

**Dr. Annie Homer: A Woman in the Research Laboratory –
Ambition, Expertise and Opportunity**

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Dr. Annie Homer: A Woman in the Research Laboratory – Ambition, Expertise and Opportunity

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Summary

Dr. Annie Homer (1882-1953) gained public recognition for medically important work at the Lister Institute of Preventive Medicine in London during World War I. From modest beginnings, she excelled in school, university and chemical laboratory, supported by successive scholarships, and undertook biochemical and physiological research at institutions in Cambridge, London and Toronto. The know-how she gained at the Antitoxin Laboratory of the University of Toronto proved crucial because her expertise was badly needed by the Lister Institute which was making antitoxins vital to the war effort.

In 1916, as Assistant Director of the Serum Department, Homer refined antitoxins successfully, devised improved methods, and published many scientific papers. Despite her accomplishments and professional status – elected Member of the Biochemical Society and Fellow of the Institute of Chemistry – her temporary appointment at the Lister Institute was terminated, and she left biomedical research. Annie Homer's story illustrates the opportunities open to a talented woman forging a research career in the early 20th century and the challenge of securing a permanent position.

Introduction

In March 1919, *The Times* published an article describing the role of women in research at the prestigious Lister Institute of Preventive Medicine during World War I (1). The piece gave an honourable mention to Miss Homer – “the highly-trained doctor of science” – yet in the same year she left the Institute and the world of medical research for good. This paper examines the academic and research career of Dr. Annie Homer to explain how she came to be in a position of responsibility, what was significant about her work, and why she moved on after the War.

Beginnings

Annie Homer was born on 3 December 1882 in West Bromwich (2). Her father Joseph was the son of an engine driver and, aged fourteen, worked as an office boy (3). He later rose to public office as Assessor of Taxes for the Town Hall (4). Annie was admitted to King Edward VI Girls' High School (KEGHS), Birmingham on a full scholarship in December 1897 (5). The school had an excellent reputation for teaching science, underpinned

by staff educated at Newnham College, Cambridge, and had the best laboratories of any girls' school in England (6). Homer passed her Cambridge Higher Local Examinations in 1902: Science, Class I; Mathematics, Class II; Languages, Class III (7).

Newnham College (Cambridge)

Homer's examination success earned her a place at Newnham College and election to a Clothworkers' Scholarship, worth £50 a year (8). Founded in 1871, Newnham had a chemical laboratory within the College grounds that was used to provide practical instruction for examinations (9). In 1904, Homer was graded Class I in Part I of the Natural Sciences Tripos, for which she was awarded a bonus of £20 by the Clothworkers' Company and, the following year, Class I in Part II with distinction in chemistry (10, 11). She was described as the "senior lady" in the Tripos for 1904-5 (12).

At the time, Cambridge did not award women a Degree but only a Certificate. Between 1904 and 1907, however, Trinity College Dublin (TCD) granted *ad eundem* degrees to Oxbridge women who had gained the Certificate. This entailed taking the steam packet carrying mail from Holyhead to Dublin, staying overnight, and attending the so-called commencements (13). Homer was among hundreds of "steamboat ladies" and took her B.A. degree in summer 1905 (14). The cost of the Dublin degree, which entailed a fee of £10.3s., was defrayed by a £10 bonus from the Clothworkers' Company (15).



Annie Homer, and the Staff of Newnham College, Cambridge, in 1907.
(Newnham College Archives)

Homer was awarded a Bathurst Studentship, worth up to £75 a year, renewed for a second year in 1906 (16). In 1907, she was elected to the vacant Associates' Fellowship, worth £100, and joined the Staff of the

College (17). She wrote to the Principal to request a small amount of teaching work to help cover her laboratory fees (18). During 1910, she acted as Deputy Demonstrator in Chemistry in place of Dr. Ida Freund who was ill and unable to work in the laboratory (19). In that year, Homer became the first woman awarded a TCD Doctor of Science degree (then designated Sc.D.) since 1907 (20).

Chemical Research (Cambridge)

Homer's earliest research work in the University Chemical Laboratory, begun in October 1905 at the instigation of H.O. Jones, M.A., Fellow of Clare College and Jacksonian Demonstrator in the University, involved the use of weak organic acids to resolve optically active nitrogen bases by crystallization. In January 1906, she began studying the action of aluminium chloride on naphthalene (21). Jones communicated early accounts of her work to a meeting of the Cambridge Philosophical Society on 11 March 1907 (22).

