

## How did Sir David Bruce forget Zammit and his Goats?

H. Vivian Wyatt

*Honorary Lecturer in Philosophy*

*School of Philosophy, University of Leeds, England*

### Abstract

*I have no competing interests – only an interest in Sir Themistocles Zammit, scientist, doctor, professor of Chemistry, vice chancellor of Malta University, archaeologist, founder of the Malta Museum of Archaeology, member of the Governors' Council, writer of childrens' stories in Maltese.*

*Zammit's experiments showed that Brucellosis was transmitted by goats' milk yet there is a RAMC tradition that this was the work of Sir David Bruce. Bruce himself ascribed it to the work of the Mediterranean Fever Commission without mentioning Zammit. Bruce's obituary in *The Times* continued this tradition and is the source of other biographies. Other writers from outside the RAMC rightly credit Zammit. Did Bruce forget Zammit or did he magnify the work of the RAMC and his own work?*

In 1904 David Bruce was a hero of the siege of Ladysmith, a Fellow of the Royal Society and a notable bacteriologist. In the years that followed, he attained a reputation as the doctor who not only discovered the bacterium that caused Brucellosis, but also found that the disease was transmitted by the milk of goats. Yet the real discoverer of the transmission was a Maltese doctor, Sir Themistocles Zammit. How did the legend that Bruce was the discoverer come about ?

The reputation of army doctors was at an all-time low as the war in South Africa revealed terrible inefficiencies and the deaths of Boer women and children and their native servants in the 'concentration camps'.

'Returning home in January 1901 [Col.] Keogh was met by an avalanche of criticism directed at the RAMC as the shock waves of the Romer Commission rippled through the medical profession. Many civilian practitioners considered the Royal Army Medical Corps (RAMC) a disgrace, unfit to attend to the medical needs of the Army. The cynics, distracters and those who continually dug up the past denounced the RAMC in a savage campaign of humiliation. The public image of an RAMC officer was of inferior knowledge and lacking industry and capacity.'<sup>1</sup> Keogh was appointed Surgeon-General and chairman of the new Advisory Board in December 1901. He soon appointed Majors Bruce and Horrocks as sanitary specialists. Keogh initiated radical reforms which established the RAMC as an efficient medical corps. I believe that Bruce too had a passionate wish to change the reputation of the RAMC by scientific research.

Bruce will always be remembered for his discovery in 1887 of the organism which caused Mediterranean or Malta Fever (*Brucellosis*). In 1894 he was posted to Natal and began his studies on nagana, but in the Boer War he and his wife were besieged in Ladysmith where they managed the hospital between the opposing lines. At the end of the war, he returned to Britain and had various investigations for the War Office, but he returned time and again to the transmission of Mediterranean Fever.

### Colonel David Bruce

In January 1904 Bruce became editor of the *Journal of the Royal Army Medical Corps (JRAMC)* for Volume two in which he wrote three editorials on Mediterranean Fever.<sup>2</sup> He persuaded the Royal

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<sup>1</sup> S.V. Thompson, 'Sir Alfred Keogh – the years of reform 1899-1910', *Journal of the Royal Army Medical Corps* [hereafter *JRAMC.*], 2008, 154: 269-272.

<sup>2</sup> D. Bruce [Editorials], *JRAMC.*, 1904, 2 (Pt I), 485-502; (Pt II), 603-605, 731-736.

Society, of which he was a Fellow, to establish the Mediterranean Fever Commission (MFC), funded by the Treasury. It was probably a great victory to prise the Commission out of the British Treasury, for it meant spending money. By seconding existing staff who would need only fares, allowances and equipment, the Commission could be funded on the cheap. There was, however, a price to pay for Bruce could only suggest, not pick his investigators. Moreover, the navy and army members would live and mess at different places and there might be rivalries. Bruce would only visit Malta each year, but the leader there would be Major Horrocks with whom Bruce was on very friendly terms.

