THE CONTRIBUTION OF MICHAEL SERVETUS TO THE SCIENTIFIC DEVELOPMENT OF THE RENAISSANCE*

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Pondering on the life and work of Michael Servetus one gets the impression that what has best secured his immortality is not so much his early and undeniable contribution to the physiology of the cardiovascular system or his views on the Trinity, but the tragedy of his death. Without the circumstances of his death his name would have been remembered now, at the four hundredth anniversary of his passing, only by a number of scholars. His contribution to the theological discussions of the first half of the sixteenth century do not seem any more important than those of a number of his contemporaries. Also his work on medicine, including his greatest contribution, the first printed description of the pulmonary circulation, outstanding though it is, is not thought to equal that of Vesalius in anatomy. Even the place of Servetus in the development of physiology is still being disputed by those who favour the priority of his contemporaries Realdo Columbus and Juan Valverde in describing the pulmonary circulation.

Four centuries after Servetus's tragic end one is surprised at Calvin's shortsightedness in bringing him to ignominious death. He who tried to remove Servetus and his works from the face of the earth made him immortal, at least for as long as there is any interest in the awakening of the conscience of modern man. Up to the present on every occasion that an anniversary of either Servetus's birth or of his death recurs the date is commemorated in the best way that a thinker may ever hope to be remembered—that is, by starting new interest in his contributions and particularly in his life. He is then not only reborn twice every century, but by the example he offered in confronting human intolerance he has become even more than a martyr of the old religious quarrels—a symbol for the modern Western man.

For a medical audience, I think that more appropriate than commenting on the religious writings of Servetus, a matter far beyond my competence and even interest, is to study his personality and some of the moulding factors which contributed to his own making and particularly the origin of his revolutionary physiological concept of the pulmonary circulation. Let us, then, analyse the early phase of his life until he definitively abandoned Spain at the age of 17.

His Birthplace

Among so many facts that still remain obscure about the life of Servetus, at least the place of his birth seems well established. He was born in the small village known as Vilanova de Sixena in its original Catalan spelling, or Villanueva de Sigena in Spanish. This village is situated in the area of Aragon adjoining Catalonia; administratively it is now part of the province of Huesca (Aragoh), but still belongs to the bishopric of Lérida (Catalonia) as in ancient times. The monastery of Sigena had been founded by the

Barcelonian Count Ramon Berenguer IV in the middle of the twelfth century, and was given to the Knights of St. John of Jerusalem. The father of Servetus, Anton Servet or Serveto, was a notary who worked at Sigena and who had married the Aragonian lady Catalina Conesa. She was the daughter of a nobleman, Don Pedro Conesa, and of Beatriu Caporta. From this couple three sons were born—Michael the physician, object of the present address, Peter a notary, and John who went into the priesthood and became rector of the church of Poliñino.

For a long time many doubts existed regarding the place of Servetus's birth. The reason for this was due to Servetus himself. In the course of his trials in Paris and in Vienne he manifested that he had been born in Tudela (Navarra), and many old authors accepted his word on the place of his

Michael Servetus.

birth, forgetting that at the time of the Paris and Vienne trials Servetus was hiding his own personality under the name of Michael Villanovanus, this being the name of his birthplace, Vilanova de Sigena. It seems obvious that if he had stated that he had been born in Vilanova de Sigena, Aragon, he would have been identified with the Michael Serveto who had written a few years previously the heretic and most persecuted works *De Trinitatis Erroribus* and the *Dialogorum Libri VII*. In these two books he signs as Michael Serveto of Aragon. At the end of his life, during his trial at Geneva, when the identity between Servetus and Villanovanus had been established, he states clearly "qu'il est de Villeneuve natif au Royaume d'Aragon," thus reverting to his earlier statement. But what provided the most important data to locate his birthplace was the contribution of Dr. B. R. Barrios, who found in Sigena the scriptures signed by the father of Servetus. Already in 1511 he was signing as the notary of Sigena. The last document bearing his signature is dated 1553, the year of Michael Servetus's death.

