

Historical Vignette

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Salvatore Calandruccio, Sicilian parasitologist: a story we never wanted to tell.

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Abstract

Salvatore Calandruccio was born on Christmas Day 1858 in Taormina to a family of humble origins. The family's financial straits did not allow him to continue his studies and so he decided to work as a teacher. For ten years, he worked in this profession; however, the flame of knowledge that burned within him had not dimmed in the slightest and so he decided to continue his studies and first took a degree in Medicine (1888) and then one in Natural Sciences (1891) at the Royal University of Catania. He conducted studies with Giovanni Battista Grassi that were relevant to the progress of parasitology. Grassi published under his own name the results of joint research carried out on the relationship between malaria and mosquitoes, for which he received awards including the Darwin Medal in 1896. Salvatore Calandruccio's contribution, who appealed against the non-recognition, was only recognised after his death from nephritis, contracted while conducting sampling for the study on Murenoids.

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Introduction

On 19 January 2023, the full-genome of *Ixodes scapularis*, a tick, a microscopic insect that, when you think about it, is little bigger than a lentil, was published in *Nature*. When the patriarchs of parasitology began to explore and conduct research on these pathogens of humans and animals I common microscope was in its infancy. Molecular biology revolutionised the world, Kary Mullis, an incredible visionary was a modern Prometheus who gave the 'new fire' to mankind; however, what has not changed and has remained unchanged is the passion for research that women and men of science carry within them. A burning fire that drives every researcher to go further, to pursue paths that their predecessors did not even have the courage to imagine.

The urgency not only of knowing but above all of doing, of discovering. Leonardo Da Vinci himself said '*I was impressed by the urgency of doing. To know is not enough; we must apply. Being well disposed is not enough; we must do*'.

And it is the same fire that burned in the veins of a famous parasitologist, Salvatore Calandruccio, whose name should rightfully be counted among those of the most generous sons of beautiful Sicily, but who has nevertheless been unjustly condemned to an oblivion of forgetfulness. Going through his writings, one seems to perceive the feverish anxiety, the constant nagging in an almost desperate

attempt to achieve his goals as quickly as possible, without waiting for lengthy experiments in the laboratory or on animals.

This eagerness to experiment directly on mankind Calandruccio performs it on himself and in truth also on his beloved and only daughter Maria and on some collaborators, but always testing on himself out of an intimate sense of conscience so as not to expose his collaborators to serious risks. This is the story of Salvatore Calandruccio, an experimenter on himself who gave everything, even his own life, for the love of science. Salvatore Calandruccio's is a story we never wanted to tell, or rather it is a story we would have liked to tell with a different ending. Calandruccio's life, despite the intimate joy that certainly pervaded him in his research, as we read in his writings, was certainly troubled and full of bitter disappointments that made him unhappy and led him to progressive isolation. It was, in fact, his own research that led him into a state of serious infirmity and to the premature end of his existence.

His very short career, less than two decades, was nevertheless very intense and for the scientific depth of his research and his contribution to knowledge, Calandruccio's name must be included in the Olympus of great parasitologists.

The beginnings of his career

Salvatore Calandruccio was born on Christmas Day 1858 in Taormina to a family of humble origins; from childhood, he was distinguished by his docile character, empathetic spirit and remarkable intellect. He took his primary school teacher's licence. The family's financial straits do not allow him to continue his studies and so he decides to work as a teacher. For ten years he worked in this profession; however, the flame of knowledge that burned within him had not dimmed in the slightest and so he decided to continue his studies and first took a degree in Medicine (1888) and then in Natural Sciences (1891) at the Royal University of Catania.

Already as a student, Calandruccio distinguished himself for his efforts during the cholera epidemic in Palermo in 1885; on this occasion he experimentally demonstrated the transport of vibrio by means of common flies and the effectiveness of laudanum in the initial forms of the disease. In 1887, he went to epidemic outbreaks of malaria in Catania and Messina and was awarded the silver medal for his efforts as a well-deserving public health worker. In the same year he joined the prestigious Gioena Academy of Natural Sciences in Catania; in 1890 he became a member of the Entomological Society and the Italian Zoological Society. In 1896, he was awarded a lectureship in Zoology and Comparative Anatomy at the Royal University of Catania, where in 1884, while still a student, he had been appointed Provisional Assistant to Professor Giovanni Battista Grassi, an emeritus luminary who had just returned from Germany and was appointed Chair at only 29 years of age (Grassi was only one year older than Calandruccio).

