

Chrysippus and Early Alexandrian Physicians on the Location of the Control Centre of the Soul

Masahiro Imai

Introduction

In this paper, I will discuss how Chrysippus' cardiocentric psychology reflects a history of debate about the central organ of the human body in the early Hellenistic period. I will draw specific attention to his psychological arguments against encephalocentric models of the human body proposed by early Alexandrian physicians, including Herophilus of Chalcedon (c.330-250 BC) and Erasistratus of Ceos (c.320-240 BC). Through an analysis of some of the fragments and testimonies on the Stoic theory of soul, which I suppose illuminate his relationship to these physicians, I will make it clear that Chrysippus played a decisive role in the debate against those who had followed in the footsteps of the tradition of Hippocratic encephalocentrism.

Before I begin my discussion, I want to make some preliminary remarks on historical background of the debate, which I think will make it easier for us to evaluate more effectively the relationship of the Stoic philosopher to early Alexandrian physicians. Today, there is no one who doubts that the brain and the central nervous system are responsible for our cognitive activities and voluntary motions of the body. However, the situation was completely different in the Greek world of the fifth and fourth centuries BC, when the author of the Hippocratic treatise *On the Sacred Disease* (*Morb.Sacr.*) had to argue strongly against those who were of the opinion that the heart, not the brain, is the central organ of the human body. Thus, his arguments against them run as follows.

Some people say that the heart is the organ with which we are intelligent, and it is what is distressed and what is anxious. This is not the case, but it is convulsed, just as the diaphragm, and more so for the following reasons. From all the body vessels extend to it, and it holds them tightly connected together, so that it may be affected, if there is any pain or tension occurring to a human being. And he will necessarily feel his body shiver and strained, if he is distressed, and he will suffer in the same way, if he rejoices exceedingly. That is why the heart and the diaphragm are affected

by them most of all. Neither, however, has any share of intelligence, but the brain is responsible for all these phenomena.¹

According to the Hippocratic author, the proponents of the cardiocentric model of the human body, as opposed to the encephalocentric one propounded by the author himself, held that the heart (καρδίη) is the organ by which we are intelligent and also undergo various kinds of emotional states. His arguments against them seem to indicate that cardiocentrism was older in the history of ancient Greek psychology, since its origin may be traced back to the period of Homer (active around 750 BC), who locates psychological life of a human being in his or her breast.² It should be noted that cardiocentrism became most popular from the fourth century BC, especially because Aristotle (384-322 BC) joined the debate as one of the most influential proponents of this view. He often refers critically to those who insisted that the brain is responsible for our psychic states and activities, when he argues for his own cardiocentric model of animals, including humans, in his biological treatises, such as *On the Parts of Animals* and *On the Generation of Animals*.³ It is probable that his model had much influence on post-Aristotelian medical theories of the structure and function of the human body attributed to his younger contemporary physicians. In fact, Praxagoras, who was one of the leading members of the medical school at Cos around the latter half of the fourth century BC, introduced a cardiocentric model of the human body into his school, where there had been a tradition of Hippocratic encephalocentrism.⁴ It is reported that he taught his disciples that the heart, not the brain, is the centre of all our psychic functions.⁵

¹ *Morb.Sacr.*, ch.17(20), É. Littré, *Œuvres complètes d'Hippocrate, traduction nouvelle avec le texte grec en regard*, 10 tomes (Paris 1839-1861), reprint. A. M. Hakkert (Amsterdam 1973-1978), tome 6, p. 392, 15-p. 394, 2. In Littré's edition, chapters of this treatise are divided in a different manner from those of the Loeb edition by W. H. S Jones, *Hippocrates II* (Cambridge, Massachusetts: Harvard University Press 1923). The chapters of the Jones' edition will be indicated in round brackets. I follow the Greek text of the treatise by Jacques Jouanna in his Budé edition, *Hippocrate, tome II, 3^e Partie, La maladie sacrée*, Collection des Universités de France (Paris: Les Belles Lettres 2003). I translate the passage cited above, by following the English version by Jones in his Loeb edition, though modifying it slightly for some phrases and sentences.

² See M. Clarke, *Flesh and Spirit in the Songs of Homer* (Oxford: Clarendon Press 1999), 61-126. In Homeric psychology, the terms 'diaphragm' and 'heart' are used interchangeably to denote the agent of human thought, its function or its seat. But it was this Homeric idea that might possibly have led people to regard the 'diaphragm' or the 'heart' as being responsible for our psychic states and activities, after these two terms came to mean particular organs in the human body.

³ *De Partibus Animalium*, Book II, ch.7, 652b6-27, and *De Generatione Animalium*, Book II, ch.6, 743b25-32. See also *De Juventute*, ch.3, 469a5-16.

⁴ 'Hippocratic encephalocentrism' seems to need some detailed explanation. When I use this phrase in my discussion below, I do not mean that all the authors of the medical treatises in the Hippocratic

Although he may have been one of the distinguished physicians in the medical field of his time, Praxagoras was not always successful in persuading his colleagues and other physicians to accept his own cardiocentric model of the human body. Herophilus of Chalcedon, who had been one of his disciples, rejected his teacher's cardiocentrism, and returned to the tradition of Hippocratic encephalocentrism.⁶ Herophilus has been highly valued in the history of medicine for his anatomical researches on the internal parts and organs of the human body, which led him to make remarkable contributions in Ptolemaic Alexandria to the advancement of medical knowledge of the human body, such as the discovery of the nerves and the elucidation of the structure and function of the brain. Erasistratus of Ceos may have shared Hippocratic encephalocentrism with Herophilus, although his model of the human body may well be regarded as having been more elaborate and systematic than the one proposed by his elder contemporary.⁷ Both of them were strongly convinced that they had confirmed the legitimacy of Hippocratic encephalocentrism, when they had discovered by the method of anatomical dissection of the human body that the brain, not the heart, is responsible for our cognitive activities and