On pages 487-488 of the same volume, he repeated –without citing its origin –, in Zammit's analysis of incidence for villages and towns in Malta and included the map which he later reproduced in his *1908 Medical Defence Society (RDS)* pamphlet.<sup>3</sup> Bruce, however, put Gharghur on the west of the island, whereas it is on the north. On page 501<sup>4</sup> he wrote that: 'Theobald thinks the mosquito *Acartomyia Zammitri* (Theobald) is the carrier although Zammit says he has not been able to induce the disease in monkeys by feeding them on micrococci.' He also reported that Zammit had grown a culture from a culture itself seven months old. He concluded: 'One thing appears perfectly clear, at least to our mind, and that is that no stone should be left unturned, no amount of labour thought too much, to enable us to gain knowledge of the natural history of Malta Fever...'<sup>5</sup> As editor, he filled the *JRAMC* with articles about Malta Fever.

As an FRS, Bruce was able to communicate papers to the *Proceedings of the Royal Society*, which he did for the papers by Zammit and Horrocks. He was chairman of the Sub-Committee of the Tropical Diseases Committee of the Royal Society and also chairman of the MFC. With the exception of the naval officer Shaw, all communications from the members of the MFC were passed to him, but the papers for the *Reports* were edited by the Secretary of the Royal (see above). Bruce used his position as editor to reprint many of the papers in the *JRAMC*. Captain Kennedy wrote a light-hearted paper in the *JRAMC* in 1907 in which he stated:

*Hints have been dropped from more than one quarter that the Reports of the MFC were too Deeply scientific to appear as full reprints in our Journal... some little bits of humour which might, to some extent, counterbalance the depressing effect which these reprints appear to have had.*<sup>6</sup>

### **The RAMC legend of Bruce and the disappearance of Zammit**

Bruce's publications emphasised the achievements of the RAMC members of the MFC, but omitted those of Zammit and Shaw, although references to Zammit's work were critical and unnecessary (see below). Within the RAMC, Bruce was credited with thinking that goats were involved in the transmission of the disease and also that he discovered the role of goats' milk. Those outside the RAMC, however, have recognised Zammit's contributions.

Curiously, Zammit's 1906 paper in the *JRAMC* was not indexed under Mediterranean Fever or Malta Fever (other papers from the MFC were indexed under both headings), although indexed under 'Zammit. T.' In a long editorial in the *JRAMC*,<sup>7</sup> Bruce reviewed the work of the Commission. His only references to Zammit's work were critical and omitted his momentous discovery: 'It is unnecessary to describe the various steps which lead up to the important discovery that, roughly speaking, 50 per cent of the goats in Malta are affected by this disease...'<sup>8</sup> and 'When the astonishing discovery was first made that goats could be affected by Malta Fever and act as a reservoir of the virus and that they were frequently excreting it in their milk...' Besides some early workers, he gives

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<sup>3</sup> D. Bruce, *The extinction of Malta Fever (A lesson on the use of animal experiment)* (Medical Defence Society, 1908).

<sup>4</sup> *Ibid.*, 501.

<sup>5</sup> Bruce, [editorials], *JRAMC.*, 1904.

<sup>6</sup> J.C. Kennedy, 'A little humour from the Malta Fever Commission,' *JRAMC.*, 1907, 9, 594-598.

<sup>7</sup> D. Bruce, 'Editorial: Malta Fever,' *JRAMC.*, 1906, 6, 330-352.

<sup>8</sup> *Ibid.*, 332.

93 mentions to members of the Commission (see Table).<sup>9</sup> Zammit's discoveries which led to the virtual elimination of the disease in the armed forces are not acknowledged and the four named references to his work are all negative (see Table).

- 1 'Zammit in 54 per cent'
- 2 '... reports by Wright and Zammit in which they stated that they had failed to induce the disease by feeding experiments' - followed by a Table which showed that monkeys could be infected in this way!<sup>10</sup>
- 3 'Zammit brought forward a case in which he claimed to have infected a monkey by feeding *S. fasciata* on it after they had fed on a Malta fever patient.'<sup>11</sup>
- 4 'Zammit repeated his former experiment twice.' - the experiments were negative.<sup>12</sup>

In a lecture given in 1907 Bruce mentioned by name two early Army doctors and five members of the Malta Fever Commission, but not Zammit.<sup>13</sup> The original members of the MFC were aided by others in 1906 and only Kennedy, Shaw and Zammit were long serving members. In a twenty page pamphlet, he mentioned no member of the Commission by name.<sup>14</sup>

The obituary of Sir David Bruce in *The Times* contained the following:

*It was intuition rather than research which led Bruce to his first grand discovery. A prolonged investigation into the cause of Malta fever had failed to disclose that cause, and Bruce, who was conducting the work, began to despair of success, when, one day, he was shown a series of charts relating to possible sources of infection. Goat's milk was included among the sources. His quick mind seized upon this possibility, and he began at once to test the idea. Within the space of a few years he had discovered the *Micrococcus Melitensis* and had succeeded in showing that this organism was the source of "Malta", "Rock", or "Mediterranean" fever, and that it was transmitted by the milk of goats. Further he was able to cultivate the organism outside the human body. His discovery, which has never been challenged, has enabled a peculiarly troublesome disease to be controlled, and even in many areas to be stamped out.... This early triumph brought Bruce a wide fame and secured for him the scientific career which he so ardently desired.*<sup>15</sup>

It was an astonishing account of Bruce's work to have come from any source, but all the more so as the typescript of it is in the RAMC archives in the Wellcome Collection.<sup>16</sup> Colonel Vassallo believes that the obituary 'was penned by Horrocks',<sup>17</sup> but I find this difficult to believe and I would think that Horrocks instead wrote the obituary in the *JRAMC*.<sup>18</sup> In 1905, Bruce and Horrocks were against Zammit continuing his experiments with goats (Shaw remained silent) and only reluctantly allowed him to continue with six goats. Horrocks then wrote to Bruce claiming that he (Horrocks) had shown the goats were positive for brucellosis, to be contradicted by a letter from Shaw saying that Zammit had done the experiment.<sup>19</sup> Knowing this background, it seems unlikely that Horrocks wrote that Bruce had made the discovery.

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<sup>9</sup> Ibid., 347.

<sup>10</sup> Ibid., 346.

<sup>11</sup> Ibid., 349.

<sup>12</sup> Ibid., 350.

<sup>13</sup> D. Bruce, 'Recent researches into the epidemiology of Malta Fever.' *JRAMC.*, 1907, 8, 225-235.

<sup>14</sup> Bruce, *The extinction of Malta Fever*.

<sup>15</sup> [Anon.], 'Obituary,' *The Times*, 28 November 1931.

<sup>16</sup> [Anon.], 'Obituary of Bruce,' [Box 261 RAMC 1174, Wellcome Library], London.

<sup>17</sup> D.J. Vassallo, 'The Corps disease: Brucellosis and its historical association with the Royal Army Medical Corps.' *JRAMC.*, 1992, 138, 140-150.

<sup>18</sup> [Anon.], 'Obituary,' *JRAMC.*, 1932, 63, 1-4.

<sup>19</sup> H.V. Wyatt, 'How Themistocles Zammit found that Malta Fever (Brucellosis) to be transmitted by the milk of goats,' *Journal of the Royal Society of Medicine*, 2005, 98, 451-454.

This obituary from *The Times* was reprinted in *The Malta Chronicle and Imperial Services Gazette* on 4<sup>th</sup> December 1931 on page eighteen and drew a letter from Zammit's colleague, Professor J.E. Debono, later the Chief Government Medical Officer, who put the record straight.<sup>20</sup>

Within the RAMC, the legend of the 'Malta Fever' misses out Zammit's part. In a 'Foreword' to a centenary celebration of Bruce's birth, Lieutenant-General Sir Frederick Harris DGAMS wrote: 'Between the years 1884 and 1905 he [Bruce] discovered the causal organism (*Brucella melitensis*) of the so-called Malta fever: proved that this causal organism was carried in the milk of goats.'<sup>21</sup> In the same symposium, Professor Tulloch wrote:

*Although goats had been suspected by Bruce to play some part in the transmission of the disease, the work of the Commission proceeded but slowly at the onset, mainly because attempts to infect these animals seemed to fail.*<sup>22</sup>

Tulloch then quotes Zammit's experiments of May 1905 [sic] and goes on about the need to find the tissues with the organism: 'In this Bruce's breadth of view as a biologist proved as valuable as did his drive in prosecuting the investigation'. This is fantasy. Bruce and Horrocks were not in Malta when Zammit was infecting his goats from September to May. When they returned and Zammit told them of his experiments, they both tried to stop any further work with goats. Shaw was silent and we do not know if Kennedy was there. Zammit, however, persuaded them to allow him to buy six more goats – five of which were positive for brucellosis.<sup>23</sup>