Homer discovered and characterised three new hydrocarbons, including a novel coloured compound comprised of five benzene rings, and studied their absorption spectra together with Mr. J.E. Purvis, M.A., Fellow of St. John's College. These studies were supported by two grants of £5 each from the Research Fund of the Chemical Society of London and resulted in a series of reports published in the *Journal of the Chemical Society, Transactions* between 1907 and 1910 (23-25).

Biochemical & Physiological Research (Cambridge, London & Toronto)

Cambridge

During 1910, Homer began some biochemical work with F.G. Hopkins, F.R.S., then Reader in Physiology, who was supportive of women researchers (26, 27). She was awarded a Benn W. Levy Studentship for Research in Biological Chemistry, worth £100 a year, one of two Cambridge University scholarships for which women were eligible (28). However, she resigned the Studentship in December when elected to a Beit Memorial Fellowship in Medical Research (29). Early in 1910, the Beit Memorial Fund had begun to support up to ten Fellowships a year, with an annual value of £250, tenable for three years (30). Homer was the eighteenth Beit Memorial Fellow and the third woman elected (31).

Following the lead of Hopkins, Homer chose to work on the "chemistry and physiology of tryptophane", "the metabolism and chemistry of haemoglobin in so far as they bear on its production in the animal body" and "the composition of normal and pathological tissues as regards their contents of intracellular ferments". The authorised places of research

were the Physiological and Chemical Laboratories, Cambridge (32). She began by exploring colour reactions given by tryptophan, which are characteristic of proteins, and by chemically related indole compounds. Hopkins first communicated her work to the Cambridge Philosophical Society in November 1911, and two papers followed in the *Biochemical Journal* (33, 34).

London

Homer enrolled at University College London (UCL) as a post-graduate student for the academic year 1912-13 to continue her experimental studies. The UCL Calendar listed her Department as "Biochemistry" although no such department then existed (35). It is likely that Homer worked in the laboratory of R.H. Plimmer, D.Sc., Reader in Physiological Chemistry in the Physiology Department. At this time, Ruth Skelton, B.Sc., a graduate of UCL, was Demonstrator in the Physiology Department (36).

Homer also worked at the Lister Institute of Preventive Medicine, which had a positive disposition to women researchers under its Director C.J. Martin, F.R.S., a distinguished physiologist (37). The Staff included two women researchers: Harriette Chick, D.Sc., Assistant in the Director's Laboratory, and Muriel Robertson, M.A., Assistant in the Department of Protozoology. Homer was one of eight women who were listed as visiting researchers (38). One of them, Ida Smedley-MacLean had led the way for Homer from KEGHS, via Newnham, chemical research and first woman Beit Fellow, to the Lister Institute (39).

Toronto

In January 1914, Homer moved to Canada, appointed (Sessional) Demonstrator in the Biochemistry Department of the University of Toronto (UofT) for the Easter Term, at a stipend of \$600 (40). The head of the Department, A.B. (Byron) Macallum, F.R.S., Professor of Physiology and Physiological Chemistry, was a champion of scientific medicine in Toronto and appointed the first woman lecturer in the University (41, 42). It is likely no coincidence that his son, A.B. (Bruce) Macallum, M.D., had been a Beit Fellow at the Lister Institute at the same time as Homer (38).

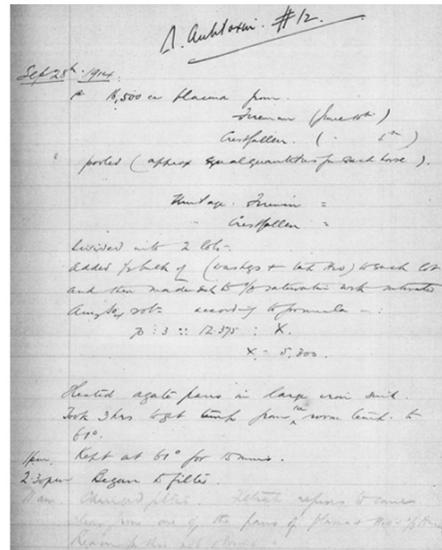
From 1 September 1914, Homer was the first and only woman Research Fellow supported by UofT's Medical Research Fund, worth \$1,500 a year, which funded her research to the end of 1915 (43). She continued the experiments begun in England on the role of tryptophan in the metabolic processes of the body and its relationship to blood pigment in dogs (44). Her first paper from the "Biochemical Institute, University of Toronto" was published in the *Journal of Biological Chemistry* in May 1914 (45). She submitted three more papers to the same journal in July 1915, listing

UofT's Departments of Biochemistry and Pathological Chemistry, and Cambridge, UCL or the Lister Institute as appropriate (46).

