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CAMPANELLA, IL SEICENTO E OLTRE

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SEBASTIANO BARTOLI ON LIFE AND THE SOUL

LEEN SPRUIT

SUMMARY

This essay analyses Sebastiano Bartoli's views on the principle of life and the human soul, pointing out the conceptual background in Joan Baptista van Helmont's thought, sketching Bartoli's career in outline, and presenting an analytical discussion of his main physiological and psychological ideas in the *Exercitationes paradoxicae*. In alternative to the traditional doctrines on the origin of life and the seat of the soul, he argued that (sensitive) life cannot be reduced to heat, temperaments, or a heap of atoms, but that it depends on a vital, 'spiritual' principle, the *archeus* or sensitive soul, which is essentially light, positioned in the geometrical center of the body.

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SEBASTIANO BARTOLI (Montella, 1629-Naples, 1676) studied mathematics, philosophy, and medicine in Naples,[1] and soon focused his interests on physiology and the study of the human body. Like several other contemporary Neapolitan physicians, he was highly polemical towards Galenic medicine and insisted on a methodology in medicine that was based on experiment and observation.[2] In the early 1650s, he made the acquaintance of Tommaso Cornelio, Leonardo Di Capua, Francesco D'Andrea and Francesco Verde, and in the following decade he attended the meetings of the Accademia degli Investiganti (1663-1670).[3] However, although he recognized on several occasions that the Investigators had emancipated him from scholasticism, he did not share their central theoretical positions. Bartoli was deeply influenced by the Renaissance naturalist tradition and by the works of Joan Baptista van Helmont.[4] These two doctrinal strands mainly shaped his theoretical views in medicine and anthropology, in particular as to the intention to provide a unified view of life. For Bartoli, the study of the body

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[1] For detailed biographical information, see N. TOPPI, *Biblioteca napoletana et apparato agli huomini illustri in lettere di Napoli*, Napoli, appresso Antonio Bulifon all'insegna della Sirena, 1678, p. 276; G. MAZZUCHELLI, *Gli scrittori d'Italia cioè notizie storiche, e critiche intorno alle vite, e agli scritti dei letterati italiani*, 7 vols., Brescia, presso a Giambatista Bossini, 1753-1763: II, 1, p. 451; N. BADALONI, *Introduzione a Vico*, Milano, Feltrinelli, 1961, pp. 65-71; *Dizionario Biografico Italiano*, Roma, Istituto della Enciclopedia italiana, 1961-, vol. 6, pp. 591-592; M. TORRINI, *Un episodio della polemica tra «antichi» e «moderni»: la disputa sulla macerazione dei lini nel lago d'Agnano*, «Bollettino del Centro di Studi Vichiani», V, 1975, pp. 56-70; IDEM, *L'Accademia degli Investiganti. Napoli 1663-1670*, «Quaderni storici», XLVIII, 1981, pp. 869-872; F. PAOLUCCI, G. D. D'APOLITO, *Note sulla famiglia Bartoli*, in *Sebastiano Bartoli e la cultura termale del suo tempo*, ed. R. M. Zaccaria, Firenze, Olschki, 2012, pp. 27-31.

[2] For discussion of the contemporary medical science in Naples, see S. SERRAPICA, *Per una teoria dell'incertezza fra filosofia e medicina. Studio su Leonardo di Capua (1617-1695)*, Napoli, Liguori, 2003, and for the polemics against Galen, see in particular pp. 40-47.

[3] See M. H. FISCH, *The Academy of Investigators*, in E. A. UNDERWOOD (ed.), *Science, Medicine and History*, 2 vols., Oxford 1953, pp. 521-563; M. TORRINI, *L'Accademia degli Investiganti*, cit., pp. 845-883.

[4] For the spread of van Helmont's views in Naples, see SERRAPICA, Malo nodo malus cuneus. *La diffusione di Van Helmont nella Napoli 'investigante'*, in *Sebastiano Bartoli e la cultura termale del suo tempo*, ed. R. M. Zaccaria, cit., pp. 45-63.

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is the study of the complex of experiences that are tied around the irradiating center of life that is light. Thus, he attempted to steer a middle course between the Renaissance naturalism, Helmontian medicine, and the new experimental science.

Bartoli's main scientific and philosophical works were centred upon the correspondence between macrocosm and microcosm. In *Astronomiae microcosmicae systema novum*,[1] Bartoli analysed the physiological functions and processes of the human body through the metaphor of the solar system. He focused on metabolism, and in particular on the role of the organs and of the several spirits in digestion.[2] He thus developed a most particular view on digestion aimed at the 'distillation' of the vegetative spirit.

In the *Exercitationes paradoxicae*, instead, Bartoli unfolded his new philosophical and physiological system based on the central role of the sensitive soul which he viewed as essentially light. This light-soul, frequently defined as *Archeus*, originates in the seed and substitutes the traditional sensitive heat as the source of all vital energy, while the nutritional functions are seen as merely a support to the cycle of life.

Bartoli only rarely referred explicitly to his sources. Galen is without doubt the author he mentioned most frequently, but without exception just to refute his views in polemical way. In the first of his *Exercitationes paradoxicae*, he also discussed the views of Galen, Epicurus and Aristotle and their followers at some length, while in the third exercitation, he referred to Galen, Erasistratus, Pierre Gassendi, and Jean Pecquet.[3] There is a short discussion with Gaspare Aselli, Jean Pecquet and Thomas Bartholin in the ninth exercitation, while at the outset of the Appendix, he mentioned, in passing, the names of Arnaldus of Villanova, Basilius Valentinus, Theophrastus Paracelsus, Andreas Libavius, Joseph Duchesne (Quercetanus), Johann Faber, Daniel Sennert, Johannes Hartmann, van Helmont, Lazare Rivière, Mario Schipa, Marco Aurelio Severino, but not because he was indebted to their views.[4] As said before, his major inspiration came from Joan Baptista van Helmont, although frequently Bartoli's interest was driven by the destructive potential rather than by the content of his views, because he disagreed with van Helmont on specific points, among which the seat of the soul.

