

Historical Perspectives

A relic of the Wellcome Tropical Research Laboratories in Khartoum (1903-34)

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ABSTRACT

This article explores the origins of an old brass monocular microscope in the Central Laboratory in Khartoum, which used to be the Wellcome Tropical Research Laboratory in Khartoum (1903-1934). Examination of the microscope and review of published literature gave clues to the historical background of this microscope. Identical microscopes were first manufactured by R and J Beck in 1898, and continued to be advertised in 1899. The microscope was probably among the instruments provided by Wellcome for the initial establishment of the laboratories in 1902-1903. The article includes a brief review of the development of light microscopy. The need for preservation and proper restoration of old relics of the Wellcome laboratories in Khartoum is emphasized.

Keywords:

Sudan medical history; Tropical medicine; Wellcome Tropical Research Laboratories in Khartoum; Microscope.

INTRODUCTION

The present-day Central Laboratory in Khartoum is a legacy of the Wellcome Tropical Research Laboratories in Khartoum, 1903-1934 [1]. In the 1980s and 90s the laboratory administration discarded what was deemed as old and obsolete equipment. The discarded items included some instruments that were symbols of the history of this laboratory. Among these were some old microscopes one of which is the subject of the present article.

It is an old lacquered brass monocular microscope (Figure 1), battered and with many damaged or missing parts. It shows past attempts of repair that ruined some of its components and left their marks on others. The lacquer coat was heavily tarnished and has been removed from most parts. It is actually a relic of a bygone era of this laboratory but it had no proper professional restoration. The present article explores the historical background of this microscope.

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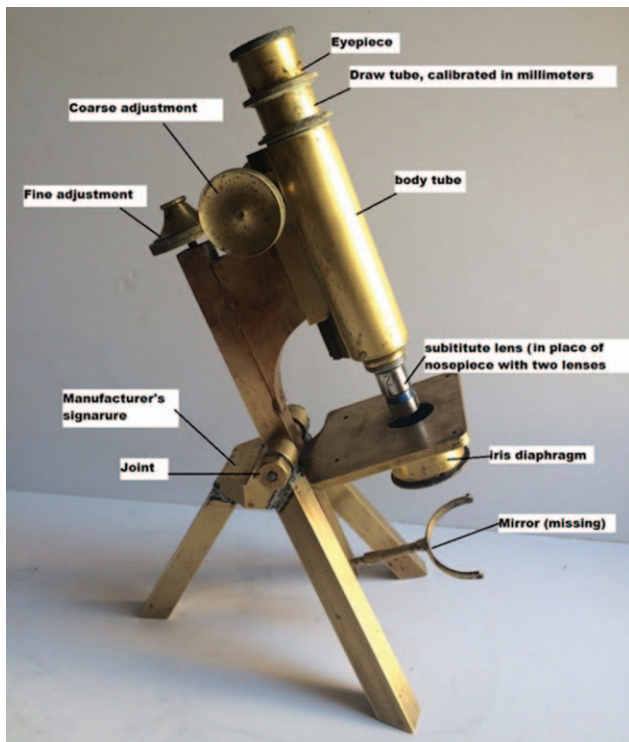


Figure1 - The microscope investigated.

I was fascinated by this microscope, because I have always admired the pioneers of tropical medicine who worked in Sudan with such primitive microscopes and were able to accomplish marvellous drawings of microscopic microorganisms, discover new diseases and conduct pioneering research. Figure 2 is a coloured plate produced in the Wellcome laboratories in Sudan in 1908 using one of these microscopes [2]. In a book on J.B Christopherson who worked in Sudan 1902-1919, Ann Crichton-Harris quoted the words [3]:

“I appreciate the diligence and perseverance of JBC. I could think of him sweating over those old monocular microscopes in Khartoum, with the sun as a light source to diagnose the cases and then weighing each dose the antimony injection and sterilizing the syringe....”