Homer also published abstracts of her work which appeared under "Proceedings of the Physiological Society" in the *Journal of Physiology* (47). Two further abstracts on related topics appeared in the same journal in 1916, and a short note in the *Journal of Hygiene* about indole in culture media marked the last of Homer's papers on this topic (48, 49).

The Antitoxin Laboratory (University of Toronto)

Britain's declaration of war on Germany on 4 August 1914 created a unique opportunity for Annie Homer. On 1 May, UofT had established a laboratory to make diphtheria antitoxin for provincial health authorities across Canada (50). The driving force was J.G. FitzGerald, M.B., Associate Professor in the Department of Hygiene, who had undertaken research at the Pasteur Institutes in Paris and Brussels, visited the Lister Institute, and studied advances at the New York City Department of Health (51). The first laboratory of its kind in Canada, the Antitoxin Laboratory played a key role in making tetanus antitoxin and other serum products for Canadian Forces and was the origin of Connaught Medical Research Laboratories (52).



The UofT Antitoxin Laboratory, and an extract from a lab notebook from September 1914. (Sanofi Pasteur Connaught Archives)

On 1 September 1914, Homer was appointed Assistant Director and Chemist in the Antitoxin Lab, on a half-time basis, coincident with her Medical Research Fellowship, with each paying half of \$1,500 for one year (53). Lab notebooks show that she was engaged in concentrating diphtheria antitoxin from the serum of locally immunised horses (54). The process for concentrating antitoxin, which involved separating it from

other proteins in the serum using fractional precipitation with salt, had been devised by Dr. E.J. Banzhaf of the New York City Health Department who acted as an active consultant to the Antitoxin Lab (55, 56).

Serum Department (Lister Institute)

The first-hand know-how that Annie Homer gained at UofT's Antitoxin Lab was of crucial value to the Lister Institute. In July 1915, the Governing Body authorised an offer to be made to Homer as a temporary Assistant in the Serum Department at Elstree, at a salary of £200 a year. She thought the offer inadequate and negotiated two years at £300 per annum and free quarters. The Institute also paid her a £25 honorarium in consideration of expenses incurred visiting US and Canadian serum labs, and compiling a report for Dr. A.T. MacConkey, Bacteriologist-in-charge of the Serum Department (57).

During 1915, the Serum Department was fully dedicated to making large quantities of antitoxins for the Army (58). In the first half of the year, there were problems, however, and only a few attempts at concentrating batches of horse serum were successful; worse still, during the second half of the year, no antitoxic serum was refined before being issued for use (59). This meant that any weakly antitoxic serum could not be used, and the serum that was issued carried a higher risk of side-effects. Homer's expertise would have an immediate and substantial impact when she took up her duties on 1 January 1916 (60).



A serum laboratory at the Lister Institute in Elstree. (Wellcome Images)

By February 1916, the Department had regained its capacity to concentrate antitoxin and all successive batches of serum were refined (59). By May, Homer had devised an improved method for concentrating antitoxic sera that achieved higher levels of refinement more reliably, leading to the first of many papers in the *Biochemical Journal* and the *Journal of Hygiene* (61). In May 1917, the Governing Body could report that all diphtheria and tetanus antitoxins issued during the previous year had been refined, and this remained the case for the remainder of the war (59, 62).

Tetanus Antitoxin

Batch	Dates	Filled	Quantity	Weight				
T187	Gibbs 3.9.15	31.12.15	40 litres					
	Komulus 13.9.15							
	Louman 13.9.15							
	Delbec 16.9.15							
	Chitrap 20.9.15							
	Vogel 3.11.15							
	Chitrap 12.11.15							
	Vogel 18.11.15							
	For 11.9.15							
	Jane 15.9.15							
T190	Kagan-Bell 15.9.15	11.1.16	40 litres					
	Chitrap 16.9.15							
	Delbec 27.9.15							
	Chitrap 20.11.15							
	Delbec 6.11.15							
	Chitrap 21.4.15							
	Woolley 13.12.15							
	For 11.10.15							
T191	Gibbs 15.10.15	27.1.16	50 litres					
	Louman 25.10.15							
	For 25.10.15							
	Delbec 28.10.15							
	Vogel 4.12.15							
	Vogel 11.12.15							
	Vogel 18.12.15							
	For 29.11.15							
	For 2.12.15							
	T192				1R 23 } Concentrated	11.2.16	22 litres	175
1R 24								
1R 25								
1R 26								
T193		1R 26 } Concentrated	26.2.16	28 litres	200			
		1R 27						
T194		1R 28 } Concentrated	3.2.16	30 litres	250			
		1R 29						
		1R 30						
T195		1R 30 Conc.	12.4.16	7	400			
T196	1R 31 8000	2.5.16						
	1R 32 11000							
	1R 33 7000							
T197	1R 31 } 25000	17.5.16	50 litres	300				
	1R 32							
	1R 33							
T198	1% Salt Solution 25000	14.6.16	50 litres	500				
	1R 33							
	1R 34							
	1R 35							