Corpus shared encephalocentrism. In fact, some authors are standing in opposition to it, including the author of the treatise *On Diseases*, Book II, who explicitly advocates the cardiocentric view. On the other hand, the Hippocratic Corpus includes the famous treatise *On the Sacred Disease*, the author of which, I am convinced, was one of the most influential proponents of the encephalocentric view to open the way to new stages of the debate about the central organ of the human body from the fifth and fourth centuries onwards to the Hellenistic period. It is probable that the author belonged to the Hippocratic medical school at Cos in the fifth century BC. So it would seem to be legitimate for us to regard him as one of the representative advocates of 'Hippocratic encephalocentrism'. Polybus (c.400 BC) may well be regarded as another representative advocate of 'Hippocratic encephalocentrism'. He may have been one of the most influential physicians in the Hippocratic medical school at Cos, because he is reported to have been Hippocrates' son-in-law and the author of the treatise *On the Nature of Man*, a most famous treatise in the history of medicine for the Hippocratic theory of four humours. I would not insist, of course, that these two Hippocratic authors shared exactly the same view of encephalocentrism. See my article 'Aristotle on the Debate about the Central Organ of the Human Body in the 5th and 4th Centuries BC', *Historia Scientiarum: International Journal of the History of Science Society of Japan*, 22-1 (Tokyo: The History of Science Society of Japan 2012), 4-5.

⁵ Athenaios, *Deipnosophistai*, XV 687e [=F. Steckerl, *The Fragments of Praxagoras of Cos and His School* (Leiden: E. J. Brill 1958), 65, Fr.30].

⁶ See my article 'Herophilus of Chalcedon and the Hippocratic Tradition in Early Alexandrian Medicine', *Historia Scientiarum: International Journal of the History of Science Society of Japan*, 21-2 (Tokyo: The History of Science Society of Japan 2011), 103-22.

⁷ In my recent article on Erasistratus, I made it clear that his anatomical physiology of a human being has theoretical sources in some basic ideas from the tradition of Hippocratic medicine, although he is reported to have rejected humoral pathology, the core doctrine of Hippocratic medicine, following in the footsteps of his teacher Chrysippus of Cnidus. See my article 'Erasistratus of Ceos and the Theoretical Sources for his Anatomical Physiology of a Human Being', *Historia Scientiarum: International Journal of the History of Science Society of Japan*, 24-3 (Tokyo: The History of Science Society of Japan 2015), 103-25.

voluntary motions of the body, which they explained on the distinction between sensory and motor nerves.⁸

In this debate, the Stoics might be regarded as having adhered to a scientifically old-fashioned model of the human body to make strong claim to the legitimacy of their cardiocentric psychology, as A. A. Long argued that they maintained out-of-date theories in physiology against the new discoveries of Erasistratus in the medical field.⁹ In his famous article on Greek philosophy and the discovery of the nerves, Friedrich Solmsen, who referred to Praxagoras' cardiocentric model of the human body as having being authoritative for Chrysippus to insist that the control centre of the soul (τὸ ἡγεμονικόν) is located in the heart, not in the brain, went as far as to say that the Stoic philosopher was lacking in a feeling for scientific progress.¹⁰ This is a view common in modern scholarship on the relationship of the Stoics to their contemporary medical achievements, including the discovery of the nerves.

I am reluctant to share this view, because it seems to be prejudiced in favour of the discovery of the nerves. Most historians of medicine would be most inclined to think that the situation in the history of medicine changed drastically from the moment when early Alexandrian physicians discovered the nervous system with the exact knowledge of the structures and functions of the brain as the central organ of the human body. The discovery of the nerves, innovative as it may indeed have been in the advancement of medical knowledge of the human body, did not put an end at all to the debate about its central organ as to whether the soul is located in the brain or in the heart. This does not mean, on the other hand, that the discovery of the nerves had nothing but a small impact on the debate, even though, as some scholars supposed, anatomical researches on the human body were practiced at limited

⁸ On their distinction between sensory and motor nerves, see a medical treatise *On the Anatomy of the Parts of Man*, 71-5 [=Heinrich von Staden, *Herophilus: The Art of Medicine in Early Alexandria* (Cambridge University Press 1989), 200, T81]. The treatise has been attributed with disputed authenticity to the first century AD physician Rufus of Ephesus.

⁹ A. A. Long, *Hellenistic Philosophy: Stoics, Epicureans, Sceptics* (London and New York 1974), 12. The 'out-of-date' theories in physiology, to which Long is referring here, may include Praxagoras' cardiocentric model of the human body, and A. A. Long, 'Stoic psychology', in K. Algra, J. Barnes, J. Mansfeld and M. Schofield (edd.), *The Cambridge History of Hellenistic Philosophy* (Cambridge: Cambridge University Press 1999), 568-69. See also David Sedley, *Lucretius and the Transformation of Greek Wisdom* (Cambridge University Press 1998), 68-70, who seems to have shared the same view, arguing that 'Chrysippus defended the *outdated* Zenonian anatomy' on the mechanism of speech in a famous passage cited by Galen (see text to note 12 below).

¹⁰ F. Solmsen, 'Greek Philosophy and the Discovery of Nerves', *Museum Helveticum* 18 (1961), 150-97. It seems to be anachronistic that Solmsen appealed to the concept of scientific progress in the modern sense of the word in order to describe the intellectual circumstances of the Hellenistic world.

places.¹¹ It seems that, though it was far from bringing to an end the debate about the central organ of the human body, the discovery of the nerves had much influence on it, providing a strong argument for Hippocratic encephalocentrism. I would suggest that it is presumably under these circumstances that Zeno of Citium (c.334-262 BC), who was the founder of the Stoic School, had to argue for his own cardiocentric psychology, with an implicit criticism of those who regarded the brain, rather than the heart, as the central organ of the human body, as it is indicated by a famous passage attributed to Zeno by Galen in his treatise *On the Doctrines of Hippocrates and Plato*, Book II.

