Appearance of bacteriology in the British medical school curriculum

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ABSTRACT

Published histories of bacteriology concentrate on the scientific concepts, exemplified by Louis Pasteur and Robert Koch. Arguably, the early British bacteriological studies are headed by Lord Lister, whereas other notables such as Ronald Ross, Robert Bruce and Patrick Manson are honoured for their discoveries of 'tropical' microbes, accomplished abroad. What then was happening in Great Britain? The introduction of bacteriology into the medical school curriculum is examined according to the published lectures in *The Lancet* between 1889 and 1901 and the dates are reviewed in light of other published sources. The names of the people delivering bacteriology at the medical schools in Great Britain and Ireland provide a guide to the relevance of crediting Lister as the leading light for microbiology in the UK. The diversity of names and backgrounds suggests that a critical reassessment of the perceived late and limited start of UK medical bacteriology is needed.

KEY WORDS: Bacteriology.
Education.

Introduction

This review seeks to map the appearance of bacteriology in the medical schools of England. The established histories of bacteriology[1] mostly concentrated on the scientific breakthroughs, understandably then, dealing mostly with the work of Pasteur and Koch. A recent exception to this is the detailed analysis of bacteriology in Britain by Worboys,[2] in which he addresses the impact of the growing awareness of bacteria in medical and veterinary conditions. However, with the recent exception of Worboys, the literature does not represent the appearance of bacteriologists in the UK.

At a time when university microbiology departments have mostly been incorporated into larger units, if not closed entirely, this review seeks to identify the chronology of the introduction of bacteriology into the medical schools and to highlight the people carrying the torch. Worboys[2] demonstrates how several of the early bacteriologists were surgeons who only temporarily explored bacteriological research in the laboratory. It is shown here that there were a number of professors in universities that remained advocates of the discipline up to 1900.

The framework of the review compiles information on bacteriology departments within medical schools (listed alphabetically) taken from the published lists of lectures at the medical schools in England, Scotland and Ireland in *The Lancet* (Tables 1 and 2). Between 1899 and 1900, medical school curricula were given in tabular form for the academic year in the educational issues of *The Lancet*. During this period, bacteriology appears as a distinct lecture programme in most but not all of the medical schools and thus offers a picture of the key people who introduced the discipline to the medical curricula.

However, bacteriology was taught within other contexts (most frequently as pathology) and hence the introduction of bacteriology has been corroborated (or not, as the case may be) by examining other published sources. Hence, in those medical schools listed where bacteriology does not appear, the teaching of the subject is discussed. While it is apparent that *The Lancet* lecture listings are not always in agreement with other sources, this review seeks to provide a reference for discussion on the development of medical bacteriology in the UK. For perspective, the first Chair of Bacteriology at the medical school is provided (Table 3).

It is apparent that the bacteriologists employed are mostly located within departments of pathology. As most pathologist positions were a temporary but necessary component of the medical training (and do not reflect a strategic career choice) the data may over-represent bacteriological interests.

For the following listings, the title of bacteriologist at a hospital does not necessarily mean that the person holds a lectureship (or Chair) in bacteriology at the related medical school. Equally, a Chair at a university may be an entirely academic post, with no related hospital appointment. It was common to hold more than one appointment at a time. For example, one may be pathologist at hospital X and a physician to hospital Y.

The people mentioned are given mostly without biographical information. The criteria for inclusion is evidence of working and contributing to the published studies of laboratory-based bacteriology (mycology has, regrettably, been ignored as it is too broad, and virology as a distinct discipline mostly falls outside the time

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Table 1. Published lecture sessions in bacteriology at London medical schools, 1890 to 1901*.

Medical school	1890/1	1892	1893	1894	1895	1896	1897	1898/9	1900	1901
Guy's	Washbourn	''	''	''	''	''	''	Washbourn & Pakes	''	Pakes
King's College	Crookshank	Crookshank & Hewlett	''	''	''	Crookshank	''	''	''	''
University College	–	Boyce	–	–	Vaughan-Harley	''	Martin	''	''	''
Westminster	–	demonst	''	''	''	''	Blaxall	''	''	''
St. Thomas'	–	–	Shattock	''	''	''	''	''	''	''
The London	–	–	–	Hadley	''	–	–	Bulloch	''	Bulloch & W. Hunter
Royal Free	–	–	–	–	–	Roughton & Andrewes	Roughton	Roughton & Crawfurd	''	''
Middlesex	–	–	–	–	–	–	–	Foulerton	''	''
St. Georges'	–	–	–	–	–	–	–	–	–	Slater
St. Mary's	–	–	–	–	–	–	–	–	Plimmer	Plimmer & Paine
St. Bartholomew's	–	–	–	–	–	–	–	–	–	Andrewes
Charing Cross	–	–	–	–	–	–	–	–	–	Eyre

*Compiled from the published lists in *The Lancet* between 1890 and 1901.

The appearance of a name indicates the year bacteriology first appears in the list of lectures.

Note that bacteriology was not listed anywhere in 1889.

– : not listed as distinct topic.