In this essay I analyse Bartoli's views on the principle of life and the human soul. Section 1 offers a very brief indication of some central tenets of Joan Baptista van Helmont's doctrinal system, central to the conceptual background of Bartoli's ideas. Section 2 sketches Bartoli's career in outline, while section 3 presents an analytical discussion of his main physiological and psychological ideas.

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The doctrinal background in van Helmont

It has become a common place to stress the central role of van Helmont's works in seventeenth-century medicine. Helmontian philosophy and medicine flourished all over

[1] S. Bartoli, *Astronomiae microcosmicae systema novum, … Cui suasu Amicorum accessit Exercitationum paradoxicarum decas In eversionem scholasticae medicinae Opusculum studiorum Authoris Tyrocinio elucubratum ac non bene digestum*, Neapoli, apud Novellum de Bonis Typograph. Arch. superiorum licentia, 1663.

[2] Bartoli shared the attention for nutrition with Tommaso Cornelio; see T. Cornelio, *Progymnasmata physica ad illustrissimum & excellentissimum D. Dominicum Franciscum Marinum Caracciolum Abellinatum principem*, Venetiis, typis haeredum Francisci Baba, 1663, cap. VI, pp. 94-122.

[3] S. Bartoli, *Artis medicae dogmatum communiter receptorum examen in decem exercitationes paradoxicas distinctum*, Venetiis [Naples], sumptibus Stephani Taurini, 1666, pp. 119-122.

[4] *Ibidem*, pp. 141-142.

Europe and challenged traditional medicine as well as medical institutes. Van Helmont adopted many views of Paracelsus, but basically his medicine is grounded on an original and complex synthesis of medical, philosophical and religious motives. He presented his doctrines as Christian philosophy and rejected the method and content of both Aristotelian science and Galenic medicine, unable to penetrate to the essences of things. Van Helmont rejected the theory of elements and humours, as well as the Paracelsian doctrine of the three chemical principles. All bodies are made up of water (material) and of active principles, that is, seeds or *archei*.

Van Helmont held that God was the only true form of everything, and that every form is created by the Father of light. Life is ineffable light (*lux indicibilis*), diffused throughout nature according to the different degrees of perfection of natural bodies. Van Helmont distinguished between four types of forms or levels in reality: essential forms (metals, minerals), vital forms (plants), substantial forms (animals), and formal substances (angels and human minds).[1] Furthermore, the influence of St. Paul's anthropology is recognizable in the clear distinction between body, sensitive soul and mind (the image of God). The main functions of the animal body are governed by a spiritual entity, the *archeus*. In addition to the *archeus*, van Helmont believed that there is the sensitive soul which in man is the husk or shell of the immortal mind.[2]

Van Helmont proposed his own doctrine of vital functions. In the human body, life is not located in one specific organ. The ruling organs are two in men (stomach and spleen) and three in women (stomach, spleen and womb). The brain is regarded as subordinated to the stomach, where the sensitive stomach is located. the primacy of the stomach is confirmed by the fact that rich food causes vertigo and nightmares and that many remedies as well as poisons act though the stomach. Passions and thoughts, too, originate in the stomach. Van Helmont furthermore replaced the body/soul dichotomy by a dichotomy between divine and sensitive soul. The divine soul is one and simple, whereas the sensitive soul is the place where oppositions and conflicts occur. However, the sensitive soul is not entirely separate from the divine soul as the latter constitutes the root of life. For van Helmont, the sensitive soul receives life from the divine soul.[3]

Bartoli's professional career in context

The dedicatory letter to the ninth of the *Exercitationes paradoxicae* reveals that in 1654 Bartoli had «emancipated himself from the tyranny of the schools»[4] and that he had become aware of the path to follow. From this period, in effect, Bartoli started to develop his innovative scientific views on physical reality and on the nature of the human body. He set about composing a series of «paradoxical exercitations» attacking the tenets of traditional medicine. In 1663 he decided to publish some of these, along with his new «system of microcosmic astronomy», that is, medicine.[5] Of the ten 'paradoxical exercitations' three were dedicated to Leonardo Di Capua, Tommaso Cornelio, and Juan Car-

[1] J. B. van Helmont, *Ortus medicinae, idest initia physicae inaudita, Progressus medicinae novus, in morborum ultionem, ad vitam longam. … Edente authoris filio, Francisco Mercurio van Helmont, cum eius praefatione ex belgico traslata*, Amsterodami, apud Ludovicum Elzevirium, 1648, pp. 144-145; cf. G. Giglioni, *Immaginazione e malattia. Saggio su Jan Baptiste van Helmont*, Milano, FrancoAngeli, 2000, pp. 54-58.

[2] Giglioni, *Immaginazione e malattia*, cit., pp. 68-75.

[3] *Ibidem*, pp. 75-80.

[4] See Bartoli, *Artis medicae examen in decem exercitationes paradoxicas*, cit., p. 109.

[5] Bartoli, *Astronomiae microcosmicae systema novum*, cit.