It is known that from both sides Servetus belonged to the lower nobility, or what was then called in Aragon "Infanzones." Servetus was probably born in 1511, and it seems that he was educated in his early days in the monastery at Sigena, but we do not know where his

*Abridged version of a lecture read to the Osler Club, at the Medical Society of London on November 13, 1953.

secondary education took place. It is supposed that he had been at the University of Saragossa, but no evidence of this exists.

Influence of Sabonde

From Spain, at the age of 14, he went to Toulouse, in the South of France, to study law. The School of Law in Toulouse was reputed to be one of the best in Europe, and in Servetus's time the inquiring spirit of the Renaissance was more alive there than in either Saragossa or Barcelona. While in Toulouse he became interested in the theological discussions of the early Reformation, and decided to enter into what may be called a personal research on the biblical scripts. It is known that he read the *Loci Theologici* of Melancthon and probably the *Theologia Naturalis Liber Chreaturorum*, which had been written in Toulouse in the early fifteenth century by the rector of this University, Ramon de Sibiude (Sabonde), a scholar born in Barcelona in the second part of the fourteenth century, who left Catalonia to teach medicine and theology at the University of Toulouse until he died in 1432. Through Michel de Montaigne we know the interest which was felt during the Renaissance, particularly in France, for the book of Sabonde. It has been said that Sabonde put forward some of the bases for the modern scientific approach; a thinker with a rationalist mind as that of Montaigne was so impressed by the reading of the *Theologia Naturalis* that he translated it into French, following the advice of his own father, a contemporary of Servetus in Toulouse.

The *Theologia Naturalis* had been printed ten times before 1527, with the first edition in 1480. Four of the editions came from Lyons and two from Strasbourg. Many of the ideas of Sabonde may be found in the writings of Servetus. As an example we find Sabonde explaining how the rational exposition of God's revelation of Himself may be found in Nature, while Servetus inserted the description of the pulmonary circulation, which he called a "most admirable process," in support of his theological beliefs in the chapter dedicated to the Holy Spirit. He adduces an anatomical and physiological observation to sustain his theological opinions in a manner very close to that recommended by Sabonde. In some of the letters that Servetus sent to Calvin we may detect the same influence—for example, when he writes: "And what are after all the laws of Moses? If they are conformable to Nature, they are laws of God, the author of Nature, older than Moses and to be observed by Christians independently of Moses."

Sabonde had written in the preface of the *Theologia Naturalis* that two books are given to us by God for our guidance: "One the universal book of created things or the book of Nature. The other is the book of the Sacred Scriptures. The first was given to man in the beginning when the world was made, the second is the supplement and solves the difficulties met with in the first. The book of Nature cannot be falsified, neither can it be readily interpreted amiss, even by heretics; but the book of the Scriptures they can misconstrue and falsify at their pleasure." It was this belief that brought Servetus into the dangerous path of reinterpreting the Scriptures.

At the Italian Court

In 1529, after he had finished his studies in Toulouse, he went back to Barcelona, where he met the Franciscan Joan de Quintana, a Majorcan who was later to become the Confessor to Emperor Charles V. Servetus was engaged by Quintana as a kind of private secretary and became a follower to the Imperial Court. He visited Italy and attended in Bologna the Coronation of Charles V by Pope Clement VII. Following the Imperial Court, he was present at the Diet of Augsburg in 1530. While travelling with the Imperial Court he took advantage of the proximity of the Swiss Reformers to visit some of them. In spite of his early age—he was then only 19 years old—he was well received by Oecolampadius in Basle and tried to convince him on principles of theology. Oecolampadius, who was by then not far from 50, was surprised to find a youth who had, before 20 years of age, acquired such a good knowledge of Greek and Hebrew and perhaps even

of Arabic, apart from the common Latin. Unfortunately, with a stubbornness almost reaching obsession, Servetus considered it imperative to convince the Reformer in matters referring to the Trinity.