'' : the same as the previous year.

demonst: demonstrators.

frame covered). I have not sought to identify infectious disease physicians (unless they published laboratory studies in significant volume). Neither have superintendents of tuberculosis sanatoria and fever hospitals been included.

Prior to 1900 it was common for medical schools to employ physicians as pathologists for a year as part of their training, mostly to obtain dissection and morbid anatomy experience. As these were fleeting appointments, such people also have not been included.

London medical schools and associated hospitals

Charing Cross Hospital

Having taken the newly created position of pathologist to the hospital in 1892, Charles J Arkle was appointed to teach bacteriology at Charing Cross Medical School later the same year. He held this responsibility until 1898. William Hunter (1861–1937) succeeded Arkle as pathologist in 1895. In 1899, J. W. H. Eyre was appointed bacteriologist to the hospital but he is the last from the London medical schools to appear in the 1901 lecture sessions. Eyre returned to Guy's the following year.

What happened next has not been clarified. A. N. Leathem was the hospital bacteriologist in 1906 but the next important appointment came with that of William W. C. Topley, who joined the staff in 1909, becoming Director of the Institute of Pathology and lecturer in bacteriology and public health from 1910 until 1922. Subsequently, A. B. Rosher ran the bacteriology department. Later, Harold I. Winner ran the department for 15 years before receiving the Chair (Table 1).

Guy's Hospital

In 1890, John W. Washbourn was appointed assistant physician to Guy's Hospital, having just left Max von Gruber's laboratory in Vienna. Washbourn created and ran a bacteriological department (in a new building from 1893), but he only became the official lecturer in bacteriology in 1898. Lectures in bacteriology for the medical school appear in *The Lancet* listings for the first time in 1890, given mostly by Washbourn, but for a while (1899) he was assisted by Walter C. Pakes, who took over in 1901 when Washbourn went to South Africa.

Washbourn was highly regarded, especially for his work on pneumococci, hence his death at the age of 38 was all the more tragic. He died of pneumonia and tuberculosis on returning from service in the Boer War. His protégé was John W. H. Eyre, who succeeded him in 1902 as hospital bacteriologist.

A new laboratory of bacteriology was built using Eyre's specifications and opened somewhere between 1910 and 1915, a process that was to be repeated again in subsequent years when it became the Institute of Pathology. The other notable member of staff was Adrian Stokes, who held the Sir William Dunn Chair of Pathology from 1922 until his death from yellow fever in 1927.

King's College

Heneage Gibbes, an anatomist working as curator in the museum at King's, examined staining methods for tubercle

Table 2. Lecture sessions in bacteriology in provincial medical schools in Britain*.

Medical school (University)	1893	1894	1895	1896	1897	1898	1899	1900
Durham	–	Murray	''	''	''	''	''	''
Liverpool	–	–	Boyce	''	''	''	''	''
Sheffield	–	–	–	–	Walker	''	Robertson & Hector	''
Owen's College, Manchester	–	–	–	–	–	Delepine	''	''
Bristol	–	–	–	–	–	–	–	Stanley Kent
Birmingham	–	–	–	–	–	–	–	†
Cambridge	–	–	–	–	–	–	–	–
Yorkshire College, Leeds	–	–	–	–	–	–	–	–

*Compiled from the published lists in *The Lancet* between 1893 and 1900.

The appearance of a name indicates the year bacteriology first appears in the list of lectures.

– : not listed as distinct topic.

'' : the same as the previous year.

†: Practical pathology & bacteriology: Professor Leith and C Leedham Green

and published in the year after Koch's announcement in 1882. Gibbes assessed Koch's work again when he went with E. Klein and A. Lingard to India in 1884 to study the cholera vibrio.

The Chair in Bacteriology, created for Edgar M. Crookshank at King's College in 1886, is often quoted as the first in England. The exact title is Professor of Comparative Pathology and Bacteriology, reflecting his interests in veterinary bacteriology (Crookshank was a long-term Governor to the Royal Veterinary College).

Crookshank had trained first as assistant surgeon to Lister, who had left Scotland for King's in 1877, bringing bacteriological interests (and workers such as W. W. Cheyne) with him. The Department of Bacteriology was established in 1887, but bacteriology tuition to the medical school is reported to have started the previous year; however, *The Lancet* listings only appear in 1890. In 1892, with Richard Tanner Hewlett, Crookshank started a popular postgraduate 'vacation' course in bacteriology, which ran for over 10 years.

Crookshank also published the first conventional manual of bacteriology from the UK in 1886. Other books had been published on microorganisms and bacteria (e.g., *Pathological mycology* by G. S.Woodhead and A W Hare, published in 1885) but Crookshank's *Manual of bacteriology* went through three editions. When Crookshank resigned in 1901 he was succeeded by Richard Tanner Hewlett, who had spent time as assistant bacteriologist at the Jenner (Lister) Institute. Hewlett ran the department until 1925 when it closed.

