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John Frederick Marshall and "The British Mosquitoes"

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John Frederick Marshall, C.B.E., M.A., F.L.S., F.RE.S. was one of Britain's outstanding entomologists and yet one who has received little real acclaim. Although an amateur in the true sense of the word, he founded the Hayling Mosquito Control and the British Mosquito Control Institute, became the foremost authority on British mosquitoes of his day and was invited by the British Museum (Natural History) to update Dr William Dickson Lang's Handbook of British Mosquitoes (published by the Museum in 1920). Although it began as a revision of the 1920 Handbook, *The British Mosquitoes* developed to become a totally new monograph that even today is a reference text on the mosquitoes of Britain.

John Frederick Marshall, known to his close friends as Jack, was born in London on 5 September 1874, the only child of Charles and Jennie Marshall. His father came from a wealthy family, Jack's grandfather being James Marshall, a founder member of the prestigious London department store Marshall and Snelgrove, later to become Debenhams.

Jack (John) Marshall entered Rugby School at the beginning of the summer term of 1890. In September 1893 he was admitted to King's College and achieved First Class in both Part 1 (1896) and Part 11 (1898) of the Mechanical Sciences Tripos. As a result of his studies he was awarded the degree of Bachelor of Arts in 1896 and Master of Arts in 1900.

At King's he excelled at real tennis. The game, which dates from the thirteenth century, was called real tennis to distinguish it from the outdoor game of lawn tennis. Jack Marshall won both the Cambridge University Handicap Cup in 1896 and the University Challenge Cup in 1897, and represented Cambridge in the Inter-University Matches in 1897. His tennis career continued beyond his university days and he became one of the few people in the country to own a private real tennis court. Jack Marshall also studied law and in April 1902 he was called to the Bar at the Inner Temple, London. However, he did not subsequently practice law.

Jack was eventually to meet and marry Emily Blanche Hughes, known always as Blanche. She was born in Chelsea, London on 24 December 1871. Blanche became involved with circus people and used her psychic powers to become employed as a fortune-teller. Later she set up as a successful society fortune-teller and lived in Vigo Street, London. She is said to have had a carriage and pair smarter than that of Lily Langtry. They married in 1902 and lived in a rented house in Hayling Park Road, Croydon called *Somerleyton*. It was there that Jack's only daughter, Joan, was horn on 12 April 1907.

Jack's father, Charles, died in February 1907 and his mother, Jennie died the following year. Having inherited the family fortune, Jack and Blanche decided to move to Hayling Island. They had discovered Hayling when driving to Portsmouth some time before, being curious to visit because of the similarity of the place name and their address in Croydon. They thought that the flat island with its salt marshes was the loveliest place that they had ever seen, and decided to buy land there and have a house built. So Jack purchased a six-acre site on the south coast of the Island on which there was already a small two-bedroom cottage overlooking the sea. The new house was named *Seacourt* and had a real tennis court built in its grounds. This was said to he one of the finest courts in England and explains the name given to the house.

By the summer of 1915 Jack was working in London for the Inventions Department of the Ministry of Munitions and returned to *Seacourt* only at weekends. For a brief time the Marshall's had a furnished house in Brighton so that Jack could travel home from London every night. At *Seacourt* there were now upward of a dozen officers instead of the usual guests, billeted there after a School of Musketry was established on the Island. The house was also used as a convalescence home for military personnel wounded in the war.

Later during the war Jack went to Birmingham and was involved in the design of tanks but in September 1918, as the First World War was coming to a close, he was back in London and the family moved into a maisonette in Baker Street.

The Hayling Control

Before Jack moved to Hayling Island he had no special interest in natural history, but he quickly discovered that Hayling had an enormous mosquito problem. He is reputed to have said 'Either the mosquitoes go or I go, and I refuse

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to be driven out of my own house'. At that time those living in the central residential district were not able to sit or work in their gardens in the late afternoon and evening, and spectators at outdoor events had to cover themselves in blankets to protect against mosquito bites. So, in common with the other residents of the Island, Jack Marshall began to take a great interest in these blood-feeding insects.