Speech passes through windpipe. *If it were passing from the brain, it would not pass through the windpipe. Speech passes from the same region as discourse. Discourse passes from the mind. Therefore, the mind is not in the brain (Italics mine).*¹²

In this passage, Zeno seems to be criticizing those who were of the opinion that the brain is the seat of mind (διάνοια) in a human being, as it is clear from the last sentence of the passage, concluding his arguments for cardiocentric psychology. It is conceivable that those whom Zeno has specifically in mind in his arguments above may have been early Alexandrian physicians, including Herophilus and Erasistratus, given the fact that both Herophilus and Erasistratus were his contemporaries. Chrysippus, who was the most faithful follower of cardiocentric psychology proposed by the founder of the Stoic School, may also have thought it to be necessary to make a critical response of his own to their encephalocentric models of the human body, as will be confirmed through an analysis of some of the fragments and testimonies on the Stoic theory of soul, which illuminate his relationship to these physicians.

¹¹ Teun Tieleman, *Galen and Chrysippus on the Soul: Argument and Refutation in the De Placitis Books II-III* (Leiden, New York and Köln: E. J. Brill, 1996), 194. See also G. E. R. Lloyd, 'A note on Erasistratus of Ceos', *Journal of Hellenic Studies* 95 (1975), 172-75.

¹² Galen, *De Placitis Hippocratis et Platonis (PHP)*, II 5, 6-8, Phillip De Lacy, *Galen On the Doctrines of Hippocrates and Plato*, Corpus Medicorum Graecorum [CMG] V 4, 1, 2 (Berlin: Akademie Verlag, 1984), 130 [=H. von Arnim, *Stoicorum Veterum Fragmenta*, 4 vols. (Leipzig, 1905-1924), I 148, 40]. When I cite relevant passages from *PHP* in this paper, I follow the English translation by P. De Lacy in his edition mentioned above, except for a few modifications which I believe to be needed for some phrases and sentences.

Chrysippus against Erasistratus' Encephalocentric Model of the Human Body

I begin my discussion by referring to a passage in Galen's treatise *On the Doctrines of Hippocrates and Plato*, Book I, where Galen is severely criticizing the theory which he attributes to Erasistratus and the members of his school, i.e. the theory that the left ventricle of the heart contains only pneuma.

For what is stated by the Erasistrateans, i.e., that before being laid bare it (the left ventricle of the heart) contained only pneuma, and that blood slips in after it has been laid bare, is nothing but the statement of those who are shameless in the face of refutation. But this shameless statement on their side is also the most easy to refute. If the blood had escaped into the pneumatic ventricle of the heart contrary to its nature, then, in my opinion, all the functions of this ventricle according to its nature would have been disturbed, the arteries would no longer be pulsating in order to be filled with the pneuma coming from it, and so many activities would have been destroyed, as their source would no longer exist. Indeed, Erasistratus says that this ventricle is full of vital pneuma, while Chrysippus says that it is full of psychic pneuma. But the animal shows no symptoms whatever.¹³

This passage forms a part of the arguments by Galen for his view that both the right and left ventricles of the heart are filled with blood even at the moment when it is laid bare, as was indeed the case with his patient, a young boy suffering from a fistula in his chest, penetrating the bone in the middle of his sternum.¹⁴ In order to confirm the legitimacy of his view, Galen suggests piercing the heart, from which, he asserts, blood will be observed to be running immediately. In this context, Galen also argues against Chrysippus, who insisted on the basis of his cardiocentric theory of soul that the left ventricle of the heart is full of psychic pneuma. According to the Stoic philosopher, pneuma would run immediately from the heart when it is pierced, although this is contrary to the observable fact. Then Galen turns to the Erasistrateans of his time, who, following in the footsteps of their master Erasistratus, insisted that the left ventricle of the heart is full of vital pneuma. They are reported to have tried to explain why it is observed to be filled with blood in

¹³ Galen, *PHP*, I 6, P. De Lacy (1984), 78 [=H. von Arnim (1905-1924), II 897, 246].

¹⁴ The Greek text of the *PHP* passage which contains Galen's report on his anatomical treatment of the young boy is mutilated, but it is preserved in two Arabic versions by Rhazes (born 865 AD) and Ibn al-Muṭrān (died 1191 AD). See P. De Lacy (1984), 72-77.

these circumstances, claiming that it contained only pneuma before being laid bare, while blood runs into it after it has been laid bare. That would be inconceivable, Galen argues, given the fact that his patient had not suffered any impairment of the functions to be attributed to the left ventricle of the heart in its normal condition. However, according to the Erasistratean view, this would have been greatly disturbed as a result of the flow of blood into it.

It may deserve noting that Galen refers to the Stoic philosopher as contrasted with Erasistratus near the end of his arguments against the Erasistrateans of his time, arguing that Erasistratus says that the left ventricle of the heart is full of vital pneuma, *while* Chrysippus says that it is full of psychic pneuma. This means that Erasistratus held, on the basis of his distinction between vital and psychic pneuma, that the left ventricle of the heart contains vital pneuma, which is distributed from there through the arteries to the whole body, while Chrysippus held that it contains psychic pneuma, because he defined the heart as the seat of the control centre of the soul. The crucial here is whether Galen contrasts Chrysippus with Erasistratus, because he wants to emphasize the difference between their doctrines, or whether this rather presupposes that the Stoic philosopher made a critical response to the doctrine of vital pneuma proposed by Erasistratus, arguing on the basis of his own cardiocentric theory of soul that the left ventricle of the heart is full of psychic pneuma, *not* vital pneuma.¹⁵ I am inclined to take the second alternative, because Galen's reference near the end of his arguments against the Erasistrateans of his time to Chrysippus' doctrine of psychic pneuma *as well* would lead us to think that Galen intends to draw attention to the fact that the Stoic philosopher himself was critical of Erasistratus' doctrine of vital pneuma. The difference of their doctrines of pneuma is connected with their disagreement as regards the central organ of the human body. According to Erasistratus' encephalocentric model of the human body based on the distinction between vital and psychic pneuma, there are two kinds of vascular systems existing in the human body, i.e. the arterial and nervous systems that originate from the heart *and* from the brain, which he claimed to be responsible for involuntary movements of the body and for our cognitive activities and voluntary motions respectively. Chrysippus, on the other hand, defined the heart as the central organ of the human body, where he located the control centre of the soul.