The collaboration with Giovanni Battista Grassi

Prof. Grassi was known to most people as much for his brilliant scientific insights as for his gruff and irascible character. In fact, in spite of his young age Grassi had already collected several scientific diatribes, often using very harsh terms, with internationally renowned scientists such as Ross, regarding the priority of the discovery of malaria transmission (research that won Ross the Nobel Prize), Koch on malaria, with Perroncito on *Strongyloides stercoralis* and with other colleagues and former collaborators such as Corrado Parona, Berlese, Celli, Bastianelli and Bignami.

Immediately, given Calandruccio's submissive and calm spirit, his brilliant intuitions, respect for hierarchies and extreme dedication to work, a relationship of sincere friendship and mutual esteem was established between him and Grassi. Prof. Grassi became a true patron of Calandruccio's so much so that he wrote to his pupil on 14 March 1892: *-You know how much I love you, how much I esteem your genius, your iron will and the goodness of your character, and you can be sure that if I am writing these things to you it is because no one wants to see your career crowned with the appointment as Professor of the University, my successor, more than I do.* - These words certainly might have seemed the prelude to a brilliant career, yet they were instead the prologue to the first great disappointment and the first crack in the relationship between Master and Pupil.

In fact, in the same missive, Grassi asked to be included in a collaboration on Calandruccio's initial studies on Murenoids, which was welcomed, only to turn into outright intellectual piracy on Grassi's part, as we shall see below.

Nonetheless, the relationship between the two had partially soured following the important discovery of *Koenenia mirabilis*, a tiny arthropod found under stones in the lava soils on the slopes of Etna, probably found by Calandruccio and brought by him to Grassi. Together they classified it as not only belonging to a new genus and species, but also as the sole representative of a new family and order, an exceptional occurrence in the field of entomology. Prof. Grassi first published the discovery in collaboration, indicating Calandruccio in brackets as '*Sicilian naturalist*', but immediately afterwards published it again in two more prestigious journals with the same text as the first work but removing two words in the title and definitively dropping Calandruccio's name.

The Grassi - Calandruccio Controversy: who is right and who is wrong?

The idyllic relationship between the two was by now compromised, and Calandruccio, deeply embittered by this 'forgetfulness' resigned his position as Provisional Assistant; however, the collaboration between the two continued, especially with regard to the study on the development of Murenoids. In 1893, in a moment of great discouragement due to his poor health and the bad relationship with his wife, he wrote a heartfelt letter to his teacher asking for help in finding a

position as a concierge doctor as he was tired and disillusioned with academic life. However, this prayer went unheard and in 1895, following Grassi's move to Rome, Calandruccio succeeded him to the chair at the Royal University of Catania. By 1895, eight Preliminary Notes on the Study of Murenoids had already been published.

Grassi at this point decided to publish a Summary Note in English under his own name, making Calandruccio's role in the studies disappear; this was a great success and the Royal Society of London awarded Grassi the Darwin Prize (a gold medal and eighty pounds, a very respectable sum for the time) until then given to prestigious scholars such as Huxley and Wallace. Calandruccio is furious, his mild disposition disappears and makes way for the deepest frustration; he accuses Grassi of intellectual piracy: he has despoiled him of his scientific discoveries: Calandruccio wants to take Grassi to court. The master, for his part, felt offended by his pupil's 'pretensions' and a venomous exchange of letters and telegrams took place between the two, in which Grassi described his pupil as an ungrateful arrogant. Meanwhile, Calandruccio contacts Sir Ross, Nobel Prize winner for research on Malaria (deeply disputed by Grassi), who agrees with him and advises him to appeal to the Royal Society. The Royal Society, however, gives an ambiguous reply, understanding Calandruccio's motives, but asserting that the conditions do not exist for rediscussing the prize awarded to Grassi.

Grassi disdainfully refuses to continue the controversy. The break between the two is final, although one needs the other to finish their last collaboration on Murenoids; Grassi needs samples that only Calandruccio can provide, and Calandruccio needs Grassi's scientific rigour. In silent letters they conclude their study.