In Hagenau in 1531 he published the little book *De Trinitatis Erroribus*, which he hoped would enlighten his opponents. Unfortunately, instead of convincing them he antagonized them all, for Servetus was now touching matters related to the basic foundations on which the Christian Church had been established since the Nicea Council. He seems to have feared the personal dangers which he incurred in taking such an extreme attitude, and published a second book called *Dialogorum de Trinitate libri duo*, which was meant to dispel some of the bad impressions he had made by his earlier publication. Nevertheless, his good purpose vanished soon after he began to take up the pen, and he produced a pamphlet as uncompromising as the first.

Work on Ptolemy's "Geography"

To avoid personal dangers he left Switzerland and Germany for France, and we find him in Lyons, where he began working as a corrector for the press with the brothers Trechsel, the famous publishers of the Renaissance, under the assumed name of Villanovanus. Soon they engaged him in annotating and preparing the re-edition of Ptolemy's *Geography* which appeared in 1535. This book is one of the earliest works, if not the earliest, on comparative geography, and a few examples will suffice to show its value despite the early date at which it was written.

"Britain and Ireland"

"The language of the English, drawn from many peoples, is very difficult to understand and to speak. In warfare they are intrepid, the best bowmen, very rich and much given to commerce and celebrated for their noble cloth because of the supply of good wool. In addition to other things, they cultivate music and have splendid banquets. Their eyes are blue, their faces somewhat ruddy and their stature tall. As St. Gregory said when by chance he saw English boys sold in Rome, alluding to the word for their native land, 'they are called Angles because their countenances shine like those of angels; they must be given the road to eternal salvation'; which was done as Bede says, in the year of the Lord 156, with Lucius, King of the Britons, seeking it by a letter from Pope Eleutherius, under the emperors Antonius and Commodus.

"The dress of the Scots is unusual in almost all respects, but they have almost the same language and same customs as the English. They are of quick intelligence, ferocious and prone to vengeance. They are brave in war, very enduring of hunger and lack of sleep, of pleasing stature, but very lacking in sophistication.

"Spain and its Contrast to France."

"The temperament of the Spaniards is hotter and dryer and their color dark; of the French, more cold and moist, the flesh softer and the color lighter. French women bear more children than the Spanish. The French are endowed with larger limbs, the Spanish are tougher and have a closely knit body. The French fight with more ferocity than skill and they wage war with more force than plan. The Spanish are the opposite."

"The French are more talkative, the Spanish more taciturn and accomplished in dissimulation. The French are vivacious, animated and prone to conviviality and shun completely hypocrisy and gravity which the dissembling Spaniards maintain. For the Spaniards in banquets are less sociable, more ceremonious, affecting a kind of seriousness which the French do not possess."

"Spanish is graver speech. French more suave. Among the Spanish the widespread Castilian people employ the most elegant speech; in France you will hardly distinguish what city speaks the true French since that is the speech of the nobility and the court more than it is peculiar to any particular place. Spanish is closer to Latin."

"The French would consider barbarous that custom of the Spanish women by which they pierce the lower portion of their ears with a gold or silver rod on which they frequently hang gems. They place about their waist a wooden girdle or some kind of instrument of torture so that with a broader appearance

*I am following the recent transcription in English made by O'Malley (1953).

they may seem more dignified, nor do they leave their homes except with an accompanying troop of servants preceding and following them; but the French women [live] simply, so that scarcely a single attendant accompanies them on foot. Also the Spanish women wear shoes, sometimes a foot, sometimes a foot and a half high, so that they appear to move about almost on towers. As in the case of the ancient Roman women, so the Spanish women are to be praised for their abstinence from wine but they are to be criticized because they make their faces hideous with eye-paste, minium and ceruse because their natural coloring is less than that of the French."

