

Mosquitoes, Sir Ronald Ross and Sir Themistocles Zammit

by Paul Cassar, MD

THE feature on *Ronald Ross and Mosquito Day* describing the discovery of the transmission of malaria to man by the *Anopheles* mosquito (*The Sunday Times*, August 14) evokes the links of Sir Ronald Ross (1857-1932) with Malta and with the Maltese research worker Sir Themistocles Zammit (1864-1935).

Ronald Ross entered the Indian Medical Service in 1881 — a circumstance that brought him face to face with the misery and mortality occasioned by malaria in India. Although the French Army Surgeon, Alphonse Laveran (1845-1922) had made the all-important discovery of the Malaria parasite in human blood in, 1880 the mode of transmission of the parasite to man was still a mystery.

In 1888 Ross decided to leave India and proceed to London to follow a course in preventive medicine and train himself in the new science of bacteriology (1). On his way to England he called at Malta in early July of that year after touching at Port Said. In his autobiography he expresses his great relief at leaving the tropics and entering the Mediterranean in these words: — "Then we arrived at Malta — Europe! And I remember my delight at seeing the live (sic) Maltese in the boats and streets, and the women and children with ruddy cheeks".

He spent only "two or three days" in our island but he made the most of his very brief visit and enjoyed every minute of it. "At Malta", he wrote enthusiastically, "I woke up as one from death; the comparatively cool nights, though it was early July, revived me. The old palaces, the houses, the thronged streets, the fine cathedral (the first Italian (sic) one I had seen), the catacombs and other sights were a revelation. I had arrived at civilisation from savagery" (2).

MEDITERRANEAN FEVER

He was again in Malta — this time for a far more fleeting call in 1895, while he was on his way back to India, on the Peninsular and Oriental Steamer *Ballaarat*. He arrived on April 5 at 7 a.m. and left at 3 p.m. the same day — but not before rushing to the Civil Hospital, then at Floriana, and to the British Naval Hospital on the Bichi promontory. Here he ex-

amined the blood of three feverish patients but found that they were not malaria cases. They were, in fact, suffering from Mediterranean Fever as Brucellosis or Undulant Fever was then called. At the time, this disease was being studied, among others, by Captain M. Louis Hughes (1867-99) of the British Army Medical Service with whom Ross had a very brief meeting and whom he describes as being "a very nice and clever man". Hughes gave Ross a "French tract", written by himself, about this fever. Ross does not give the name of this "tract". I presume that it was the article with the title of *Sur une forme de fièvre fréquente sur les cotes de la Méditerranée* which Hughes had published in the *Annales de l'Institut Pasteur* some time earlier (3). Hughes subsequently published an extensive monograph on this fever in 1897 (4).

Ross may have visited Malta on other occasions in later years as he was in the Mediterranean in 1896 and in 1913 when he travelled from Spain to Alexandria en route to Cyprus and again during the First World War (5) when he was torpedoed close to the Gulf of Corinth in 1917 (6).

Ross makes no mention of meeting Dr. (later Sir) Themistocles Zammit in his autobiography but there is no doubt that the two research workers were acquainted with each other and that there was an exchange of correspondence between them. At the close of the nineteenth century it was not yet known how the germ of Mediterranean Fever invaded the human body. Some blamed the insanitary state of the Grand Harbour which received the sewage of Valetta and the Three Cities; others thought that the disease was propagated through the air which became polluted from the allegedly contaminated soil turned up for laying down drains or the foundations of new buildings. A mosquito-theory was also advanced and gained eager supporters among whom was Zammit (7).

"ENCOURAGING RAMARKS"

In a manuscript letter written to Ross from *The Laboratory, Public Health Department, Malta*, on July 19, 1902, Zammit thanked Ross for the latter's letter of July 1, and for the "encouraging remarks" regarding a paper which Zammit had written and which, presumably, he had sent to Ross. Zammit does not mention the title of this paper but very likely it was the text of his lecture on *Mediterranean Fever from a Sanitary Point of View* which he had delivered to the Malta Archaeological and Scientific Society on May 23 1902. In this paper Zammit discussed the distinguishing features between malarial fever and Mediterranean Fever and expressed his belief that, as in the case of malaria, Mediterranean Fever was an "insect-borne disease" and spread through the agency of mosquitoes (8).

