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ANTONI DE MARTÍ FRANQUÈS AND SPONTANEOUS GENERATION

CONFLICTS BETWEEN SCIENCE AND RELIGION IN THE WORK OF A NATURALIST

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Antoni de Martí Franquès was a naturalist from Tarragona, who lived during the second half of the eighteenth century and early nineteenth century. He was best known for his remarkable experiments devoted to investigating the composition of atmospheric air, and he also devoted a good deal of his experimental work to studying spontaneous generation. Martí Franquès' surviving manuscripts and the testimony of his contemporaries tell us he was convinced that he had experimentally proven this phenomenon. However, being a devout Catholic, he refused to publish anything on this subject during his lifetime for fear of being accused of heresy. What is more, his descendants also refrained from publishing any of his work posthumously due to religious prejudice.

Keywords: eighteenth and nineteenth centuries, Catalonia, spontaneous generation, Martí Franquès, religion.

This is not the first time we have talked about Antoni de Martí Franquès in this journal, a man described as «our hero» in the title of an article published in issue 72 of MÈTODE. This is not surprising given that Martí was one of the most outstanding Catalan scientists, although, paradoxically, we know very little about his work. In the aforementioned article, Grau-Bové talked about the works of Martí that had the most impact, even outside Spain: his research into the composition of air. In this article, we will look at another of the subjects that interested him greatly, and in which he invested much research: spontaneous generation. Unfortunately, Martí did not publish anything on this subject, for reasons we will try to clarify.

SPONTANEOUS GENERATION

The *Diccionari de la llengua catalana* compiled by the Institute for Catalan Studies (*Institut d'Estudis Catalans)* defines spontaneous generation as «generation whereby dead material would create living beings». This idea, which suggests that inorganic matter or the remains of organisms could create new living beings by themselves, has been at the centre of a prolonged scientific debate. In a certain sense, the debate is ongoing even today. Many philosophers from the Classical Greek period declared their belief in the existence of spontaneous generation. However, it was Aristotle's defence which had the greatest impact on Western culture due to the enormous influence the great thinker held. From the seventeenth century onwards, an important debate began to take place within the scientific community between those who believed in spontaneous generation and those who denied its existence. Prominent scientists such as Redi, Harvey or Spallanzani denied the existence of spontaneous generation, yet during the same centuries, other important scientists such as Buffon, Needham, Lamarck, or indeed Martí defended it (Farley, 1977). The most well-known debate on the subject is probably that which took place in the second half of the nineteenth century between Pouchet and Pasteur. The debate led to Pasteur's famous experiments in which he tried to prove the inexistence of spontaneous generation, and the experiments were recognised by the majority of scientists. However, the debate did not put

Martí Franquès' ideas about spontaneous generation lived on in the Royal Academy of Science and Arts of Barcelona (*Real Academia de Ciencias y Artes de Barcelona*) following his death. His approaches are included in a number of different reports and the institution considered the possibility of publishing the naturalist's work, but ultimately it never did. The image shows the current façade of the Royal Academy of Science and Arts.

an end to the controversy, as many evolutionary scientists from the nineteenth century continued to support the existence of the process, as it made it easier to explain the creation of the first living beings out of inorganic matter. Darwin himself was amongst those who defended spontaneous generation. Although he never publicly acknowledged his belief in spontaneous generation, we know that he did so in private (Peretó, 2009).

In the second half of the twentieth century, spontaneous generation was largely scorned, primarily because of the great prestige enjoyed by Pasteur and his excellent experiments. Indeed, the disdain shown towards the process is still evident in many text books from the beginning of the twenty-first century, with phrases such as, «*La concepció espontaneista s'ha mantingut per ser una explicació immediata i senzilla que dóna resposta a fets o problemes quotidians sense contrastar experimentalment*»[1] (Rubio Sáez *et al*., 2008: 32). The history of science allows us to know that, over the centuries, great scientists, both in favour of and against the idea of spontaneous generation, like Martí himself, carried out numerous experiments in order to defend their viewpoints. Thus, it would probably be much more useful if students were able to think about the reasons which led scientists to consider the matter so seriously rather than simply ruling it out with scornful statements.