Records of antitoxin production by the Serum Department show that all batches of tetanus antitoxin were concentrated from February 1916. (Lister Institute of Preventive Medicine Archives)

During 1917, as part of a programme of experimental work carried out on behalf of the War Office Committee on Tetanus, MacConkey and Homer studied the duration of the passive immunity conferred by a prophylactic dose of tetanus antitoxin in laboratory mice (62, 63). Homer continued independent research related to the economic production of purified antitoxin preparations, and published a series of papers that explored the influence of pH, heat denaturation, different salts and the use of preservatives on the process of concentration (64).

1918 proved a pivotal year for Homer. Her appointment was extended by another year (65). Admitted as a Fellow of the Institute of Chemistry of Great Britain and Ireland, one of only thirteen women (66, 67), she also became a Member of the Biochemical Society after being nominated for election in December 1917 (68). Following a review, the Governing Body decided to transfer her from Elstree to Chelsea as of 1 July (69). Finally, in March 1919, the Governors terminated Homer's appointment as from 30 September, while recording their appreciation of the valuable services she had rendered during the war (70).

Discussion and Conclusions

Several factors facilitated Annie Homer's progress in biomedical research. First, her talent, hard work and ambition were evident throughout. Second, KEGHS, Newnham College and the University of Cambridge provided her with a first class scientific education. Third, a series of studentships, scholarships and fellowships sustained her financially. Fourth, she repeatedly gained the support of male mentors and was welcomed as a research worker in Cambridge, London and Toronto, especially in biochemistry and physiology labs, which accommodated women researchers. Finally, Homer was in the vanguard of women making a career in the research lab and had good role models to follow.

Homer seems to have had great curiosity and willingness to take on new challenges as evidenced by the numerous laboratories she visited and the range of her research experience. She took the ambitious step of moving to Canada, which gave her the unexpected opportunity to work in UofT's Antitoxin Lab, and gained unique know-how as a result. Returning to help out the Lister Institute in 1916, via a transatlantic journey that entailed some risk, she was not merely a spare pair of hands, rather an expert hired to solve a specific problem. There is no doubting her achievement in quickly putting antitoxin refinement back on track at the Serum Department and by making a lasting contribution. Why then, after reaching a career pinnacle in 1918, was she deemed surplus to requirements so soon?

The most obvious reason was a lack of money. During the war, the Lister Institute had offered temporary appointments to women, and some men, to allow the depleted Staff to carry out essential lab work. After the war, resources had become stretched. The Institute's endowment income had been devalued by inflation. Increased costs of materials and labour made trading activities hard to run profitably. Military orders for antitoxins and sera were in any case expected to decline following the cessation of hostilities. Moreover, the Institute faced an unexpected tax bill on its wartime sale of products to the government. Finally, building repairs that had been deferred urgently required a large sum to be spent (71).

Although permanent appointments to the research Staff were out of the question at this time there was an alternative. A male colleague who had worked alongside Homer as a temporary Assistant at Elstree also had his appointment terminated. He was, however, allowed to continue his research at Chelsea as an "honorary" Assistant contingent on obtaining a research grant from the Medical Research Committee and paying for his own animals (72). It seems reasonable to imagine that with her skill and reputation Homer could have pursued a similar approach in order to stay at the Lister Institute, but she chose not to and left the world of biomedical research.

Coda

What did Annie Homer do instead? Perhaps unsurprisingly, she had already spread her wings beyond the confines of the Lister Institute. According to Homer's own account, as early as 1916, she had been keenly aware of the wartime shortage of potash and, having worked out a plan to break the German monopoly by exploiting the mineral resources of the Dead Sea, was the key scientific member of a group that placed a formal application before the Potash Control Department of the Ministry of Munitions on 4 October 1918 (73). She subsequently devoted her energies to securing development of resources in Palestine, and conducted enquiries on behalf of the government to obtain oil in World War II. Annie Homer died on 1 January 1953 (74).

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Author Biography

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