The London Hospital

William Bulloch will be familiar to readers of his *History of bacteriology* (1938).[1] He spent most of his career at The London Hospital, becoming bacteriologist to the hospital and lecturer on bacteriology and pathological chemistry to the medical school in 1897. However, the physician Wilfred J. Hadley was the bacteriologist to the hospital for the previous year (1896–1897), whom Bulloch replaced. An endowment enabled the Goldsmith's Chair in Bacteriology to be created for Bulloch in 1919.

Several important bacteriologists worked in Bulloch's laboratory: Frederick Twort, Paul Fildes, James McIntosh and Alan W. Downie. The eponymous McIntosh and Fildes anaerobic jar was published from the laboratory in 1916, when Fildes was assistant bacteriologist and McIntosh a Grocers' Research Scholar. Bulloch retired in 1934 and Samuel P. Bedson succeeded him.

The London School of Medicine for Women and the Royal Free Hospital

Sessions of lectures on bacteriology in the medical school started in 1896, being delivered by the surgeon E. W. Roughton, and assisted by Dr F. W. Andrewes (based at St. Bartholomew's, see below) and later (1899) R. H. P. Crawfurd. By 1920 Charlotte Iris Fox was the pathologist who did much to build the bacteriological department, but sadly she died of septicaemia in 1926 following a fingerprick accident during an autopsy.

The Middlesex Hospital

The first influential bacteriologist at The Middlesex Hospital was Alexander G. R. Foulerton, bacteriologist to the hospital in 1899 and lecturer in public health to the medical school. Foulerton had developed his bacteriological skills at the British Institute for Preventive Medicine before joining The Middlesex Hospital.

The Bland Sutton Institute of Pathology was opened in 1914, with Carl H. Browning its director. Other bacteriologists who joined the Institute included James McIntosh (as Professor of Pathology, in 1920), Lionel Whitby (assistant pathologist, 1921) and F. R. Selbie (research worker in bacteriology, 1936).

Paul Fildes established the Medical Research Council Unit of Bacterial Chemistry in 1934 and employed B. C. J. G. Knight and D. D. Woods. Whitby, as pathologist, ran bacteriology from 1935 until becoming Regius Professor of Physic at Cambridge after the war. Selbie succeeded Whitby as head of bacteriology.

St. Bartholomew's Hospital

The surgeon Charles B. Lockwood set up a bacteriological laboratory in the hospital museum in 1889 in which he

carried out pioneering research into wound bacteriology. In 1891, three rooms were built for public health and pathological work carried out by Emanuel Klein, who was becoming increasingly involved in bacteriological problems while simultaneously working at the Brown Institute, Wandsworth.

Klein was a prolific worker and published over 200 papers on bacteriology. Along with F. W. Andrewes, he identified *Clostridium enteritidis sporogenes* (*C. perfringens*) as a cause of diarrhoeal disease following a foodborne outbreak. In *The Lancet* listings, Klein was only made official lecturer in bacteriology at St. Bartholomew's in 1903, appearing in the lecture listings as tutor in physiology until then. Klein instructed the surgeon C. B. Lockwood in bacteriology, and Lockwood was actually giving practical tuition in the subject, before Klein, in 1889.

In 1893 Alfredo A. Kanthack was appointed as the first full-time lecturer in pathology, becoming the first pathologist in 1902 when new laboratories (including bacteriology) were built. Kanthack left for a Chair in Pathology at Cambridge and was replaced as pathologist by Frederick W. Andrewes, who, having joined as demonstrator in bacteriology in 1897, rose to become Professor of Pathology in 1912. Both Kanthack and Andrewes are good examples of bacteriologists employed as pathologists who made important contributions to the discipline. Bacteriology is not actually listed in the lecture sessions for medical students in the 1890s; instead, Kanthack is listed under Pathological Anatomy.

It is likely that official appointments in bacteriology appear to be so late in arising at such institutions because the work was being covered ably by the pathologists. Klein held the lectureship in bacteriology until 1912, followed by Mervyn H. Gordon (1919–1923) and Ronald G. Canti (1923–1930), but a full Chair in Bacteriology only came when Lawrence P. Garrod was promoted from reader to professor in 1937.

Table 3. Names and dates of the first Chair in Bacteriology at the medical schools of Great Britain and Ireland.

Medical school	Chair of Bacteriology	Other Chairs including bacteriology in the title
London		
Charing Cross	H. I. Winner, 1965	
Guy's	J. W. H. Eyre, 1920	
King's	R. T. Hewlett, 1901	Crookshank, 1886: Comp. Path. & Bact.
The London	W. Bulloch, 1919	
LSMW/RFH	N. F. T. Crowley, 1970	
Middlesex	F. R. Selbie, 1949	
St. Bart's	L. P. Garrod, 1937	
St.. George's	S. D. Elek, 1957	
St Mary's	A. Fleming, 1928	
St. Thomas'	R. Hare, 1946	
UCH	C. C. Okell, 1930	
Westminster	B. W. Lacey, 1962	
Provincial		
Birmingham	J. F. D. Shrewsbury, 1937	R. F. C. Leith, 1889: Path. and Bact.
Durham	E. M. Dunlop, 1932	
Leeds	J. W. McCleod, 1922	
Liverpool	A. W. Downie, 1943	
Manchester	W. W. C. Topley, 1922	A. S. Delepine, ?1901: Bact. & P.H.
Sheffield	J. W. Edington, 1932	
Scotland		
Aberdeen	J. Cruickshank, 1926	
St. Andrews, Dundee	W. J. Tulloch, 1921	
Edinburgh	J. Ritchie, 1913	
Glasgow	C. H. Browning, 1919	
Ireland		
Dublin		E. J. McWeeney, 1891: Path. & Bact.

