

## Michael Servetus. Pulmonary circulation at the stake

*Miguel Serveto. La circulación pulmonar a la hoguera*

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After the discovery of **Ibn an-Nafis**, around the year 1245, the author of the first print that developed the concept of minor circulation in the western world was **Michael Servetus (Miguel Serveto y Revés)**, since the text of the Arab doctor was only known in 1924. **Servetus** was born in Villanueva de Sijena (Huesca) in 1511. The circumstance of belonging to a noble and wealthy family allowed him to attain a solid culture and to treasure at an early age a classical humanistic training linked to the spirit of the Renaissance, which -as we will see later- made him the martyr of a new way of life: freedom of thought.

**Servetus** lived in a time imbued, from a philosophical point of view, with the anti-dogmatism of **Desiderius Erasmus** (Dutch, 1467-1536), who favored in his theology the return of faith to the first word of God. Tireless traveler, he was a doctor, astrologer, mathematician, philosopher, but fundamentally his field was theology. He studied law in Toulouse (France), the site of initiation of his reformist religious thought, when he came into contact with new religious ideas promoted by **Philip Melancthon** (German, 1497-1560) and **Raymond of Sabunde or Sibiuda** (Spanish, who died in 1436), authors of "*Loci Communes*" and "*Theologia Naturalis*" or "*Liber Creaturarum*" respectively. In this atmosphere **Servetus** was an isolated researcher, since the new paradigm of modernity was propelled primarily in personalities and in academies. Instead, the universities showed a scholastic continuity, a much more pronounced Galenic profile.

In Bologna he was secretary to **Fray Juan de Quintana**, attending in 1530 the coronation of **Charles V**, of whom **Quintana** was confessor. This historical fact of lavish court was the starting point of his dissatisfaction with the traditional church. Later in Geneva, Basel and Strasbourg, he connected with reform theologians such as **Martin Bucer** (German, 1491-1551), **Ulrich Zwingli** (Swiss, 1484-1531) and **John Ecolampadius** (Swiss, 1482-1531), culminating his position with the first in bitter dispute. From that moment on, his life became a permanent pilgrimage, trying to avoid the persecution and surveillance to which he was subjected.

In 1531 he published "*De trinitatis errobrus libri septum*" (Basel) dealing with the Trinity, holding that "*Jesus was the son of the eternal God, but not the eternal son of God.*" This text gained the disapproval

of both Catholics and reformers. The following year he publishes "*Dialogorum de Trinitate*" ("*Two dialogues on the Trinity*"), with an equidistant position with respect to the religious personalities mentioned above, derived from his studies on sacred texts. Then he went to Paris, where he came into contact for the first time with **John Calvin** (French, 1509-1564), a relationship evidencing a deep dispute from the start. Fleeing from the Inquisition of Zaragoza, he moved to Lyon, where he changed his name to **Miguel Villanueva**, editing with important corrections the Ptolemy Geography in 1535 and "*In Leonardum Fuchsium Apologia*" (1536), of medical-theological character.

His only text of a medical nature, "*Syruporum universa ratio*", published in Paris in 1537, evidences the classical knowledge of medicine of **Hippocrates** and **Galen**, although always ready to accept the modifications that observation could provide. Thus, he does not hesitate to attack the use of syrups in humorally based febrile affections. Written under the pseudonym of **Villanueva**, he declared himself in favor of "*a happily Renaissance*" science, condemning the "*Saracen phalanges*", demonstrating a high humanistic content, with a return to the concept of "*vis medicatrix naturae*". In this same year he enrolled at the University of Medicine of Paris, on the advice of the physician and botanist **Symphorien Champier**, with whom he had been related in Lyon. There, together with **Andreas Vesalius**, he is a disciple of **Jean Fernel** (French, 1497-1558), **Jacob Dubois** "*Silvio*" (French, 1475-1555) and **Günther von Andernach** (1505-1574).

The practice of dissection on corpses allowed his fundamentally theological studies to add the anatomical knowledge necessary for his sensational medical discovery, made by the author as a means to carry out his religious reasoning. Predecessors of his practice in dissection can be found in the text by **Günther von Andernach** "*Institutiones anatomicae*" (Basel, 1539), who states: "*After [referring to Vesalius], Miguel Villanovanus who was my friendly assistant in dissections -a person who honors in any branch of the letters-, does not lag behind anyone in knowledge of the galenic doctrine*".