"If you desire to know the customs of these [French] men: of fiery mind, emotional, athirst for new things, quick, animated and inclined to conviviality. Juvenal considered the Gauls litigious, and today they hold this name because they are moved to litigation over very small matters, which is not the case with the Germans and Spaniards unless compelled. Whence I dare to affirm that there are more advocates, procurators and notaries in France alone than in ten Germanies and Spains."

Servetus's faculty of accurate observation is made patent when, referring to the King of France, he states it has been said "that the king himself by his touch cures those suffering from struma or scrofula. I myself have seen the king touch many attacked by this ailment but I have never seen any cured."

Activities in Paris

Before Ptolemy's *Geography* was published Servetus spent some time in Paris, and we have some information about his activities there. He had begun to be interested in medicine under the influence of Champier, the medical humanist of Lyons, who had edited the *Magnum Opus* of Arnald de Vilanova and was responsible for the preface to that important medical work. In Paris he studied at the Collège de Calvi and read anatomy, as is testified by Joannes Guinterus of Andernach.

While in Paris he wrote *In Leonardum Fuchsum Apologia*, which was printed in Lyons in 1536 with the preface of the book signed in Paris. This is important because it gives information about the time when Servetus was already interested in anatomy. He writes then as a devout Catholic against Luther's ideas on the justification by faith. The *Apologia* against Fuchs was written in support of the Lyons physician Symphorien Champier, probably his first teacher in medicine. It is worth noting that in this book Servetus exhibits an extensive knowledge of the classical medical writings of Hippocrates, Galen, Dioscorides, and Plinius. He also shows a substantial knowledge of Arabic medicine, in particular that of Avicenna, whom some believe he was able to read in its original Arabic language. In this new book he uses the same method he had previously employed in support of his ideas on the Trinity: when claiming he follows the original writings of the New Testament, what he really does is to interpret them as he thinks best.

In 1537 he published also in Paris *Syruporum Universa Ratio*. This is an extremely erudite work full of quotations from classic authors, in particular from Galen. As it has recently been denied that Servetus had anatomical training to justify his early discovery of the pulmonary circulation, I am interested in quoting here Servetus's words on his teacher Sylvius, "a man with sharp judgement and highly skilled in interpreting Galen, etc.," to show that before the end of 1537 Servetus was acquainted with Parisian anatomists. In the same books on the syrups he writes that Guinter of Andernach was a "very meticulous restorer of Galen and an outstanding physician," giving evidence that he already knew him then. Later in his life, when he was persecuted in Vienne for his heresy by the Inquisitor Mateus Ory—the same who also denounced St. Ignacius of Loyola—he said that he had studied anatomy with Sylvius, with Guinter of Andernach, and with Ferneilius. It is then difficult to understand why O'Malley (1953) thinks that Servetus could not have been working in anatomy with Andernach until 1538, when Vesalius had already left Paris for more than a year. Surely the man who while in Paris wrote in 1535–6 the *Apologia* for Champier and in 1536–7 *Syruporum Universa Ratio*,

and who had been in Paris at least since 1535, might have had more than one opportunity to meet Vesalius and even work with him in the anatomical departments of Sylvius and of Andernach. The latter has given evidence of the anatomical training of Servetus, as he places him side by side with Vesalius in his *Institutionum Anatomicarum . . . libri quatuor*, published in Basle in 1539. There he states that he had been most helpfully assisted in his dissection "first by the young Andrea Vesalius, extremely proficient in anatomy, and secondly by Michael Villanovanus, distinguished by his literary knowledge, which is in respect to Galen second to none."

In 1538 Servetus published in Paris *Apologetica disceptatio pro Astrologia*. He was then in the Collège des Lombards, where he was pursuing his medical studies. He became acquainted with a fellow student, Jean Perell, who was later to be personal physician to Pierre Palmier, Archbishop of Vienna in the Dauphiné, and who invited Servetus to follow him. Servetus dedicated to Palmier the second edition of Ptolemy's *Geography*, printed in Lyons in 1542. He probably met Archbishop Palmier in Paris; what is certain is that he was invited to join him in Vienne after having had serious trouble with the University of Paris for the publication of his pamphlet on astrology. For the moment Servetus went to Lyons, from there on to Avignon, and then back to Lyons; finally, he settled in Charlieu, about 40 miles from Lyons. There he practised medicine for about three years. Afterwards he went to live in Vienne as a physician attached to the household of the Archbishop, but he had time to publish an annotated Bible in 1541, to be followed by the second edition of Ptolemy's *Geography* in 1542. During this time he became a naturalized French subject.