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amuel, while a fourth was dedicated to Giambattista Capucci, a doctor and correspondent of Marcello Malpighi, close to the positions of the moderns. With less prudence than Cornelio and Di Capua, Bartoli criticized the marriage between Aristotelianism, Galenic doctrine and Christian faith.

In 1663, Bartoli had obtained the ecclesiastical and civil imprimaturs,[1] the book was printed at Naples, and it was about to be issued, when the traditional physicians got wind of it. At the instance of Carlo Pignataro, the 'archiater' or chief medical officer of the Kingdom of Naples, it was condemned by the ecclesiastical authorities as blasphemous, and nearly all the copies that had been printed were seized and destroyed.[2]

In the 1666 edition of his work Bartoli complained:

> I have brought upon myself the insults of the whole synagogue; for here the barbers have gathered, there the surgeons, yonder the pharmacists, in the homes the physicians, in the cloisters the scholastics – indeed the whole miserable corporation and their tributary following plies me with curses, because I do not let blood, because I use balsams, because I shrink from purgatives, because I subvert the medicine which has been accepted for so many centuries, because I do not admit the authority of Aristotle in physics, and finally because I exhort men to free themselves from the impostures.[3]

Shortly afterwards, there arose a pressing problem of public health on which the two parties of 'ancients' and 'moderns' took opposite sides in a protracted war of decrees, court decisions and pamphlets. In October and November 1663, there was an epidemic of 'malign fevers', accompanied by skin eruptions and high mortality. Though it was by no means confined to the region of Naples, the traditional physicians alleged a local cause: the great quantities of flax and hemp which, as usual, were submerged for retting in the Lake of Agnano, in the Campi Flegrei area near Naples. The theory proposed was that the water of the Agnano lake and thence the air were thereby corrupted, and this had caused the epidemic. Thus, they sustained the view that the retting itself, which was a partial rotting, was injurious to the health of the inhabitants of the region, and ought to be stopped. The representatives of the modern philosophical and scientific culture, featuring Bartoli, rejected these positions and urged further investigation, as there was no ground for destroying an industry on which so many persons depended for their livelihood.[4]

Under these circumstances Cornelio, Di Capua and others founded the Accademia degli Investiganti, and they put themselves under the protection of Andrea Concublet, Marquis of Arena.[5] In the following years the academy received numerous members of foreign academies, including several fellows of the Royal Society.[6] Among the subjects discussed during the first years of the Academy's existence Leonardi Di Capua mentioned: the principles of natural things; the soul; motion; the so-called sensible qualities; sensation; the life of animals; the origin of the tides.[7]

[1] See the frontispiece of the 1663 edition.

[2] See Fisch, *The Academy of Investigators*, cit., pp. 524-525.

[3] Bartoli, *Artis medicae examen in decem exercitationes paradoxicas*, p. 52 (translation by Fisch, *The Academy of Investigators*, cit., p. 525).

[4] See also M. Torrini, *L'Accademia di Sebastiano Bartoli: gli Investiganti*, in *Sebastiano Bartoli e la cultura termale del suo tempo*, ed. R. M. Zaccaria, cit., pp. 33-43, on pp. 35-38; and Serrapica, Malo nodo malus cuneus, cit. on p. 50.

[5] Fisch, *The Academy of Investigators*, cit., p. 526.

[6] Fisch, *The Academy of Investigators*, cit., p. 527f.

[7] L. Di Capua, *Lezioni intorno alla natura delle mofete*, in Napoli, per Salvatore Castaldo, 1683, p. 3f.

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In the autumn of 1664, the Lake Agnano controversy returned centerstage. On 31 July a medical commission of fourteen members had recommended, with four dissenting votes (including Tommaso Cornelio's), that the retting of flax and hemp should be forbidden for that year. The city authorities adopted that recommendation, but this decision was soon subject to review by the Collateral Council, because many peasants and workers earned a living by the linen and hemp industry. When in August a report written by Nicolo Susanna appeared in support of the majority recommendation, the Academy of the Investigators decided to tackle the issue and started an extensive study of the phenomena of the surrounding region, with its hot springs, fumaroles and mephetic vapors. Taking account of these experiments and investigations, the Academy did not pronounce directly on the dispute, but it clearly disapproved the prohibition of the infusion of the flax.[1]

Meanwhile an anonymous reply to Susanna appeared, in the form of a letter to the viceroy under the date 25 September 1664, but apparently not published until two months later. It was rumored that he author was Sebastiano Bartoli, and the rumor was correct.[2] Bartoli sketched an alternative explanation of the fevers, and promised to publish shortly a book on the subject.[3] He apologized for the haste with which he had been obliged to write, and begged his readers to «think only that this crop was germinated in a HEAD of integrity, FREE OF DREAMS, and far from prejudices».[4] Susanna replied immediately with a pamphlet entitled «The innocence of Agnano found culpable in the deliriums of Free Head» (7 February 1665), and other pamphlets followed.[5]

When the war of pamphlets subsided in the course of 1665, Bartoli achieved an opportune cure for an apparently hopeless case. Domenico Caracciolo, Marquis of Brienza, had wasted away in April and May from a painful illness which the orthodox treatment failed to arrest. When in May one of his relatives induced Bartoli to try to save his life, by the end of August Bartoli had brought him back to good health.[6] On the strength of this and other cures, in the following year Bartoli was appointed physician to the new viceroy, Pietro Antonio d'Aragona,[7] who ecouraged him to publish the book that had been suppressed three years ago. Bartoli published it in 1666, now in Venice, eliminating the «new system of microcosmic astronomy», but adding an appendix, entitled «The Triumph of Spagiric Medicine».[8]

Meanwhile, Bartoli had met the opposition of ecclesiastical censorship. In December 1664, an anonymous Neapolitan censor sent in an extensive examination of Bartoli's works that had appeared the year before in Naples. And when on 8 April the Holy Office read the letter by Alessandro Crescenzi, bishop of Bitonto and minister of the Holy Office in Naples, who transmitted Bartoli's books, an examination of these works was

[1] FISCH, *The Academy of Investigators*, cit., pp. 530-531.