In August 1920, with his usual dedication and showing his powers of organisation and leadership, Jack Marshall undertook to collect information on anti-mosquito measures. In his efforts to find details of control methods he was introduced to a leading authority on mosquitoes, Frederick Edwards of the British Museum (Natural History) in London. In a letter to Jack Marshall dated 20 August 1920, Mr Edwards stated that the nuisance mosquitoes were most likely to be the salt marsh species *Ochlerotatus caspius* and *Ochlerotatus detritus*. During September and October 1920 local people collected thousands of mosquitoes from the central residential area. It was during these early surveys that Jack started his long and profitable association with John Staley. Staley was a gardener with a keen interest in natural history and in the early days he spent his Sunday afternoons with his daughter, Ivy, collecting mosquitoes and locating and mapping their breeding sites. The mosquitoes were identified using the recently published book of *British Mosquitoes* by William Dickson Lang. Apart from small numbers of *Culex pipiens* and *Theobaldia (*now *Culiseta*) *annulata*, almost all were found to be *Ochlerotatus detritus*. Pools and ditches adjacent to the residential area were examined, but it was not until the following year that larvae of *Ochlerotatus detritus* were found in accumulations of stagnant brackish water about a mile and a half from the centre of the residential district. Jack Marshall appreciated from American literature that coastal mosquitoes could fly several miles inland and so he believed that these sites were the source of the problem.

Impetus was given to the campaign when, on 8 April 1921, Frederick Edwards delivered a lantern lecture at the home of Jack Marshall about mosquitoes and their control in various parts of the world. After the lecture a general discussion took place and a provisional committee was formed to investigate the possibility of taking definite measures to alleviate the mosquito nuisance on the Island.

The early 1920s were a time of great interest in British mosquitoes because of the problems, which had arisen immediately after the First World War, when malaria was transmitted in Britain by native mosquitoes. This followed the return of soldiers with the disease from the Mediterranean to centres in southern England, and Government reports were written and there were many papers appearing in scientific journals. Also the South Eastern Union of Scientific Societies formed a Mosquito Investigation Committee which published a series of circulars on *Anopheles* mosquitoes.

On 13 April 1921, a further meeting, attended by over seventy local residents, was held at *Seacourt*. The proposal to actively commence an anti-mosquito campaign was supported by all present and a number of sub-committees were established with responsibilities for the various aspects of the proposed work. It was decided that the organisation should be called The Hayling Mosquito Control. The control programme was commenced in June 1921. A number of new and interesting facts were soon established regarding *Ochlerotatus detritus*, among them that it could he found not only in normal strength seawater, but in seawater which had been either concentrated by evaporation or diluted by rainwater. Investigations were also begun to determine the quantity of paraffin necessary to treat a given area of water. An ordinary pneumatic sprayer was employed, and a series of tests showed that one pint of paraffin was sufficient to cover forty square yards and that the operation took only two minutes to complete. It was found that under certain conditions, such as when clumps of reeds were present paraffining was not totally successful. In such cases it was found necessary to apply larvicides. A number of chemicals had been suggested, but details of the concentrations and methods of were not available. Trials were therefore carried out and it was eventually discovered that a well-known disinfecting fluid called White Cross Fluid killed mosquito larvae even when used in extremely low concentrations. During the summer and autumn of 1921 a number of larval habitats were permanently abolished by drainage and many others were treated with either paraffin or larvicides. The task of controlling the Hayling mosquitoes continued throughout 1923 and 1924 and, at last, the problem abated. Evidence of the success came from many sources including several postcard canvasses of the residential district.

The British Mosquito Control Institute

Because the activities of the Hayling Mosquito Control expanded so rapidly and because of the importance that Jack Marshall attached to the work, the accommodation at Seacourt was no longer adequate. To expand the facilities and activities of the Mosquito Control, Jack decided to erect, at his own expense, a separate building in which the various aspects of the mosquito work could be performed effectively. He hoped that the required financial assistance would be forthcoming to make the Institute self-supporting and establish the control programmes on a permanent basis.