LSMW/RFH: London School of Medicine for Women/ Royal Free Hospital.

UCH: University College Hospital, London.

Comp Path: comparative pathology.

PH: public health.

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St. George's Hospital

Charles Slater is reported to have "started bacteriology" at St George's Hospital with his appointment as lecturer in bacteriology to the medical school in 1889, although his name and bacteriology do not appear in *The Lancet* listings until 1901. Slater attended the bacteriology course at the Pasteur Institute in 1893. New clinical laboratories were built in 1895 and Slater was the director. In 1913 he became consulting bacteriologist to the hospital. H. R. D Spitta was appointed assistant bacteriologist in 1902 and taught bacteriology and public health at the medical school. J. D. Benjafield became bacteriologist to the hospital in 1920, but a Chair in Bacteriology came only in 1957, held by Stephen D. Elek until 1974.

St. Mary's Hospital

Cope,[3] in his history of St. Mary's Hospital, states that James J. Clarke was pathologist from 1890 to 1897 and in 1894 was ''asked to conduct classes in bacteriology.'' Leonard Rogers was appointed demonstrator in bacteriology in 1890, but left shortly after for an impressive career in tropical medicine in India. The first bacteriologist was H. G. Plimmer in 1896 who was interested in microorganisms in cancer. Bacteriology only appears in 1900 in *The Lancet* listings, with Plimmer as the tutor. In 1901 he was joined by A. Paine, but then Plimmer left in 1902.

Almroth E. Wright joined as pathologist and bacteriologist to St. Mary's in 1902, having left the Army Medical School, Netley, in disgust at the reception of his typhoid vaccine. Wright's research led to the creation of the Inoculation Department in 1906. A number of luminaries joined Wright in the Department of Pathology and Bacteriology, including A. Fleming (1902), L. Colebrook (1908) and S. R. Douglas (1912). In part privately sponsored, the Inoculation Department has been credited in the literature as the first research institute attached to a hospital in the UK. When Wright took the Chair of Experimental Pathology, the first

Professor of Bacteriology at St. Mary's was Alexander Fleming, awarded in 1928.

St. Thomas' Hospital
In December 1885, the surgeon Charles A. Ballance is recorded as demonstrating the 'bacteriological resources' of St. Thomas's Hospital to the in-house Medical and Physical Society. The first teaching of bacteriology at the hospital is variously given as 1892 or 1893 (the first entry in *The Lancet* listings is for 1893) by Samuel G. Shattock, who had joined the hospital in 1884 as lecturer in pathological anatomy, a post he kept until his death in 1924.

Facilities dedicated to pathological work were established later in November 1897, with the opening of the Louis Jenner laboratory founded at the request of Lady Jenner, the bacteriology section encompassing a third of a single room. Louis L. Jenner was the superintendent of the clinical laboratory (as well as demonstrator in morbid anatomy) for three years but gave up clinical work in 1900 to pursue bacteriological research at the Pharmaceutical College (now the London School of Pharmacy). He then joined the Lister Institute, where, working with *Salmonella typhi*, he caught and died from typhoid fever in 1904 at the age of 38 years.

The pathologist L. S. Dudgeon had worked under Jenner and Shattock and succeeded Jenner as superintendent (effectively the clinical pathologist) in 1903, and then as director in 1905. Dudgeon was the bacteriologist to the hospital from 1905. Joseph Bamforth had joined Dudgeon as assistant bacteriologist in 1922 and became Director of Clinical Pathology on the death of Dudgeon in 1940. Bamforth was also a pathologist rather than a pure bacteriologist, but he carried out bacteriological investigations.

University College Hospital
There were several people with interests in bacteriology at University College Hospital (UCH), most of whom lectured on pathology to the medical school. Henry C. Bastian was appointed Professor of Pathological Anatomy in 1867. Bastian experimented vigorously to demonstrate spontaneous generation and, consequently, clashed with Pasteur. Bastian was succeeded by Victor Horsley in 1887 as Professor of Pathology.

Rubert Boyce joined Horsley's department and delivered a series of lectures on bacteriology for the medical school year of 1892–3. Vaughan Harley was invited by Horsley to establish a Department of Pathological Chemistry, having spent several years abroad, including a spell with Pasteur and Roux in Paris. Vaughan Harley directed the medical school bacteriology classes from 1895.

Sidney H. C. Martin followed as Professor of Pathology from 1895 to 1907. Martin carried out experimental studies on tuberculosis and later bacterial toxins. Martin lectured on bacteriology to the medical school from 1899, having taken over from Vaughan Harley.

