Deer [Richardson], 1980.

soul by means of this heat is able to effect the necessary changes in the body to complete the functions needed for life. Central here is the *nutritive* faculty of the soul, which Harvey connects with the most basic functioning of the parts of the body (or at least those parts not under control of the will), and which is thus of primary importance in anatomical investigation, for this faculty is shared by all living creatures.

Nutrition and generation, twin sides of the same faculty, both involve concoction, and Harvey writes in a note to himself that, "Concoction is the alteration of the whole of substance which occurs in the process of generation and corruption, for out of food and drink together come both chyle and blood."[139] Indeed, nutrition and generation are central because, as the most basic capacity of soul, their presence indicates life. Harvey writes, "In the mid section [of the body] is the very power of life, the first beginning of both the other parts, and from the middle comes one way nutrition and generation, and the other the senses and the understanding."[140] Thus the middle part of the body, containing the stomach, heart, guts etc., the instruments of nutrition., is of great import and is the seat of soul and the source of life, and about which Harvey's discovery of the circulation would forever change.[141] Harvey's work in the *De motu cordis* should be conceived of as an investigation into nutritive soul, for the heart, arteries, veins and blood are the instruments of nutrition: in discussing the larynx in his discussion of the upper belly in the *Prelectiones*, Harvey notes that "…the veins are for its nourishment and the arteries are for life itself…."[142] Life and the nutritive capacity are deeply interrelated, for it is this nutritive capacity which is responsible for the

[139] Harvey 1616, 116, "Coctio mutio totius substantie cum generat et corrumpit quia ex cibo et potu mistis chilus et sanguis." See also Harvey 1616, 32, 98.
[140] Harvey 1616, 32. "medio loco quod primum omnium fundamentum; in medio virtus principium utrorumque, hinc nutritio et generatio illinc sensus et intellectus."
[141] A simple perusal of the *Prelectiones* will reveal that Harvey mentions nutrition numerous times throughout the work, and that it is something that was of concern to him and his research, in addition to being important to the lessons he hoped to teach aspiring physicians and surgeons.
[142] Harvey 1616, 232. "…venae nutritionis, arteriae vitae gratia…"

body's functionality, including vital operations such as respiration.[143] In a late addition to the notes, probably in 1627, Harvey mentions the circulation, and we see him struggling to explain its purpose. There he writes, "Why? Is it for the sake of nutrition, or is it rather for the preservation of the blood and of the limbs by means of the infused heat?"[144] Indeed, life, heat, nutrition, respiration, and concoction are all tied together: "Life cannot exist without nourishment, nor nourishment without concoction, nor concoction without heat, nor heat without ventilation, for heat destroys itself by languishing or by smothering."[145] I will take up these issues and this question of purpose again at the end of this chapter, and at the beginning of the next chapter, where we look at these problems left over in the wake of *De motu.*

Harvey, following in a long tradition of natural philosophical writers, understands anatomy to investigate what is common to body and soul. One can draw at least two lessons: first, every organ needs a reason to explain its existence, the reason being its function (this picture will be complicated below in the section on Harvey's terminology, 2.2.4); and 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 what the organ needs to looks like, what it must be made out of, etc. The first lesson determines the logical order of explanation: functions explain the existence of organs. The second lesson adds to this explanatory system the fact that functions also explain not only *why* the organ exists, but also *how* it exists, that is, why the organ is structured and constructed the way it is. In order to complete this account of Harvey's conception of the subject matter of anatomy, I must turn to this second lesson, and to the matter of the body and the possible ways to divide it.

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[143] The physicians also called these operations the natural movements or powers. On respiration see: Harvey 1627, *De motu locali animalium,* Cap.5, 39-45. See also: Laurentius 1600*,* Lib.IX, Q.20, 372-374.

[144] Harvey 1616, 272. "An? Hoc gratia nutritionis an magis conservationis sanguinis et membrorum per infusum calidum." James Lennox has rightly pointed out to me that this language is very close to what Harvey writes about the final cause of the circulation *De motu cordis* Cap.8.

[145] Harvey 1616, 294. "Vita non potest esse sine nutrimento, nutrimentum sine coctione, coctio sine calore, calor sine eventatione qui ipsum seipsum marcore vel suffocatione interimit."

2.2. ORGANIZING THE BODY: THE MEANING OF A PART

If anatomy studies body and soul, it must understand how soul organizes the body, that is, it must investigate what it means for something to be a 'part' of the body, and *how* those parts exist for the sake of the soul.[146] The anatomist must discover the set of hypothetical necessities that govern the material and structural nature of the part in service to the soul capacities; an anatomist must known both formal and material natures. This is a very Aristotelian project insofar as Harvey is elaborating the set of hypothetical necessities which govern the construction of the parts of animals. This is the method suggested by Aristotle in the *De partibus animalium*,

> There is absolute and simple necessity from reason, as in eternal things, but there is also a mortal[147] 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…[148]

For Harvey, anatomy investigates the structure of the parts, which (as I shall show in Chapter 4) helps reveal the actions and uses of the parts. The term that Harvey and other anatomists often use to designate this structure and construction is *fabrica,* a word of prime importance in Vesalius' *De fabrica corpora humanis.* In early modern Latin, *fabrica* has the connotation of art and craftsmanship, that is, it is used in situations which tend to imply that the structure, composition, etc. are as they are (that is, made of wood in the shape of a triangle, or has sharp

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[146] The sense of organization I am using in this chapter is as described above in footnote 57.
[147] The verb here used adjectively, cado, literally means 'to fall,' an echo of Christian metaphysics not found in the original Greek.
[148] Aristotle, *De partibus animalium*, Lib. I, Cap. I, 63, "Inest idipsum rebus quidem aeternis simplici absolutaque ratione: sed caducis etiam gignendisque omnibus ex suppositione tribuitur: quomodo in artificiosis ut aedibus, & quibusuis alijs generis eiusdem. Materiam enim talem adesse necesse est, si domus, qut quiuis alius finis futurus fit: atque etiam fieri, moverique illud primum oportet, de inde hoc, ac deinceps ad hunc modum itur ad finem, cuius gratia res quaeque & efficitur…." The Latin here, unlike the Greek, does not make it clear that both eternal things and generated things are natural. I thank James Lennox for pointing this out.

serrated teeth) in order to accomplish certain ends—structural integrity, the ability to cut, and so forth. For example, if the muscles are for the sake of movement, they must have the strength and structure to accomplish that goal. In his discussion of muscles in *De motu locali animalium*, Harvey writes:

> Since in every action there is the more and the less, Nature in the construction of the muscles 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.[149]

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. 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*."[150] Natural objects, in this case the muscles, have ends and they have means by which those ends are accomplished. However, given this system of ends and means (or, more properly, uses and actions, terminology to be discussed in the next setion), there are a variety of 'engineering' questions remain concerning how exactly the action accomplishes its end through its structural and material nature.

To use another example, in discussing the layout and distribution of the veins, Harvey argues that "…since it is necessary that the veins should be distributed into tiny branches for the sake of concoction, lest they should be injured, entwined and intertangled, each organ packs them, supports them and spreads them out with soft parenchyma, and warms them with gentle heat and

[149] Harvey 1627 [1959], 126. "Quia in omni actione magis et minus, Natura in fabrica musculorum ad duas respicit actiones et functiones, seu perfectionem actionis. Unde in musculo duo animadvertenda sunt, videlicet: compositio gratia actionis, arteficium mechanicum gratia roburis et virium."
[150] Harvey 1627 [1959], 128. "Natura non respicit ergo ad figuram, situm, magnitudinem sed gratia roboris et ad melius tutelandum vel sine qua non." My emphasis.

promotes concoction"[151] 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.). Determining the nature and meaning of a part of the body, viewed as an instrument of the soul, is thus a project of great philosophical and anatomical import. Thus, unsurprisingly, one finds a discussion of how to understand the nature of a part in Harvey's *Prelectiones,* exactly the sort of discussion one would expect to find from a natural philosopher concerned with the subject matter of anatomy as I have been explicating it.

The problem with parts has to do with certain ambiguities in part whole relationships. Harvey observes: "WH a part is so called relative to the whole, wherefore, since body is said equivocally and in multiple ways, [thus the meaning] of a part and what [is a part] is ambiguous."[152] The meaning of a part depends on its relation to the whole body. Harvey expresses this idea a bit later in the following way, "And a part is that which by any manner whatsoever completes a whole as perfect."[153] This last part is especially interesting, because it nicely indicates the teleological system that undergirds this conception of the parts: the body is a unified whole, but one that can be divided into functional parts, each one organized according to how it accomplishes some activity

[151] Harvey 1616, 142. "Cum venas in ramusculos propter coctionem necesse destribui, ne laedantur twined and intertangled, parencymate molli distipit, fulcit extendit et blando [*ms* blandi] calore fovet, coctionem promovet."
[152] Harvey 1616, 6. "WH pars relativum est et ad totum dicitur, unde quoniam corpus equivocum et multifarium dicitur, pars ambigua et quid sit ambiguum. The WH signifies that Harvey is directly stating his own opinion on this matter, often times in contradistinction with the orthodox view.
[153] Harvey 1616, 8. This is a very difficult passage, not the least of which occurs because the original is incredibly hard to decipher, and Whitteridge disagrees with my own archival research, as well as the 1886 editors of the notes. I read the line as: "*Et pars WH quod quovis modo totum integratur pars integrum*," whereas Whitteridge has the line as, "*Et pars WH quod quovis modo totum integrat prout integrum compositum sive continens, contentum, impetum faciens etc*." In the original notes, however, '*Compositum sive*' is on a separate line, and after the '*Compositum sive'* there is a curly brace containing '*Continens'*, '*Contentum'*, and '*Impetum faciens &c*' listed on separate lines. I have tried to take this into account in my translations above by separating what Whitteridge put together as one sentence.

which completes that unified whole, that is, which accomplishes some biological good for the sake of the organism. Body and soul are a *teleological* unity, and thus parts must be understood in relation to this unified whole.