Zammit's interest in the mosquito as a possible carrier of the germ of Undulant Fever to man, led him to take advantage of Ross's kindness to ask him to identify the species of a number of mosquitoes which he had caught — one in his bedroom and the rest from the sea-shore when they were found to be breeding freely in the salt pans. He also sent him some larvae and pupae of mosquitoes, preserved in formalin and alcohol, obtained from the neighbourhood of houses where several cases of Mediterranean Fever had occurred. It was his intention to send Ross further mounted specimens (9) but we are left in the dark as to whether this line of investigation was kept up.

However that may be, Zammit's interest in this insect stood him in very good stead in 1904 in a different but more fruitful direction. In August of that year, together with Dr. Giuseppe Caruana Scicluna, he investigated the occurrence of an epidemic of malaria at

Wied-il-Qligha near Chadwick Lake. He found that the parasite of malaria had been carried to persons living in that area by the mosquito *Anopheles maculipennis* from British soldiers suffering from the disease who had come to Malta from Crete, then a malarious country, and who were lodged at nearby Mtarfa (10).

Zammit's concern with the mosquito as a carrier of Mediterranean Fever had not waned by 1904 when he was still endeavouring to support his mosquito-theory of the transmission of the fever by means of an experiment in which he succeeded in infecting a monkey with the disease by means of the bite of a mosquito (*Stegomyia fasciata*) which had previously fed on a man suffering from Mediterranean Fever (11). Zammit, however, does not seem to have repeated this experiment so that there was no conclusive proof of the mosquito's role in the spread of the disease. In fact other members of the Commission for the Investigation of Mediterranean Fever admitted in 1906 that in none of the cases examined in that year (the last year of the work of the Commission) could they obtain "any evidence of the spread of Mediterranean Fever through the agency of mosquitoes or other biting" insects (12).

BROTHER'S LETTER

The name of Zammit again crops up in connection with Ross in a letter of July 8, 1904 written on a *Union Club*, Malta, note paper from *HMS Lancaster, Mediterranean Fleet* by Ronald's youngest brother Edward Halford Ross MRCS, LRCP. Edward was a surgeon in the British Royal Navy from about 1901 to about 1907. He was involved in an anti-malarial campaign in Port Said in 1906 and acted as assistant to Ronald at the Liverpool School of Tropical Medicine in 1911 (13). In this letter Edward told Ronald: — "I have been to see Dr. Zammit here and gave him your compliments. He was very pleased". Edward continued to say that Zammit had offered him "a place in his laboratory" which he could not accept as the fleet was on the point of leaving the island for a three months cruise of the Levant. The "place" referred to seems to have been a post as member of the Mediterranean Fever Commission which was set up jointly in that year by the Royal Society of London, the British War Office and Admiralty

and the Government of Malta for the investigation of that fever in the island. Edward was keen to obtain such a post as the Admiralty representative. He reckoned that, besides himself, there were only two other service doctors who had shown an interest in bacteriological work (14). Things, however, did not turn up as Edward had hoped for the naval member chosen to serve on the Commission was Staff Surgeon E.A. Shaw R.N. (15). In spite of this setback Edward's link with Zammit had not flagged by 1906 when he wrote a paper *On the Habits of the Marine Mosquito (Acartomyia Zammitii)* — a species of mosquito named after Zammit and which had "only comparatively recently been recognised as a distinct entity, being formerly regarded as a common *Culex*" (16). But by then Zammit's concern with mosquitoes as possible carriers of Mediterranean Fever had waned as in 1905 he had noted the occurrence of the natural infection of goats with the germ of the disease and in June of that year, working as a member of the Commission, he proved conclusively that the goat was the reservoir of the germ of Mediterranean Fever, now known as *Brucellosis*, and that the microbe of the disease was conveyed to man by drinking infected goats' milk — a discovery which Ronald Ross qualified as a "great piece of work" (17).

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