Nadar

The most famous debate about spontaneous generation is probably that which took place between Pouchet and Pasteur in the second half of the nineteenth century. The debate led to Pasteur's famous experiments which tried to disprove the existence of spontaneous generation, and the experiments were recognised by the majority of scientists. Spontaneous generation was largely scorned during the second half of the twentieth century, largely owning to the prestige enjoyed by Pasteur and his excellent experiments. The image shows Louis Pasteur, in a portrait taken by the photographer Nadar.

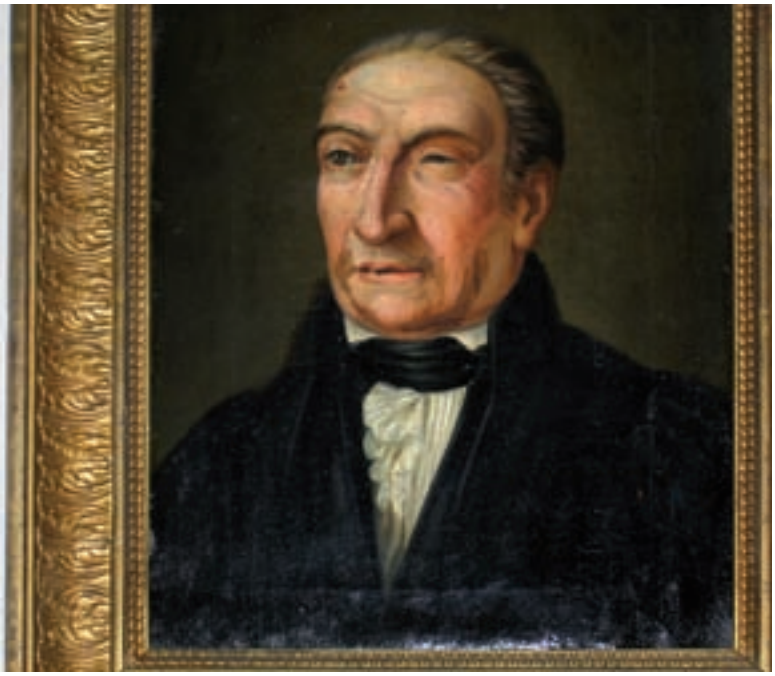
MARTÍ FRANQUÈS' SCIENTIFIC ACTIVITY

Thanks to the great work carried out by the pioneer of the history of science in Catalonia, Antoni Quintana Marí, we possess a substantial amount of information about the life of Martí Franquès. From a well-to-do family, he was born in 1750 and died in 1832. He lived between Altafulla, his birthplace, in Tarragona, where he set up his home in 1798, and Barcelona, a city he visited on a regular basis and where he participated in scientific institutions. It should be noted that between 1801 and 1802 he went on a lengthy trip to the main European cities, including Paris, London and Brussels, where he visited different academic institutions.

With regard to his scientific activity, it is worth mentioning that, as a young man, he received very little science related teaching. However, he acquired an extraordinary autodidactic education thanks to the large library that he gradually amassed over the years, which allowed him to find out about scientific developments in Europe. He was a member of the Royal Academy of Science and Arts *(Real Academia de Ciencias Naturales y Artes)* and the Royal Academy of Medicine of Barcelona (*Real Academia Médico Práctica de Barcelona*), where he presented five papers, three of which we know about. Of these three, it is worth emphasising the paper named *Sobre la cantidad de aire vital que se halla en el aire atmosférico* («Regarding the Quantity of Vital Air Found in Atmospheric Air») where he outlined the percentages of oxygen and nitrogen contained in the air, as well as providing evidence of this. The paper made a considerable impression on an international level (Grau-Bové, 2012). Additionally, he made contact with foreign scientists such as Francesc Aragó and Jean-Baptiste Biot, especially when he collaborated with French expedition members during investigations carried out to measure the length of the earth's meridian.