The laboratory facilities for bacteriological work certainly existed in the form of laboratories established by William Corfield, the first Professor of Public Health and Hygiene at University College (1875–1904), built for teaching practical hygiene.

By 1900 David N. Nabarro and Corfield were the bacteriologists to the hospital, succeeded by F. H. Thiele (later Sir Francis H. Teale), lecturer in bacteriology between 1908 and 1935. However, during this period Hedley D. Wright was lecturer in bacteriology to the medical school in 1923, leaving in 1930 to become Professor of Bacteriology in Sydney, Australia. The first Chair in Bacteriology was taken by C. C. Okell in 1930, despite authorisation for the post having been established in 1925.

Westminster Hospital
Richard Grainger Hebb was the pathologist (initially unpaid) at the hospital between 1880 and 1900 and again between 1903 and 1918, following the illness of W. S. Lazarus-Barlow. Hebb is reported to have maintained a culture of Koch's tubercle bacillus that was displayed by Lord Lister at the opening of the new clinical laboratories in June 1900. Frank Blaxall was a lecturer in bacteriology at the Westminster Hospital around 1898 (listed as Bloxall in the lectures series in 1897). Blaxall left in 1909 for the post of bacteriologist at the Government Lymph Establishment, London. J. A. Braxton Hicks, who joined in 1910 as assistant pathologist, carried out bacteriological studies at Westminster Hospital. Dr R. J. V. Pulvertaft was appointed pathologist in 1931 and he ran the bacteriology laboratory along with morbid anatomy and haematology.

Provincial medical schools

University of Birmingham
Percy C. Frankland, the Professor of Chemistry at Birmingham from 1895, played an important role in the introduction of bacteriological examination of water and sewage treatments (among other things) but did not teach bacteriology. Bacteriology did not appear in the listings within this time frame, other than a special lecture heading of Practical Pathology and Bacteriology by R. F. C. Leith and the surgeon C. Leedham Green in 1901. Leith became the first Professor of Pathology and Bacteriology to the medical school in 1899 when new laboratories were built.

C. J. Lewis arrived in Birmingham in 1905 as lecturer in public health and bacteriology, working under Leith, but his commitment to bacteriology and sanitary sciences as head of the Department of Public Health and its laboratory resulted in a Chair of Hygiene and Public Health. The Diploma in Public Health, including a bacteriology component, was delivered at Birmingham (listed from 1898).

Leith retired in 1919 but the lineage via Lewis continued with the appointment of J. F. D Shrewsbury in 1925, who had assisted Lewis in the Public Health Laboratory. Shrewsbury became reader and then Professor of Bacteriology in the joint Department of Pathology and Bacteriology in 1937. A Department of Microbiology at the university was established in 1956, with David G. Catcheside in the Chair of Microbiology until 1964.

University College, Bristol
The Medical Officer of Health for Bristol from 1886 to 1928 was David S. Davies, who around 1895 started a diagnostic bacteriology service in his office. Davies started performing Widal tests for typhoid agglutinins in 1897, during a sizeable outbreak in Bristol that year, and he would have been one of the earliest to do so in England. On the creation of the Bacteriology Department in 1897, Dr. J. O. Symes was appointed honorary bacteriologist to the Royal Infirmary.

Symes left two years later to become physician to the hospital.

A clinical and bacteriological department at the Royal Infirmary opened in October 1901 under Professor A. F. Stanley Kent, honorary bacteriologist at the Royal Infirmary from 1899 to 1906 as well as Professor of Physiology at the University College from 1899.

Isaac Walker Hall succeeded Stanley Kent in 1906 as honorary pathologist, bacteriologist and director of the clinical laboratory at the Royal Infirmary, remaining until 1933 at University College, Bristol. The university laboratory for public health work was under his remit and, with Davies, he documented the first bacteriological evidence of a British typhoid carrier.[4] The university microbiological research grew, with Kenneth E. Cooper becoming lecturer in bacteriology in 1940, culminating in the microbiology department finally being established in 1951, with Cooper as professor.

Cambridge University

Charles Smart Roy took the first Chair of Pathology in Cambridge in 1884. Roy had spent time in the laboratories of Virchow and Koch and ran the Brown Institute between 1881 and 1884. Thus, he brought first-hand expertise in pathology and bacteriology to the job and endeavoured to establish teaching in the discipline: for example, he introduced a practical course in bacteriology in 1895. Regrettably, Roy died in 1897 and was succeeded by Alfredo A. Kanthack from 1897, but the following year he too died in post. German Sims Woodhead was then chosen to take the post from 1899. Woodhead was also strong on bacteriology as well as pathology and combined both in a particular interest in tuberculosis, being a member of the Tuberculosis Commission of 1901.

Courses in bacteriology were run by G. H. F. Nuttall in 1899, prior to his promotion to lecturer in bacteriology and preventive medicine in the following year. The lectureship ceased when Nuttall became reader in hygiene in 1906. Despite far from ideal laboratory conditions, many students of note passed through the 'department', including some as Groces' Scholars. In particular, H. E. Durham devised his famous tube for detecting gas from bacterial fermentations, as well as carrying out research on salmonellas at Cambridge.