[2] S. BARTOLI, *Il lago d'Agnano utile et innocente con l'infusione de lini e senza quella dannosissimo alla cittadinanza di Napoli et a massari della Campagnafelice*, Napoli, s.i.; cf. TORRINI, *Un episodio della polemica tra «antichi» e «moderni»*, cit.

[3] BARTOLI, *Il lago d'Agnano utile et innocente*, cit., p. 47.

[4] *Ibidem*, p. 48; translation by FISCH, *The Academy of Investigators*, cit., p. 532.

[5] For detailed discussion, see FISCH, *The Academy of Investigators*, cit., pp. 532-534.

[6] Bartoli told this history in the Appendix to the *Exercitationes paradoxicae*, entitled «Domini Dominici Caraccioli Briensium Marchionis, et Athenarum Principis Vita restituta Spagyricae Medicinae Triumphus», dedicated to Caracciolo, and published on pp. 140-152.

[7] SERRAPICA, Malo nodo malus cuneus, cit., p. 91.

[8] See BARTOLI, *Artis medicae examen in decem exercitationes paradoxicas*, cit., pp. 140-152.

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commissioned to Lorenzo Brancati.[1] On 17 June, the *censura* by Brancati, which apparently went lost, was read in the meeting of the Holy Office, which decided to transfer the case to the Congregation for the Index.[2] The Index scheduled the examination of Bartoli's works, and between September 1665 and Juna 1666, his works were examined by three censors, Agostino Favoriti, Girolamo Valvasori and Girolamo Savignano. On 21 June 1666, the Congregation decreed a total ban on Bartoli's works.[3] After almost two years, and when a second edition of the work was issued in Venice, further denunciations were sent to the Congregation for the Index and a discussion of Bartoli's work was again scheduled in the convocation for the Index's meeting of 14 April 1668. Unsurprisingly, the Congregation confirmed the prohibition also for the newly appeared edition.[4]

In the autumn of 1668, Bartoli wrote to the cardinals of the Index, underlining that his work had been published with the approval of the civil and ecclesiastical authorities in Naples. After the printing, so he stated, the book had been confiscated because of the title. And when a second edition had appeared under a different title, his enemies had put a Dominican friar at work for a *censura* showing that his book contained all heresies possible, transmitting this assessment to Rome. Bartoli urged to let the book be reconsidered by learned men without prejudice and in the case they might find some trace of heterodoxy, he promised to give it to the flames.[5] Bartoli's letter was discussed in the Congregation on 27 November, and after Vincenzo Fani, secretary of the Index, having explained Bartoli's request to the cardinals, the decree of prohibition was confirmed.[6] Then, on 8 December Fani wrote to the Nuncio in Naples that, according to the rules of the Index, Bartoli's work had been reviewed by three consultants, and that only the first part (*Astronomiae microcosmicae systema*) was liable to correction, while it was sheerly impossible to correct the second part (*Paradoxicae exercitationes*).[7]

Medical baths were a prominent feature of Bartoli's practice. Probably at his suggestion, the new viceroy undertook the project of restoring the baths of Pozzuoli, which had fallen into decay. A medical commission was set up to consider the feasibility of the project, and Bartoli composed two books concerning the project, the first appearing in 1667 and the second after his death.[8] in 1668, he was appointed professor of anatomy and surgery at Naples. His tenure of the chair of anatomy was short but significant, from Padua he brought the reputed anatomist Antonio Manzoni to conduct his dissections. In 1670 the academy was suspended and in 1676 Bartoli died.[9] Bartoli left an unpublished manuscript, «Treatise on the anatomy of the liver with appendices on the anatomy of the spleen, kidneys, and urinary bladder», which provides a good sample of the anatomy lectures he delivered at the University.[10]

[1] Archive of the Congregation for the Doctrine of Faith, Sanctum Officium (from now on: ACDF, SO), *Decreta*, 1665, f. 57*v*.

[2] ACDF, SO, *Decreta*, 1665, f. 101*r*.

[3] Cf. *Index des livres interdits*, eds. J. M. De Bujanda *et al.*, 11 vols., Sherbrooke-Genève, Centre d'Etudes de la Renaissance-Librairie Droz, 1980-2002, vol. XI, p. 110. The prohibition was promulgated with the edict of January 18, 1667.

[4] ACDF, Index, *Diari*, 7, f. 19*r-v*.

[5] ACDF, Index, *Protocolli*, OO (II.a.37), fols. 474*r*-475*r*.

[6] ACDF, Index, *Diari*, 7, f. 21*v*.

[7] ACDF, Index, X.1, f. 64*r-v*. The complete documentation on the Roman censorship of Bartoli's works will be published in U. BALDINI, L. SPRUIT, *Catholic Church and Modern Science*, vol. II (in preparation).

[8] S. BARTOLI, *Breve ragguaglio de' bagni di Pozzuoli*, Napoli, tip. Roncagliolo, 1667; and *Thermologia Aragonia*, Napoli, Ex typ. De Bonis, 1679. See also *Sebastiano Bartoli e la cultura termale del suo tempo*, ed. R. M. Zaccaria, cit.

[9] FISCH, *The Academy of Investigators*, cit., p. 537.