Most of his scientific work was carried out in offices he set up, first in Altafulla and later in Tarragona. In these offices, he carried out several experiments on the nutrition and reproduction systems of plants and spontaneous generation. The most important surviving documentation about his experiments is comprised of

[1] The idea of spontaneous generation has survived because it offers an immediate and simple answer for daily events or problems without providing evidence from experiments.



Royal Academy of Science and Arts of Barcelona

Martí Franquès received very little official scientific education; however, he acquired an extraordinary autodidactic education thanks to the large library that he gradually amassed over the years and which allowed him to find out about scientific developments in Europe.

3,000 hardly legible hand-written pages. It is estimated that these pages contain over 50,000 observations but only a small portion of them have been transcribed. These pages only gather together work on experiments carried out when Martí was aged between 66 and 78 years old. Of the enormous amount of work he carried out before that period, we only know what remains in the three papers and the testimonies of his contemporaries. Any other documentation was lost when Napoleon's troops led their assault on Tarragona.

MARTÍ FRANQUÈS' EXPERIMENTS ON SPONTANEOUS GENERATION

We have evidence of the intense experimental work which Martí carried out on spontaneous generation from three sources of information. Firstly, there is the testimony of his contemporaries; secondly, we have his manuscripts; and thirdly, there is a peculiar conversation which he had with a cleric (Camós, 2013*b*). A Doctor named Jaume Parcet, a friend of Martí who visited him on several occasions at his office in Tarragona, wrote the following in an obituary in Martí's honour shortly after his death:

> Se le ha oído repetidas veces que a un cadáver lo reduciría todo a una masa térrea, y que ésta la dispondría después de un modo que todos sus principios, o la mayor parte de ellos, constituirían organizaciones vegetales improcedentes también de símil; y pertenecientes estas y las anteriores a la última clase de Ligneo [*sic*].[2]
>
> PARCET, 1907

Equally, there is testimony from Josep Arrau, a young painter and a member of the Royal Academy of Science and Arts of Barcelona, who took part in informal debates in Barcelona which Martí also attended in his elderly years. Arrau explained how the scientist from Altafulla was convinced that he had created plants using spontaneous generation. This account is included in the biography written by Elías de Molins:

> Entre estas discusiones se logró varias veces que el señor Martí explanase los medios que se valía para lograr artificialmente la formación y crecimiento de las plantas acuáticas criptógamas que el denominaba trémulas y más corrientemente materia verde, y la teoría que en su concepto podía admitirse para explicar ese maravilloso fenómeno.[3]
>
> ELÍAS DE MOLINS, 1895

Another witness was Fèlix Torres Amat, a distinguished cleric and also a friend of Martí. He included Martí's biography in his extraordinary work: *Memorias para ayudar a formar un diccionario crítico de los escritores catalanes (*"Notes towards the Creation of a Critical Dictionary of Catalan Writers). He wrote:

> Estos ensayos tuvieron por objeto la producción artificial de los vegetales por la organización de la materia inorgánica; habiendo alcanzado a formar a su arbitrio varias conservas, tremolas y otras plantas celulares, teniéndose presentido haberse extendido igualmente a algunas vasculares.[4]
>
> TORRES AMAT, 1836

In one of the surviving manuscripts, Martí himself records details about the experiments he carried out on spontaneous generation. Quintana transcribed the manuscript in his work on the scientist:

> Un vaso con un excremento de palomo, y poca agua no dio gas ni mata. [materia] verde en Dbre. [diciembre] hasta el cabo de 11 días; y un frasquito tapado de medida lleno de la agua del vaso en que estuvo el excto. [excremento] por

[2] On many occasions he said that a corpse would be reduced to an earthy mass, and that this would prepare it so that all of its constituent parts, or most of them, would then form plant-like bodies which were similarly unsuitable; and that both the former and later bodies belong to the lowest rank of *Ligneus*.

[3] During these discussions there were many opportunities for Mr Martí to explain the measures he used to artificially create and grow aquatic cryptogram plants which he called *tremulas*, and more commonly, green matter, and the theory that could explain this marvellous phenomenon in his opinion.

