Brain beats heart: a cross-cultural reflection

In contemporary language and culture, we sometimes refer to people as ‘good-hearted’, ‘warm-hearted’ or ‘hard of heart’. In much of the non-medical community, the heart has long been considered the home of the emotions, a tradition that can be seen, for example, in the aphorisms of the great classical poets, such as William Shakespeare in 1606 in ‘Macbeth’—‘False face must hide what false heart doth know’—or Johann Wolfgang von Goethe in 1786 in ‘Iphigenia in Tauris’—‘The gods speak to us only through our hearts’. For contemporary brain scientists and neurologists, however, this attribution of cognitive and emotional capacities—which are undeniably brain functions—to the heart is baffling.

In this Essay, we argue that the widespread assignment of emotional and cognitive functions to the heart in ancient secular and religious cultures throughout the world can most likely be explained by the absence of a concept of brain function in those early times.

Ancient examples of the heart being ascribed functions it does not in fact have, can be found in the Egyptian Book of the Dead, the doctrine of the Greek philosopher Aristotle, and in some aspects of traditional Chinese medicine. In Medieval Europe, extraordinary religious rituals emerged, such as the separate burial of heart and body, or the Catholic devotion to the ‘Sacred Heart of Jesus’. Overcoming the transcultural historical belief that the home of the soul is the heart rather than the brain led us to the metaphor ‘brain beats heart’. For it is the brain which houses cognition and emotions and controls the frequency and rhythm of the heartbeat.

A mystic example of an irrational significance of the heart of decedents is found in the Egyptian Book of the Dead. In ancient Egypt, it was believed that death involves mastering a hazardous journey through a complex netherworld in order to finally reach paradise in the afterlife.1 The Book of the Dead consists of individual papyrus rolls marked with hieroglyphic spells that supposedly have magical powers. The book acted as a kind of travel guide for the deceased to help them overcome sudden obstacles. At that time, the Egyptians were convinced that the heart and not the brain was the most valuable organ, the source of individual intellect, character, emotions and memory and—most importantly—the key to a successful journey through the afterlife. For this reason, the mummification process involved removing the brain through the nostrils, but leaving the heart in the corpse. In addition to magic spells, the Book of the Dead also contained fascinating coloured illustrations such as that of the ritual of weighing the heart (Fig. 1). It was imperative that the heart of the deceased should not weigh more than the feather of the goddess Maat, who was responsible for order and truth. If the heart was lighter than the feather, the dead were allowed to proceed further to finally join the company of gods.

Centuries later in ancient Chinese medicine, the brain was also held to be of secondary importance, while the functioning of the heart was thought to determine an individual’s quality and understanding of sensory perceptions. In the ‘Huangdi Neijing’—the fundamental text in Chinese medicine, which was continuously revised and covers the period between 2nd century BC and 2nd century AD—individual physical functions were interpreted and classified on the basis of various abstract theories.2 These theories were the ideas of Yin and Yang, the five phases of transformation (wood, fire, earth, metal, water), and the concept of Qi, the energy of life.

In the ‘medicine of correspondences’, the following Yin organs were assigned specific functions: liver, heart, spleen, lungs and kidney, while the brain belonged to neither the Yin nor the Yang organs and, if mentioned at all, was described as a kind of storage organ for a substance called ‘marrow’.3 The heart played a central role in perception, mediated by reciprocal connections with the sensory organs. The ability to see clearly, for example, was associated with a state of balanced emotions, this in turn being a function of the heart.

The Confucian legalistic philosopher Xunzi (3rd century BC) wrote about these interconnections: ‘The heart possesses an overall understanding. Because of this overall understanding, it may rely upon the perception of the ear and understand sounds correctly or rely upon the perception of the eye and understand forms correctly’.4 The eyes were the recipients of the essence of the various organs in the body. In addition, they stored two different forms of Qi, the breath soul and the body soul, and let the mind Qi emerge. ‘When the mind (shen) is exhausted, the breath and body soul and the will (zhi) and thoughts (yi) disperse into chaos (luan)’.5 This idea is also evident in ancient descriptions of two disorders: motion sickness and fear of heights. In contrast to the European view at the time, both conditions were believed in Chinese medicine to elicit dizziness by virtue of pathogens such as the wind or the cold penetrating the body through the neck and tightening the eye–brain connection by rotation.6