¹⁵ As far as I know, Giuseppe Cambiano was the first to draw attention to the passage in question, indicating that there might be possibility that Galen's contrast between Erasistratus and Chrysippus reflects an argument taken directly from the Stoic philosopher. See G. Cambiano, 'Philosophy, science and medicine', in K. Algra, J. Barnes, J. Mansfeld and M. Schofield (edd.), *The Cambridge History of Hellenistic Philosophy* (Cambridge: Cambridge University Press 1999), 601-02.

In an attempt to confirm that Chrysippus was well aware of Erasistratus' encephalocentric model of the human body, I draw attention to a famous passage quoted by Galen in his treatise *On the Doctrines of Hippocrates and Plato*, Book III, from the first book of Chrysippus' treatise *On the Soul*, where the Stoic philosopher refers in some detail to the disagreement among physicians and philosophers as to the location of the control centre of the soul.

This being so, there is agreement about all other parts, but they disagree about the governing part of the soul, some placing it in one place, others in another. For some say that it is located in the chest, others say that it is located in the head. And they also disagree as to these locations themselves, not agreeing among themselves as to where in the head and where in the chest it is located. Plato, who said that the soul has three parts, placed the rational part in the head, the spirited in the region of the chest, and the desiderative in the region of the navel. Thus, the place appears to elude us, since we have neither a clear perception of it, as with others, nor sure signs from which one might infer. Otherwise, disagreement among physicians and philosophers would not have grown so great.¹⁶

In this passage, Chrysippus seems to be following the doxographic tradition on the location of the control centre of the soul.¹⁷ After having propounded his own cardiocentric theory of soul that it is substantially *pneuma connate* with us with its control centre being located in the heart, the Stoic philosopher goes on to argue that there is disagreement among physicians and philosophers as to where in the body it is located, explaining that some people insist on its location in the head, while others on its location in the chest. Above all, it is significant that Chrysippus goes as far as to say that amongst those who share the common view on its location in the head, there is disagreement as to where in the head it is located, as in fact there was even among early Alexandrian physicians following in the footsteps of the tradition of Hippocratic encephalocentrism. In fact, Erasistratus located it in the membrane of the brain (i.e. the *dura mater*), while his elder contemporary Herophilus in the fourth ventricle of the brain, as reported by ps.-Plutarch in his doxographic treatise *On the*

¹⁶ Galen, *PHP*, III 1, 12-15, P. De Lacy (1984), 170 [=H. von Arnim (1905-1924), II 885, 238-39].

¹⁷ See J. Mansfeld, 'Chrysippus and the *Placita*', *Phronesis* 34-3 (1989), 311-42, who suggests that the arguments made by Chrysippus in the first book of his treatise *On the Soul* may reflect the doxographic tradition, as it has been transmitted in Aëtius' *Placita* and some other sources depending on it or on the *Vetusta Placita*.

Opinions of Philosophers, Book IV.¹⁸ It is true that Chrysippus does not mention Erasistratus or Herophilus by name at all in the passage cited by Galen from the first book his treatise *On the Soul*, and of course there might have been some others who were of the different opinions as to where in the head to locate the control centre of the soul. It would be difficult to think, however, that the Stoic philosopher did not have either Erasistratus or Herophilus in mind at all, especially when discussing a crucial question about the location of the control centre of the soul in the human body, with some detailed reference to the disagreement on this matter among physicians and philosophers.

We may therefore conclude that Chrysippus had knowledge about Erasistratus' encephalocentric model of the human body, which was well enough for him to argue against the doctrine of vital pneuma proposed by the Alexandrian physician. His distinction between vital and psychic pneuma presupposes two kinds of vascular systems, i.e. the arterial and nervous systems having their origins in the heart and in the brain respectively, which would mean that there are *two* central organs existing in the human body. It is probable that Chrysippus found it to be in opposition to his cardiocentric psychology, according to which the Stoic philosopher defined the heart as the *unique* central organ of the human body and therefore as the seat of the control centre of the soul.

Chrysippus' Response to the Discovery of the Nerves

If it is true that Chrysippus had knowledge about Erasistratus' encephalocentric model of the human body, which was well enough to argue against his doctrine of vital pneuma, it would be legitimate to presume that the Stoic philosopher also obtained some detailed information about the nerves in the exact sense of the term, i.e. nerves which had been discovered by early Alexandrian physicians. It is confirmed by another passage from Galen's treatise *On the Doctrines of Hippocrates and Plato*, Book I.