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A site was selected in the extensive grounds of Seacourt and construction of the building was started in February 1925 and completed in August of the same year. In June 1925 Sir Richard Gregory, who had been Chairman of the Hayling Mosquito Control from the outset, approached a number of eminent scientists with regard to the formation of a Council for a new organisation, which it was proposed to call The British Mosquito Control Institute. At this stage John Staley left his employment as a gardener and was appointed as Chief Assistant to Jack Marshall the Director of the Institute. Sir Ronald Ross, Director of the Ross Institute and Hospital for Tropical Diseases formally opened the Institute at 4 p.m. on 31 August 1925.

There were therefore two organisations: the Hayling Mosquito Control, responsible for local control activities, and the British Mosquito Control Institute with responsibilities for research, advisory and educational work. The two organisations were kept entirely distinct from one another. The work carried out by the British Mosquito Control Institute may be considered under the following four headings: mosquito control, advisory work, educational work and research work.

With his knowledge of engineering it is not surprising that Jack Marshall designed many new pieces of apparatus in the Institute. Among these were a rearing chamber, a microscope projection apparatus, an automatic titrater and, perhaps the most significant of all, an optical apparatus which allowed highly detailed, close-up photographs of mosquitoes to be taken. The first two of these were marketed under the trade name of *Moscon*, an abbreviation of Mosquito Control.

A series of papers both in scientific journals and published by the Institute recorded some aspects of Jack Marshall's work. His writings began in 1922 with his account of 'Unofficial Mosquito Control in England' and culminating with the publication in 1938 of *The British Mosquitoes*. The supportive work of John Staley was invaluable. He assisted with the publications from the Institute and provided much of the experimental details on which the scientific papers were based and most of the morphological data for the book *The British Mosquitoes*. Jack Marshall and John Staley were a team and complemented one another with their abilities.

Jack Marshall's daughter, Joan made an observation in Italy in 1927, the importance of which was not appreciated at the time. She sent Jack countless matchboxes full of mosquitoes, the specimens chloroformed and carefully packed in cotton wool as she had been instructed. They were accompanied with the news that they appeared to be *Culex pipiens* and that they were biting her. Jack was delighted to receive the tributes of affection, but refused to believe the observation. He wrote to Joan saying. "*C. pipiens* under no circumstances will bite human beings. It is presumed that they take their blood meal from birds. You will doubtless remember, if you can spare the time to think of such matters, that although Staley spent several days, stripped to the waist in a cage of *C. pipiens*, none of them could be persuaded to bite him. This is a scientific fact, so in future make your observations with more care".

Had he taken more notice of Joan he would have realised that she was referring to a form of *Culex pipiens* that was then called *molestus.* It was not until two years later that continental workers reported the characteristics of this form, and not until 1935 in a paper entitled Exhibition of "autogenous" characteristics by a British strain of *pipiens* L. co-authored with John Staley that he recognised that this form occurred in Britain.

On 12 February 1927 the Institute was formally incorporated under the Companies Acts as a Limited Company, the word 'Limited' being omitted from the title by Licence of the Board of Trade. It was a 'Company limited by guarantee and not having, a share capital'.

Management of the Institute

The management and control of the Institute was vested in Jack Marshall as its Director, and a Council consisting of between five and twenty-five members. The members of the first Council were: Major E.E. Austen; Dr Andrew Balfour; Professor F. Balfour-Browne; Dr Patrick Buxton; Sir James Crichton-Browne; Dr F.L. Eltringham; Sir Richard Gregory (Chairman); L.W. North Hickey; Colonel S.P. James; Dr C.G. Lamb; Dr G.A.K. Marshall; Professor E.B. Poulton; Sir Ronald Ross; Professor Sir William Simpson and Dr C.M. Kenyan.