More fundamental bacteriology at Cambridge originated in the Department of Biochemistry, being the research on bacterial chemistry established by Frederick G. Hopkins and Marjory Stephenson (joined 1919), which was formalised as the Chemical Microbiology Research Unit in 1944, financed by the Medical Research Council.

University of Durham at Newcastle upon Tyne

Of the medical schools listed in *The Lancet*, Durham was the first with lectures delivered in 1894. George R. Murray was appointed in 1891 and became Heath Professor of Comparative Pathology two years later. Murray was responsible for a large diagnostic service, and was one of the earliest to do so. H. M. Hutchens was appointed demonstrator in bacteriology in 1905, while working on a Royal Commission on TB, and he later succeeded Murray.

Yorkshire College, Leeds

A. S. Grunbaum (who later changed his name to Leyton) occupied the first full-time Chair in Pathology from 1904 until the First World War. He also directed the Corporation Bacteriological Laboratory, providing a diagnostic service to the area. Prior to his appointment at Leeds, Grunbaum had been working in Gruber's laboratory in Vienna, with H. E. Durham, on the serological diagnosis of typhoid, which arguably should be termed the Durham-Grunbaum test, but remains better known as the Widal test. J. W. McLeod took the new Brotherton Chair of Bacteriology in 1922, established alongside the new Department of Bacteriology.

Liverpool

The position of demonstrator in bacteriology was created for A. A. Kanthack on his arrival in Liverpool in 1892, and he gave the first lectures on bacteriology for the 1892–3 session. He left to direct the pathology department at St. Bartholomew's Hospital Medical School sometime between 1892 and 1893, so bacteriological teaching was taken up by Rubert W. Boyce, appointed Holt Professor of Pathology in 1894. *The Lancet* sessions support this date (Table 2).

Boyce was central to the establishment of bacteriology and the creation of departments (and schools) of hygiene, comparative pathology and tropical medicine in Liverpool. He became corporation (city) bacteriologist in 1898, worked on tuberculosis and sewage disposal, and recruited A. T. MacConkey, among others, in the process of making Liverpool a dominant force in microbiology.

The first Chair in Bacteriology was occupied by James M. Beattie in 1912, who also took the post of city bacteriologist (Boyce having died the previous year), hence Beattie's appointment (and that of his successor, H. D. Wright) may be considered a part-time post only. The full-time appointment had to wait until Alan W. Downie joined in 1943.

Owen's College, Victoria University, Manchester

Victoria University was an amalgam of Owen's College, Manchester, University College Liverpool and Yorkshire College, Leeds. At Owen's College, Julius Dreschfeld was Professor of Pathology between 1882 and 1891, during which time he was wrestling with the problems of identifying Koch's tubercle bacillus, publishing on the topic as early as 1882.

Auguste Sheridan Delepine was appointed the first Proctor Professor of Pathology in 1891. Delepine developed the bacteriology service within the pathological department (including a course on bacteriology and public health) and eventually a new department and Chair of Public Health and Bacteriology were created for him.

Bacteriological facilities had been accommodated in the 1894 extension of the medical school and Delepine designed the new laboratories. In light of the considerable bacteriological workload Delepine's laboratory carried out for the surrounding municipal boroughs, the university transferred his Chair to that of Comparative Pathology and Bacteriology in 1901, and finally to Public Health and Bacteriology. As director of the public health laboratories at the University of Manchester, Delepine provided an early model of a municipal diagnostic service, serving a wide stretch of the country.

University of Oxford

Oxford was not included in the tables of lectures in

The Lancet despite being an examining body for degrees in medicine. One of the reasons suggested is that the shortage of suitable hospital facilities for clinical examination prevented it from taking students.

Some time prior to 1897, H. C. Acland invited Carl Menge from Munich to establish the bacteriology teaching. Menge had spent time working for Robert Koch in Berlin. James Ritchie, lecturer in pathology, took over Menge's classes in 1897. Acland was succeeded by (Sir) John Burdon Sanderson as Waynflete Professor of Physiology, who continued to build up pathology and physiological sciences at Oxford. Ritchie became reader in 1901 and it remains unclear whether or not Ritchie received a Chair in Pathology at Oxford prior to leaving to become director/superintendent of the laboratories of the Royal College of Physicians, Edinburgh, in 1907. Ritchie co-authored the *Manual of bacteriology* with Robert Muir from the time he started at Oxford.

A building for the new Department of Pathology was built and opened in 1901, which included laboratories for bacteriology teaching. The Dane George Dreyer was appointed to replace Ritchie as Professor of Pathology in 1907 and the Medical Research 'Oxford Standards' Laboratory was created within this building in 1915, run by A. D. Gardner until 1946. The Dunn School of Pathology was opened in 1927. The work of Howard Florey on penicillin was based in this building.