[10] *Tractatus anatomiae hepatis, cui accedit anatomes lienis, renum, et vesicae urinariae*, kept in the National Library of Naples, ms. XIV.D.38.

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Life and soul in the *Paradoxical Exercitations*

In the first of the 'paradoxical exercitations', Bartoli laid the groundwork for his philosophical-medical system, presenting his view of the principle of life. In order to avoid misunderstandings, he proclaimed at the outset of this work that he used the terms «sensitive life», «living soul», «impulse providing spirit», «self-moving force», and «archeus» as synonyms.[1] Yet, throughout the work this last term is certainly the one most used. Like in Paracelsus, the *archeus* in Bartoli is a mirror of the world (microcosmos) and a force, rather than a well-defined entity. It guarantees the continuity and order of the body, and supervises the latter's transformations. It is unclear whether Bartoli theorized the existence of *archei* for individual parts of the human body, such as the liver, the stomach, and the heart. His focus is on the coordination of the body's development and transformations by the (central) *archeus*.

Bartoli argued that sensitive life is not the presence of heat in humid, nor the temperament of elemental qualities or a heap of atoms, but that it is a simple light propagated by the 'fuel of seeds'. Moreover, analysing sickness as motion in living beings, he emphasized that the rhythms, motions, and tasks of the plastic virtue, defined as *archeus*, cannot be scrutinized from anatomical research on dead bodies. This vital principle precedes in the seed the construction of the body, it is provided with «agendarum rerum ideis formatriceque scientia», it builds the animal body, and once the latter is formed it conducts all vital organs and processes.[2] By consequence, Bartoli refuted the view of the heart as origin of the vital spirits, and that of the brain as origin of animal spirits. Surprisingly, he also used the metaphor of the clock for the activity of the *archeus*.[3] However, this image is not functional in a mechanistic picture, but it explains the relationship between 'centre' and 'periphery' in a living being, as all parts are moved by one force and fit a unique aim.

In support of this doctrine Bartoli referred to the views of a large group of 'predecessors', including not only Moses, Plato, Pythagoras, and Hermes, but also Hippocrates, and even Aristotle for his conception of the «spiritus spumosus».[4] However, he underlined that the pristine intuitions had been thoroughly distorted by Aristotle and Galen, who established that the origin of life was heat or the mixt of humors, respectively. Bartoli formulated four arguments refuting the principle of innate heat as responsible for life. First, he admitted that heat is unique in the nature of the universe. The original, unique heat manifests in infinite species, but these do not differ essentially. Heat, however, is not provided with the free power of willing, sensing, imagining and memorizing, as it acts through the laws of nature. Second, if heat were the principle of life, cold animals could not be defined as living beings. Third, the digestion of food in cold living beings does not depend on heat, but on vital energy. Fourth, the three different types of humid substances («simplex aqueus», «mixtus non oleosus», «mixtus oleosus, sulphureus») do not possess an intrinsic principle of heat.[5]

[1] Bartoli, *Artis medicae examen in decem exercitationes paradoxicas*, cit., p. 5.

[2] *Ibidem*, pp. 3-4.

[3] *Ibidem*, p. 5: «Simillima quippe habitudo est horariae machinae ad machinam microcosmicam, ac tantum in eo diversa, quod motus ab impetum faciente, concitatus in microcosmica machina est ab intrinseco, et liber. In machina verò horaria ab extrinseco ab homine movente impressus, ac necessarius».

[4] *Ibidem*, cit., p. 6.

[5] *Ibidem*, cit., pp. 6-9.

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Then, Bartoli refuted Galen's recourse to the doctrine of the four humours in the explanation of the origin of life. First, recent research has established that sublunary beings are not made up of the dreamed of mixt of qualities and elements. Fire is not an element at all; air cannot be part of bodies – as it cannot be mixed with earth or water; and earth has not the required simple nature of an element. And no element or elementary quality is able to handle, «in the root of its essence», the properties of life, because depending upon a proportion of accidents (qualities) life would become an accident itself. Second, if life may spring from lifeless qualities, life would not be transmitted by the seed of living beings. Third, among the created bodies the condition of life is deemed the most excellent, and thus, in Galen's view, it seems reasonable to suppose that it depends upon excellent qualities, such as those of gold and silver. But no life arises from the latter. Fourth, sense, imagination, fantasy, and free will, which cannot be separated from life, are not bodily entities. Fifth, both vital heat and pain are felt by the living being. But if life depended on heat or mixture, these passions could not be felt, because an entity cannot be at the same time a potency and its own object («cum non possit idem esse sui ipsius obiectum, et potentia»); for example, the eye does not see itself.[1]

Subsequently, Bartoli passed to an evaluation of the views of Epicurus and his followers. According to this philosophical school, true knowledge of natural reality was based on the (infallible) senses and the judging mind. Moreover, they held that only two principles exist, the void and body made up of infinite atoms. Bartoli refuted this conceptual frame: (I) the void cannot be an object of sense; (II) the infinity of either body or void would exclude the existence of one or the other; (III) that indivisible atoms may have different shapes is unconceivable; (IV) that from the swerve of atoms might arise an ordered world is simply ridiculous; (V) vital and mental phenomena are free, and thus not dependent upon moving particles. In conclusion, Bartoli proclaimed the existence of an all-pervading spirit and of a 'medium' between body and spirit, that is, light, in virtue of which all natural entities come into being, move, and live. [2]

After the refutations of Galen's and Epicurus' views on the origin of life, Bartoli drew a sharp distinction between the immortal mind, created in the image and similitude of God, and the sensitive soul, which is mortal, and subject to change and passions.[3]

[1] *Ibidem*, pp. 10-13.