[4] These experiments were intended to artificially create plants through the organisation of inorganic matter. He managed to intentionally create various algae, tremulae and other cellular plants, and he felt that he would also manage to create some vascular plants.

> espacio de 24 horas dio gas y mata. verde al cabo de 5 días. Dbre. 23 y 27 exp. [experimento] 3 y 7.[5]
>
> QUINTANA, 1935

That is to say, Martí was convinced that he was able to produce living organisms, «green matter» in experiments using the remains of organisms. However, he then asked himself if it would be possible to create the same process using only inorganic material. In another section of the same manuscript we can find the following reflection, which was also transcribed by Quintana:

> Así como el gas carbo. [carbónico] se descompone por la mat. [materia] verde, apropiándose esta su carbón con que se alimenta, y crece, y soltando oxígeno en gas, dicho gas carbónico con la agua pura y sin intermedio alguno, formaría mat. verde?[6]
>
> QUINTANA, 1935

Another remarkable account comes from an explanatory interview which took place in Barcelona in 1819 between Martí and a clergyman, who was a friend of his. During the interview Martí tried to resolve a series of conflicts regarding the origin of man because he felt that the results of his scientific investigations contradicted his firm religious beliefs. His worries centred on three questions: the age of the Earth, the transformation of organisms, and spontaneous generation (Camós, 2013*a*). As for the last issue, Martí explained to the clergyman that he was able to produce spontaneous generation in experiments. Torres Amat, who is very likely to have been the clergyman he spoke to, used the conversation in the biography devoted to Martí:

> Enseguida explicó el Sr. Martí a su amigo la producción artificial que él había logrado hacer dentro de botellas de agua de muchas plantas *confesvas* [*sic*], algunas de las cuales tenían ya 20, o 30 años, y presentándose con un microscopio otra partes más pequeñas.[7]
>
> TORRES AMAT, 1836

It is worth mentioning the somewhat surprising answer of the cleric, especially in view of the predominating attitudes of most Spanish clerics at the time. That is to say, Martí was told that his three questions were compatible with Catholicism.

THE REASONS WHY MARTÍ AND HIS DESCENDANTS REFRAINED FROM PUBLISHING HIS RESEARCH

As previously mentioned, Martí only published five papers between 1787 and 1792, when he was about 40 years old. He subsequently published no more results of his scientific investigations, although we have evidence that he continued to carry out an enormous amount of experimental work up until the age of almost eighty. Only one of his papers was published. It was entitled *Experimentos y observaciones sobre los sexos y fecundación de las plantas* ("Experiments and Observations Regarding the Sexes and Fertilization of Plants"), and refuted the thesis on plant reproduction put forward by the Italian Catholic cleric Lazzaro Spallanzani, who was himself a staunch opponent of spontaneous generation.

Although Martí's insecurity and shyness partially explain why he refused to publish his work, the main factor deterring him was his fear of contradicting his firm Catholic beliefs and being accused of heresy. This idea is strongly outlined by Torres Amat is his biography of Martí: «[…] *fué el temor de que muchos, más por ignorancia que por malicia, se levantarían contra él. Y quizás le acusarían de hereje o impío*.»[8]

Even after the aforementioned interview, in which the clergyman assured him that his scientific approaches did not go against religion, Martí continued to reject the idea of publishing any of his findings. Some of his contemporaries who were aware of the value of his scientific work, such as Torres Amat himself, persistently tried to encourage Martí to publish his findings, but they did so unsuccessfully. Up until his death, Martí refused to publish. Amongst Martí's contemporaries there is one who stands out, who can be considered his disciple, the naturalist Agustí Yáñez. In the 1820 edition of his book *Lecciones de historia natural* ("Lessons in Natural History") he wrote:

> Este sabio laborioso é infatigable se está ocupando en esperiencias [*sic*] muy delicadas relativas à las plantas criptógamas; las cuales, si llegan a publicarse, no dudo que causarán mutaciones de mucha consideración en la fisiología de los vegetales.[9]
>
> YÁÑEZ, 1820

After Martí's death, the scientific community in Barcelona continued to remain aware of the scientific work carried out by the man from Altafulla. They too

[5] A glass with pigeon excrement and a little water produced neither gas nor green matter in December after being left for eleven days; and a little bottle that had contained the excrement for 24 hours which was covered over and half-filled with water produced gas and green matter after 5 days. December 23 and 27, experiments 3 and 7.