In Greek antiquity, body and soul were the subject of intense philosophical debate, in particular by Aristotle and Hippocrates. There were philosophical proponents for the allocation of the spirit and the soul to both the heart and to the brain. Aristotle (384–322 BC) saw the heart as the seat of spiritual and mental functions connected with all parts of the body via the blood vessels. He was of the opinion that the major task of the brain was to cool the heart, which was often too hot-blooded with a tendency to ‘bubble up’.7 The physician Hippocrates (460–370 BC), however, wrote...
in his work *De morbo sacro* that the brain is the most powerful organ in humans: ‘κατά ταῦτα νομίζω τὸν εγκέφαλον δύναμιν ἔχειν πλείστην ἐν τῷ ἄνθρωπῳ… διὸ θαύμα τὸν εγκέφαλον εἶναι τὸν ἐρμηνεύοντα τὴν ζώσιμαν’. He also stated that some are mistaken when they claim to think with the heart ‘λέγοντες δὲ τις ἐν καρδίᾳ καὶ γραντίζομεν τῇ καρδίᾳ καὶ τὸ ἀνώμαλον τούτῳ ἐστὶ καὶ τὸ γραντίζον’. 6

One of the most influential Greek physicians Galen of Pergamon (~130–200 AD), who also performed human autopsies, further elaborated on the concept that the brain is the home of the soul and is connected to the body by a network of nerves. Interestingly, he did not believe the brain tissue, but rather the ventricles and cavities to contain the spirit and soul. 5 Many centuries later, the philosopher René Descartes (1556–1650) declared the pineal gland to be the seat of the rational soul.

In Medieval Europe, however, ‘higher heart function’ was revived as the home of Christian humanity, giving rise to a new Catholic devotion known as the Sacred Heart of Jesus. Historically, this devotion dates back to the 11th and 12th centuries of Christianity in Benedictine and Cistercian monasteries. The repeated apparitions of Jesus to the French nun Margaret Mary Alacoque (1647–90), supported first by her confessor, the Jesuit Father Claude de la Colombière, and later by the Mother Superior of the Salesian Sisters Marie-Christina Melin, resulted in the introduction of the feast of the Most Sacred Heart of Jesus (Solemnitas Sanctissimi Cordis Jesu). This Catholic ceremony was liturgically scheduled for the third Friday after Pentecost. After varying phases of propagation and suppression, the devotion to the Sacred Heart became one of the most meaningful Roman Catholic devotions worldwide. Numerous paintings and sculptures depict this devotion, some of which show Jesus holding his heart in his hands.

Another custom that dates back to Medieval Europe is that of the separate burial of heart and body. There may be various explanations for the act of burying the heart of an important individual in a distinct place. It was well known from ancient embalming practices that evisceration can delay infection and the decay of corpses. Putrefaction was a major problem for long-distance transport of corpses when members of the upper echelons of society died far from their home country during armed conflicts such as the Crusades. Thus, separate burials of entrails and the skeleton after boiling off muscles and other tissues from the bones (mos teutonicus) offered a useful solution for practical reasons.

In the early period of this kind of burial in Europe, viscera and heart were not separated. The separate burial of the heart at a location far away from the body began in France and in England. 7 The heart of Richard the Lionheart, who died in 1199 in Chalus, was buried in Rouen and his body was interred in Fontevraud. The ritual of establishing two grave sites for a high-ranking individual in medieval and post-medieval Central Europe helped to amplify and spread loyalty by doubling the number of monuments in honour of the deceased. 7 The particular importance of the heart was without doubt still shaped by the belief that it is within the heart that the human soul resides. The continuation of the custom of a separate heart burial can be seen in the rare examples of Frédéric Chopin (1810–49), whose heart was buried in Paris (Fig. 2), or Otto von Habsburg, whose heart was buried in 2011 in the Benedictine Abbey Pannonhalma in Hungary, with his body remaining in the Capuchin Crypt in Vienna.