But this is not the purpose for which I mentioned the things elucidated by the method of anatomy. Rather, I did so with a view to showing that psychic pneuma is contained in the ventricles of the brain. On this point, I would be especially critical of Chrysippus, because, although he intended that what occupies the place of authority in the soul is unmixed and pure

¹⁸ See ps.-Plutarch, *Placita philosophorum*, IV 5, J. Mau, *Plutarchi Moralia*, Vol.5, 2, 1 (Leipzig: BSB B.G. Teubner 1971), 117.

pneuma, he inappropriately stationed it in the heart. Nevertheless, you should be tolerant toward Chrysippus, who modestly declared that his heart does not vouchsafe to him either the knowledge that it *is* the source of the nerves, or any other answer to the questions related to this problem. In fact, he admits that he is ignorant of the things related to anatomy. When Aristotle and Praxagoras affirm, contrary to the phenomenon, that the heart is the source of the nerves, they deserve to be censured.¹⁹

In this passage, Galen, who has argued for his own view that psychic pneuma is contained in the ventricles of the brain, with an explicit criticism of Chrysippus as having inappropriately stationed it in the heart, goes on to say that one should be more sympathetic with him than with Aristotle and Praxagoras. In fact, he explains, the Stoic philosopher was frank enough to admit that he is not sure whether or not the heart is the source of the nerves, because he is not an expert in anatomical researches on the human body (ἀπείρως ἔχειν τῶν ἀνατομῶν). It may deserve attention that Chrysippus is reported here to have expressed his stance, by modestly declaring that *his* heart does not vouchsafe to him the knowledge that it is the source of the nerves (μήθ' ὅτι τῶν νεύρων ἀρχὴ ἢ καρδία τὴν γνῶσιν αὐτῷ χαρίζεται), especially because his declaration as it is reported by Galen, with an intriguing use of the term '*his* heart' (ἡ καρδία), may preserve some of his own wording related to his cardiocentric theory of soul.²⁰ It is presumable, then, that the Stoic philosopher had detailed information about the nerves in the exact sense of the term.

According to Teun Tieleman, Chrysippus seems to be indicating here that *his* heart did vouchsafe to him *another* kind of evidence that helped to solve the problem about the location of the control centre of the soul.²¹ With a view to explaining what he took to be *another* kind of evidence, Tieleman referred to a passage from Chrysippus' treatise *On the Soul*, which is cited by Galen in his treatise *On the Doctrines of Hippocrates and Plato*, Book III. The Stoic philosopher argues there for his own cardiocentric view, which he thinks to be commonly shared by most people, because, he insists, they have an inner awareness of the affections of mind (τῶν κατὰ τὴν διάνοιαν παθῶν) occurring to them in the region of the chest and specifically in the place where the heart is situated. This is especially the case with some passions such as distress, fear and anger, because they are always felt to

¹⁹ Galen, *PHP*, I 6, 11-14, P. De Lacy (1984), 80 [=H. von Arnim (1905-1924), II 897, 246].

²⁰ See on this point T. Tieleman (1996), 191. There may be no doubt at all that Chrysippus himself identified *his* heart with *his* soul or *his* mind.

²¹ See T. Tieleman (1996), 191.

be accompanied by particular kinds of physical movement of the heart.²² In that sense, it may indeed be said at least that the heart would provide him some information that the control centre of the soul is there. However, it is not clear at all that the Stoic philosopher had any indication of the case with passions as *another* kind of evidence for his cardiocentric view, when he is reported by Galen in the passage cited above to have modestly declared that *his* heart does not vouchsafe to him the knowledge of itself as the source of the nerves. Rather, I would say, his declaration as it is reported by Galen may presuppose that the Stoic philosopher would have obtained knowledge (γνώσις) of the heart as the source of the nerves, if indeed he had been an expert in anatomical researches.

It has generally been held in modern scholarship that Chrysippus, who was not an expert himself in anatomical researches, may thus have been led to adopt Praxagoras' cardiocentric model of the human body as being authoritative for his insisting on the legitimacy of his own cardiocentric theory of soul, as, among others, Solmsen put it.²³ There is an interesting passage in the treatise *On the Doctrines of Hippocrates and Plato*, Book I, where Galen reports that Chrysippus referred to Praxagoras in his opposition to those who held that the nerves have their origin in the head. I cite below the relevant passage, with specific attention to the Greek text of the subordinate clause which constitutes the latter part of the passage.

But since I have once become engaged in examining all the views, I wish to converse briefly with Praxagoras, especially because Chrysippus too mentioned that man, after having opposed those who held that the nerves take their beginning from the head (καὶ μάλιστα ὅτι καὶ Χρῦσιππος ἐμνημόνευσε τὰνδρὸς ἀντιθεῖς τοῖς ἀπὸ τῆς κεφαλῆς ἄρχεσθαι τὰ νεῦρα νομίζουσιν).²⁴

The clause in question was translated by P. De Lacy in his edition as 'especially because Chrysippus too mentioned the man (i.e. Praxagoras), *opposing him to those who hold that the nerves take their beginning from the head.*' Tieleman, following this translation, took it to the effect that 'Chrysippus mentioned Praxagoras and *opposed him to the proponents of the head as the seat of the regent part* (*Italics*

²² Galen, *PHP*, III1, 21-25, P. De Lacy (1984), 172 [=H. von Arnim (1905-1924), II 886-887, 239-41].

²³ F. Solmsen (1961), 150-97. See text to note 10 above.

²⁴ Galen, *PHP*, I 7, 1, P. De Lacy (1984), 82 [=H. von Arnim (1905-1924), II 897, 246].

mine).²⁵ I am doubtful whether these interpretations of the clause are correct, because (1) the verbal participle in the aorist tense (ἀντιθεῖς) would mean that Chrysippus' own expression of disagreement with the proponents of the head as being the origin of the nerves is antecedent to his mention of Praxagoras, and (2) it would seem to be better to take this verbal participle to be intransitive, as indeed it is followed by dative objects (τοῖς ἀπὸ τῆς κεφαλῆς ἄρχεσθαι τὰ νεῦρα νομίζουσιν).²⁶ So I would translate the clause as 'especially because Chrysippus too mentioned the man (i.e. Praxagoras), *after having opposed those who held that the nerves take their beginning from the head.*' In that case, the Stoic philosopher would have developed arguments of his own in opposition to those who held that the nerves have their origin in the head, *and then*, he would have referred to Praxagoras as one of the representative advocates among Greek physicians for the tradition of cardiocentrism. If this interpretation is correct, it may indicate that Chrysippus was not necessarily dependent on his cardiocentric model of the human body as being the authority for him to make strong claim to the legitimacy of his cardiocentric theory of soul.