By complete one should understand something like 'contributes to the well-being of;' in modern (and anachronistic) terms, these activities of perfection are the metabolic and regulatory processes which order and maintain the body as a whole, functional organism. In Greek, the verb *teleiousthai* means 'to complete,' and the adjective *teleion* means 'complete.' Both of these words are part of a family of terms containing the root *tele-*, including the term for an end, *telos*. Aristotle's teleological system revolves around the idea that excellence is a matter of completion or perfection, and around how ends are achieved, or completed. In *Metaphysics* V 16, Aristotle defines what it means to be complete, providing three sorts of ways in which the term is used. It is the second of these that is most important,

> And [the second way in which we call something complete] is that which, in respect to excellence and goodness, cannot be exceeded in its kind, such as when a musician or flute player is complete, when they are not deficient in anything proper to their kind of excellence…And excellence is a certain sort of completion, for everything is complete, every substance complete, when it lacks part of its natural magnitude with respect to its proper kind of excellence..[154]

Monte Ransom Johnson discusses this passage in his book on Aristotle's teleology, and writes that,

> A most important feature of this definition is the notion that the complete…is complete relative to 'the kind of excellence native to it' (or 'proper' to it…). Complete means having reached an end that constitutes an excellent condition of a specific kind of thing.[155]

Parts of the body on this view, then, complete the whole relative to 'the kind of excellence native to it,' which in the case of the body can only be relative to the proper functioning of that body, its

[154]Aristotle (1552), *Metaphyiscorum Libri XIII,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 8, Venice, Lib.5, Cap.16., 61-62. "Et quod secundum virtutem et quod est eius, quod bene, non habens excessum ad genus ut perfectus musicus, & perfectus tibicen, cum secundum propriae virtutis speciem in nullo deficient…Virtus quoque quadam perfectio est unumquodque nanque tunc perfectum est, cunctaque substantia tunc perfecta, cum secundum speciem propriae virtutis nulla desit particula magnitudinis naturalis."

[155] Johnson 2005, 84. This line occurs in the context of discussing how to conceptualize ends in Aristotle's teleology.

maintenance, overall well being, and flourishing in its environment. Thus a part expresses what it is for—that is, for the sake of which it acts—when it has reached that end which constitutes its specific sort of good; at that point, it is complete in the relevant sense. Johnson states that,

> It is important to realize that the explanation or cause 'for the sake of which' is an end in this specific sense—that of providing a limit which makes things comprehensible and achievable. If I can ascertain that for the sake of which something is produced or exists, then I can begin to understand its structure, constituents, history, development, and so forth.[156]

It is this Aristotelian conception of completion that is in the background to Harvey's statement, and his conception of anatomical understanding is identical, founded upon this deeply teleological conception of life and the activities of living things.

Harvey's next line after discussing this first aspect of part-whole relationships concerns how the parts can be divided such that they form together a whole, and it is this concern that animates much of the rest of his discussion of the meaning of a part. Harvey writes, "[A part] is formed [through] containing [another part], or being contained [by another part], or [by] causing motion."[157] As Whitteridge notes, this division of the parts of the body is ultimately derived from Hippocrates, adopted by Galen, and cited on the first page of Bauhin's *Theatrum Anatomicum*, where he writes,

> The container, naming the solid parts, in order that they surround and protect the fluids [of the body]; the contained, the humors, in order that they are surrounded by the solid [parts]; and the causes of movement, the spirits, in order that they are easily and in a moment of time carried into every part of the body.[158]

There are three examples here of parts of each kind: there are containing parts, which refer broadly to all the solid parts that contain some fluid, a prime example being the heart. Then there are the fluids so contained, and these refer to the humors, including, of course, the blood contained within

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[156] Johnson 2005, 83.

[157] Harvey 1616, 8. "Compositum sive {continens, contentum, impetum faciens etc.}." The passage is difficult to parse in an easily comprehensible way from the Latin; I have thus interpolated some words in order to make both the passage and my specific interpretation of it clear.

[158] Bauhin, Caspar (1605), *Theatrum anatomicum*, Frankfurt, 1. "Continentia, solidas partes nuncupat, ut quae comprehendant tegatque humida: contenta, humores, ut qui a solidis comprehendantur: & impetum facientia, spiritus, ut qui momento temporis & facile…in omnem corporis partem ferantur."

the heart. Finally, there are the causes of movement, which refers, in the original Hippocratic case and among many Galenic physicians during Harvey's time, to the natural spirits (*naturales spiritus*, or *pneuma*) of the body. This last division, *impetus faciens*, is part of the ancient Hippocratic term *horme*, and is sometimes translated as 'what moves the whole.'[159] The *impetus faciens* was often equated with the *causa efficiens*: that is, the *impetus faciens* are those spirits (or whatever agents or processes one thinks as being causally responsible) that are the motive cause of various sorts of goal directed processes in the body. In particular, and following my discussion above, these *impetum faciens* might be identified with the efficient causal aspect of nutritive or vegetative soul. According to Galen, the referent of this Hippocratic term was the same as Aristotle's nature (*phusis*), though he interpreted the Hippocratic notion in a very Platonic way, that is, as the result of the action of Design of the Demiurge.[160] I note too that Aristotle sometimes uses this same term to refer to natures instead of the more common *phusis*.[161] Most relevant here is the status of the spirits, as these were thought, by the Galenists at least, to be the causes of the functions of the parts, or, to put it another way, the spirits were thought to be the most direct instruments of the soul by which it carries out its tasks in the body, chiefly the tasks of the nutritive part of the soul.[162] If the goal of anatomy is to understand the soul that is the cause of the body, then it is essential to understand these spirits.

The status of the spirits presented a difficult problem for physicians and philosophers, and there was no agreement on exactly where the spirits were located, what they did, or whether they were even needed. Harvey, by the time of *De generatione animalium*, has quite an anti-spiritualist bent, and we see this in evidence already in the *Prelectiones*. In the course of the *De generatione*,

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[159] French, Roger (1994b), *Ancient Natural History*, New York: Routledge: 153.
[160] French 1994b, 153-154.
[161] I thank Jim Lennox for this point. See for instance, Physics II192b18-19: "…but none of these [things due to art or chance] have an inborn *horme* of change'
[162] The story of spirits is complicated, and involves those elements we mentioned above with regard to the nutritive soul: heat, concoction, respiration, and life.

he uses rather the concept mentioned above, the 'innate heat (*calidus innatus*)', and not spirits, as the means by which the soul performs its duties in the body, much in keeping with Harvey's Aristotelianism.[163] Amongst the physicians, however, there was a proliferation of spirits, and thus Harvey writes,

> Evidently, for us Physicians, the spirit is that which Hippocrates called the *impetum faciens;* this is whatsoever causes, by its own endeavor, any motion with agility and vehemence, or starts any action, and under that term the spirits of wine, vitriol, etc., are so called. And for this reason in the writings of the Physicians there are as many spirits as there are principle or operations parts of the body, namely, animal, vital, natural, visual, auditory, concoctive, generative, implanted, and flowing spirits, etc.[164]

Harvey is clearly making fun at the proliferation of spirits amongst the physicians, and his preferred solution is to invoke Ockham's Razor and view the blood, carrier of the innate heat, as the source of this motion, thus reducing a multiplicity of instruments to a singleton. Harvey, as James Bono has argued, is interested in the reformation of language,[165] and his opinion in the *De generatione* seems to be that one can do without so many spirits labeled as *impetum faciens*. However, the *category* of *impetum faciens*, the necessity of having some internal source of motion that causes the vital activities of the living body—a capacity or power, or a nature, to use different terminology—is still a category of fundamental importance to Harvey, even if he wishes to unburden his science from a terminology so misused. This can be seen in the paragraph immediately after the one just cited from the *De generatione,* where Harvey argues that it is the *blood*, that part first engendered in the

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[163] A professor at Padua in the early seventeenth century, Cesare Cremonini argued as well for the importance of innate heat as the instrument of the soul. Cremonini also argued for a very similar position to Harvey's on the question of universals, namely, that they are known through the senses from particulars. As Roger French notes, one cannot tell exactly what influence Cremonini had on Harvey, though he almost certainly read some of his work (French, Roger (1994a), *William Harvey's Natural Philosophy,* Cambridge: Cambridge University Press, 64). See: Cremonini, C. (1626), *Apologia dictorum Aristotelis de Calido Innato*, Venice.

[164] Harvey, William (1651), *Exercitationes de Generatione Animalium*, Ex. 71, London, 244-245. Note that due to a printing error, most of the exercises are numbered incorrectly: so Ex.71 is labeled as Ex.70 in this edition. "Nimirum id nobis Medicis spiritus est, quod Hippocrati, impetum faciens; quicquid scilicet proprio conamine aliquid molitur, & cum agilitate ac vehementia motum excitat, aut actionem aliquam aggreditur: eoque nomine, vini, virtrioli &c. spiritus dicuntur. Ac propterea apud Medicos, tot sunt spiritus, quot partis corporis praecipuae, aut operationes; nempe animales, vitales, naturales, visivi, auditorii, concoctivi, generativi, implantati, influentes &c. "

[165] See: Bono, James (1995), The *Word of God and the Languages of Man: Interpreting Nature in Early Modern Science and Medicine*, *Vol. 1, Ficino to Descartes*, Chapter 4: Fernel vs. Harvey, Madison: University of Wisconsin Press.

construction of the embryo according to his research, which contains the source of change within the body:

> Scaliger, Fernel and others who have not given their minds to considering the excellent endowments of the blood, have conjured up yet other aerial or ethereal spirits, or ones compounded form some ethereal and elemental substance, to be a more excellent and divine innate heat than blood, and have fancied them to be the most immediate instrument of the soul and most suited to all its works.[166]

Given the context of the lectures, Harvey's respect for the Ancients, and the fact that Harvey took his duties to uphold the rules and standards of the College of Physicians quite seriously, it is not surprising that Harvey still used the Hippocratic cum Galenic terminology of *impetum faciens*, whatever his personal views on the spirits were during the years of his lectureship (1616-1627).

The issue of the *impetum faciens* is really an issue about instrumentality: by what means does the soul perform its work in the body? What is the efficient cause of the actions of the parts? One must inquire not only into the final causes of the parts, but also into the efficient causes that bring about those ends—it's a package deal. And so, even in these early lectures, Harvey cleaves to an Aristotelian position, a position that emphasizes the preeminence of the heart over the liver and the blood over ethereal spirits. Thus, in his discussion of the liver, Harvey writes,

> The action of the liver is concoction [and] sanguification but only as an instrument of the heart and secondarily…It creates the natural spirits. The innate heat is the author of everything, it is that which in respect to concoction is the instrument of instruments, and which is made first by the heart…WH if I could shew what I hav seene yet were att an end between physicians and philosophos. The blood is more the author of the viscera than they of it…Soul is in the blood. The innate heat is the author [of life], where it most excels, and there is where it exists principally and primarily. I have seen, and Dr Argent will testify, something with everything perfected yet the liver unformed; a heart formed with auricles, yet the liver ill formed and shapeless; an exceedingly white heart, auricles purple and filled with blood.[167]

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[166] Harvey 1651, Ex.71, 245. "Scaliger, Fernelius, aliique, sanguinis eximias dotes minus perpendentes, spiritus alios (tanquam praestantius & divinius calidum innatum) aeros, aut, aethereos, vel ex substantia aetherea & elementari compositos finxerunt, proximumque animae instrumentum ad omnia maxime idoneum crediderunt..."