Whether ‘brain beats heart’ or ‘heart beats brain’ is also a question for neurology. Is the medical proof of human death based on the failure of heart or brain function or both? There are medical criteria for cardiopulmonary death that require complete biological loss of function of the heart and lungs. 8 However, in the case of heart failure, the life of the individual can be rescued by cardiac...
transplantation. This is different therefore from the diagnostic criteria for brain death in use worldwide, which form the legal and scientific basis for the medical decision to end organ support and the permission to initiate the separate and distinct procedure of organ donation. Although there is still no global consensus on the details, this general concept is accepted by the majority of physicians, lawyers and ethicists, with a few exceptions mainly attributable to cultural and metaphysical influences. Current conclusions state:

‘The most important elements of the determination of death are the irreversibility of the loss of brain function, loss of integration of bodily functions into a single living being, and loss of ability for any self-reflection or any independent interaction with the environment.’

Transcultural conceptualizations of cognitive functions of the heart—which, from the perspective of our scientific understanding today are irrational, untenable concepts—appear to be based on a common fount of historical wisdom: the experience that heartbeats reflect emotions such as happiness, love or anxiety. This is best illustrated by psychophysical experiments on self-reported maps of bodily sensations associated with viewing emotional stimuli such as words, movies or facial expressions. This kind of interoceptive conscious emotional experience is culturally universal. It may also be key to understanding the historical disregard for brain function. All cognitive and emotional processes, which are generated by interactive neuronal hubs and complex cerebral networks integrating sensory inputs with experiences and expectations, work without any ability on our part to localize the underlying brain activity. What we perceive instead are the autonomic responses of these cognitive processes, especially of the heart, even to the extent that we may experience a transient ‘broken heart syndrome’. Thus, historically it was bodily symptoms and sensations rather than unnoticed brain functions that led to the heart being deemed the organ that contains the soul.

Thomas Brandt and Doreen Huppert
German Center for Vertigo and Balance Disorders, Ludwig-Maximilians-Universität, Munich 81377, Germany

Correspondence to: Thomas Brandt
E-mail: thomas.Brandt@med.uni-muenchen.de

Thomas Brandt is Professor of Neurology at the Ludwig Maximilian University of Munich and the author of Vertigo and Dizziness: Common Complaints and Vertigo: Its Multisensory Syndromes.

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References
1. Taylor JH. Ancient Egyptian book of the dead: Journey through the afterlife. British Museum Press; 2010.
2. Unschuld PU. Huang Di nei jing su wen: Nature, Knowledge, Imagery in an Ancient Chinese Medical Text. University of California Press; 2003.
3. Brandt T, Bauer M, Benson J, Huppert D. Motion sickness in ancient China. Neurology. 2016;87:331–335.
4. Kovacs J, Unschuld PU. Essential Subtleties on the Silver Sea – The Yin-hai jing-wei: A Chinese classic on ophthalmology. University of California Press; 1998.
5. Elsner N, Luer G, eds. Das Gehim und sein Geist. Wallstein Verlag; 2000.
6. Hippocrates De morbo sacro. In: Müri W, ed. Der Arzt im Altertum. Artemis&Winkler; 2001:264–267.
7. Weiss-Krejci E. Heart burial in medieval and early post-medieval Central Europe. In: Rebay-Salisbury K, Stig Sorensen ML, Hughes J, eds. Body parts and bodies whole changing relations and meanings. Oxbow Books; 2010:119–134.
8. Lewis A, Greer D. Current controversies in brain death determination. Nat Rev Neurol. 2017;13:505–509.
9. Brandt SA, Angstwurm H.; Working Group "The relevance of irreversible loss of brain function as a reliable sign of death" of the Scientific Advisory Board within the German Medical Association. The relevance of irreversible loss of brain function as a reliable sign of death. Dtsch Arztebl Int. 2018; 115:675–681.
10. Nummenmaa L, Hari R, Hietanen JK, Glerean E. Bodily maps of emotions. Proc Natl Acad Sci U S A. 2014;111:646–651.