It would seem to be difficult to think that, after early Alexandrian physicians, including Herophilus and Erasistratus, had discovered the nerves as constituting an independent system which has its origin in the brain, Chrysippus still adhered to Praxagoras' cardiocentric model of the human body with his conception of arteries as originating from the left ventricle of the heart and changing into the nerves at the extremities of the body.²⁷ In fact, there is a passage which may confirm that the Stoic philosopher made a decisive step further by sharing their view that the nerves have their origin in the head, because, as it seems, he found that it is not incompatible at all with his own cardiocentric theory of soul. In his treatise *On the Doctrines of Hippocrates and Plato*, Book II, Galen cites an intriguing passage from Chrysippus' treatise *On the Soul* as constituting his own arguments against those who held that the head is the source of the nerves.

²⁵ T. Tieleman (1996), 190.

²⁶ According to P. De Lacy (1984), 82, Iwan von Müller suggested reading ἀντιτιθεῖς (in the present tense) instead of ἀντιθεῖς (in the aorist tense) in his edition of *PHP* [=Claudii Galeni De Placitis Hippocratis et Platonis Libri Novem recensuit et explanavit Iwanus Mueller, Vol. I. Prolegomena critica, textum Graecum, adnotationem criticam, versionemque Latinam continens (Leipzig: Teubner, 1874)]. It seems to me that I. von Müller proposed that one should emend the text, following his suggestion, if one is to understand the action of the verbal participle to be coincident with that of the leading verb, as indeed P. De Lacy and others do.

²⁷ Galen, *PHP*, I 6, 18 [=Steckerl (1958), 49-51, Fr.11].

I shall now transcribe the actual passage in which Chrysippus shows that his earlier argument is not demonstrative. It is as follows: “But as I said, it contains more importance for them on all accounts that, although it may be granted, according as they proceed, the beginning of the movements would not be at all from the head to the parts mentioned. Let us examine it further. For as concerns what they might argue about speech, that it is carried out of the chest through the windpipe with some kind of initiation coming from the head, it is possible to make nearly the same arguments, if the governing part is in the heart, while the beginning of the movements is from the head (ἔχει δ’ὡς ἔφην πλείονα αὐτοῖς ἐπὶ πᾶσι, μή ποτ’εἶ καὶ τοῦτο δοθείη, καθάπερ ἐπιπορεύονται, ἀπὸ τῆς κεφαλῆς εἶναι τὴν ἀρχὴν ἐπὶ τὰ εἰρημμένα μέρη. ἐπιζητήσωμεν. σχεδὸν γάρ, οἷα ἂν τινα λέγοιεν περὶ τοῦ τὴν φωνὴν ἐκ τοῦ στήθους φέρεσθαι διὰ τῆς φάρυγγος, ἀπὸ τῆς κεφαλῆς ποιᾶς τινος καταρχῆς γιγνομένης, τοιαῦτ’ἔξεστι λέγειν, ἐν τῇ καρδίᾳ μὲν τοῦ ἡγεμονικοῦ ὄντος, τῆς δὲ τῶν κινήσεων ἀρχῆς ἀπὸ τῆς κεφαλῆς οὐσης).’ What Chrysippus wants to say in this passage is this: even if a person should concede that the head is the source of the nerves, he or she will not necessarily concede that the governing part is also in the head. For what those people can argue about speech being carried out of the chest through the windpipe, while the head sends the beginning of activity to the parts, may be made to us about the nerves that they start from the head, but they receive their activity from the heart. Thus, Chrysippus himself conceded that it is possible that speech be sent out of the chest and through the windpipe, while the head supplies the beginning of motion to the parts in that region.²⁸

In the passage cited above, the Greek text of the arguments attributed by Galen to the Stoic philosopher is obscure and might possibly be corrupt, as P. De Lacy pointed out.²⁹ However, the whole context is clear enough for us to reconstruct his main point by referring to the critical comments which Galen is giving at the latter part of this passage. Chrysippus seems to be arguing here against those who insisted that speech be carried out of the chest through the windpipe, as the movement is

²⁸ Galen, *PHP*, II 5, 68-73, P. De Lacy (1984), 141-42 [=H. von Arnim (1905-1924), II 898, 246-47]. See also Galen, *PHP*, III 5, 35, P. De Lacy (1984), 208, and Galen, *PHP*, III 7, 55, P. De Lacy (1984), 222 [=H. von Arnim (1905-1924), II 884, 238].

²⁹ See P. De Lacy (1984), 630-31.

initiated from the head as the seat of the control centre of the soul and transmitted from there to that region by means of the nerves having their origin in the head. According to the Stoic philosopher, even if one may admit that the head is the source of the nerves, it does not necessarily follow that the control centre of the soul is also there, because it is possible, he argues, that the movement of speech has its origin in the head from which it is transmitted to the region of the chest and the windpipe by means of the nerves, while the nerves themselves have the power of their activity from the heart as the seat of the control centre of the soul. Unfortunately, there is no explicit mention of the nerves in his own arguments, but it is most probable that Chrysippus may have referred to them, given the fact that Galen is using the term of the nerves (τὰ νεῦρα) in his critical comments on Chrysippus' own account of the mechanism of speech as based on his cardiocentric theory of soul.