Until 1553, when the thousand copies of *Christianismi Restitutio* were published in Vienne, he lived a quiet life, meditating and probably preparing the publication of the book in which for the first time the pulmonary circulation was to be described. Under the assumed name of Villanovanus he had maintained a correspondence with Calvin, then at Geneva, and to whom he sent the manuscript of his new book, *Christianismi Restitutio*. It seems that under the inspiration of Calvin and the mediation of one of his friends, the Catholic authorities of Vienne were advised on the publication of Servetus's book, and the great majority of the thousand copies were seized and its author cast into prison. He was accused of heresy and his trial began, but three days after its beginning, Servetus, with some help from outsiders, escaped from prison and directed his steps towards Italy. In crossing through Geneva on August 13 he was recognized and imprisoned, accused of heresy, and finally burned at the stake on October 27, 1553.

Description of the Pulmonary Circulation

In the book *Christianismi Restitutio*, from page 168 to page 173, the pulmonary circulation is described. It is interesting to gather from which source he had the insight to detect Galen's error on the circulation. It has recently been said by O'Malley that in Galen's anatomical writings he might have found all the elements necessary for the new conception, but this seems to me untenable. If the anatomical bases necessary for the new conception were known since Galen's time one must ask why then they had not been noted by any of the readers of Galen's works, including such careful anatomists as Eustachius, Sylvius, Andernach, and Vesalius. This would make Servetus a genius of unprecedented size. Apart from an unknown reference from the thirteenth-century Arabian writer Ibn-an-Nafis, it is not until Servetus describes the pulmonary circulation in 1553 that the concept of the circuit through the lungs enters into the anatomical works. It seems gratuitous to assume that Vesalius had himself in his first edition of the *Fabrica* doubted the existence of the blood flow as stated by Galen. What probably happened is that a heretic mentality like that of Servetus, who had worked with good anatomists and had dissected the human body in the same place where Vesalius worked, was surprised to find, as he mentions in his

description of the pulmonary circulation, several important facts which were not in accordance with Galen. Here thus his physiological "heresy."

These facts are as follows :

A. That there is no communication through the septum of the heart "as is commonly believed" (against Galen).

B. That the blood reaches the left ventricle from the right following a long track or lengthened passage ; that the blood mixes with air in the lungs (and not, as thought by Galen, in the heart).

C. That the pulmonary artery has a remarkable calibre, which would be much in excess of that required to provide only for the metabolic requirements of the lungs (no mention of this occurs in Galen).

D. That in the foetus until the time of birth the nutrition of the lungs is not dependent on the pulmonary arteries, because of the disposition of the "little membranes" of the heart. Servetus calls them *membranules* in one place and *vulvulae cordis* in another.

E. The great number of communications in the lungs between the pulmonary arteries and pulmonary veins. He calls anastomoses the channels of union between arteries and veins (Galen had seen them, but not in the lungs).

