Original Manuscript

Journal of Medical Biography
1–6

DOI: 10.1177/09677720221095515
journals.sagepub.com/home/jmb
SAGE

Richard Muir: Edinburgh-based pioneer biomedical scientist and medical artist

Ken Donaldson[1,2] and Christopher Henry[1]

Abstract

Richard Muir (1862—1931) began his career as a 'lab boy' in the Pathology Department of the University of Edinburgh in 1876 at the age of 13. This was a newly created category of worker that eventually became today's biomedical scientist Muir rapidly gained expertise in pathological and bacteriological techniques including staining and microscopy. Exceptionally, for someone non-medical and non-university-educated individual, he was elected a member of the Pathological Society of Great Britain and appointed Demonstrator in Pathology in the University of Edinburgh Pathology Department. He authored papers on staining techniques for bacteria and on the pathology of syphilis of the ear and became a recognised diagnostic histopathologist, despite having no medical qualifications. He especially excelled as an artist, depicting the microscopic world of pathology and microbiology and produced diagrams for hundreds of publications including his own book and also large wall hangings of the microscopic world for teaching purposes. This paper describes the unique contribution of Richard Muir to pathology in Edinburgh and beyond in the early 20th century.

Keywords

Richard Muir, lab-boy, medical illustration, pathology, biomedical scientist

Introduction

Richard Muir (1862–1931; RM) had a unique and varied career in the field of pathology whilst employed in the University of Edinburgh in the late nineteenth and early twentieth centuries. Beginning as the first 'lab boy' or laboratory assistant he was instrumental in the founding of The Pathology and Bacteriology Laboratory Assistant's Association (PBLAA), now the Institute of Biomedical Science. He also developed and published new and modified pathology techniques and became a recognised diagnostic histopathologist. RM was an expert and sought-after medical artist, illustrating many papers and books including his own, with beautiful representations of the microbial and pathological world, making large wall charts for teaching purposes and authoring the section on pathology in the Encyclopaedia Britannica of 1912.

Lab-boy, the forerunner of the biomedical scientist

Richard Muir was employed at the age of 13 in 1876 as a new category of medical worker, the lab-boy as the post was then known (they were all male initially), in the Pathology Department of the University of Edinburgh. He was appointed to the job by Dr D. J. Hamilton (1849−1909), assistant to the Professor of Pathology Professor William Rutherford Sanders (1828–1881).[1] The career of lab-boy was not an easy course for a young man, working '..from 8 a.m. to 6 p.m. with an hour for dinner, for 16/6d per ~ week and with the prospect of much unpaid overtime..'[2] Professor William Smith Greenfield (1846–1919) Sanders' successor in the Edinburgh Chair of Pathology made an application in 1881, for running costs for the Pathology Department, which included the following request - 'grant to pay the laboratory boys. It was very difficult to get boys at all, and the work is so difficult and complex, the risks to health so great and the prospects so poor, that it is even more difficult to keep them'.[2]

RM did not acquire a conventional medical/pathology qualification but learned histopathology, bacteriology and eventually pathology, 'on the job' under the mentorship of Professor Greenfield. He organised the first practical classes in Pathology in the University of Edinburgh, which commenced in 1877, taught by Greenfield who was famed as a teacher and pathologist.[3] Eventually RM

[1]Senior Honorary Research Fellow, Surgeons Hall Museums, Edinburgh, UK
[2]Emeritus Professor of Respiratory Toxicology, University of Edinburgh, Edinburgh, UK

Corresponding author:
Ken Donaldson, Surgeons' Hall Museums, Royal College of Surgeons of Edinburgh, Nicolson Street, Edinburgh, EH8 9DW, UK.
Email: kdctoxtwo@outlook.com

became a supremely knowledgeable histopathologist, medical laboratory scientist and pathologist (see later), - 'one of the leading, if not the leading, pathological laboratory assistants in this country'.[1] RM no doubt learned much about pathology from being involved in this organisational role in the classes and through his close association with Greenfield. RM's status grew as his expertise in pathology and pathological techniques grew and the University bestowed on him the unique academic title of 'Demonstrator of Pathological and Bacteriological Methods in the University of Edinburgh' Figure 1.