[167] Harvey 1616, 126. I must mention that Harvey seems to switch his position on the location of the soul between here and the *De motu,* and then returning to the *Prelectiones* position again in the *De generatione.* This will be discussed (briefly) in the following chapter. "Iecoris action concoctio sanguification sed tanquam instrumentum cordis et secundario…Naturales spiritus procreare. Calor vero nativum author omnium quae circa coctionem et instrumentum instrumentorum quod corde primario fecit…WH yf I could shew what I hav seene yet were att an end between

The basic idea is that each part has its characteristic function, and the innate heat, the instrument of instruments, efficiently causes it. Elsewhere in the *Prelectiones*, Harvey seems somewhat sympathetic to the spirits, though note that he disagrees about the way in which they act in the body, and he also reemphasizes the role of the heat as the 'instrument of instruments.' Harvey writes in his discussion of the nerves,

> Can it be that that the faculties pass right through [the nerves] together with the actuality [of the faculty], that is to say, the spirits, [or is rather that], as according to Galen, the faculty [passes through the nerves] apart from the actuality? I think that the spirits do not march forward in the nerves, but rather they beam forth and cause actions, whence sensory and motive spirits [are like] light in the air, or perhaps the ebb and flow for the sea…Indeed spirits unite that which is contrary, WH together with heat as Aristotle [says] is the instrument of instruments, like a hammer. [168]

Thus the picture is one where the function teleologically causes the part (that is, it explains its necessity and activity), and the *impetum faciens* (either as the heat or as spirit) causes the motion of the part that works towards that end.

So how should one understand Harvey's use of *impetum faciens*? The best way is to understand it as signifying internal sources of motion, that is, soul as efficient cause, and which, as was just illustrated, Harvey (at least sometimes) takes to be found in the blood. Returning to Harvey's division of the parts, I can thus conclude that those parts labeled as *impetum faciens* are divided on the basis of their natures, their internal sources of growth and change, their form or soul as efficient cause. This has the added benefit that this is an interpretation that Galen himself put

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physicians et philosophos. Sanguis enim potius author viscerum quam ipsa eius…Anima est in sanguine. Calor nativus author et ubi exuperat plus ibi primario. Vidi teste Dr Argent omnia perfecta informato iecore; cor formatum cum auriculis iecur rudis indigestaque moles; cor albissimum auriculae puniciae refertae sanguinae."

[168] Harvey 1616, 328. "An facultas cum essential videlicet spiritus pertranseunt, ut Galenus, cum vel citra essentiam? Puto spiritus nervis non progredi sed iradiant et actus fiery unde sensus et motus ut lumen in aerem, forsan ut fluxus et refluxus maris…Spiritus enim quod idem contra conciliat, WH cum calore ut Aristoteles instrumentum instrumentorum ut melleus." The reference to the instrument of instruments is most likely to the end of Aristotle's *De generatione animalium*, GA 789b9; Aristotle (1552 [1st edition]), *De generatione animlaium,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6a, Venice, Lib.V, Cap.8., f.255 [1st]. Note that the translation of 'pneuma' here is as 'spiritus,' which thus lends at least some support to the position of the Physicians from Aristotle (or at least Aristotle in translation).

forward, as well as a predominant interpretation of the Latin medical tradition.[169] The subject matter of anatomy, then, includes not only an investigation into the functions of the parts, but must also be complemented by inquiring into the efficient causes of those functions.

At this point Harvey moves on to discuss two other ways of dividing the body into parts, both of which are teleological: first, that the parts can be divided by means of their ends, and second, into those parts which are sensitive and insensitive. Now, in a certain very weak way, the Hippocratic division of the parts is already divided on the basis of ends, that is, the containing parts have the end of containing things, and so forth. However, Harvey now seems to be pointing to something more complicated when he writes "And so another division of the parts is: philosophically and medically by their end; anatomically according to sensation, as the body is a composite."[170] Let's consider each of these distinctions. The first is quite straightforward: one can divide the parts of the body on the basis of their ends, that is, for every end there is a corresponding part or set of parts designed to achieve that end. As Aristotle argues in the *De partibus*, the natural philosopher must consider first the 'for the sake of which,' and then the cause of motion. In other words, as I have been emphasizing, each part is a part on the basis of the peculiar function that it has, its end being whatever biological role it fulfills. Harvey returns to this way of dividing the parts as what he calls the 'philosophical division of the parts', and I discuss it in more detail below.

The second division, anatomical, is here referring to an Aristotelian distinction between those parts that are capable of perception, and those that are not. For Aristotle, this difference is founded upon the material composition of parts, namely, only those parts that are materially uniform can be said to be capable of sense perception, and these parts comprise the non-uniform

[169] French 1994b, 154.
[170] Harvey 1616, 8. "Divisio itaque partium alia: philosophica et medicina a fine; anatomica ad sensum, ut est compositum."

parts.[171] The non-uniform parts are what Aristotle calls the instrumental parts.[172] What is important for my purposes here is the relation between the uniform and non-uniform parts, where Harvey writes "The use and necessity of the homogenous parts [follows from], their actions and passions; and [from the need to] make up the matter of the heterogeneous parts."[173] The basic idea here is that the uniform parts exist for the sake of the non-uniform parts, which are built from the uniform. Further, the functions of the body come about as a result of these heterogeneous parts, and, as Aristotle says, the diversity of substances out of which the parts are composed present one with a diversity of powers that parts so constructed can perform. Harvey seems to here be referring a passage in *De partibus animalium* where Aristotle argues that the uniform parts are for the sake of the non-uniform, and the latter are for the functions and actions. [174] Somewhat below the line from Harvey quoted above, Harvey goes into quite a bit of detail along the lines Aristotle lays out, specifically about the qualities of the uniform parts, that is, which uniform parts are hard, soft, liquid, solid, etc., then going into the non-uniform parts constructed from the uniform.[175] The detail here is important given the pedagogical purpose of the lectures, that is, it surely proved useful to the

[171] Harvey 1616, 8.
[172] "Some parts of the animals are instrumental while others are sense-receptors, and each of the instrumental parts is non-uniform, as noted earlier, while perception occurs in every case in the uniform parts. This is because perception, of whatever sort, is of some one kind of thing, and because the sense-receptor is receptive of each of the objects of perception. That which is potentially is acted on by that which is actually, so that the former and the latter are the same in kind," (Aristotle, *PA* II.1, 647a1-10, Lennox translation). For the Latin version Harvey consulted, Aristotle (1552 [1st edition], 1562 [2nd edition]), *De partibus animalium,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6a, Venice, Lib. II, Cap.1., f.68 [1st], f.128, [2nd].
[173] Harvey 1616, 8. "*Similarium usus et necessitas propter {actiones et passiones; et ut fiant materia dissimilarium}*." The braces indicate that Harvey has a curly brace leading to the two listed items after the word '*propter'*.
[174] Aristotle (1552), *De partibus animalium,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6a, Venice, Lib. II, Cap.1, 68. See also: Aristotle, *PA* II.1, 646b10-25, Lennox translation. "Constant igitur animalia ex utroque membrorum hoc genere. Verum similaria dissimilarium gratia habentur: illorum enim officia sunt, & actions, ut oculi, ut narium, & faciei totius: item digiti, manus, & brachii totius sed cum actions, motionesque multiformes tum animalibus totis, tum etiam membris eiusmodi tribuantur, diversa virtutibus esse ea, ex quibus constant, necesse est: ad alia enim mollities, ad alia durities commodior est: & alia intendi, alia flecti debent. Itaque partes similares obtinent sibi vires eiusmodi singillatim accommodates: alia enim mollis, alia dura est, & alia humida, alia sicca, & alia lenta, alia rigida. Alia vero dissimilares plures, & compositas vires continent vis enim alia ad premendum alia ad mittendum commode manui est. Quamobrem partes organicae, quas officiales, & instrumentarias licet appellare ex ossibus, nervis, carne, ceterisque eiusmodi constant, non illa ex iis."
[175] See Harvey 1616, 10

students to demonstrate which parts were considered hard or soft and so forth. It is furthermore helpful insofar as these are the exact sorts of similarities and differences that surgeons and physicians should attend to in their anatomical investigations, which I discuss in more detail in Chapter 4.

Note that this division of the parts is explicitly teleological, that is, the nature of the body is such that teleological relations are of fundamental importance to the anatomist in dividing the body. Namely, the relation between uniform and non-uniform parts is a 'for the sake of' relation and is a result of necessity, what Harvey calls 'use and necessity'. Harvey argues that the use and necessity of the uniform parts is due to their actions and affections, that is, what they can do and the way in which they are sensitive, and the need for these parts to provide the material for the non-uniform parts. He seems again to be referring to the *De partibus*, where Aristotle argues that these homogenous parts are for the sake of constructing the heterogeneous parts, and that this follows form necessity (since it is impossible that the reverse be true, that the heterogeneous make up the homogenous).[176] So there are two ways in which this conception of the construction of uniform and non-uniform parts belies Harvey's teleology: uniform parts either play a (1) direct functional role, in that their actions and affections are designed to accomplish some physiological end, often of a sensory nature due to the necessity of sensation only taking place in uniform material; and an (2) or an indirect functional role, an instrumental role, where the uniform parts are for the sake of the construction of the non-uniform parts.