It is evident from this passage that Chrysippus knew well about the discovery of the nerves.³⁰ Indeed, the Stoic philosopher is willing to admit that the head or the brain may be the source of the nerves, which would have been inconceivable, if he had been dependent upon Praxagoras' cardiocentric models of the human body. More significantly, however, the passage seems to provide us detailed information about the role played by Chrysippus through his arguments for his own cardiocentric theory of soul in the debate about the central organ of the human body in the early Hellenistic period. The crucial point is that the Stoic philosopher is responding critically in his own right to those who attempted to explain the mechanism of speech on the basis of the encephalocentric model of the human body for the purpose of giving a critical response to the cardiocentric arguments of Zeno for Stoic psychology. As I have mentioned above, Zeno had already taken part in that debate through his arguments on the mechanism of speech, where he is implicitly criticizing those who were of the opinion that the brain is the seat of mind (διάνοια) in a human being.³¹ His arguments might have been directed at early Alexandrian physicians, including Herophilus and Erasistratus. They were now ready to give their own account of the mechanism of speech in a critical response to Zeno, because they were convinced of their account of the mechanism of speech as based on their encephalocentric models of the human body, which they believed were confirmed by their anatomical researches on the structure and function of the brain and the nervous system. Chrysippus, who knew well about the discovery of the

³⁰ See Solmsen (1961), 191-95.

³¹ See text to n.12 above.

nerves, was ready to share their view that the nerves have their origin in the head, because he found that it is not incompatible at all with his own cardiocentric theory of soul. It is true, the Stoic philosopher argues, that the head or the brain may be the source of the nerves, because all our voluntary motions are to be transmitted from the head or from the brain as the source of the nerves, but it is also reasonable for him to presume that the nerves themselves may have the power of their function from the heart as the seat of the control centre of the soul.

So much is my analysis of the key passages of the treatise *On the Doctrines of Hippocrates and Plato*, Books I and II, where Galen is reporting on Chrysippus as one of the most representative advocates of the cardiocentric model of the human body. The passages in question enable us to have the impression diametrically opposed to the opinion shared by modern scholars, who have held that the Stoic philosopher still adhered to Praxagoras' cardiocentric model of the human body, which, in their opinion, was authoritative for his insisting on the legitimacy of his cardiocentric theory of soul, even after early Alexandrian physicians, including Herophilus and Erasistratus, had discovered the nerves through their anatomical researches on the structure and function of the human body. Rather, it may be confirmed through my analysis of these passages that Chrysippus, who knew well about the discovery of the nerves originating from the brain, was prepared to integrate the nervous system itself into *his own* cardiocentric model of the human body as constituting a new theoretical basis of Stoic unified psychology.

Thus, it may follow as a consequence of my analysis of these passages that Chrysippus developed the cardiocentric arguments for Stoic psychology, which he had taken over from Zeno as the founder of the Stoic School, into more elaborate ones, which was to open the way to a new stage of the debate, far from being dependent upon Praxagoras' cardiocentric model of the human body, as modern scholars have generally held that he was. In fact, Chrysippus, who was ready to share with early Alexandrian physicians their view that the nerves have their origin in the head, was prepared to integrate them into a new form of cardiocentric model of the human body, which *is* different from the one proposed by Praxagoras, who had insisted that the nerves are the smallest ramifications of the arteries which originate from the left ventricle of the heart and change into them at the extremities of the body.

Conclusion: Early Alexandrian Medicine and Hellenistic Philosophy

Thus far, I have discussed how Chrysippus' cardiocentric psychology reflects a history of debate about the central organ of the human body in the early Hellenistic period, with specific attention to his psychological arguments against encephalocentric models of the human body proposed by early Alexandrian physicians, including Herophilus and Erasistratus, who followed in the footsteps of the tradition of Hippocratic encephalocentrism.

First, I made it clear that Chrysippus had knowledge about Erasistratus' encephalocentric model of the human body, which was well enough to argue against his doctrine of vital pneuma. The fact that the Stoic philosopher himself was critical of this doctrine is indicated in Galen's reference to Chrysippus as contrasted with Erasistratus in his treatise *On the Doctrines of Hippocrates and Plato*, Book I, where Galen argues that Erasistratus says that the left ventricle of the heart is full of vital pneuma, *while* Chrysippus says that it is full of psychic pneuma. Chrysippus was well aware of Erasistratus' encephalocentric model of the human body, as is confirmed by the passage cited by Galen from the first book of Chrysippus' treatise *On the Soul* in his treatise *On the Doctrines of Hippocrates and Plato*, Book III. Chrysippus, following the tradition of doxography on the control centre of the soul, argues that amongst those who share the view on its location in the head, there is also disagreement of opinions as to where in the head it is located, as indeed there *was* even among early Alexandrian physicians, because Erasistratus located it in the membrane of the brain, while Herophilus in its fourth ventricle.

And secondly, I have shed new light on the historical relationship of Chrysippus to Praxagoras, who has generally been regarded by modern scholars as having been the authority for the Stoic philosopher to insist on the legitimacy of his own cardiocentric theory of soul. Through my analysis of the relevant fragments and testimonies on his cardiocentric theory of soul, I have made it clear that Chrysippus was prepared to develop *his own* cardiocentric model of the human body, by integrating the nervous system itself into it, which *is* different from the Praxagorean cardiocentric model of the human body. According to Galen, who reports on Chrysippus' arguments against those who gave their account of the mechanism of speech as based on their encephalocentric models of the human body in his treatise *On the Doctrines of Hippocrates and Plato*, Book II, the Stoic philosopher was ready to share their view that the nerves have their origin in the head, because he found that it is not incompatible at all with his own cardiocentric theory of soul. The head or the brain may be the source of the nerves, he argues, because all our voluntary motions are to be transmitted from the head or from the brain as the source

of the nerves, but it is also reasonable for him to presume that the nerves themselves may have the power of their function from the heart as the seat of the control centre of the soul. That would have been inconceivable, if Chrysippus had still adhered to the Praxagorean cardiocentric model of the human body, because Praxagoras had insisted that the nerves are the smallest ramifications of the arteries originating from the left ventricle of the heart and changing into them at the extremities of the body. It is probable that Chrysippus took over the arguments for the Stoic psychology from Zeno, an elder contemporary of Herophilus and Erasistratus, who had already taken part in the debate about the central organ of the body, by giving arguments on the mechanism of speech against these physicians. Chrysippus went as far as to develop the cardiocentric arguments of Zeno for Stoic psychology into more elaborate ones as a more systematic critical response of his own to their encephalocentric arguments against the founder of the Stoic School.