The Articles of Association provided for the election of life members who contributed one payment of £10 and annual members who subscribed £1.1s.0d. yearly. The subscriptions received to support the British Mosquito Control Institute were low from its inauguration and the Seventh Report of the Hayling Island Branch of the British Mosquito Control Institute (1929) contained the following statement:

"During the years 1927 and 1928 ... the suppression of the mosquito nuisance of Hayling Island has entailed a financial loss of over £30.0s.0d ... before the end of this year (1929) the Committee will therefore have to decide

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whether the local mosquito work shall be curtailed to an extent limited by the amount of funds that can be guaranteed or whether it shall be suspended altogether."

As there were long periods of drought during the summer of 1929 and the majority of places in which stagnant water was usually found had dried up, thus removing the need for treatment and constant inspection. The financial position was also improved, as in 1929 the Havant Rural District Council increased its annual contribution from £75 to £ 100.

The eleventh, and final, Annual Report appertaining to 1932 and published in early 1933, differed from those that preceded it. Reports of mosquito biology and control activities were minimal and the Report was devoted to the finances of the scheme. Referring to the figures for income, it was pointed out that the total sum received was about £160, apportioned as £120 for the outside work and £40 for the laboratory work. The latter was noted to be especially inadequate to cover wages, chemicals and other expenditure. The report continued:

"... As far as can he seen, the early termination of its work is practically unavoidable ... the time has come for the Havant Urban District Council and the residents of Hayling jointly to assume responsibility of deciding between two alternatives, namely:

whether the mosquito control work of Hayling shall be discontinued altogether, or

whether the said work shall be continued with adequate financial support. ... It is estimated that a minimum annual sum of £300 is required for carrying on the work satisfactorily ... This annual sum would enable the mosquito control work of Hayling to be continued independently of the British Mosquito Control Institute, in the (unfortunately likely) event of the said Institute ceasing to exist."

The Report ended by saying that the balance in hand would be used until exhausted, and then the work discontinued until the Havant Council and Hayling residents made their views known.

The Report of the Director presented at the Sixth Annual General Meeting on 14 December 1932 contained similar messages and interestingly presented the financial picture of income for 1931 and 1932, a breakdown of expenditure for 1931 and 1932, and the relationship between expenditure and income for 1927-32. The annual deficits were considerable even though the level of expenditure was reducing. This, however, was being achieved by a reduction in activities and, in 1932, by a generous donation of £100.

Jack Marshall further commented in the Report of the Director (1932): "It has unfortunately become obvious that if the work of the Institute is to be kept going, some fairly comprehensive scheme for directing attention to its difficulties will have to be devised. At the present time of financial depression, however, any attempts to obtain support for scientific work such as is carried on at the Institute would be foredoomed to failure ... "

The operations of 1933 were, to some extent, facilitated by the long period of drought with the result that there was a sufficient balance in hand to keep the work going until March 1934. After that date the mosquito control work on Hayling Island was suspended.

A new factor was introduced in 1934 when the Public Health Committee of Portsmouth Council invited the Institute to carry out a mosquito survey of the City and to implement anti-mosquito measures. These operations took six weeks during which time the mosquito problems in Hayling had returned. The local Committee therefore decided to resume the mosquito control work in Hayling on a temporary basis, pending the consideration by the Urban District Council of the issues involved. The Committee decided to finance the work during this 'emergency' period by utilising a portion of the funds subscribed by Hayling residents in 1933 (amounting in all to £103.16s.0d), that had been held in reserve. Havant and Portsmouth Councils soon became concerned at the level of the mosquito problem in their areas and asked the Institute to name a figure for recommencing the work. The suggestion was £600 per year, and the two Councils each promised £300. At the last moment Portsmouth (where a 'lower the rates' campaign had commenced) reduced their promised contribution to £200. A sum of £500 was therefore available to finance local mosquito control and so the continuation of this aspect of the work was assured.

In 1936 Jack Marshall's work on mosquitoes and their control in Hayling Island and elsewhere in Britain was formally recognised when he was made a Commander of the Order of the British Empire (C.B.E.). The honour was announced in the London Gazette and The Times on 1 January 1936.