[6] Just as carbonic gas breaks down due to green matter, as the matter feeds on the gas, it grows, and produces oxygen, would the same carbonic gas form green matter if it were left in pure water with no other intervening factors?

[7] Immediately, Mr Martí began to explain to his friend how he had been able to artificially produce many different alga-like plants inside bottles filled with water, some of the plants were already 20 or 30 years old. He also explained that he could show other smaller parts with a microscope.

[8] […] there was a fear that many people would turn against him, more out of ignorance than malice. He feared that perhaps he would be accused of heresy or of being ungodly.

[9] This hardworking and untiring learned man is working on very delicate experiments relating to cryptogram plants. If this work is published, it would greatly change our considerations of plant physiology. (Yáñez, 1820).

hesitated between a desire to publish the findings of his scientific work and a fear of how the Catholic Church might respond. This happened continuously in the Royal Academy of Science and Arts of Barcelona, where Martí's ideas about spontaneous generation lived on and were used in different papers, and where on different occasions they debated publishing his work. However, ultimately they never did so. (Camós, 2013*b*).

Martí's family continued to have fears regarding his work. Soon after his death, they had his manuscripts analysed by members of religious orders and naturalist scholars, as explained by Elías de Molins (1895). According to the account of one of Martí's descendants, the prestigious naturalist Joaquim Castellarnau, Martí's library was purged once again more than a century later, probably for religious reasons. Quintana reports the following statement by Castellarnau:

> Antoni de Martí, com molts savis del seu temps, era partidari de la «Generació espontània» doctrina aquesta com és ben sabut, condemnada i combatuda per l'Ortodòxia amb el mateix aferrissament que més tard ho fou el darwinisme. ¿Pogué això influir en l'anima excessivament religiosa, d'un dels descendents i hereu universal –com aleshores era costum– perquè aquesta munió de llibres venerables no fossin conservats amb l'alta estima que mereixen?[10]
>
> QUINTANA, 1935

Almost one and a half centuries later, however, spontaneous generation was once again at the centre of controversy.

CONCLUSION

Although Martí Franquès published nothing on spontaneous generation, largely due to his fear of being accused of heresy, through the accounts of his contemporaries and some of his manuscripts, we have evidence of his stance on the subject. We know that he not only defended the existence of spontaneous generation, but that he was also convinced of his ability to control the process through experiments and produce small single-cell algal plants at will. Moreover, these small algae became increasingly complex over time, in a process of plant transformation similar to the approaches defended in France by Martí's contemporary, Jean-Baptiste Lamarck. If a complete transcription is ever made of the 3,000 surviving manuscript pages providing details of the experimental work of the latter years of Martí's scientific career, we will have a better understanding of his experiments and ideas regarding spontaneous generation and transformism.

Luis Fernández García

Martí Franquès was convinced of his ability to control spontaneous generation using experiments and produce small unicellular algae. Moreover, these small algae grew into increasingly complex plants over the course of time, due to a transformation process which was similar to the approach being defended in France by his contemporary Jean-Baptiste Lamarck. The image shows a statue dedicated to Lamarck in the Jardin des Plantes in Paris.

[10] Antoni de Martí, like many scholars of the time, was a supporter of «Spontaneous generation», a doctrine which, as it is well known, was condemned and fought by the Orthodoxy with the same fury that would later be unleashed on Darwinism. Could this have influenced the excessively religious soul of one of his descendants and universal heir – as was then the custom – in such a way that these venerable books were not preserved with the respect they deserved?

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