[176] Aristotle (1552), *De partibus animalium,* In: *Aristotelis libri omnes, ad animalium cognitionem attinentes, cum Averrois Cordubensis variis in eosdem commentariis*, Volume 6a, Venice, Lib. II, Cap.1., 68. "Causa cuius gratia, cur haec ita se habent, haec est. Sed cum praeterea quaratur, quam ob causam haec ita se habere necesse sit, ratio manifesta est, quod iam prasuit, ut ita se invicem ex necessitate haberent. Dissimilares enim constare ex similaribus possunt…At fieri non potest, ut similares ex dissimilaribus conficiantur: sic enim pars similaris multae essent dissimilares…"

Evaluating the body as a whole, Harvey notes that, "...there is no part that in some manner is not fashioned as an instrument."[177] As I've beenx emphasizing, this conception of instrumentality is central to Harvey's understanding the unity of body and soul, as a system of interrelated and harmonious teleological relations. Instrumental relations allow Harvey to understand how a particular organ and its function are embedded in the body's larger framework of parts and ends. This line occurs in the context of one of Harvey's 'WH' marks, indicating his opinion. The full line is, "*WH forsan {ad se} nullae partes corporis. Praeteria nulla pars quae aliquo modo non figurate organice; ut caro vitelli cocta*."[178] The manuscript is extremely difficult to make out, especially a scribble between '*forsan*' and '*nullae*', a mark which Whitteridge leaves out entirely, but which my archival research leads me to transcribe as '*ad se*' and which matches the 1886 edition of the *Prelectiones*. This has the benefit of making clear Harvey's remark, for he is surely not saying that no part is a part of the body (which is Whitteridge's reading), but rather that no part is a part *to itself* ('*ad se*'): this then makes sense of his comparison to the cooked veal, as flesh, in the absence of the rest of the parts of the body (not to mention having been cooked) is a part of the body only in name and memory. Thus one is again reminded of the importance of part-whole relationships, as these relationships undergird the teleological conception of the parts of animals—the anatomist, even when concerned with the division of the body into parts, must be careful to remember that a part is a part of the body only when it is connected to all the other parts according to the necessities of life, that is, according to how all the functions and powers of soul are integrated and materially instantiated within the whole organism. Again, one is reminded of the teleological concepts of completion and perfection, so important in the Greek context, and so here too.

[177] Harvey 1616, 8. "Praeteria nulla pars quae aliquo modo non figurate organice."
[178] Harvey 1616, 8. "WH for nothing is part of the body to itself. Moreover, there is no part which is not in some way fashioned for some instrumental [purpose], as for example cooked veal [has no purpose]."

Somewhat later in the *Prelectiones* Harvey returns to dividing the parts by their ends, what he now calls the philosophical division of the parts. It is on these matters that I shall end this section, as they return to the theme of the previous section: the union of soul and body as the subject of anatomy. They are furthermore quite important in that these ideas are essential in understanding the methodology Harvey advocates for doing anatomy, to be discussed in Chapter 4. Harvey writes: "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."[179] What Harvey seems to be saying here is that the philosopher divides the parts according to those ends which are accomplished through the capacities afforded by the instruments of the soul, as I have been discussing. Below this line are a series of five sections that discuss this philosophical division.

Harvey presents there 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 that was discussed above, but also Fernel's division of the parts according to locations (private vs. public regions).[180] The items most relevant to my concerns, however, are the third and fourth, both of which offer insights into some important terminology: action, use, and usefulness. I discuss these terms in the following section, but what is important to note at this point is what these terms reveal about how Harvey conceives of the living body and the task of the anatomist. In the third numbered item, Harvey writes:

> [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, nothing is a part which has not some action, nor are there any limbs that have not a function. Whence the instrumental parts are

[179] Harvey 1616, 12. "Philosophica divisio partium secundum quod organum animae, secundum divisiones animae vel secundum facultates: a finali causa." This is the only time Harvey uses the phrase *final cause,* which indicates that, even at this early stage of his career, Harvey was quite wary of using the term, as one sees not only in this work but also (for perhaps more obvious reasons) the *De motu cordis*.
[180] See: Fernel (1567), *Therapeutices universalis, se medendi rationis libri septem*, Lib. II, Cap. 1, In: *Universa Medicina*, Paris, 359.

> 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.[181]

By the formless parts, I take it that Harvey means the uniform parts. 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.'[182] This is actually an excellent way to think of the subject matter of anatomy: a search into the soul made manifest, form and matter in union: an investigation into the parts of living animals.

There is a further sort of teleological conception of the parts that permits another way of dividing the body, namely, by the *utilitas* of the parts. Harvey in the fourth numbered item writes:

> [We can divide the parts by their] Utilities and excellences, whence [they are] simply necessary, indispensible, for the better, for protection, [or] for adornment. Whence [they are] the most necessary principle parts; [or the] less principle parts; [or] are ignoble parts in which there is less innate heat, soul and power.[183]

Despite the similarity in their literally translated meanings, and despite the fact that most early modern authors including Harvey use the terms indiscriminately, *usus* and *utilitates* are to be distinguished, or perhaps better, to be placed on a teleological scale with action on one end and utility on the other, use somewhere in between; I discuss this below. For now, I offer a preliminary interpretation of this passage. Both of these terms are explanatory, providing the cause of the part. However, whereas use explains the existence of the part through its functionality, that is, through its ability to complete the end for which it is designed, usefulness concerns the fittedness of a part to its use, to its function. In her introduction to her translation of Galen's *De usu partium*, Margaret May emphasizes this understanding of usefulness (*chreia*.) distinction, and she writes that usefulness,

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[181] Harvey 1616, 12. "Actionibus et usu: organicae instrumentales, figuratae, qui actionem edunt; informes, usum latum habentes…Nil enim pars prout signum animae, quod non actionem quondam habeat, nec membrum cuius non est functio. Unde organicas partes non contrarias similaribus sed (quia omnes aliquo modo figuratae) ut plurimum actionem quandam edant."

[182] Harvey 1616, 13.

[183] Harvey 1616, 12. "Utilitatibus et praestantia unde necessarie simpliciter, sine qua non, ad melius, ad tutelam, ad ornatum. Unde principes primo necessariae; minus principes; ignobiles in quibus minus est caloris nativi minus animae et virtutis."

> …does not mean function, as one might naturally suppose. Function is more nearly *energeia* or 'action,' in Galen's terms. *Chreia* means for him rather the suitability or fitness of a part for performing its actions, the special characteristics of its structure that enable it to function as it does. Sometimes *Chreia* is best rendered 'reason' (why a part has a certain feature) or 'advantage' (to be gained form a certain feature). The nearest Galen comes to an actual definition is…where he says that usefulness is the same as what is called utility (*euchrestia*, serviceableness)….[184]

Usefulness (I here follow May, but, in Harvey, I render the term more literally as utility) is a term deeply embedded in the natural philosophies of Aristotle and Galen. Further, the term has distinct natural theological overtones.[185] So, whereas the previous mode of dividing the parts was based on the life goals that a part accomplishes, the present mode divides the parts on the basis of how each part accomplishes those goals *according to the best and by necessity*. There is, here, a very central role for a conception of the Good—that is, the best or optimal way for a part to exist is central to understanding its utility: in Harvey's time, this conception of the Good manifested itself through various theological commitments and conceptions of God and His Goodness in relation to His Design.

Thus one might say that, if action and use divide the parts on the basis of which goal they complete and how they complete it, then the division on the basis of utility is a conception of the parts on the basis of how they complete that goal in the most perfect way possible, and in such a way as to give knowledge of God's Perfection and the perfection of His Design.[186] Given Harvey's prose, here, it may seem a stretch to interpret the division of the parts by *utilitas* in such a manner; indeed, there is some validity to this skeptical position. But note that this natural theological conception of *utilitas* goes back all the way to Galen: Galen's original category was highly natural theological in just this sense, and though he was no Christian, his Platonic conception of the

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[184] May, Margaret T. (1968), *Galen on the Usefulness of the Parts*, Ithaca: Cornell University Press, 9.
[185] Hankinson, R.J. (1989), "Galen and the Best of All Possible Worlds," *The Classical Quarterly,* 39(1).
[186] As noted above, this goal became quite important and explicit in the anatomical context. One of the texts upon which Harvey based his notes, Bauhin's *Theatrum anatomicum* is one of the leading examples of this sort of natural theological commitment among the anatomists, and he begins that work with a long proem singing the virtues of the human body and soul, most perfect and God-like.

Creator, the *Demiurgos,* made Galen's project easy to reinterpret into Christian terms.[187] Harvey, at the time of the lectures, is not nearly so concerned with this natural theological aspect as Galen or as many of his contemporaries—there is nary a mention of God. However, by the time of the *De generatione animalium*, this does become a more central concern for him, and so one sees natural theological language in full effect.[188] So, for instance, he marvels at the miraculous design and power of eggs,

> And while we are on this subject, I thought to myself, how small are the fertilized origins of eggs, truly pimples and beads smaller than seeds of millet, and reflecting on the size of the cock born from them, his magnanimity and his adornment, I cannot but wonder that such great natural powers are placed in such small origins, and that the omnipotent Creator wanted to appear at his greatest from the smallest beginnings.[189]

Supposing, *ad argumentum*, that this sort of attitude is applicable to Harvey of the *Prelectiones*, one might then describe the division as being on the basis of design—that is, utility is about how God had designed natural objects so as to maximize the fittedness and goodness of the means (actions) to the ends (uses).

Now that I have established my interpretation of Harvey's conception of the parts as the subject matter of anatomy, I now look specifically at Harvey's language and terminology, where I shall discuss in more detail Harvey's categories of use, action, and utility (*usus*, *actio*, *utilitas*), as well as other related terms.

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[187] For Galen's natural theology, see: *De usu partium*; c.f., Hankinson, R.J. (1989), "Galen and the Best of All Possible Words," *The Classical Quarterly*, 39(1), 206-227. That natural theology was widespread and important in Harvey's era and especially in the practice of anatomy I take as unproblematic, though for a nice discussion of some of these religious overtones, see: French, Roger (1999), *Dissection and Vivisection in the European Renaissance,* Aldershot: Ashgate.

[188] I discuss why one finds more of this sort of language there in Chapter 3.

[189] Harvey, William (1651), *Exercitationes de generatione animalium*, London: Ex. 41, 111. Note that in the first edition, Exercise 4 occurs twice, resulting in incorrect exercise numbers. Though I translate and provide the Latin from the first edition, I have corrected these numbering errors. "Atque hic dum sumus, cogitanti mihi, quam exigua sint prolifica ovorum primordia, papulae nempe, & sudamina milii semine minora, considerantique galli inde nati amplitudinem, magnanimitatem, atque ornatum; mirari subit, tantas vires a natura rerum in tantillis exordiis reponi & Creatorem omnipotentem apparere voluisse maximum e minimis initiis."

2.3. ACTION, USE, UTILITY: TELEOLOGICAL TERMINOLOGY

Interestingly, the section of the notes where Harvey provides the most detailed discussion of the definitions of these terms is entitled '*In historia anatomica*.' Whitteridge translated this section as "Of the Study of Anatomy in General," but this is an incorrect translation. Whitteridge misunderstands what *historiae* are—I shall discuss *historiae* more fully in Chapter Four, but here merely note that the thought the word *historia* has a variety of meanings, the primary sense was an empirical one, at least in medical writings, and usually meant 'collected observations,' here concerning anatomical structure. Furthermore, Harvey knew of the work of Laurentius by the same name (*Historia anatomica*), and thus the title of this section might be seen as alluding to that work—for the Frenchman's treatise contained one of the most sophisticated and complete accounts of the proper foci of anatomical observation and practice.