In 1907 the first meeting of the newly instituted Pathological Society of Great Britain took place, the first professional society for pathologists. At that meeting the admission of laboratory assistants to the society was addressed and it was concluded that 'there was nothing in the rules which necessarily prevented the admission of these gentlemen'. At the same meeting RM was approved as a member, where he is described as 'a man outstanding for his technical work, and a considerable medical artist'.[4]

RM was the first non-medically qualified member of the Association and we can find no evidence that any other 'lab boys' attained sufficient status to become a member of the Pathological Society of Great Britain. In any case the laboratory assistants were soon to form their own association, as described below.

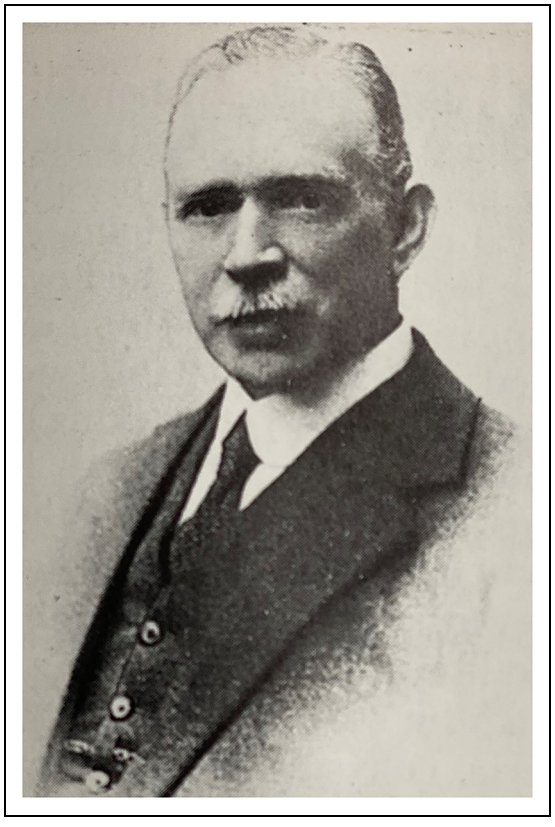

Figure 1. Richard Muir. Provenance of this image is unknown, its only known previous publication is unacknowledged in 13, from where it was copied.

The pathology and bacteriology laboratory assistant's association (PBLAA)

By the end of the first decade of the 20th century, in response to the biomedical revolution, the numbers of laboratory assistant working in UK hospital and research laboratories and carrying out routine pathological, bacteriological and biochemical techniques related to diagnosis, was increasing, and numbered well over 100 individuals.[3] Like RM, Albert Norman (1882–1964) began as a 'lab boy' in the University of Cambridge before moving to The Department of Obstetrics and Gynaecology at The University of Liverpool and ending his career at the Board of Agriculture and Fisheries in Surrey. John MacLean (1875–1963), who began his career as lab-boy in Edinburgh, Birmingham University and London, was also a key figure having first attempted and failed to form an Association for pathology assistants in 1896.[3] At the annual meeting of the Pathological Society of Great Britain in Liverpool in 1912, a group led by RM, Norman and MacLean, gained the general backing of the Pathology Society for a professional Association for pathology assistants. Two Professors of Pathology were especially supportive in this undertaking, Professor German Sims Woodhead (1855–1921) Professor of Pathology at the University of Cambridge, who had started his pathology career in Edinburgh and Professor James Lorrain Smith (1862–1931), Greenfield's successor in the Edinburgh Chair of Pathology.[5] The letter of proposal for the formation of the Society was signed by RM and 10 others and The Pathology and Bacteriology Laboratory Assistant's Association (PBLAA) was duly established, its mission '"To form a means of communication amongst the assistants; to supply information regarding appointments and to assist in the general advancement of its members"; RM is recorded as the first member (Member No 001).[3] Such was RM's dedication and commitment to the new Society that he personally underwrote the costs of the PBLAA during its gestation when, prior to a regular flow of subscriptions, there were outgoings but minimal income.[3]

The PBLAA's own journal entitled 'The Laboratory Journal' was launched to deal with 1) technical aspects of pathology and bacteriology laboratory work 2) publishing Association news and 3) advertising job vacancies. The officers of the new Association can be found in the first issue in March 1913,[6] under the heading 'Association News', with Richard Muir shown as Vice President, John MacLean as a representative member on the committee and Albert Norman as Treasurer. It also states that the first president was Professor John Lorrain-Smith (1862–1931) of Edinburgh University 'without whose influence