While taking a course on astrology in Paris, he is put on trial from which he emerges with a benevolent sentence. Therefore, in 1540 he goes to Charien

(Loire), and then to Lyon where he reviews and edits the “Bible” of **Santes Pagnini** (1542), the “*Summa*” of **Saint Thomas** and the “*Biblia sacra cum glossis*” (1545). Established in Dauphiné Vienna, he dedicated himself to the practice of medicine, reprinting the “*Syruporum*” on several occasions.

From approximately 1536, **Servetus** had in mind to write the “*Christianismi Restitutio*”, which only saw the light in 1553 in printed form, in an edition of 800 copies, with 734 pages, without the author’s signature or place of printing. A manuscript of the text, dated 1546, had been sent to **Calvin**, causing him a great astonishment, to the point of expressing “*no matter how little authority I have, I will not tolerate him staying alive*”. This explains the circumstance that when the publication became effective, he was prosecuted in Vienna on April 4, 1553 for heresy, managing to flee from the city. On June 17, the sentence was handed down to be burned alive. **Servetus** remained hidden, until he was apprehended again on August 13 in Geneva by order of **Calvin** and sentenced to death at the stake, which was carried out on October 27, 1553. The edition had previously been incinerated, thus preventing its disclosure. Only two complete texts (currently in Vienna and Paris) and one incomplete (Edinburgh) with 16 missing pages were saved.

The work “*Christianismi Restitutio*” is theological, but in its Book V, between pages 168 and 173, mention is made of the minor circulation, in a clear and precise way. How does such a physiological finding emerge from a religious work? **Augustus Teulon** expresses that the event occurred “*when trying to find the existing correlation between the two great books: the one of the word of God, the Bible, and the one of Nature*”. In order to correlate the “*physis*” with the “*deidos*”, it was necessary to merge in **Servetus** the position on faith and his medical training, in an era, that of the Renaissance, which allowed him the verification “*ob oculo*” of the human anatomy. In essence “*Christianismi Restitutio*” is a compendium that deals with the Trinity, makes an apology of **Philip Melancthon** and contains the correspondence with **Calvin**. According to **Servetus**, from the analysis of the Genesis, Leviticus and Deuteronomy it follows that blood is the means for God to communicate with man. This concept was the fundamental reason that led him to the description of the pulmonary circulation.

**Servetus**, despite his description, as **Ibn an-Nafis** had done before, did not depart from **Galen’s** physiology. He only advanced on the cardiopulmonary

functional complexity, by truly describing the minor circulation. Through doubt he develops the reasoning, wondering if the size of the “*vena arterialis*” (pulmonary artery) was justified only for the function of nourishing the lung. That leads him to the following explanation: “*The remarkable size of the pulmonary artery confirms that it was not made of such size, nor does it emit such a large and important volume of blood from the heart to the lungs, simply for its nutrition.*” He also tries an explanation of the pulmonary oxygenation, considering the left ventricle very narrow, so as to carry out in it the total pneumatization of the blood with the vital spirit, which was the element admitted at that time to mix with the fluid. In his own words, he explains the pulmonary oxygenation in the following way: “*In the same way, not only air, but air mixed with blood is sent from the lungs to the heart through the venous artery. Therefore, mixing takes place in the lungs. The red color given to the blood has been in the lungs, not in the heart. In the left ventricle there is not enough space for such a copious mixture or for the elaboration to imprint the red color.*”

It follows from the text that **Servetus** annuls **Galen’s** description of the passage of blood from the right heart to the left through the pores of the septum, by saying “*... this communication is not made through the heart’s midwall, as is commonly believed, but by some grand artifice the subtle blood is propelled forward from the right ventricle by a long circuit through the lungs,*” and further on he states: “*Finally, the interventricular septum, since it lacks vessels and mechanisms, is not suitable for that communication and elaboration, although something may filter.*”

Incinerated, **Servetus’** work was just going to be rediscovered and placed in its just primacy by **G. Wotton** in 1694 in his book “*Reflections upon ancient and modern learning*” (London). Had he abjured his claims, **Servetus** would have saved his life, but he preferred the value of his ideals over physical death. This alternative, in total accordance with his lifestyle and thought, is an attitude that lays bare a personality dedicated to the objectivity of knowledge, the seed of future achievements. The story of **Guilhem Farel**, **Calvin’s** second, speaks to us about his moral value, expressed in the text of **J. Calvini**, “*Opera*” (Strasbourg, 1870): “*he never wanted to make an authentic confession. Several times he prayed and asked his companions to pray for him. But we could not get him to openly consider his error and acknowledge Christ as the eternal Son of God.*”