Note that this section is placed immediately after Harvey's '*Canones anatomes generales*,' where he provides a list of specific procedures, recommendations, and methods to be used in the course of performing an actual anatomy (again, to be discussed in Chapter 4). That *In historia anatomica* follows this practical section should give one a hint as to how to understand its content: namely, it is not about 'anatomy in general,' but is rather focused upon the specifically historical aspect of anatomy, that is, the part of anatomical research which involves the actual dissection and empirical observation of bodies and the structure and composition of their parts, the necessary inductive foundation for inferences about the causes of the parts and their activities. This section is thus best translated much more literally, so, 'On anatomical history" or "On anatomical observation"—the emphasis on Harvey's conception of the empirical aspect of anatomical practice (noting, as I shall argue in Chapter 4, that this aspect cannot be strictly separated from the causal/theoretical aspect of anatomy, at least on Harvey's conception of anatomy). I can briefly

summarize the content of *In historia anatomica* as concerned with the specifics of anatomical observation: what must be looked at in each part, what properties are most relevant for understanding the body, and a discussion of the terminology and concepts which are fundamental to anatomical knowledge, namely, the categories of use and action.

These terms are of Galenic origin, found most importantly in the *De natura facultatibus* and *De usu partium*, though of course they had been added to and changed over the course of interceding history between Galen and Harvey. I noted above that action is central to Galen's *De natura facultatibus*, where Galen distinguishes between actions and faculties—the former being active motions, the latter being the causes of those motions.[190] The term action is split further into two kinds, active movement (*energeia, actio*) and work (*ergon, opus*), and Galen writes, "Now, again, I call 'work' that which is brought about and completed through an action: such as blood, flesh, or muscle: I call 'action' that which is itself an active movement."[191] Actions are things like the motion of the muscles, the motions of the heart, and so on and so forth. The category of use is, naturally enough, central to Galen's work *De usu partium*. Use (*chreia, usus*) is a much trickier case than that of action, and the definition is significantly less clear, in both Galen and, indeed, throughout the history of the category right up through Harvey's era.

But I start with action and its difference from use. Galen writes the following, "Now the action of a part differs from its use, as I have said before, because action is active motion and use is the same as what is commonly called utility."[192] The distinction is more or less the distinction between efficient and final causality. Hankinson writes that a use, "…is what some activity, the normal functioning of the part in question, is for, what, in the overall economy of the animal it seeks

[190] For which, see above.
[191] Galen 1549, *De natura facultatibus*, Lib. I, Cap. 2, 1 1115-1116. "Porro opus appello quod iam factum atque completum per actionem est: velut sanguinem, carnem, nervum: Actionem vero, ipsum activum motum…"
[192] Galen 1549, *De usu partium corporis humani…Nicolao Regio Calabro interpretate*, Lib. XVII, Cap. I, In: *Galeni Peragameni…opera quae nos extant omnia*, Volume I, 341. "Partis igitur action ab eiusdem usu (ut antea diximus) differt, quod action quidem motus quidam est activus: usus vero nihil aliud est, que quod vulgo appellatur *euchrestia*…"

to accomplish; and hence it serves to explain, teleologically, the existence of the activity in question."[193] However, the terminology in Galen is quite vexed, and, as such, there has been some debate about the proper way to translate especially the category of 'use,' made more difficult that Galen himself hardly seems to define it. Returning to how I started this chapter, the notion of use is connected to soul, and here Galen sounds quite like Aristotle in the *De partibus animalium*: "These uses however are themselves of the soul, since the body is as you see the instrument of it,: and for this reason animals differ greatly in respect to their parts since their souls are themselves different…Truly, in every case the body is suited to the character and faculties of the soul."[194] The use of a part, to put it another way, is the purpose to which an instrument of the soul is put, and the instrument is suited to its task. A use is a need, something the animal cannot live without, and the instrument that accomplishes that need is constructed just so to be able to perform that use.

However, situation becomes even more complicated in the early modern period, as one finds that there are (sometimes) two terms used to denote Galen's *chreia*: *usus* and *utilitas*. Given that Galen himself seems to define use in terms of utility (or, as May translates euchrestia, 'serviceableness'), one might expect there to be these two, more or less equivalent terms. However, the situation is made more confusing by the fact that the terms are sometimes used to denote different things (as is the case in Harvey), but many other times, they are used synonymously, some authors seemingly preferring *utilitas* to *usus* or *vice versa* for no apparent reason—so, for instance, Fabricius tends to use '*utilitas'* whereas Laurentius tends toward '*usus'*, though both often seem to use them as equivalents (at least in many cases I have encountered).[195] With this in mind, I cannot agree with Roger French when he maintains that there is a distinction between use and utility in

[193] Hankinson, R.J. (2002), "Causation in Galen," In: *Galien et La Philosophie*, Geneva: Vandouvres: 48.
[194] Galen (1549), *De usu partium*, Lib. I, Cap. 2, 417. "Utiles autem sunt hae omnes ipsi animae, quippe cuius organum corpus est: & propterea multum different a se invicem particulae animalium quoniam ipsae animae different…Omnibus vero aptum est corpus, animae moribus & facultatibus. "
[195] As a random example, Fabricius' third chapter in the *De brutorum loquela* is called 'De usu loquelae animalium,' but, within the first lines of the chapter, he uses 'utilitas' and 'usus' interchangeably. See Fabricius (1625), *De brutorum loquela*, Cap.3, In: *Opera anatomica*, 9.

Fabricius, and that only utility should be conceived of as a final cause.[196] Both, in fact, are final causes in the Aristotelian sense explored above, that is, as instances of 'being for the sake of which.' French's reading of Fabricius, and of Harvey, as understanding the actio-usus-utilitas in the same way is thus simply mistaken, and the triumvirate of terms is complicated, and thus French's 'hierarchical series' helps very little in understanding Harvey's system.[197] French's account suffers, I fear, from not keeping separate the various categories of causes. For instance, French writes that, Harvey looked, "…for the *utilitates propter quid* of the parts, their purposes or causes (including the final),"[198] and while there is truth to this statement, French seems unaware that the *utilitas propter quid* rather just *is the category of the final cause*, and as a category would not contain, for instance, the material or efficient cause. Further, purpose and cause are not coextensive, neither in Aristotle nor in Harvey, and French here seems to conflate these distinctions which matter a great deal if one is to properly understand Harvey's philosophy. It is vital, then, to understand this terminology as Harvey lays it out in the *Prelectiones,* for it is here that he reveals in the most detail his conception of this terminology.

The most basic category of action is relatively unproblematic, though not all authors distinguish, as Harvey and Galen do, between the process and the product, that is, action and work. Harvey's definitions are thus in some ways non-standard—besides the distinction just mentioned, very few people use the terms use and utility together to the extent that Harvey does, and the distinction discussed below between mediate and final utilities is found, to my knowledge, in no other author.[199] Further, there are a variety of synonymous and related terms, so, function, work, and office, most of which are used by Harvey's contemporaries. However, Harvey is interesting

[196] French 1994a, 66.
[197] French 1994a, 311. French also says that Harvey uses this trio as an 'Aristotelian demonstration from first principles,' but I am unclear what French means by this phrase. There does not seem to be anything having to do with 'first' principles here.
[198] French 1994a, 311.
[199] At least no other author writing before Harvey.

insofar as he takes the time in his *Prelectiones* to distinguish with some care these terms, and to lay out relatively clearly the relations between them. This is not to say that he is entirely consistent, nor that the system is entirely perspicacious, but only to point out that, even at this early stage in his career, Harvey has put no small effort into philosophical considerations of his subject, that is, upon the bodies of animals, their parts and relations, and, importantly, the proper way to categorize and philosophically conceptualize them. I must also note that Harvey here develops a number terms and distinctions that he fails to deploy more widely in the rest of the *Prelectiones* and in his other works. Despite this fact, this section of the lecture notes is revealing of how Harvey conceptualized the subject matter of anatomy (just the subject in this chapter), even if he fails to adequately use the full range of terms and concepts he develops. Further, the less theoretical, more factual sections of the *Prelectiones* are much more heavily indebted to Bauhin and other authors, and, since he did not use Harvey's terminology (of, for example, *utilitates finales*) one should not expect to find such terminology in these parts of his lecture notes.

The sub-heading of this section is 'On the Actions of the Parts [*In actionibus partium*].' Harvey begins with the most basic category, *actio.* He writes,

> Action [is] active movement of which the accomplishment is called function, [or] in matter [is called] work. Work and function [occur]: [either] by themselves, [or] with other [functions]; [that is, either] principally [or] instrumentally, helping [by] completing [or] maintaining [the function].[200]

Harvey here makes a variety of distinctions, the first set of which concern the various processes and products that occur in animal bodies. First is the distinction between *action* and *function*, then the distinction between these terms and *work:* thus, in sum, we have the distinctions between an active movement (action), a completed process (function) and the material product of such a process

[200] Harvey 1616, 22. This fragment is very difficult to translate into actual English, so I have had to resort to a variety of interpolated remarks to make apparent the interpretation of the text that I am offering. Although Harvey has the last three groups on different lines, enclosed by a brace, I take him to be restating the same distinction in three different ways, not to be making three different distinctions. "Actio motus activus cuius effectio functio dicitur in materia vero opus. Opus et functio: per se, cum aliis; principaliter instrumentaliter; adiuvans, perficiens conservans."

(work). The second set of distinctions involves the ways in which those processes and products are completed. So, Harvey writes, functions (or products) can work by themselves to bring about some particular end (the principle functions carried out by the powers of the principle parts), or they can work in concert to complete some end (the instrumental functions which are accomplished by the instrumental parts).