Figure 2. Photograph of delegates at the first annual meeting of the PBLAA in Edinburgh in 1924. Richard Muir is seated in the place of honour at the front centre and is marked RM; Albert Norman is marked AN. (Image from.[5)] The location is easily recognisable as the doorway into the Anatomy Department in the University of Edinburgh Medical School Quad in Teviot Place, virtually unchanged today.

and support in obtaining the recognition of the Pathological Society, the Association would not have made such progress'. The following is also stated 'The committee felt satisfaction in inviting Mr Richard Muir, a prominent and perhaps the best-known member of the association to be Vice President for this year'.[6] The article also states that the membership after 1 year numbered 117, including one member in Sudan.

Early on the officers of the PBLAA appreciated the need for members to have access to formal, taught courses and examinations leading to a 'Certificate in Laboratory Technique' providing proof of competence in biomedical laboratory techniques. The syllabi for the 4 subjects that eventually evolved - Bacteriological Technique, Pathological Technique, Pathological Museum technique and Special Subjects - are given in.[5] The PBLAA began running classes teaching these syllabi in the evening in various UK centres, the dawn of the long process leading to today's graduate-level training for qualification as a Biomedical Scientist The first exams were held in 1921 and RM was amongst the first 3 individuals awarded certificates without the necessity of sitting examinations, on the basis of their extensive experience prior to the existence of the qualification. RM was also involved in teaching and Association records show that RM gave a talk on malaria in 1913 to a meeting of members in Edinburgh, and a lecture on filarial worms in 1914.[3] By 1920 RM was running a bi-weekly evening class on practical subjects aimed at completing the Examination syllabus including preparation and staining of histological materials and microbes.[3] By December 1921 RM was in London setting out a framework for courses directed towards passing the examinations involving classes 'once or twice a week from about 6.30 till 9.00 pm in the evening to receive instruction in the form of a series of lectures and demonstrations'.[3] Annual conferences of the PBLAA were started for the exchange of information on laboratory techniques, the first being held in Edinburgh in 1924 (Figure 2).

RM died in 1931, by which time the term 'technician' was coming into general use for someone who carried out scientific methods for routine purposes. In November 1942 The Institute of Medical Laboratory Technology incorporated the Pathological and Bacteriological Laboratory Assistants Association and took over the publication of the Laboratory Journal and the title of Medical Laboratory Technician came into use. In 1978 the name Medical Laboratory Technician was changed to Medical Laboratory Scientific Officer (MLSO) for staff employed in NHS laboratories. In 1994, the name of the organisation was changed to Institute of Biomedical Science, reflecting the expanding of the membership beyond the NHS to include academia, veterinary pathology and pharmaceutical research; the members then became known as Biomedical Scientists. Currently some 16,000 BMSs are members of the IBMS, working in hospital and research laboratories throughout the world.[7] RM therefore played a seminal role in the organisation and education of what were to become today's biomedical scientists and in recognition