A more recent history of the RAMC gives this account of Bruce: 'there [Malta] he unravelled the puzzle of the common factor in the spread of Malta Fever, which proved to be goats' milk.'<sup>24</sup> The book is one of a series Famous Regiments under the general editorship of the then Lt. Gen. Sir B. Horrocks who was the son of Major Horrocks of the Commission. McLaughlin continued: 'Colonel Sir William Horrocks.... who finally confirmed Sir David Bruce's hypothesis that the goat was the culprit in spreading Malta Fever.' Thus, there appears to be a RAMC tradition which almost ignores the part played by Zammit, and of course Shaw of the Royal Navy.<sup>25</sup> However, Colonel E.E. Vella RAMC, himself a distinguished Maltese doctor, in a sympathetic appreciation of Bruce, rightly credited Zammit and his contributions.<sup>26</sup>

### **The *Times* obituary as a source for biographies**

Recently, a biography of Bruce says: '[...malta fever commission (sic)]. It identified the source of infection in Malta fever as the goat, transmission occurring when contaminated milk was consumed.' The *Times* is noted a source for this biography.<sup>27</sup> I have written to the *DNB* suggesting that Zammit be given credit for his work. More recently, the London School of Hygiene and Tropical Medicine published a booklet of the biographies of the 26 pioneers featured around the parapet of the building. Bruce is given the credit for Zammit's work as per *The Times*. I have presented a petition signed by more than a hundred Maltese doctors etc, but the School has declined to alter the biography or to include a correction slip. The School has said they will alter the inter-net account.

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<sup>20</sup> J.E. Debono, 'Sir David Bruce and Undulant Fever,' *The Malta Chronicle and Imperial Services Gazette*, 7 December 1931.

<sup>21</sup> F. Harris F., 'Foreword,' *JRAMC.*, 1955, 101, 79-80.

<sup>22</sup> W.J. Tulloch, 'Sir David Bruce. An appreciation,' *JRAMC.*, 1955, 101, 81-90.

<sup>23</sup> H.V. Wyatt, 'How Themistocles Zammit found that Malta Fever (Brucellosis)'.

<sup>24</sup> R. McLaughlin, *The Royal Army Medical Corps. Famous Regiments series* (Leo Cooper, 1972), 32.

<sup>25</sup> H.V. Wyatt, 'Royal Navy surgeons and the transmission of Brucellosis by goats' milk,' *Journal Royal Navy Medical Service*, 1999, 85, 112-117.

<sup>26</sup> E.E. Vella, 'Major-General Sir David Bruce, K.C.B.,' *JRAMC.*, 1973, 119, 131-144.

<sup>27</sup> 'Biography of Sir David Bruce,' *Dictionary of National Biography*, 289.

### **Other sources of Bruce's work**

How is it that the RAMC ignored Zammit, but others outside the RAMC knew who had discovered the role of goats in Malta? These legends of Bruce appear to have come from within the RAMC and possibly from the RAMC College where Bruce was Commandant. Someone who knew him in another context – the Lister Institute – wrote an account of his work including ‘the connection of Malta Fever in man with the infection in goats and its dissemination by the use of the milk of these animals was established by Zammit.’<sup>28</sup>

The obituary of Bruce in *Nature*, includes ‘After months of hard and disappointing work, Dr. Zammit, a Maltese colleague, happened to examine the blood of a goat - an animal which had been already and repeatedly immune to the disease; but now it turned out that the goat's blood agglutinated...the micrococcus - a fact which Bruce took to mean that the organism must have been living and multiplying within the apparently healthy goat.’<sup>29</sup> Obituaries in the *British Medical Journal* and the *Lancet* mention his discovery of the organism, but are ambiguous about the work of the Commission. His obituary in the *JRAMC* ascribes the discovery of the role of goats' milk to the Commission. There appears to be a different tradition in the Navy. In their monumental history of the Royal Navy, Lloyd and Coulter wrote: ‘but the most valuable contribution to the Report published in 1905 was that by Sir Themistocles Zammit of the Malta Board of Health, who showed that goats' milk was the main source of the infection.’<sup>30</sup>