Finally, Harvey divides the ways in which an instrumental part can act in concert with other such parts, namely, through helping to complete a function by acting together, or helping by maintaining the same functional process to keep occurring. It will be helpful to look to the definitions of Laurentius, where one finds some similar distinctions, noting that his work is perhaps the most comprehensive treatment of these sorts of philosophical issues and definitions at the start of the seventeenth century. Laurentius defines action like so:

> Action is defined by Galen as the motion of a productive part, or the active motion, in order to distinguish it from an affection: an affection, indeed motion is to be acted upon, where the body is the patient; action on the other hand is efficient. Thus the pulse is the action of the heart, whereas its palpitation is an affection, or passion; the former flows from a faculty, the latter is caused by disease. Concerning actions, these are found everywhere, some together, others alone; the latter are perfected by a single part; an action performed in combination is nutrition, all the parts are nourished, indeed, they are vivified and animated, as life is defined by nutrition. Singular actions are produced by a specific organ, and these are the principle parts, or serve the principle parts. Again, some of the actions are performed by the homogenous parts, others by the organic parts.[201]

So here too we find a concern with actions that work together in coordination to complete some activity, and those that operate by themselves. We also find Laurentius equating action with active movement. Yet there are some differences as well, and Laurentius is concerned especially to

[201] Laurentius (1600),"Quid in qualibet parte spectare debeat Anatomicus." Lib. I, Cap. XVII, 24. "Actionum definio cum Galeno, motum partium factivarum, vel motum agentis, ut ab affectio distinguatur: affectio enim, motus est passivus, vel patientis corporis; actio autem, motus est effectivus. Sic pulsus, actio est cordis, palpatatio, affectio est, seu passio; ille a facultate manat, hic a causa morbisica. Actionem, aliae sunt communes, aliae propriae, illae, ubique reperiuntur; hae, ab unica parte perficiuntur: Communis actio est nutritio, viventes enim partes omnes, & animatae nutriuntur, cum vita definiatur nutritione: propriae actiones, a peculiari eduntur organo, suntque aut principes, aut principibus ministrantes. Rursum, actionum aliae sunt similares, aliae organicae. Simlaris actio a sola temperie inchoatur, ab eadem perficitur, & a qualibet partis particula integra & perfecta editur; organica, a sola temperie non inchoatur, nec nisi a toto organo integra editur."

distinguish actions from passions, the latter of which are a result of the body suffering some motion, as the result of disease. This difference stems in part from Laurentius' being much more interested in *medical* anatomy, that is anatomy having some relevance to medical practice and healing, and thus concerned with affections and passions, a concern that we do not see shared by Harvey. Indeed, when he mentions affections, he is mostly concerned not with the Galenic focus on disease, but with the Aristotelian concern with the affectivity of the sensitive parts.[202] Finally, Harvey's terminology is more precise, in that he distinguishes work, function, and action. But let me look at a few instances in Harvey's notes to see how he uses these specific terms, as we will be able to more clearly grasp their signification

First there are actions: "The action of the guts is making chyle etc., into a pappy substance, whence the blood is divided from the chyle [so as to] serve the liver."[203] Importantly, though actions serve some end, when describing them as *actiones,* Harvey tends to avoid functional language, that is, he does not say what biological goal is being met by the action. Thus the guts action is just that by which food is turned into a pappy substance, the chyle. Now, there is a minimal sense in which this action is teleological, that is, insofar as the guts are for the purpose of producing chyle, this is their function. And indeed, in these cases, Harvey seems to equate the two, an example being the following: "The function of the liver: the second concoction, [that is] sanguification."[204] But more to the point at the moment, this is a case that seems to involve equating *actio* with *functio.* Thus one finds that Harvey arguing that "The action of the liver is concoction and sanguification, but only as an instrument of the heart and secondarily."[205] Now there are multiple ways to take this. The most obvious way, perhaps, to think about the

[202] This is a concern about use. See for instance: Harvey 1616, 8, "Propter passiones ut Aristoteles propter per sensum." See also: Harvey 1616, 22.
[203] Harvey 1616, 116. "Coiliae action chilifactio etc. into a pappy substance, unde cum ex chilo sanguis famulari dividitur iecori."
[204] Harvey 1616, 124. "Iecoris functio: coctio secunda, sanguificatio."
[205] Harvey 1616, 126. "Iecoris actio concoctio sanguificatio sed tanquam instrumentum cordis et secundario."

terminological usage here, is that Harvey is simply being inconsistent in his deployment and use of terms—a charge that would fit, I might add, just about every philosopher working in the seventeenth century.

But another way to think about it, a more productive way, is to think that there are cases when an *actio* and a *functio* are more or less the same, the difference mostly a matter of emphasis: *actio* stresses the process of an efficient cause (or a part thereof), whereas *functio* usually designates the completed process of this cause which serves some specific biological end. So in this example, when Harvey uses *functio* it is because he is emphasizing the *complete* and *entire* process by which the chyle is turned into blood by the power of the liver; when he uses *actio* he is emphasizing the motive cause of that process (the faculty of the liver). The cases where *actio* and *functio* are most similar are in cases where a product is produced—*opus* to use Harvey's term.[206] So, in the example just decided, after he notes that there are diverse opinions and much disagreement amongst both physicians and philosophers over the question of the origin of the blood,[207] Harvey comes down on the side of Aristotle (though giving the Galenic position on the importance of the liver some due credence), and writes, as I just noted, that the liver acts secondarily and as the instrument of the heart. Overall, then, it seems as if in those cases where an instrumental function is being considered, Harvey often equates function with action.

Moving on to *usus* and *utilitates*, one sees similar vagaries of terminology. First examine what Laurentius writes about use:

> Finally, the anatomist comes to consider the use of a part: the Philosopher wrote that not from structure but from use are we lead to knowledge of an instrument. Use again, in Greek χρεια, is meant in two ways by Galen. One way follows the action, that is, it proceeds by means of this very action, and it is the end of the action, so that, an animal aims at this use

[206] Now, it is equally possible that Harvey could have described the function of the liver in terms of its products, that is, he could have described the *opus* of the liver as being the blood. However, throughout the *Prelectiones*, I have found that Harvey consistently formulates such claims of *usus* and *functio*, preferring this language to that of *opus*. I will discuss these terms in more detail below, in Section 2.2.4.
[207] Harvey 1616, 124. "Questio inter medicos et philosophos et inter medicos."

> by means of this action about to be seen, so that it flees that which is harmful, and pursues that which is useful. This use follows the action, but if you look at its generation and constitution, it will be determined that its dignity is prior to the action since it is the end of every action; indeed the end is more noble than those things which happen before the end. Another use precedes its action, and it is defined as an aptitude for some activity; thus, vision chiefly flows primarily from the crystalline humor in the eye, the remaining humors, tunics, optical parts, nerves assist this use, and they are directed to the completed action.[208]

Now this picture should be familiar from the discussion above, and the importance of the final cause here is plain. Further, the ordering here is the same as in Harvey, wherein action precedes use in time, but not in dignity, and action and use are deeply related, they cannot be understood apart from each other. Interesting, the latter distinction of use (that which is less in dignity, as an aptitude) is never cited by Harvey, and note further that Laurentius does not distinguish between use and utility.[209]

Instead, we see in Harvey the deployment of some additional terminology in an effort to more clearly distinguish functions and actions from uses and utilities.[210] Like his contemporaries,

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[208] Laurentius (1600), "Quid in qualibet parte spectare debeat Anatomicus." Lib. I, Cap. XVII, 24. "Postremo, partium usus anatomico considerandus venit: scribit enim Philosophus, nos deduci in cognitionem organi, non ex structura, sed ex usu. Usus porro, Graecis χρεια, duplex a Galeno statuitur. Alter sequitur actionem, id est procedit ab ipsa actione, & est finis actionis, ut, ex videndi actione hunc usum cosequitur animal, ut fugiat quae nocitura sunt, & prosequatur quae utilia. Hic usus, actione quidem posterior est, si generationem & consitutionem spectes, sed dignitate prior censetur, quia actionum omnium est finis; finis autem nobilor his quae ante finem. Alter usus actionem praecedit, & definitur aptitudo quaedam ad agendum; sic, in oculo critallinus visionem edit primario; reiqui humores, tunicae, opticus, nervus, usum praestant, & ad actionem perficiendam diriguntur. "

[209] C.f. Fabricius (1625), "De actione et utilitate partium Foetus," *De Formato Foetu*, *pars secunda*, In: *Opera anatomica*, Padua: 108; this definition shares much in common with Laurentius, and is again, different from Harvey's as I show below. "Etenim utilitates semper ad actionem referuntur eamque, respiciunt, quae a similari parte prodit propter quam causam in quoque organo perpetuo datur una pars, quae est praecipuum instrumentum actionis, ut puta a qua actio proficiscitur, aliae vero ad ipsam, ut ministrae & utiles referuntur. Verbi gratia oculus est organum, cuius actio visio est; quae in cristallino potissimum celebratur, alicuius vero oculi partes, ut cornea, vuea, & coeterae, illi sunt utiles, vel ad melius, vel ad tutius videndum. Quod si non amplius de oculi partibus sed de toto organo, & eius actione inquiras utiltatem, ut puta cui scilicet visio sit utilis; responde re est, alicui alteri actioni, ut puta cerebri, quia per visionem principibus facultatibus cognoscentibus, idest imaginationi, rationi, & memoriae species offeruntur: ut inde, quod verum est, & falsum, salutare ac perniciosum discernant, ad alterum assequendum, alterum vero vitandum, & fugiendum; quod tandem ipsi vitae, ut puta actioni pleniori, ut dicit Aristotelis: est utile. Ex quibus iam patet, utilatem semper respicere actionem, sic si de actione quaeratur, utilitas, sic de alijs, aut consequentibus, aut accidentibus; neque posse ullam utilitatem inquiri, nisi prius actio organi cognita sit."

[210] It must be noted that, while Harvey in these passages goes into some detail setting up this system, he very rarely actually deploys any of this terminology beyond the triumvirate of *actio*, *usus*, *utilitas*. The reasons for this are unclear, and it does point to the fact that one should not be overzealous in the use of this terminology given Harvey's inconsistent usage. However, so long as one remains careful not to read to much of this terminology into Harvey's *practice*, this set of words and ideas are invaluable for understanding Harvey's systematic conception of the subject matter of anatomy, that is, the human body and its teleology.