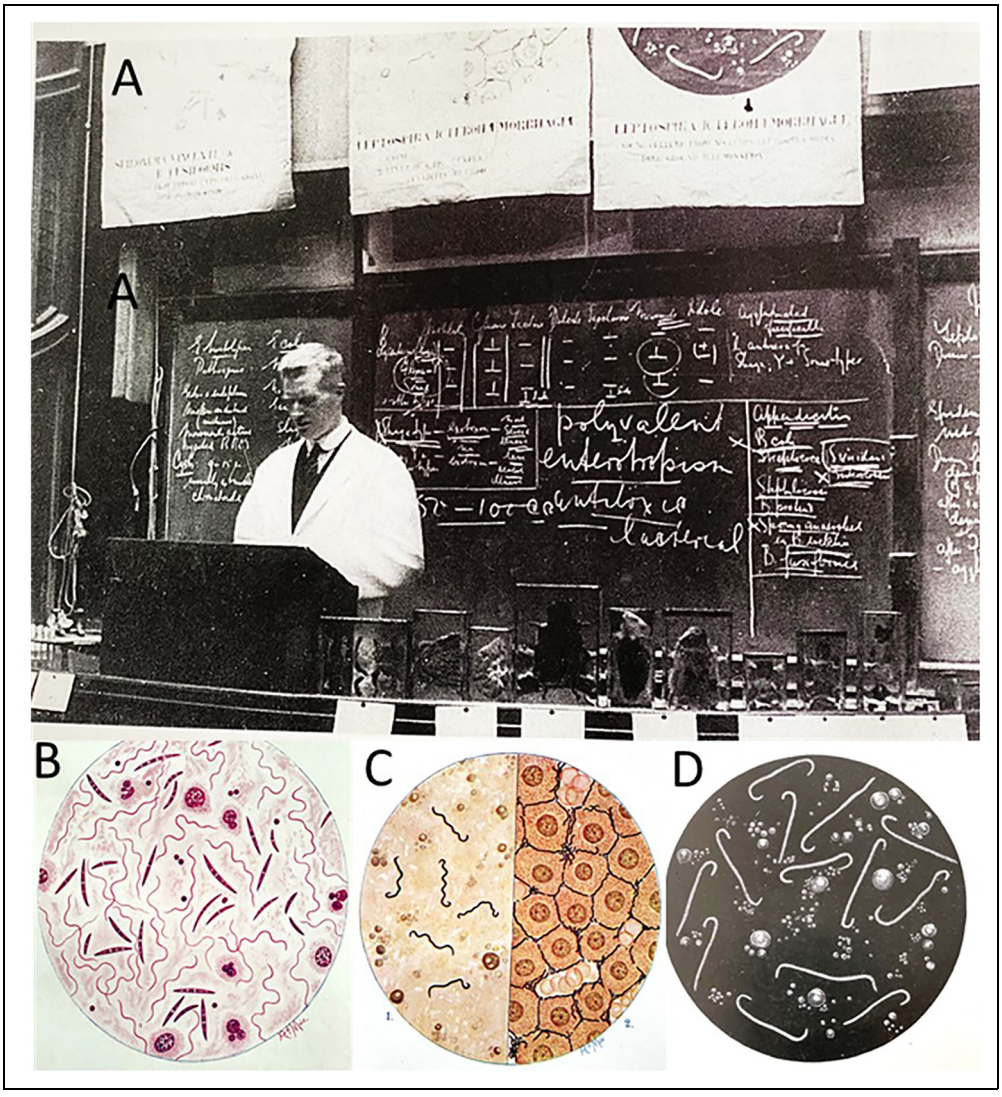

Figure 3. A) Image of professor T. J. Mackie teaching in the Pathology Department of the University of Edinburgh, date unknown. Above his head are 3 of RM's wall hangings which can be matched to images in[14] shown as B, C and D in the same order, left to right, as they appear above Professor Mackie's head. They are; B) Spironema vincenti and Bacillus fusiformis; C) Leptospira icterohaemorrhagiae Fontana stain; D) Leptospira icterohaemorrhagiae dark ground illumination. Provenance of image A is unknown, its only known previous publication is unacknowledged in[15] from where it was copied. Images B, C and D are from[14] (copyright expired).

the IBMS website refers to him as the first member or 'Member 00001'. On the website his role in the dawn of the IBMS is described briefly, along with reproductions of his artwork.[7]

Publications

RM published a number of papers pertaining to development and modification of staining techniques. In 1915 he published a method for 'killing two birds with one stone'[8] in the form of the Gram reaction and a bacterial capsular stain. Hitherto determining the Gram reaction and the presence or absence of a capsule required 2 different slides and two different staining methods. In this paper RM outlines a method for staining to determine both the reaction to gram stain and to demonstrate a capsule, if one is present. In 1900 RM published a new method for fixation and staining of blood films using alcoholic eosin and methylene blue.[9]

RM was also involved in other pathology papers and It is interesting to consider whether he reached a level of knowledge where he was expert in diagnostic histopathology, rather than in histopathological techniques; several sources suggest that this was indeed the case. A paper on otosclerosis addressing whether there was an inflammatory component to the disease, contains the following - 'Mr Richard Muir, of Edinburgh, an expert