In 1898 and 1899, Calandruccio entered competitions for professorships in Parma and Naples, and in 1900 in Messina; he failed in all of them and his publications were evaluated very badly. Grassi was present in all the commissions that judged him, and with the support of Professor Emery, one of the greatest luminaries of science at the time, he succeeded in casting Calandruccio and his work in a bad light. In fact, Emery himself, in one of his zoological compendiums, had deliberately omitted Calandruccio's contribution to the research conducted by Grassi with this one. Angered, Calandruccio published a pamphlet denigrating Emery's work, highlighting gross inaccuracies in the studies conducted by the latter, and finally attacked Grassi himself by publishing three Notes against the Master at his own expense. Deeply annoyed, Grassi in turn published furious letters against his pupil, accusing him of mediocrity and lack of scientific consistency. Calandruccio, deeply embittered and feeling abandoned, put a revolver in his pocket and took the ferry from Messina to Rome to confront Grassi, who was nowhere to be found. Calandruccio, still furious, decides to go to a Roman printer and immediately publish the pamphlet "Unicuiquesuum, prof G.B

Grassi" at his own expense, taking inspiration from Cicero as if to say "to each his own", i.e. he wants to give Grassi "what he deserves".

In this pamphlet, Calandruccio also reports the harsh judgements on Grassi by Robert Koch, Sir Ross and Laveran, with whom Grassi was in open dispute. Grassi's response was not long in coming, accusing Calandruccio of poor intellect, calling him a mere executor of his detailed orders, and pointing out his profound ignorance of languages, particularly English and German.

Calandruccio deeply embittered and pilloried by the scientific world of the time, Emery did not forgive him for the pamphlet on his studies, deciding to end his precocious career and retire to private life in one of his properties in Fiumefreddo di Sicilia where shortly afterwards, due to the disappointments and precarious state of health caused by his research, he died at the age of only fifty.

The sad epilogue

Calandruccio, precisely to give temporary reprieve to his eagerness to know and his urgency to do, and not to wait for the long laboratory experiments, often conducted experiments on himself, as mentioned above. By the middle of the 19th century, many famous scientists had conducted experiments on volunteers such as Grassi himself, Perroncito, Marchiafava, the great Leuckart, Kuchenmeister and Loss, but very few had conducted experiments endangering their own health; still very few could say that they had conducted only half of Calandruccio's vast range of self-infections.

A paradigmatic case is that of the studies on Malaria. In fact, Calandruccio, scornful of danger and heedless of his own health to comply with his master's studies, on 1 December 1890 inoculated himself with a gram of blood from a subject suffering from quartana in the under-skin, developing symptoms of quartana after eighteen days and showing *Plasmodium malaria* in the blood. After treating the fever as best he could with quinine he had a relapse and then after another three months two more. With this first experiment, on the one hand he confirmed the transmission of malaria from human to human and that quartan fever always remains quartan and that the relevant parasite is therefore a separate species, and on the other hand, by repeating this experiment four more times with different plasmids, he seriously compromised his own health.

Lastly, ironically, Calandruccio fell seriously ill, having contracted nephritis as a result of the physical exertion he underwent while conducting sampling for the study on Murenoids, the study that later led to his break with Prof. Grassi, recovering on stormy nights the deep-sea specimens stranded on the shoreline before the seagulls at sunrise could devour them. In fact, confiding in his teacher on 15 December 1896, he wrote: '*one stormy day in Messina I had to walk the shore to Torre Faro where I first found the Leptocephalus brevis in the process of transformation.*

Drenched in water and all battered, I soon came back with acute nephritis and related haematuria'.

It was the worsening of this acute nephritis that led Calandruccio to surrender and abandon his academic career and go into voluntary exile.

At the Fiumefreddo di Sicilia estate, the scientific vein, the anxiety that had always driven him to investigate the arcana of science, faded and died, just as his life died on 31 March 1908. This is the ending we never wanted to write.

Conclusion

This is the sad story of Salvatore Calandruccio, Sicilian parasitologist, experimenter on himself unjustly condemned to an oblivion of forgetfulness. More than one hundred years after his untimely death, we believe it is necessary to rehabilitate the figure of this illustrious master parasitologist and keep alive the memory of Salvatore Calandruccio and his sad existence torn between his urgency to know and do and an oblivion to which he was unjustly condemned.

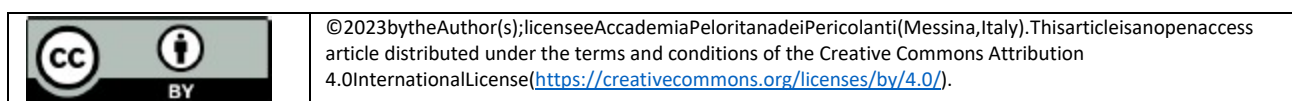
Ethical disclosures

The authors declare that this article is original, unpublished and not simultaneously submitted to other journals. The authors guarantee the veracity of the data presented in the paper and the objectivity of their interpretations.

The authors declare the absence of conflicts of interest.

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