[2] *Ibidem*, cit., pp. 13-18.

[3] *Ibidem*, p. 19: «de ea vita loquor, quae tam in specie brutali, quam in specie humana parentum seminibus per individua propagatur, hebraice in libris Geneseos per verbum (nefesc) designata». In the Jewish tradition the term *nephesh* is used in different ways. First, the term is employed simply as a synonym for a person (Exod. 1:5); and in legal matters the word was used to denote an individual (Gen. 35:18; 1 Kgs. 17:21). Second, the word *nephesh* is used to denote the form of life that man possesses in common with animals and that ceases to exist at death. When a person dies, *nephesh* is said to depart; and if in special circumstances life should be restored to the corpse, it is said to 'return' (1 Kgs. 17:21; Hab. 2:5; Ps. 107:5; Jer. 2:24, 15:9; Job 11:20, 41:21). Third, the idea of the soul is used to refer to the varied emotions or inner thoughts of a man. Man was called to love God with all his heart and with all his soul (Deut. 13:3). From the soul (*nephesh*) originate knowledge and understanding (Ps. 139:14), thought (1 Sam. 20:3), love (1 Sam. 18:1), and memory (Lam. 3:20). An individual does not have a *nephesh* in the sense of a separate or separable possession, rather, an individual is a *nephesh*; the human life is coterminous and coextensive with its *nephesh*; it refers to psychic power, abounding personality, energy. When the Hebrew concepts expressed by *nephesh* and *ruah* were rendered by the Greek *psyche* and *pneuma*, they took on new connotations. These were shaped, at least in part, by Greek philosophy which influenced the translators of the Septuagint, the Greek-speaking Jews, and the first Christian authors. See L. Spruit, *The Origin of the Soul from Antiquity to the Early Modern Period*. A Short Introduction, Lugano, Agorà, 2014, ch. 2.1.

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Subsequently, Bartoli further enfolded his view of the sensitive soul as light: 1. all ensouled beings live through the light of the main *luminaria*; hot ones through the Sun, cold ones through the Moon; 2. life consists in light; 3. the seeds of all sensitive beings are «lucida, diaphana, transparentia, atque perspicacia»; 4. the spirit enclosed in the spumous substrate of the seed possesses the knowledge to construct the body; 5. every form in the visible world is light; 6. the entire essence of life consists in the free capability to operate, and this power requires images and ideas, which cannot be preserved if not in lucid diaphanum; 7. only light has the speed for immediate execution of voluntary decisions; 8. vitality is present in the entire body, and only light is able to penetrate everywhere; 9. all diseases manifest through the lack of light or colour; 10. the eyes, which in all creatures are like windows, have a luminous appearance. Finally, in Genesis light is the first of the creatures, the substrate of the implementation all other divine ideas.[1]

In the second exercitation, Bartoli discussed the role of heat in the generation of living beings. He showed that through heat the vital principle operates faster and more efficient; but this principle does not necessarily need heat for its functions, as it performs them in virtue of its own power. Heat has an important function in the generation of animal life, but it is an extrinsic factor; its function is 'dispositional' and 'occasional', it does not shape the living being from within. For example, heat is important in the hatching of eggs, but the metamorphosis of the yolk into a chicken is the work of the *archeus* only.[2]

In the third exercitation, Bartoli analysed the function of air. He first rejected al traditional theories for the function of air: a. refreshing the heart (Galen); b. warming up the heart (Aristotle); c. production of vital spirits (Erasistratus); d. exhaling sooty (some «neoterici»); e. the production of phlegma (Gassendi); f. the ampullary dilatation (Jean Pecquet).[3] Subsequently, he formulated some largely shared suppositions regarding air, the main being: it fills up the space left by other bodies; and it enables motion, the spread of heat, and combustion. Then, Bartoli passed to the function of air in breathing animals. Surprisingly, air is not seen as necessary to life, as it merely guarantees the space for the motions of the bowls and the blood. As a matter of fact, embryos and fishes do not breath, and yet they are alive.[4]

At the outset of the fourth exercitation, Bartoli insisted again on one of his central views: the 'seminal foam' contains an 'ideated light' which progressively develops into the form of the conceived living being. He then dwelled upon the (central) seat of life. He rejected the views of Aristotle and Galen, who established the seat of life in the heart and the brains, respectively. As to Galen: (1) life is latent in the seed before the formation of the head and the brains; (2) imagination, memory and rational thinking depend on the brains, but there are many vital phenomena which do not; (3) the entire life («vita integra») is present in the child, although his mental functions are not yet fully developed; (4) fundamental vital functions persist in unconscious states (die to sleep,

[1] Bartoli, *Artis medicae examen in decem exercitationes paradoxicas*, cit., pp. 19-22; see p. 22: «Idea igitur vitae sensitivae praecessit in Creatoris mente, antequem crearetur, omnibus completa numeris, haec idea ut extra divinam mentem specificaretur (quod per verbas; *producat terra animam viventem*, ex instituto creationis successit) requirebat subiectum in quod sigillaretur, ut tanquam formale, activumque initium produceret in materia […]». See also p. 105, where Bartoli interpreted God creating in the firmament a 'major and a minor light' as a confirmation of his central view.

[2] *Ibidem*, pp. 26-37. [3] *Ibidem*, pp. 41-46. [4] *Ibidem*, pp. 47-50.