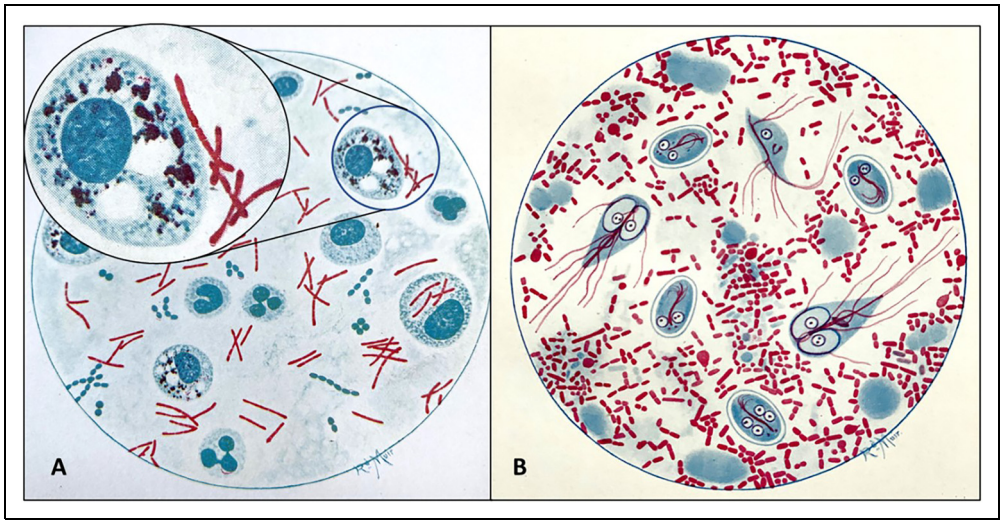

Figure 4. A) Plate XV from[14] Bacillus tuberculosis. Ziehl Neelsen stain of a sputum specimen B) Plate LVI from[14] Giardia intestinalis in a faecal film stained with alcoholic eosin and methylene blue.

pathologist, when he examined specimens from his (the speaker's) cases of otosclerosis, had concluded that otosclerosis was a chronic inflammatory affection…'.[10] In a paper by Lediard[11] on appendicitis with threadworms, RM is stated to have 'suppled a case' for the study. In a paper on renal subcapsular haemorrhage[12] the following statement occurs 'The kidneys were examined and prepared for me by Mr Richard Muir, of Edinburgh, who reported on the kidney removed by operation as follows -"The renal tissue shows advanced chronic interstitial nephritis followed by more acute changes and is extensively necrosed, etc". In a paper by Thomson and Graham[13] the following appears at the start -'we claim to have made a number of reliable observations. We use the word reliable with confidence, because in the examination of the more difficult specimens we have had the advice of two expert pathologists, Dr James Ritchie, Superintendent of the Laboratory of the Royal College of Physicians, and Mr Richard Muir of the Pathological Department of the University of Edinburgh'. Final confirmation is to be found in RM's obituary[1] by a writer who, though anonymous, is clearly a medically trained pathologist He states that 'His (RM's) knowledge of pathological anatomy was a very extensive one, and many of us who were trained in that school had, in later years, our difficult problems of diagnosis solved by him. Personally, I valued his opinion on a pathological specimen more than the opinion of many of my colleagues.'[1] Space restricts, but other instances could be provided and taken together these amply confirm that RM was eventually considered a source of diagnostic pathology knowledge in some areas of pathological diagnosis and so, in these areas of pathology, he crossed an important line from 'technician' to diagnostic histopathologist.

Pathological /medical illustration

RM had a substantial influence in the area of medical illustration. Beginning at a time when there was no microphotography and little macro photography for use in publications and no teaching aids like PowerPoint or slide projection, RM made contributions in all of these areas. Of these different areas, his paintings of preparations viewed down the microscope seem to these authors his most remarkable. Self-taught, he reached a standard sufficient for his work to be published as a book,[14] which contains 60 watercolour images of the most common bacteria, as seen down the microscope at between 1000 and 1500 × magnification. As described in the preface, these paintings began as large wall hangings to assist teaching in the classes of Professor Thomas J. Mackie (1888 −1955).[16]

Professor Mackie, Professor of Bacteriology at the University of Edinburgh, is shown in Figure 3, teaching in the Bacteriology Department of Edinburgh University, date unknown. Above his head hang 3 wall charts painted by RM which are readily matchable to images in the Bacteriological Atlas (see legend to Figure 3). Figure 4 shows another 2 plates from the Atlas to demonstrate the clarity and accuracy of these illustrations.