Harvey does not strictly distinguish use from utility, but, unlike his contemporaries (at least in attempt at clarity), he sets up a more complicated system of organic relations that fall upon a sort of teleological continuum. The system that Harvey sets up here is one with a variety of what one might think of as teleological 'levels'. All the processes of the body, as I have shown repeatedly, are in some sense teleological—even the most basic material components of the body, the uniform parts, are *for* the construction of the non-uniform ones. But, even though in a sense the action of a part is teleological, this is a very shallow sort of teleological orientation; the use of the part, is, in a sense, 'more teleological' in that the use of a part isn't just teleological in the sense that the part is for its action, but it further serves some biologically necessary use—e.g., the expelling of waste, nutrition, etc. And beyond use, further down the teleological continuum, is utility, which is about, not the biologically necessary end that the part serves, but about the fact that that a parts means and ends serve the Good more generally, in that the part is well designed, according to the best: it is in some sense optimal. But between these levels are borderline cases, where one can equally call some end a use or a utility, and Harvey seems to distinguish at least somewhat these cases. Using Harvey's terminology, which I discuss below, one might thus arrange the teleological hierarchy along the following lines:

Actio → *Usus/Utilitas media* → *Utilitas finalis*[211]

Harvey first distinguishes use and intermediate utilities:

> Uses and intermediate utilities[212] [can be learned by considering the parts]:
> According to homogeneity: [if a part is] hot [then its use is] to make warm, to cook, to keep warm;
> [if] cold [then its use is] to make cool, to keep cool;
> [if] wet [then its use is] to lubricate, to make slippery, to soften, to blunt;

[211] Interestingly, Harvey, unlike some of his early modern contemporaries, doesn't include structure at the beginning of this scale, though he does, of course, discuss the importance of structure in determining actions, uses, and utilities.
[212] I take this to mean that a use and a medium utility are synonymous..

According to [other qualities]:	[if] dry [then its use is] to harden, to strengthen [by considering a part's] color, [we can learn about the use in relation to] the blood, its temperament, its activities; [by] its hardness or softness, [we can learn about its use in relation to] its temperament, its passions; [by] its thickness, [we can learn about the use in relation to] its lightness, its heaviness; [by] its thickness, [we can learn about the use in relation to] its firmness, its fragility;
According to instrumentality:	[by considering a part's] shape, size, location, construction.[213]

You will notice that I have interpolated quite a bit here. The notes are quite unclear as to what exactly Harvey means to indicate with these lists, and I follow in Whitteridge's general reading and understanding of this text, though I disagree on many points of detail regarding the actual translation.[214] This passage reveals how to link aspects of a part's *fabrica* (understood broadly to include color, elemental make up, and so forth) to the part's use—it is, in other words, the very embodiment of anatomy as the investigation into body and soul, the unity of matter and form in living things. It is a schema for licensing inferences to uses on the basis of observations about the structure and action of the parts (I discuss this again in Chapter 4). But here I am interested in getting clear on the terminology.

First note that Harvey here seems to equate uses with intermediate utilities. From above, I made the following sort of distinction between the two terms, use and utility: while both terms refer to a sort of organic purpose in the body, a function for some specific end, the term utility is meant to

[213] Harvey 1616, 22. "Usus et utilitates media: [/prout similare: calidum, calfacere coquere fovere; / frigidum, refrigerare contemperare; / humidum, lubricare laevigare emollire retundere; / siccum, firmare roborare;] [/pro: coloratum, sanguis temperies activitas; / durum aut molle, temperies passivitas; / densitate, levitas gravitas; / crassitie, robur fragilitas;] [/pro organco: figura, quantitas, situs, compositio]."

[214] Whitteridge's translation: "The uses and intermediate usefulness of the part must be examined in the following ways. Considered as something which is homogenous, if it be hot its use will be to make warm, to concoct and to keep arm; if cold, it will be to make cool and to keep cool; if moist, to lubricate, make slippery, soften and blunt; if dry to make secure and strengthen. From consideration of the coloring of each thing comes the knowledge of the degree of its kinship to blood, it temperament and active movement; from its quality of hard or soft, its temperament and passive movement; from the density of its texture, its lightness or heaviness; from its thickness, its strength and weakness. Considered as instrumental, its shape, amount, situation and composition must be bourne in mind" (Harvey 1616, 23).

connote not only this means-end relations, but, further, it concerns the fittedness of means to ends, or, somewhat differently, the necessity of that means-end relationship. Use, then, is closely tied to action—an action is what a part *does*, a use is what it does that action *for*—and utility is tied, not just to action, but to *acting well* or *acting by necessity*. Why then, would Harvey equate these two terms, use and intermediate utility? The obvious reason is just that the line between a use and a utility is not always clear, especially since a utility often, in some sense, *contains* the use—a utility is about the pairing of an action of a part to its use, and thus it makes essential reference to that use. That is, a utility is about not just the goal that an action serves, but, to return to May's suggested interpretation from above, it is about how the action accomplishes that use in an optimal way, about how the fittedness of the means to the ends allows the part to serve some grand life function.

However, the following line of the manuscript puts some seeming distance between use and utility, as Harvey writes, "Both use and action follow final [and] intermediate utilities."[215] Whitteridge translates the verb as 'follow from', but this does not get the sense right. What exactly does it mean for one thing to follow from another? One way to read the phrase would be to think of it as some sort of (efficient) causation: that is, utilities cause uses and actions, and thus the latter follow from the former. But this would be the wrong sort of causal picture for Harvey—rather, what the '*sequuntur'* refers to is final causation. Remember that the verb *sequor* can also mean 'to aim at,' or 'to strive after'—and so in this situation one should read 'follow' in this sense.

What are these grand life functions, these necessities of living creatures? Harvey describes these as the final utilities, and he writes following:

> Final [utilities of the parts are]: For their [very] existence, whence their necessity;
> To benefit their existence, whence their dignity;
> For their protection;
> As they could not be otherwise [*sine qua non*], whence their necessity;

[215] Harvey 1616, 24. "Et usum et actiones sequuntur utilitates finales, mediae."

For adornment;[216]

Utilities, then, are explanatory of the very existence of a part, and how it exists (in the sense of it existing in this way as opposed to some other way), and how it benefits the organism. A use/intermediate utility explains the action of a part; a final utility explains the necessity of that use, its existence, and how, more specifically, that action-use pair exists. An example will help make these distinctions clear. One clear example of such utilities is one concerning generation. So, Harvey writes the following concerning the utility of the genitalia:

> Utilities: 1. immortality.[217] 2. The mind is made sharp, the body healthy, whence incurable diseases happening near onset of sexual activity are either cured or, and those [which are not cured] they begin to be incurable. 3. The vigor of the body is caused by the sparks of these parts. That it is vigor is apparent in eunuchs whose mental habits, temperament, and manners are altered in such a way that they that they are less in everything, in magnanimity, intelligence, wisdom, fortitude and even health [and] they degenerate into women.[218]

So the utility of the genitalia is to achieve immortality, to perpetuate the species, and to ensure the overall vigor and vitality of the body. Harvey does not, unfortunately, make use of the term *usus* here, but one can surmise that use of these parts is generation, that is, they are for the purpose of reproduction. But their utility, the purpose of being for generation so to speak, is that it is by such processes mortals achieve perpetuity, immortality, and, further, such processes, though their use is but for generation, also serve the utility of making the body healthy and the mind sharp—in other words, they are for the overall good of the living creature, and they exist in order that living

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[216] Harvey 1616, 24. "Finales: ad esse, unde necessitas; [/Ad bene esse, unde dignitas; /Ad tutelam; /Sine qua non, unde necessitas; /Ad ornatum]." This seems somewhat similar to what Fabricius wrote in his definition of use when considering the use of the whole organic system.

[217] The word here so translated, '*perpetuitas*' means literally continuity, or permanence. But in the context of generation, one must recall Aristotle's argument that it is through generation that mortal creatures achieve a measure of immortality through the perpetuation of their form through the ages. For which, *De anima* II: 415b 1–10. I thus think that immortality, while not the most literal translation, gets the sense of the term in its appropriate philosophical context. Further, at the beginning of this section (174), Harvey writes that genitalia are, "By the string tyed to eternity."

[218] Harvey 1616, 176. I follow the 1886 edition in reading *omnibus* and not *obnisi*, as Whitteridge does, and which makes no sense in the sentence. So, correcting Whitteridge (though following her emendations of the text, e.g., *incurabiles* for the manuscrits *incurabilis*), "Utilitates: 1. Perpetuitas. 2. Mens acuitur, corpus salubre redditur, unde morbi incurabiles circa adventum veneris aut curantur et qui non aut incipient incurabiles. 3. Corporis vigor harum partium igniculis excitatur. Vigor apparet castratis quorum habitus anima temperamentum et mores adeo alterantur ut minus omnibus magnanimitate ingenio sapientia fortitudine vel sanitate in faeminas degenerant."

creatures live well. And thus Harvey explains the necessity and dignity of the part, that is, why it exists and why it must exist, and how it exists so as to benefit the living creature. As Harvey writes just below his definition of final utilities, "The preeminence [of a part] follows its uses, as is clear by many things. [That is] the necessity [of a part], its essence, is for [the sake of] its existence. The dignity [of a part] [is to] benefit its existence, and [is for] its perfection, protection, and adornment."[219]

I must finally discuss the term 'office [*officio* or *munus*]'. Again, this term is used inconsistently—sometimes Harvey uses the term to mean something equivalent to action, that is, some basic function of a part, and other times the terms seems to be closer to use. However, there does seem to be an independent meaning to the term office, namely, in this instances the term refers to a general functional *role* that can be played by a part, but which can be instantiated in different animals in different ways. Thus, in these cases, the office of a part should not be confused with any actual, specific function that occurs in any specific part of any specific animal.[220] Consider an example: Harvey discusses the uses of the hands, which are the following: "[The hand has] three uses: caring for the body, defending one's self, [and] crafts [since the hand is] the instrument before [other] instruments since it is the form of forms."[221] This conception of the instrument of instruments is common to both Galen and Aristotle.[222] Harvey then goes on to use the word *officio* in the relevant sense: "Those [creatures] which lack hands, their office is supplied [by either] a long neck and beak, a tongue [as in] bees [and] dogs, a proboscis, [as in] the elephant [and] the butterfly,

[219] Harvey 1616, 24. Again, though the reading of most of the words is clear here, the meaning is much less so, and I have thus interpolated quite a bit. "Praestantia sequitur utilitates, videlicet ad plura. Necessitas sine qua non, ad esse. Dignitas bene esse et perfectionem, tutelam, ornatum."
[220] Again, there are counterexamples to this understanding of the word 'officio,' just as there are for most terminology that Harvey uses. So, for instance, Harvey sometimes seems to use 'officio' in a way equivalent to 'usus,' though much depends on translation. I am here interested in how he uses the term in ways that are distinct from other terms, and he does use, more or less consistently, *officio* in such a distinct way.
[221] Harvey 1616, 26. "Usus tres: curandi corpus, se defendendi, artes organum ante organa ut intellectam formam formae."
[222] Galen *De Usu Partium* I.3, Aristotle *De partibus animalium* IV.10..