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coma, epilepsy); (5-6) temporal asphyxiation (by hanging or submersion under water) may cause long during interruption of mental functions; (7) if the brain is the seat of life, it should contain the testicles; (8) life can be compared to the sun which generates minerals in the centre of the Earth, and vegetation and animal life on its surface; (9) that flowers and seeds are generated in the extreme parts of trees and plants does not entail that the seat of life is in the extremities; (10) the prominence of the brains does not contradict a seat of life elsewhere in the body.[1]

Then, Aristotle's position is critically, although summarily, discussed: (i) the heart does not rule the entire body; (ii) it merely sustains life; (iii) several animals lack a heart; (iv) the perennial motion of the heart would disturb the soul. Bartoli individuated as the seat of life the geometrical centre of the torso, that is, precisely at the point of the diaphragm, between the 13th vertebra and the sternum, thus slightly correcting van Helmont's view of the *praecordia*.[2]

In the fifth exercitation, Bartoli argued that the theory of the three main organs (liver, heart and brains) as propagated by the schools is not correct: (1) there are functions which cannot be reduced to one of these three organs and which nonetheless are indispensable, such as nutrition and digestion; (2) warm animals cannot live without breathing; (3) the generating faculty surpasses the others in nobility, energy and efficacy. Furthermore, like in the dilemma of the chicken and the egg, it is impossible to establish a priority between the organs and their respective spirits. And thus Bartoli insisted again on the autonomy of the life-giving principle.[3]

Then, in the following exercitations, Bartoli explained that all parts necessary for the integrity of the perfect animal are formed from the seminal matter.[4] Actually, the animal is not nourished, but its life is sustained by the essences of food. Life, being a 'living light', is not regenerated by food, drinks or air. The seminal light is present from the start in every living being, it shapes its organs, and persists in the organism until death, regenerating itself. All parts that are necessary for the formation of the living organism are produced out of the 'seminal matter', and do not depend upon any (direct) nutrition. Nutrition plays a role in the formation of trees and plants, but again the formation of the chicken in the closed egg shell is referred to as a conclusive argument for the (relative) self-sufficiency of the *archeus* in animal beings. The growth of a living individual depends upon unfolding, that is, it depends upon *generation*, rather than on nourishment.[5]

Also blood and the formation of blood vessels, which can be detected as the first physiological development in all animal embryos, have a 'sperm-like' nature.[6] This does not mean, however, that all vital development is to be seen as (pure) unfolding. Bartoli distinguished between two substances in the formation of an embryo: a «substantia seminalis spermatica» and a «substantia cibalis», and the latter is transformed into living matter by the former. This means that, for example, 'new' blood does not arise through the concoction of food in the bowels, but that the final products of digestion are transformed through the contact with 'spermatic' blood.[7]

[1] *Ibidem*, pp. 53-58.
[2] *Ibidem*, pp. 59-63.
[3] *Ibidem*, pp. 66-74.
[4] *Ibidem*, pp. 77-86.
[5] *Ibidem*, pp. 88-98.
[6] *Ibidem*, Exercitatio VIII, pp. 101-108.
[7] *Ibidem*, p. 103: «Substantia ergo cibalis, dum a cibis per motum arteriarum intro trahitur, spermatico se miscet liquori, cuius commercio fit organis familiaris, nam rubore tingitur, odore imbuitur, vitae lumine illustratur, gravitatis leges exuit, et vitalis facta sursum, deorsum, quo illam orga-

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Thus, without the vital influx of the *archeus* no 'new' blood is produced.[1]

In the ninth exercitation, Bartoli summed up several alternative views for the generation of chyle.[2] In this context he formulated a key view on nutrition and metabolism. Following the 'paths of nature' one discovers, so Bartoli argued, that the essence of the nutriments is separated from the individual aliments, and then in virtue of the attainment of the vital light of life the «guest becomes domestic».[3] Thus, in digestion the body does not absorb 'juice' (*cremor*) or chyle, but the vegetative spirit contained in food.[4]

Bartoli argued that also the efficacy of drugs depends upon the intermediary role of the life-giving light.[5] In the tenth section, Bartoli also dwelled on the philosophical suppositions underlying his views on physiology and medicine. What exactly happens in the body is not accessible to sense perception, and this deprives the speculations of the schools concerning 'virtual and intrinsic' qualities and humours and their alterations involved in diseases of any fundament.[6] The doctrine of the schools is based on false assumptions, because there are many substances with well-known effects, which do not produce these effects in the bodies of sick persons. Desert gourd (*colocynthis*), scammony (*scamonium*), pepper and saffron (*crocum*), generally listed among the *calefacentia*, are cases in point. Those who argue that the effects of drugs depend upon their nature endorse a «rustica philosophia», which looks only at the effects, while they regard the causes, the adaption of drugs, and the modes of cooperation (i.e. with the receiving organism) as inscrutable. Furthermore, those who refer to «the occult properties of sympathy and antipathy» just take refuge to an «ignorantiae asylum».[7]

Non-living bodies do not interact in virtue of their intrinsic properties, Bartoli argued, but merely through extrinsic properties, such as those of gravity, shape, fluidity, solidity, softness and hardness.[8] Now, it is generally accepted that all drugs (*pharmaca*) are non-living bodies; by consequence, they do not act through specific properties of their essence. Then, not only the humors but also the very blood is not a living, but only a vital being. They may sustain life, but only under the «power and jurisdiction» of life itself.[9] Indeed, the first subject of drugs is either (1) the flesh of the organ, or (2) the humor of some part of the body, or else (3) the faculty of the organ, or (4) the power of life. In the first case (ad 1), there is no difference between the effect of drugs on a living or a dead body, but this is false. For the second case (ad 2), Bartoli referred to what he said before about the interaction among lifeless bodies, not depending upon inexistent,

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norum potestates alliciunt pro eorum sustentamento celeriter currit, itaque sanguis verus, rubeus liquor vitalis, influi spiritus domicilium, spermaticus est, primus in semine constitutus, similaris, homogeneus, oleosus, volatilis, omnino excludens partium heterogeneitatem a primo generationis initio, usque in ultimam vitae periodum perseverans, et ut singulae corporis partes, sustentatione indiget, ut in vitae cursum continuetur».