These points lead us to draw the conclusion that Chrysippus played a decisive role in the debate about the central organ of the human body as one of the most influential proponents of cardiocentrism in the early Hellenistic period, following in the footsteps of Aristotle. This means, I would insist, that he was a thinker of the highest originality in contributing to the development of the intellectual relationship between early Alexandrian medicine and its contemporary philosophy. In this respect, I want to refer to one intriguing feature that may characterize the Stoic cardiocentric theory of soul as differentiated from Aristotelian psychology. Aristotle regarded the soul ($\psi\upsilon\chi\eta$) as a life principle of all living things, attributing to it all kinds of life functions, including those of plants.³² In the Stoic tradition, on the other hand, they made a conceptual distinction between nature ($\phi\acute{\upsilon}\sigma\iota\varsigma$) and soul, limiting the functions of the soul to cognition and voluntary motions of animals, including humans, as is reported by Galen in the following passage of his treatise *Against Julian*.

For every plant is directed by nature, while every animal by nature and soul together; if at any rate we all men use the name of nature for the cause of nutrition and growth and such activities, and use soul for the cause of sensation and self-movement.³³

³² *De Anima*, II, ch.3, 414a29-414b19.

³³ Galen, *Adversus Julianum*, 5, C.G. Kühn (1821-1833), Vol.18A, 266 [=H. von Arnim (1905-1924), II 718, 205]. For this passage, see also A. A. Long, 'Soul and Body in Stoicism', *Phronesis* 27 (1982), 34-57.

In this passage, Galen is reporting on the Stoic doctrine of living things on the basis of the conceptual distinction between nature and soul. The distinction between these two principles may remind us of the fact that Herophilus introduced the concept of nature as being responsible for involuntary movements of the body, such as the pulse and respiration, while he defined the soul as being responsible specifically for our cognition and voluntary motions. According to Heinrich von Staden, it is historically plausible that Chrysippus was the first to introduce the conceptual distinction between the two principles, because he was actually prompted by Herophilus' distinction between psychic and natural capacities within a living being *and* by Erasistratus' distinction between psychic and vital functions.³⁴ However, it would be difficult to think, at least, that the Stoic philosopher was influenced by Erasistratus' distinction between psychic and vital functions, if it is true that he made a critical response to the doctrine of vital pneuma proposed by the Alexandrian physician, arguing that the left ventricle of the heart is full of psychic pneuma, *not* vital pneuma.³⁵ Chrysippus argued so, particularly because he thought that Erasistratus' doctrine of vital pneuma as distinct from psychic pneuma would affect his own cardiocentric theory of the soul, according to which he located the control centre of the soul in the heart, which he believed to be *unique* as the central organ of the human body.

How, then, would Chrysippus have explained that there *is* the nervous system existing in the human body, which has its origin in the brain and is different from the arterial system originating from the left ventricle of the heart. To answer this question, I would presume that the Stoic philosopher may have posited a distinction *within* his own concept of psychic pneuma, between (1) psychic pneuma according to the traditional conception of the soul as a life principle of all living things, and (2) the distinctively 'psychic' one in the more limited sense of the word. Psychic pneuma as (1), being responsible for all kinds of life functions, including, of course, cognition and voluntary motions of the body, is distributed from the left ventricle of the heart as the control centre of the soul through the arteries to the entire body. In the case of animals, including humans, he assumed, there *is* an amount of it that may reach the brain as the origin of the nerves, through which it would be distributed as

³⁴ H. von Staden, 'Body, Soul and Nerves: Epicurus, Herophilus, Erasistratus, the Stoics and Galen', in J. P. Wright and P. Potter (edd.), *Soma and Psyche: Physicians and Metaphysicians on the Mind-Body Problem from Antiquity to Enlightenment* (Oxford: Clarendon Press 2000), 102. Of course, modern scholars have different views about the introduction of the conceptual distinction between the two principles, because there is some diversity in our evidence. See on this topic See Christopher J. Gill, *Naturalistic Psychology in Galen and Stoicism* (Oxford: Oxford University Press 2010), 101-03.

³⁵ See text to nn.13-18 above.

(2), specifically responsible for our cognitive activities and voluntary motions, to the particular sense organs such as eyes and ears, and to the other parts of the body, such as hands and feet. It may follow from this presumption that Chrysippus' introduction of the concept of nature as distinct from soul, if it was true, would be intended to make a conceptual distinction between two kinds of functions, i.e. natural functions like nutrition and growth, and the distinctively 'psychic' ones, such as cognition and voluntary motions of the body. The most crucial point is, I think, that these two kinds of functions are, essentially, two functional aspects of one and the same principle, i.e. psychic pneuma. And this is exactly the reason why he located the control centre of the soul in the heart, which he believed to be *unique* as the central organ of the human body.

Thus, while I partly agree with H. von Staden, who suggests that Alexandrian physicians might have influenced the thinking of Chrysippus, I would go further to suggest that the Stoic philosopher might have replaced Erasistratus' concept of vital pneuma with his own concept of nature, following Herophilus, who had introduced the conception of nature as being responsible for involuntary motions of the body, such as the pulse and respiration, although there is no decisive evidence to confirm my suggestion. More generally, however, Chrysippus' connections to early Alexandrian physicians may be regarded as one of the most illustrative examples that indicate that the historical interrelation between medicine and philosophy in this period was much more substantial than one might imagine today.

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Hirosaki University
masahiro@hirosaki-u.ac.jp