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Jack Marshall will forever be remembered for his book *The British Mosquitoes*, the successor to William Dickson Lang's *Handbook of British Mosquitoes* (1920). The book was commissioned by the British Museum (Natural History) and published by them in 1938. It established Jack Marshall as the number one authority on British mosquitoes, and remains the most complete and authoritative work on the subject. In his book he described nine species not mentioned in Lang's book, and filled numerous gaps in the knowledge of the morphology, life cycles and habitats of many other species. The inclusion in this book and other publications of detailed photographs of mosquitoes demonstrated his skill at close-up photography, the apparatus for which he invented himself. That he was an extremely enthusiastic, devoted and patient man is reflected in the quality of the book. Only one edition of this text was produced and only 1000 copies were printed.

As the Institute was incorporated by Board of Trade licence, there was a legal obligation to call at least one General Meeting in each year. The 1939 meeting, the thirteenth, was held at his solicitor's office on 29 December. Jack felt at the end of 1939 that: "the affairs of the British Mosquito Control Institute are now of such utterly trivial interest in these appalling times that I feel that it is almost indecent to refer to them."

In July 1939 Jack and Blanche Marshall decided to evacuate to Bournemouth. In a letter dated 24 September 1939 Jack Marshall wrote: "I have, for financial reasons been trying to sell it (*Seacourt*) for over four years; but, owing to the general depression, I found it impossible to do so. At the end of the present year, an unfortunately large slice of my income automatically disappears, owing to the expiration of some London leaseholds. I therefore had to decide, some months ago, to warehouse our furniture &c ... and to empty the house in order to save rates and various other expenses."

John Staley remained in Hayling and continued to run the Institute alone. Hs personal research work was soon discontinued as the facilities were no longer available because the local fuel office would not issue permits for the purchase of fuel to heat the Institute. John Staley completed some of the experiments that were in progress in a paraffin-heated outhouse, but soon devoted all of his time to the practical issues of mosquito control. This involved the maintenance of the sluices and the network of ditches that were established in the low lying areas of the Island, regular inspection of all potential breeding sites and the destruction of any larvae and pupae found using paraffin and other chemical sprays.

Jack was not proposing to sell the Institute as he hoped that it might prove possible to resume all aspects of its work after the War. He felt that as long as he continued to receive £300 a year from Havant and £200 a year from Portsmouth, for the local work in those respective areas, it would not be difficult to keep that part of the Institute's work going. The joint contribution just about paid the wages of John Staley and two field workers and other expenses incurred. However, he thought that he could not recommence the non-local activities of the Institute until his plans were more settled. He considered it most likely that he would eventually either add a residential extension to the Institute or else build a small house on the same piece of land. He was well aware that before he could do this he must dispose of *Seacourt*.

Away from the Institute Jack Marshall continued his great interest in mosquitoes and, ably assisted by John Staley and also Duncan Wilson, advised the National Fire Service on the problems of mosquito colonisation of static water tanks used for fire fighting and their control. This activity, which was centred mainly on the Portsmouth area, continued until the end of the War and resulted in several scientific publications and the discovery of an introduced species, *Culex modestus*.

After the War, Jack and Blanche moved back to Hayling Island and in 1946 they sold *Seacourt* to a builder who converted it into three houses and sold the beach to the Council. Jack Marshall was to have no more to do with the Institute as a mosquito control organisation, and indeed ended his long association with mosquitoes, his last publication which resulted from the discovery of *Culex modestus* appearing in 1945. The Institute was not to function again. At this time Jack and Blanche moved into the Institute to live and renamed it *Somerleyton* after their first house in Croydon. After two strokes and bouts of severe depression, Jack Marshall's physical and mental health were now failing and he was soon to enter a nursing home in Portsmouth where he died on 5 December 1949, leaving Blanche to continue to live in the Institute.