Another important forum for RM's paintings of micrographs, as well as his photography was the 11th edition of Encyclopaedia Britannica, in the entry on Pathology.[17] This section was co-written by RM with Professor David James Hamilton, (1849–1909) of the Pathology Department, Aberdeen University. RM also supplied all the figures for a textbook of pathology by Beattie and Dickson.[18] Space constraints make it impossible to fully document the number of papers and books to which RM contributed illustrations and photography, but they number in the hundreds.

RM retired in 1931 and died in the same year, leaving the astonishing legacy described above. His eminence was partially summed up in his obituary in the Journal of Pathology - 'The high standard of his work, not merely as a laboratory technician but as a demonstrator and an artist, brought his work into prominence in every pathological and bacteriological laboratory throughout the country.'. To this should be added his importance in the professionalisation of the laboratory assistant and his exemplary character, which the obituary writer sums up as 'honest, unselfish, retiring'.

Acknowledgements

I would like to thank Mr Alan L. Smith, sometime Senior Biomedical Scientist in the Pathology Department of The University of Edinburgh, for his insights into the life and work of Richard Muir.We also acknowledge the late Mr James Waugh, who first told one of us (KD) about Richard Muir.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Ken Donaldson https://orcid.org/0000-0002-2093-1852

References and notes

1. Anonymous. Obituary, Richard Muir. 1862–1931. *The Journal of Pathology and Bacteriology* 1931; 34: 395–397.
2. Edinburgh Pathology, pathology pioneers https://www.ed.ac.uk/pathology/about-us/history-pathology/pathology-pioneers (accessed 25/01/22).
3. Petts D and Harding T. and Nation B. (Eds). *Letters of consequence: 1912–2012 a history of the institute of biomedical science*. London: Institute of Biomedical Science: 2012, 340.
4. Dible JH. A history of the pathological society of Great Britain and Ireland. website https://www.pathsoc.org/files/history/c02.pdf (accessed 25/01/22)
5. Farr AD. *Learn, that you may improve: the history of the institute of medical laboratory sciences*. England: Denley Instruments; 1982, 214.
6. The Laboratory Journal vol 1 Issue 1 March 1913
7. IBMS website https://www.ibms.org/about/ibms-history/our-first-member/ (accessed 25/01/22)
8. Muir R. Staining of bacterial capsules in films and sections. *The Journal of Pathology and Bacteriology* 1915; 20: 257–259.
9. Muir R. Laboratory notes. Fixing and staining blood films. *The Journal of Pathology and Bacteriology* 1900; 6: 394–396.
10. Fraser JS and Muir R. The pathology of congenital syphilitic disease of the ear. *J. Laryngol Rhinol Otol* 1917; 32: 8–30.
11. Lediard HA. Verminous appendicitis. *The Lancet* 1910; 176: 878–879.
12. Lediard HA. Subcapsular haemorrhage (renal). *Proceedings of the Royal Society of Medicine* 1924; 17: 30–32.
13. Thomson A and Graham JM. Fibromatosis of the stomach and its relationships to ulcer and to cancer. *Edinburgh Medical Journal* 1913; 11: 7–20.
14. Muir R. *The bacteriological atlas: a series of coloured plates illustrating the morphological characters of pathogenic micro-organisms*. Edinburgh: E and S Livingstone; 1927, 134.
15. Smith CJ. *Edinburgh's contribution to medical microbiology*. Glasgow: Wellcome Unit for the History of Medicine University of Glasgow; 1994, 312.
16. As a teenaged junior pathology technician in the Pathology Department of the University of Edinburgh in the 1960s, one of the authors (KD) was shown a large collection of these wall hangings in the basement of the Pathology Building. He was told about Richard Muir, whose name and work was proudly kept alive by the current technical staff of the University of Edinburgh Pathology Department. The beauty and impeccable clarity of these illustrations has remained with him. Some of these wall charts were gifted to the IBMS and examples are shown on the IBMS website.
17. Hamilton DJ and Muir R. Pathology. In *Encyclopædia Britannica*. 11th ed. Cambridge, Ed H. Chisholm: Cambridge University Press;1911, 20, 913–928.
18. Beattie JM and Dickson WEC. *A text-book of general pathology: for the use of students and practitioners*. London: Rebman; 1908, 475.