### **What happened to Zammit?**

Zammit's part in the discovery of the role of the goat in Malta fever has faded. The efforts of Dr. Paul Cassar have kept Zammit's role in front of the Maltese although he is still remembered more for his archaeology. Bruce was a formidable and powerful figure whose work on Nagana and human trypanosomiasis was the stuff of legend and hero-worship. Did Bruce expect his audiences to be familiar with Zammit's part in the discoveries, so that specific mention was unnecessary? Bruce had communicated Zammit's discovery to the Royal Society. Zammit's paper must rank with Crick and Watson's as an example of brevity: Zammit's was just over 200 words long, excluding dates.<sup>31</sup>

In 1907 a retired RAMC Colonel had written a letter to *The Times* making claims for Captain Hughes to have found the bacteria in milk [Hughes was killed at Colenso in South Africa in 1899] and Horrocks to: ‘definitely tracing the goats' milk as the real cause of Mediterranean Fever.’<sup>32</sup> Bruce, who elsewhere had ignored Zammit, replied: ‘Although in my view, the credit of any discovery made by a Commission should belong to the Commission as a whole...in the interests of accuracy, it may be well to state that the actual observation which led up to this discovery was made by Dr. T. Zammit, the Maltese member of the Commission.’ Bruce continued with a precis of the parts played by Zammit and Horrocks.<sup>33</sup>

If Bruce believed that Zammit's discovery had been an accident, this diminished Zammit's part, as an accident could happen to anyone. It would also reinforce his idea of a co-operative research effort in which all should share the credit. It is interesting that the members of the Commission assumed the role of (acting) chairman in the order Bruce, Horrocks, Kennedy, Shaw then Zammit, in the reverse order of their interest in goats. But it was no accident. Temi Zammit had devised a simple test for brucellosis. He had infected and monitored a goat. He had infected a second goat. He tested his new goats to check that they were free of the disease. It was an accident that some of the goats were infected but as Pasteur had said ‘Chance favours the prepared mind.’

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<sup>28</sup> M. Robertson, ‘Sir David Bruce: an appreciation of the man and his work,’ *JRAMC.*, 1955, 101, 91-99.

<sup>29</sup> ‘Obituary of Bruce,’ *Nature*, 16 January 1932, 129, 84-86.

<sup>30</sup> C. Lloyd and J.L.S. Coulter, *Medicine and the Navy: 1200-1900, volume IV, 1815-1900* (London, 1963).

<sup>31</sup> T. Zammit, ‘A preliminary note on the susceptibility of goats to Malta Fever,’ *Proceedings Royal Society*, 1905, 76B: 377-78.

<sup>32</sup> H.C. Kirkpatrick, ‘Malta Fever,’ *The Times*, 12 September 1907.

<sup>33</sup> D. Bruce, ‘Malta Fever,’ *The Times*, 1 October 1907.

The British Army and the RAMC in particular was still recovering from the disgrace of the camps in South Africa in which Boer women and children and their Black servants had been packed. The conditions, reminiscent of the Crimea, of tents, waterlogged sites and appalling administration resulted in typhoid and measles epidemics with heavy mortality and consequences which haunt us still. The RAMC needed a scientific hero. Bruce may well have wanted all the members of the Commission to be recognised, but his towering reputation has overshadowed the work of the others, and whether he aided it or not, has absorbed their work.

From their correspondence, Bruce seems to have been on easier terms with his RAMC officers than Shaw of the RN and the civilian Zammit. His first impressions, written on his fourth day in Malta, 16 June 1904, from the Royal Hotel to Sir Archibald Geike, Secretary Royal Society: 'I don't know how Zammit and Shaw will turn out as workers, but at present "I hae ma doutts" [Bruce's emphasis].'<sup>34</sup> Yet it was these two workers who had the right ideas about goats. Did Bruce remember and regret those words to Geike?

To conclude: Is it possible that Bruce encouraged his colleagues to believe in the myth of his own researches and did nothing to disprove them? Who wrote his obituary for *The Times* and had he approved or known of it?

**Table 1: Number of times members of the MFC were quoted**

	Bruce 1906 (5)	Bruce 1907 (6)
'The writer' [Bruce]	6	
Horrocks	20	2
Kennedy	9	
Horrocks and Kennedy	20	
Shaw	14	
Johnstone	8	1
Zammit	4	
Davies, Gilmour, Bassett-Smith	2 each	
Eyre	1	
Clayton		2
McCulloch and Weir		1

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<sup>34</sup> Bruce to Geike, 1904, *Royal Society Archives*: MC 4109.