In 1948 the then Havant and Waterlooville Urban District Council Health Department officially undertook the responsibility for the control and financing of the control unit. Portsmouth Council retained the services of the new unit by subscribing to the Havant rating fund, but Gosport withdrew and introduced its own mosquito control department. The new unit had the use of the laboratory in the Institute. The headquarters of the mosquito control operation remained

at the Institute until Blanche Marshall died in 1964 and the building was sold. From then on the operation was run from the Council Offices.

John Staley worked in the laboratory in the employ of the Council until he was nearly 74. Then on 1 April 1958 the control activities were taken over by Ronald Francis who was John Staley's son-in-law. Mr Francis continued as the Mosquito Control Officer, assisted by two mosquito control operators for 20 years, until in 1979 the Council temporarily discontinued the service on financial grounds and replaced it by a programme of monitoring. However, following the pressure from local residents and a return of the mosquito problem, finance was made available again in 1983, but only after a long debate in the council chambers on a report by a consultant entomologist confirming the residents' opinion that it was necessary. The consultant was asked if he would take on the running of the control scheme but declined. The control measures are still carried out (now administered by the Havant Borough Council) although because of the building, infilling and drainage that has now taken place on the Island the problem is nothing like as acute as in Jack Marshall's day.

John Staley remained actively interested in entomology and other aspects of natural history for the rest of his long life, which ended on 29 May 1983 at the age of ninety-eight.

After Jack's death Blanche lived on an annuity provided by the sale of *Seacourt*. She died in the autumn of 1964 aged 92. At the time of her death she was still residing in the Institute. On 14 May 1965 the British Mosquito Control Institute building was sold at auction. It is now a fine private house known simply as *Somerleyton*, 190 Seafront Road, Hayling Island. The real tennis court still remains and is part of a sports complex. It is of interest that in a letter dated February 1939, Jack Marshall wrote, "I still have some hope that when World conditions improve (if they ever do!) this place might be turned into a club, and the tennis court thereby preserved". So his wish was finally granted.

On reflection

John Frederick Marshall was a rich and well-educated man from an upper middle class family. He was therefore not only able and confident, but also had influential friends and was in a position to finance his interests. It is against this backdrop that his work, firstly to control and later to study British mosquitoes, must be viewed. Given the education and opportunities that his upbringing provided, it was no surprise that he emerged as the leader and main organiser of the Control that began in the 1920s. His many letters to local newspapers, and his willingness and ability to give lectures provided an initial impetus to the scheme that most people could not have given. Add to this the fact that he did not have to seek employment and the financial backing that he could provide, the ingredients were there for success. Without Jack Marshall it is extremely unlikely that the control programme would ever have begun, and the scientific world would never have had the benefit of his many publications especially the monograph *The British Mosquitoes*, which remains an important work on the mosquitoes of Britain.

His early life had taught him to be a perfectionist. He considered that if a task was to be performed then it had to be done properly. Two prime examples of this are that he played real tennis and so he built his own court and he studied mosquitoes and so he required a purpose-built Institute.

Communication was one of Jack's strong points, and it was necessary for him to write numerous letters to gain support for the venture, to publicise the scheme, to answer queries and advise on control and to generate income. He was, in fact, a prolific letter writer and whenever possible he answered his letters the same day, usually typed, although sometimes in his most beautiful handwriting. He would constantly amend drafts and considered it unthinkable to let a text go to the printer with ink corrections. A page that had even a comma altered meant that the page required to be retyped.

Although strictly an amateur, Jack Marshall was a first rate entomologist. He mixed with scientists from universities and the Ministry of Health, and was a member of many learned societies, including the Entomological Society of Hampshire and the South of England, the Royal Society of Tropical Medicine and Hygiene, the Royal Entomological Society of London, the Linnaean Society and the Zoological Society of London. He was fortunate to have the services of John Staley, and the team of an educated, single minded entrepreneur and a dedicated, hardworking biologist was formidable. Between them they made an enormous contribution to the understanding of mosquitoes and laid the foundations for further studies.