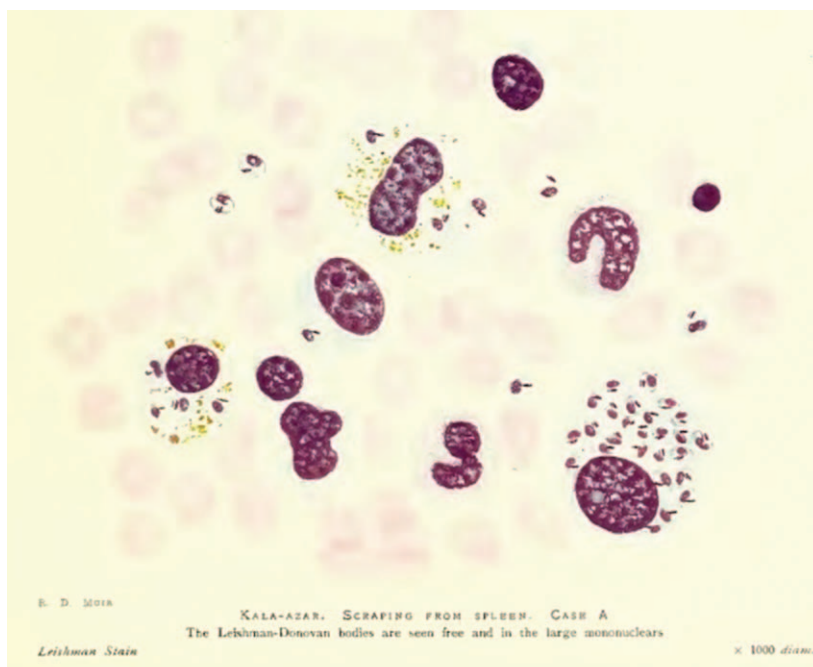


Figure 2 - A coloured plate from the *Third Report of the Wellcome Laboratories, 1908*, showing splenic aspirate smear with intracellular and extra-cellular Leishman-Donovan bodies, Leishman stain [2].

Indeed, those pioneering scientists treasured their microscopes as their trade tools and as companions of their arduous work in remote areas and under harsh conditions. Figure 3 shows a recent photograph of the microscope used by S. Neave appointed as travelling protozoologist in 1904 [4]. This microscope is kept by the family of JB Christopherson [3]. Neave described the first case of visceral leishaniasis by identifying the parasites by microscopic examination of a splenic aspirate from a patient [5]. In the second report of the Wellcome Laboratories Neave described his working conditions [4]:

“In all I made some 800 blood slides and it has been a matter of great labour examining them. While at work in camp the thermometer was often up to 110° F. and over in the tent. This, together with numberless flies attacking one’s face and Myzomyia attacking one’s legs, etc., made life unpleasant, especially when it is remembered that two hands are required when examining a blood slide under the microscope...”



Figure 3 - The portable microscope of S Neave used in and given to JB Chistopherson about 1904.

A brief History of Light Microscopy

Before going into the history of this particular microscope, I will give a brief account of the history of the light microscope.

- The Grec-Roman Claudius Ptolemy (87-168 AD) was the first to describe the phenomenon of light refraction. During the Islamic Golden Age, Muslim scholars extended the work of Ptolemy in refraction and achieved great advances to the science of optics. Ibn Sahl (940-1000 AD) wrote “*Treatise on Burning Mirrors*” (Figure 4), then Ibn al-Haytham (905-1040 AD) wrote a seven-volume treatise on optics which he called “*Kitab al Manazir* (book of optics) [6,7].

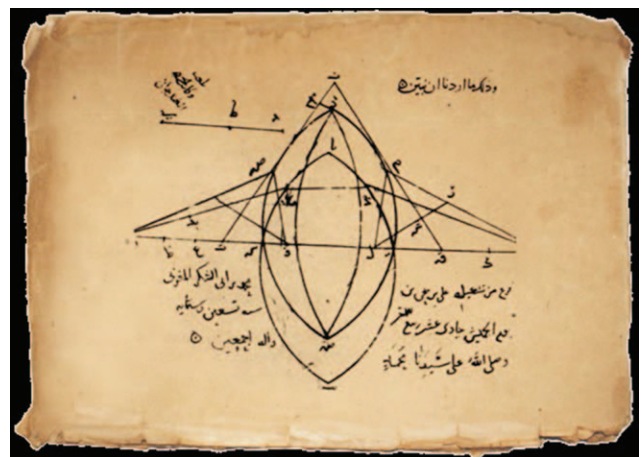


Figure 4 - Diagram for a Biconvex Hyperbolic Lens by Ib-Sahl (940-1000 AD).