That revolutionary concept saw the light in printed form in 1553. The book had been seized and destroyed at Vienne, but we know that at least three copies have escaped and reached our time. One is in the Imperial Library in Vienna, the second is in the National Library in Paris, and the third is in the Advocates Library in Edinburgh. Apart from these three copies which have reached our time, we know of others which have now disappeared but have existed, as, for instance, the one that was kept in the Municipal Library of Vienne and which was destroyed by the fire in the Library in the eighteenth century. The distribution of Servetus's books in Poland and Hungary is a recognized fact, for several of Servetus's contemporary physicians and humanists of the North of Italy were well acquainted with his last work, among them Gribaldi, Curione, Blandrata, Massari, and probably Sambucus. Thus the discovery was not totally unnoticed by some of the physicians and anatomists, particularly those of Italy. That may explain why the Spaniard Juan Valverde, in his book of anatomy in Spanish, *Historia de la Composicion del Cuerpo Humano*, printed in 1556 in Rome, gives the second printed description of the circulation and follows almost exactly the original description by Servetus even if he does not mention him. It is true that Valverde attributes to himself and his teacher Columbus the discovery of the pulmonary circulation and insists that it had never been described and printed before. I think he was cautious in stressing his lack of knowledge of Servetus's book because 15 years later, when Caesalpinus published his description of the circulation in *Quaestionum Peripateticorum libri V*, he was imprisoned and accused of heresy, and was saved only by Pope Clement VIII, to whom he was private doctor.

In Columbus's book *De Re Anatomica*, published in Venice in 1559, a new description of the circulation appears, the third ever to be printed, and finally, in a second edition, this time in Italian, of Valverde's *Anatomia del Corpo Humano*, Rome, 1560, the fourth description saw the light following the original pattern of Servetus. It has been said that Columbus had already discovered the circulation some time before Servetus had printed his book, but even in this case the priority of Columbus cannot be claimed, because in a manuscript of Servetus's *Christianismi Restitutio* in the National Library in Paris, which was written in 1546, the description of the circulation is already present, antedating Columbus, if we accept Valverde's evidence, by at least eight years. I have already dealt with this subject more extensively elsewhere (Trueta, 1948).

The Personality of Servetus

Which of all these works and events can be given as featuring Servetus's personality and the character of his

contributions ? It seems to me that what is notable of Servetus's life and contributions is his enormous curiosity, which brought him to inquire into all the subjects he touched undeterred by any dangers he might incur. In denying Calvin the right to impose upon him an intellectual subservience he assumed an attitude which is now characteristic of all the freedom-loving people of the West. He died, as so many have done after him, and are still doing in contemporary times, to remain true to himself. And to-day, four hundred years after his death, we should remember him, not only for what he contributed to the modern study of geography or for having been the initiator of a work which ended seventy years later by the discovery and demonstration of the general circulation of the blood by William Harvey, but for his passion to know the truth even if so frequently, like many other great men, he failed to find it.

Placing side by side the figure of Ramón y Cajal and that of Servetus, one is struck by more than one point of resemblance between these two great men, who were born less than one hundred miles from each other: more than anything by the unquenchable persistence of their will-power, their desire to penetrate into the unknown world and their lack of allegiance to established scientific creeds when they conflicted with their own findings. They were both the type of Spaniards who belong to Europe and have little in common with the picture of that fatalistic, unproductive Spaniard which some people think is almost outside the Western world.

The dictum that Pope Gregory VII wrote of himself nearly nine hundred years ago could be appropriately applied to Servetus : "I have loved justice and hated iniquity, therefore I die in exile."

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MEDICAL EDUCATION IN THE SOVIET UNION

BY

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Before the October revolution of 1917 there were in Russia 13 medical faculties and five medical schools for women, from which about 1,500 doctors qualified annually, after a five-year period of medical education. In 1917 the total number of doctors in Russia was about 20,000, and the overwhelming majority were in the towns and central regions of the country. The rural population was served by the "Zemstvo" medical organization on a regional basis, and there was only one doctor to many thousands of people. Because of the shortage of doctors, "feldshers" (medical auxiliaries) formed an integral part of the service. The outlying parts of the Russian Empire, Central Asia, Transcaucasia, and Siberia were even worse off. As is well known, from a sanitary and epidemiological standpoint the condition of the whole country was extremely unsatisfactory and this was reflected in the fact that the infant mortality was one of the highest in Europe.

After the October revolution the whole question of social reform, including medical services, was raised. From the first days of Soviet power the principle of a medical service free and freely available for all was accepted and, with the active participation of the public,