Another important worker was Donald D. Woods, who, as reader in microbiology in 1946, discovered the mode of action of sulphonamides while working in the Department of Biochemistry. He became the first Iveagh Professor of Chemical Microbiology in 1955.

University College, Sheffield

The first listing of bacteriology lectures is for 1897, given by Dr. Andrew Walker, but by 1899 they were given by John Robertson and a Dr. Hector Robertson was Sheffield's Medical Officer of Health and part-time Professor of Public Health, appointed unpaid lecturer in bacteriology at the medical school. He was joined in 1903 by Charles Porter, demonstrator in bacteriology.

A professorial appointment came in 1906, with Louis Cobbett taking the first full-time Chair of Pathology. Cobbett had bacteriological interests, most famously with his work on tuberculosis, but he left in 1907 to return to Cambridge, and James M. Beattie was appointed to replace him, albeit in the Chair of Pathology and Bacteriology. Beattie went on to a Chair in Bacteriology at Liverpool in 1912.

A Department of Bacteriology was established separately from pathology when Howard Florey arrived in 1932 and J. W. Edington was appointed Professor of Bacteriology. He was succeeded by Wilson Smith in 1939. A certain H. Krebs was appointed lecturer in biochemistry in 1935. The title of Professor of Microbiology was established for S. R. Elsden as West Riding Professor of Microbiology in 1959 with the creation of an Agricultural Research Council Unit of Bacteriology. The department name did not change to microbiology until 1967.

Scotland

In 1901 the list of medical schools in Scotland comprised the universities of Aberdeen, St. Andrew's (Dundee), Edinburgh and Glasgow. Also listed were St. Mungo's College Glasgow, Glasgow Anderson College Medical School and Glasgow Western Medical School.

Aberdeen

D. J. Hamilton was Professor of Pathology between 1882 and 1908 at the university in Aberdeen and occupied the first full-time Chair of Pathology in the UK. During his tenure he was responsible for introducing a diagnostic bacteriological service to the north of Scotland (which, in that period, was almost exclusively the diagnosis of diphtheria and typhoid). His bacteriological interests included studies of braxy and the aetiology of louping ill in sheep. He chaired a committee on the subject and erroneously (as it turned out) blamed a bacillus as the cause. He quickly challenged the erroneous view of Koch that bovine tuberculosis was not infectious to humans. The more famous bacteriologist was the surgeon Alexander Ogston, who reported his eponymous coccus in 1880.

Dundee, St. Andrews

Robert Muir was given the first Chair in Pathology for a year between 1898 and 1899, but the first Professor of Bacteriology was W. J. Tulloch from 1921 in the new Department of Bacteriology at St. Andrews University. J. P. Duguid succeeded Tulloch in 1963 and kept the Chair in the new University of Dundee, formed as a distinct university in 1967.

Edinburgh

Whereas the listings for Edinburgh only give bacteriology lectures by Drs Shennan and Taylor Grant for the year 1901–2, there is evidence that bacteriological research was taking place much earlier than that. Lister's assistant William Watson Cheyne started working on bacteriological aspects in makeshift conditions in 1876.

The surgeon John Chiene, working at the Edinburgh Royal Infirmary, also carried out bacteriological research, following Joseph Lister's innovations in aseptic techniques of surgery, with articles appearing in 1878. W. S. Greenfield occupied the Chair of Pathology from 1881 to 1912. His interests in bacteriology had started before this with work on Woolsorter's disease.

A Public Health Laboratory was opened in 1888 under the direction of Sir (Andrew) Douglas Maclagan. Bacteriology was taught in this laboratory and Charles Hunter Stewart was chief assistant between 1888 and 1898, after which he was appointed to the new Chair of Public Health and Sanitary Science, created in July 1898.

The John Usher Institute of Public Health was opened in 1902. James Ritchie was the first Robert Irvine Professor of Bacteriology at the University of Edinburgh, appointed in 1913. Muir and Ritchie published the popular *Manual of bacteriology* from 1897, running for seven editions (the last published in 1919) in their hands.

Glasgow

The two leading cities of Scotland played major roles in establishing pathology and bacteriology in English universities, yet they appear to have little recognition in the listed Table of Lectures. Bacteriology lectures given by Charles Workman appear in Table 3 (1890) at St. Mungo's College, a medical school serving the Royal Infirmary.

Comrie[5] records N. Carmichael as bacteriologist to the college for the previous year. D. McCrorie succeeded Workman in 1895.

In the University, Joseph Coats was Professor of Pathology from 1893 to 1899, before Robert Muir commenced his long tenure from 1899 to 1936. Coats was assisted by Robert M. Buchanan, who became the first lecturer in bacteriology at the university around 1895. He left to become the first city bacteriologist to Glasgow. At some point he was given the bacteriological laboratory that had been established in 1895 within the Sanitary Chambers. Thus, between them Muir and Buchanan provided bacteriological cover to the city. Only in 1919 did Carl Browning become Gardiner Professor of Bacteriology in a new department, following the founder's donation.