[1] *Ibidem*, p. 108: «Sed requiritur Archei vitalis influxus, et illuminatio, quibus vere sanguinis, pro sustentatione animalis, acquiritur energia, quod in transitu per septum cordis efficacissime prosequitur, non quod cordis caro tanquam vitalis facultatis instrumentum id efficiat, sed munus est ibi praesidentis vitae Archei, qui ante cordis efformationem, iam erat, immediatèque sibi ex seminis materia sanguinem procreavit».

[2] *Ibidem*, pp. 113-114.

[3] *Ibidem*, p. 114: «[…] sic modos, et vias agnovissent, quibus ciborum essentia (quae cremor, chylusve non est) a concretis sequestartur, atque in surculos insinuatur, ut per adeptionem vitalis luminis vitae fieret hospes domesticus».

[4] *Ibidem*, p. 125.

[5] *Ibidem*, Exercitatio x, pp. 127-139.

[6] *Ibidem*, p. 131.

[7] *Ibidem*, p. 132.

[8] *Ibidem*, p. 134.

[9] *Ibidem*, p. 135.

intrinsic qualities. The third possibility (ad 3) implicitly admits that drugs are passive with respect to living beings.

Arrived at this point of his argumentation, Bartoli interrupted his discourse for a more general consideration regarding the 'ontology' of drugs. They are not provided with sense, motion or free will. Their energy consists essentially in color, taste and smell. The latter are sensible qualities, «non entia respectu corporum», as they lack sentience.[1]

Bartoli then turned again to the humours, which, although he does not accept them in the sense of the schools, may be seen as similar to drugs, that is, as non-living bodies, the effects of which are due to the living body they inhere to.[2] He concluded with a list of eleven properties of life: (I) sentient; (II) moved by objects; (III) capable of pleasure and displeasure; (IV) intrinsically and freely moving; (V) keeping the idea of the object that moved it; (VI) able to move the intrinsic parts of the living body; (VII) although it is sometimes stirred from the outside, the results are its own; (VIII) able to react to external stimuli; (IX) maintaining the control over humours; (X) the beginning of all motions in the body.

Concluding remark

Bartoli developed his physiological and psychological views in a continuous polemics with traditional medicine and philosophy. He used experimental and observational data to underpin his views, but he was convinced that the understanding of a complex systems, such as living beings, required a unifying principle providing an explanatory model.

In alternative to the traditional doctrines on the origin of life and the seat of the soul, he argued that (sensitive) life cannot be reduced to heat, temperaments, or a heap of atoms, but that it depends on a vital, 'spiritual' principle, the *archeus* or sensitive soul, which is essentially light, positioned in the geometrical center of the body.

Bartoli tacitly assumed that this vital principle is *ex traduce*, as he proclaims that it precedes in the seed the construction of the body. Bartoli sought support for his view in an ancient tradition (Moses to Plato, Hermes to Aristotle), but his main inspiration is clearly the Paracelsian tradition which he absorbed through the works of the Flemish physician Joan Baptista van Helmont. Vital acts do not and cannot depend on underlying, non-vital principles. Life is non-reducible and the purely physiological model is apparently unable to account for vital phenomena, as if life, in his view, were 'unsimplifiable'.

Like van Helmont, in human psychology he endorsed the distinction between a vital, sensitive principle, and an immortal mind, created by a unique divine act. This view does not only derive from the tradition of Paracelsus and van Helmont, however, but is traceable also in Renaissance naturalism and early modern materialism, including Bernardino Telesio and Pierre Gassendi.

The *archeus* or sensitive soul in the semen has a precisely constructive function. It contains the code or structure for the intricate construction of the human body in all its parts. Thus, Bartoli implicitly chose a position in the ancient controversy between epigenesis and preformation, fresh development or simply unfolding of pre-existent structures, the history of which is almost synonymous with the history of embryology. The

[1] *Ibidem*, pp. 138-139. [2] *Ibidem*, p. 139.

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seed is a living substance and gradually develops into blood, organs and brain.[1] Or in Bartoli's words: the 'seminal foam' contains an 'ideated light' which progressively develops into the form of the conceived living being.

Furthermore, the *archeus* possesses a capability for elaborating external data, including nourishment. Due to its structure or code it transforms 'foreign stuff' into well-ordered elements of the body's organs and parts. The *archeus* adapts a part of the incoming food to its own structure, which is defined as soul. In *Astronomiae microcosmicae*, Bartoli explained that the *archeus* appropriates the 'vegetative spirit' distilled by the body's organs, veins and arteries from external nourishment. Actually, the animal is 'not nourished', but its life is 'sustained' by the essences of food. The incoming food is transformed through the contact with the 'spermatic substance'. And drugs are effective only under the 'guidance' of life itself.

[1] In seventeenth-century medicine and embryology, epigenesis remained the dominating theory until in the 1660s the systematic use of the microscope revolutionized the discussion on animal generation and triggered the doctrine of pre-existent germs For a summary view of the contemporary controversy, see L. Spruit, *The Origin of the Soul*, cit., ch. 8.

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