[or by] feet, [as in] monkeys [or] parrots."[223] The basic idea here, then, is that, though, say, elephants lack proper hands, the same functional role played by hands—involving caring for one's self, defense, etc.—is played by the elephant's nimble trunk. Thus the term *officio* is an important one for anatomy done comparatively, since it allows one talk about organs that are morphologically different (a nose vs. a trunk) but functionally similar.

I thus conclude my discussion of Harvey's teleological terminology, and with it, my discussion of the soul in its union with the body, of the teleology of being for the sake of. I have one last task: I must now incorporate the *De motu cordis* into the conception of anatomy I have been discussing.

2.4. THE TELEOLOGY OF THE *DE MOTU CORDIS*

The *De motu cordis* has been seen as a non-teleological and even as a non-causal work by some historians, even if those same historians admit that Harvey was himself deeply concerned with teleology.[224] Indeed, Roger French has argued that the *De motu cordis* and Harvey's later replies to his critics represent a 'Principle of Limited Explanation,' whereby Harvey places factual, observational knowledge as the primary sort of knowledge that philosopher's should be interested in, over and above causal knowledge.[225] If this were true, this would undermine the argument set forth in this chapter, for to understand anatomy as an investigation into the soul and its union with the body is to understand it as an investigation into causes, indeed, into all the causes, but especially into the final cause. In fact, French's interpretation is the wrong way to look at Harvey's project;

[223] Harvey 1616, 26. "Qui minibus carent earum officio supletur: colli longitudine et rostro; lingua, apes canes; proboscide, elephas papilio; pedibus, simae psittacus."[223]
[224] Pagel, Walter (1976), *New Light on William Harvey,* New York: S. Karger.
[225] This is discussed in a number of places in French 1994: 277, 301, 313, 317, 346, 350, 362. I will return to this principle of French's at the end of Chapter 4.

one should rather, as I have been arguing in this chapter, understand the *De motu cordis* as an investigation into soul and body, and as deeply concerned with the teleology of 'being for the sake of' and the efficient causes which act for those ends. I do not deny, of course, that Harvey repeatedly emphasized that his discovery of the circulation was true even in the absence of the final cause, but French seems to imply that this 'Principle of limited explanation,' indicates a general pragmatic attitude with respect to determining the final causes of things in nature. In fact, even in the absence of the final cause of the circulation, the *De motu cordis* remains a deeply teleological work in how Harvey there conceives of the living body and its functionality. I will discuss French's principle in more detail in the concluding section of Chapter 4, but in this section, I want to demonstrate the ways in which the conception of body and soul described above is apparent in *De motu.*

Though Harvey does not final causally explain the circulation, he makes some very important contributions and revisions to the causal picture of the heart and the arteries and veins, and of the body in general. A few random examples will serve to illustrate this point: Harvey discusses the action of the muscles in the second chapter, writing "…the muscles, whilst they are in motion and in action, are invigorated and stretched, from soft become hard, they are uplifted and thickened, so likewise the heart."[226] Here, by comparing the muscles motions and actions to those of the heart, Harvey can begin to make his argument about the proper interpretation of systole and diastole, and thus come to argue eventually that the action of the heart is its forceful systole on the basis of this comparison with the *actio* of other muscles. Use, too, is important to Harvey in the *De motu.* In the *Proem,* Harvey makes the following point which should seem quite familiar given what I have argued above, "And since the passages and vessels answer to one another in point of size, namely the *vena arteriosa* and *arteria venosa,* why should the one be destined to a particular

[226] Harvey 1628, Cap.2, 22. See also: Cap.5.

use, that is to say to nourish the lungs, the other to a general?"[227] Here we thus have Harvey arguing that the traditional picture of the use of the ventricles, and these two vessels, cannot be right on the basis of their structure, since similar structures imply similar uses. The anatomist cannot, in good conscious, think that they have different ends, for, if this were so, the set of hypothetical necessities governing their structural and material nature would also be different.

Returning again to Roger French's assessment of Harvey. In his discussion of the seventh chapter of the *De motu cordis,* French writes that

> Harvey refuses to be drawn into a digression on the purpose of the blood passing though the lungs and contents himself with demonstrating that it can happen and that it does happen. That is, despite the *actio-usus-utilitas* structure of his anatomical method, Harvey is here pragmatically stating that it does not vitiate the demonstration to stop before reaching the final stage, or the discovery of the final cause.[228]

French here is correct in pointing out that Harvey here has not determined the final cause of the blood, but he takes this to mean that Harvey has, in general, abandoned the search for final causes he is mistaken. Rather, one finds that causal language is deeply relevant to this chapter! Importantly, one must not conflate the final causes of two different things, namely, the motion of the blood (through the lungs and around the body) and the motions of the heart and its parts. Harvey does not provide the final cause of the blood's circulation in this chapter or elsewhere, but he *does* give the final cause of right ventricle. He writes that, "And in this way the right ventricle is the *cause* of the lungs and for the sake of the transfer of the blood, and not merely for the sake of nutrition."[229] Harvey here argues that the lungs are the cause of the right ventricle, and, especially given the later 'for the sake of', one can only understand this as a final cause. French, in overemphasizing the originality of Harvey's demonstration without the *causa finali*, underemphasizes the very traditional, and very teleological, conception of the parts and movements

[227] Harvey 1628, *Proem,* 16,.
[228] French 1994, 104.
[229] Harvey 1628, Cap. 7, 40. "Et hoc modo dextrum ventriculum pulmonum causa, & ob translationem sanguinis, non ob nutritionem."

of the heart that Harvey here evinces—just the conception I have been belaboring in this chapter. On this front one note that, few translations of the *De motu cordis* translate the 'causa' from the quote above as 'cause' nor do they respect the sense of 'ob' as 'for the sake of,' and, while some translations do render the 'causa' as 'having been made for the sake of' this cumbersome phrase does not immediately register as distinctly causal language.

Indeed, if Boyle is to be believed, Harvey's initial research which led him to the circulation was inspired by a question of final causality, of use: namely, the use of the valves of the veins. Boyle writes,

> And I remember that when I asked our famous Harvey, in the only discourse I had with him, What were the things that induced him to think of a Circulation of the Blood? He answer'd me, that when he took notice of the Valves in the Veins of so many several Parts of the Body, were so plac'd that they gave free passage to the Blood Towards the Heart, but oppos'd the passage of the Venal Blood the Contrary way: He was invited to imagine, that so Provident a Cause as Nature had not so plac'd so many Valves without Design: and the Design seem'd more probable, than That, since the Blood could not well, because of the interposing Valves, be Sent by the Veins to the Limbs; it should be Sent through the Arteries, and Return through the Veins, whose Valves did not oppose its course that way.[230]

So the use of the valves of the veins was a problem to be solved for Harvey, for 'so Provident a Cause as Nature' would not have made any part that serves no purpose. It thus seems that considerations of causality—including, as we see in this passage, the final causality or the use of the parts—were central to Harvey's method. Thus, in chapter thirteen of *De motu,* Harvey argues that Fabricius' explanation of the valves, that they were for the purpose of stopping the pooling of blood, or that their use was to stop blood from falling downwards, was vitiated by his observations and experiments:

> The finder out of these portals did not understand the use of them, nor others who have said lest the blood by its own weight should fall downward: for there are in the jugular vein those that look downwards and do hinder the blood to be carried upwards. I (as likewise others) have found in the emulgent veins and branches of the Mesenterie, those which did look towards the vena cava and vena porta; add to this moreover that there are no such in the arteries, and it is to be observ'd that dogs and cattle have all their portals in the dividing of

[230] Boyle, Robert (1688), *A Disquisition about the Final Causes of Natural Things*, London: Taylor, 157-158.

> the crural veins at the beginning of the os sacrum, or in the Iliac branches near the Coxendix, in which there is no such thing to be feared by reason of the upright stature in man. Nor are their portals in the jugulars, as others say, for fear of Apoplexie, because the matter is apt in sleep to flow into the head through the soprall arteries.[231]

So here we have an example where Harvey is making an explicit argument about the use and purpose of a part. We will look at this passage again in Chapter 4, but for now merely note that not only does Harvey not shy away from making arguments concerning use, but that, furthermore, the use of the valves of the veins is an important part of his argument for the use of the veins and for the existence of the circulation. Indeed, part of what French gets wrong with his 'Principle of Limited Explanation' is that, while Harvey could not causally explain the *circulation*, he did use final causes in arguing for the existence of the circulation, and he did come to a new causal understanding of the *heart*—its action is the forceful systole, its use to create the circulation.[232] And not just the heart, but also the uses of the veins and arteries are within Harvey's purview, for their uses must be understood in terms of the circuit of the blood that they carry. And it goes without saying that Harvey's work in the *De motu* falsified the use of the liver as the origin of the vessels and manufacturer of the blood, and in this negative sense, Harvey can be seen as centrally concerned with purposes and causes.

I have shown, using just a few examples drawn almost haphazardly, that Harvey's work in the *De motu* follows the pattern argued for in this chapter, wherein the sorts of considerations of action, use, and of hypothetical necessity are central to Harvey's fundamental picture of the living animal body. But what about soul? Harvey makes no mention of it here directly, but I shall show in the beginning of the next chapter that it soul is, in fact, central to a set of problems created in the wake of the *De motu.* These problems concern the very question that Harvey could not answer, the final cause of the circulation. This is a problem, he comes to see, of the purpose of the blood: why

[231] Harvey 1628, Cap.13, 55.
[232] Harvey 1628, Cap.17, 70-71.

must it ceaselessly circulate around the body? Harvey, on traditional grounds, believes that this must have something to do with the nutritive faculty of soul. This can be seen even the *De motu cordis,* in the eighth chapter, where Harvey writes,

> So the heart is the beginning of life, the Sun of the Microcosm, as proportionally the Sun deserves to be call'd the heart of the world, by whose virtue and pulsation, the blood is mov'd, perfected, made vegetable, and is defended from corruption and mattering; and this familiar household-god doth his duty to the whole body, by nourishing, cherishing, and vegetating, being the foundation of life and author of all. But we shall speak more conveniently of these in the speculation of the final cause of this motion.[233]

In other words, the heart, as the beginning of life, is the source of that life. And life, remember, just *is* the set of goal-oriented capacities of the soul in its union with the body. Here, following a long tradition, Harvey states that the blood has the purpose of nourishing and maintaining the entire body, just that faculty of the nutritive soul. I take up the topic of nutrition in the following chapter.

[233] Harvey 1628, Cap.8, 42.