Ireland

The medical schools in Ireland listed in 1901 were Dublin University, Dublin Royal College of Surgeons, Catholic University, Dublin, Queen's College at Belfast, Cork and Galway. Bacteriology is not listed as a distinct lecture series in *The Lancet* from 1889 to 1900, and only in 1901 is a course in bacteriology at Queen's College, Belfast, listed.

Queen's College, Belfast

J. Lorrain Smith was the first full-time Professor of Pathology in 1901, succeeded by W. St. Clair Symmers in 1904. Both men had bacteriological interests. Lorrain Smith had become lecturer in pathology in 1894 and carried out bacteriological investigations on the large Belfast typhoid epidemic of 1897–1898 in the Queen's College pathology laboratory. W. James Wilson, famous for the Wilson and Blair medium for typhoid, was appointed lecturer in hygiene in 1909. Wilson became director of the public health laboratory and by 1922 was Professor of Hygiene and Public Health. A Chair in Microbiology had to wait until 1954 with the appointment of G. W. A. Dick.

Dublin

The first bacteriology department in Ireland was opened in May 1890 at the Catholic University School of Medicine. The opening address was by Edmond J. McWeeney, who was made Professor of Pathology and Bacteriology the following year, in addition to being the city bacteriologist. McWeeney published regularly on bacteriology, having particular interest in laboratory differentiation of typhoid from other enteric organisms. His bacteriological grounding was achieved through attendance at Koch's bacteriology course in 1899.

Elsewhere in Dublin, at Trinity College, Adrian Stokes was given the Chair of Bacteriology and Preventive Medicine in 1919. Stokes died of yellow fever in 1922.

The Chair and department continued with J. W. Biggar from 1924. The Chair was changed to that of Microbiology with the appointment of John P. Arbuthnott in 1976.

Discussion

It is important to clarify that the data presented here are for the lectures specifically entitled 'Bacteriology' and published in *The Lancet*. The topic was also included in courses with different titles (e.g., 'Pathological Anatomy' at St. Bartholomew's given by Andrewes) and the text of the article (hopefully) corrects these distortions.

The impression from the tabulated lists gives Scottish bacteriology a poor representation. This is misleading. Significant early developments were established there by Lister and his students,[5–7] and D. J. Hamilton providing the earliest diagnostic bacteriology service for the region. The situation in Ireland appears worse, and perhaps justifiably so. Was McWeeney representing the subject single-handedly during this period?

The names of people in Tables 1 and 2 teaching bacteriology may be greater than expected and indicative of a healthy interest in the discipline. However, within the time frame covered only four (of 28 names in the lists) held a Chair with 'Bacteriology' in the title: Crookshank, Leith, Delepine and McWeeney. In a study of medical schools, it is not surprising that almost all are physicians or surgeons. While the temporary nature of the positions was highlighted in the introduction, it is notable that many of the early bacteriologists held the posts for long periods of time, notably Washbourn, Crookshank, Shattock, Murray and Boyce. Delepine receives credit in Foster's studies[8,9] for his services to diagnostic bacteriology, whereas the contributions of Washbourn, Shattock and Murray remain under-represented for their length of service to bacteriological education.

Worboys[2] points out how many of the earliest bacteriologists in Britain were surgeons who subsequently dropped the topic as they progressed. From the data presented here it is clear that early leading lights in London were also lost to bacteriology in a more fundamental manner: Washbourn died from tuberculosis, Kanthack from cancer and Stokes from yellow fever.

Textbooks of bacteriology may provide another indication of the level of interest in bacteriology in persons teaching the subject on medical school curricula. Of the two longest serving textbooks of the period, one was written by men not listed as bacteriologists in *The Lancet* lecture series: Robert Muir and James Ritchie. Their *Manual of bacteriology* (first published in 1898) ran to nine editions under their pen. Muir was better known for pathology and he and Ritchie both spent most of their professional career in places that did not have specific departments of bacteriology. The other text of the same name by R. T. Hewlett at King's College London also ran to many editions. Klein wrote several texts, and *Elements of bacteriological technique* by J. W. H. Eyre ran to three editions.

The focus on medical schools omits those people who were working in research institutes such as the Lister Institute for Preventive Medicine (MacFadyean, Arkwright, Ledingham), veterinary colleges (MacFadyean), the Army Medical School (Bruce), industrial or college brewing departments or Imperial laboratories where bacteriology was developing. Several of the people held city bacteriologist posts (Boyce, McWeeney), serving to highlight the role of bacteriology in municipal laboratories. Obviously, *The Lancet* lists provide no information on these important laboratories.

The question about why so few British bacteriologists were able to first isolate hitherto unidentified disease-causing organisms remains puzzling. The growing numbers

of samples that would have been sent to the departments offering a diagnostic service would have provided interesting material. Information on the volume of material that was examined needs further investigation. If increasing workloads overloaded the available manpower with diagnostic work then they may have been victims of their own success.

Much information has been kindly supplied by current members of departments of microbiology across the country who replied to email requests. Likewise, I am grateful to those archivists who search for information. I wish to thank Ron Fraser and the Society for General Microbiology for access to material.

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