- In Holland, Zacharias Janssen (1580-1638) created the first compound microscope which had an objective lens and an eyepiece [8]. This was the basis of the compound microscope and the telescope. By moving the objective lens away from the eyepiece the viewer can have a magnification of 3x-10x, (Figure 5).



Figure 5 - The first microscope designed by Hans and Zacharias Janssen.

- Anton van Leeuwenhoek (1632-1723), a Dutch cloth merchant, built a simple microscope with only one lens to examine blood, yeast, insects and many other tiny objects [9]. Although he used one lens he achieved high magnification of about x300 and was able to see bacteria for the first time. Figure 6-A shows a replica of Leeuwenhoek’s microscope, Figure 6-B reveals its structure and Figure 6-C shows how it was used.

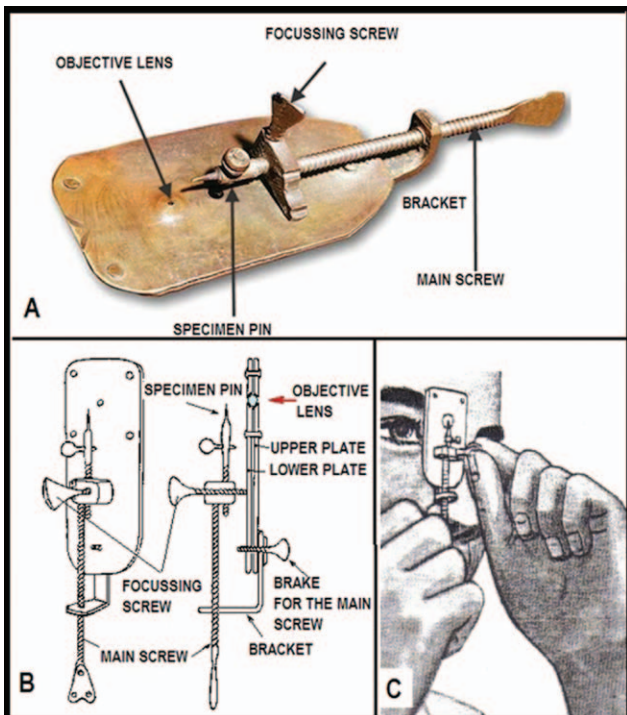


Figure 6 - Leeuwenhoek’s microscope.

- Robert Hooke (1635-1703) is an English physicist who developed a compound microscope with a source of light. He achieved a magnification of X30 (Figure 7). He described biological materials and coined the term “cell” for the first time [10]. Van Leeuwenhoek was secretive of his method for lens making and his secrets died with him. Over the next two centuries the resolving power of microscopes was not much higher than Hooke’s compound microscope.

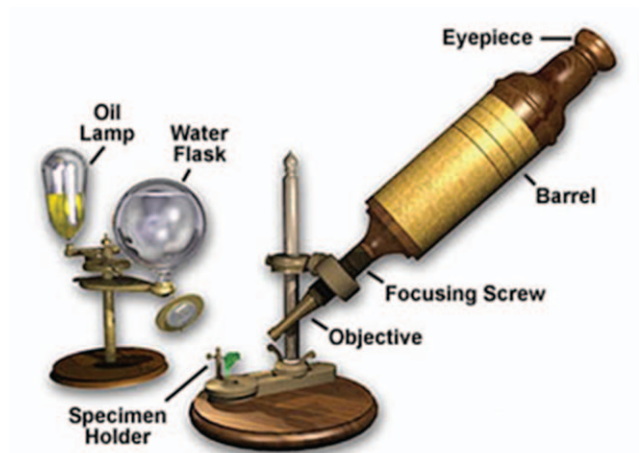


Figure 7 - Hooke’s microscope.

Joseph Jackson Lister (1827-1912) [11] reduced the «chromatic effect» by showing that several weak lenses used together at certain distances gave good magnification without blurring the image and made further developments that made the study of in histology possible . These developments include the “Lister limb” and a short lever mechanism for fine focus (Figure 8).

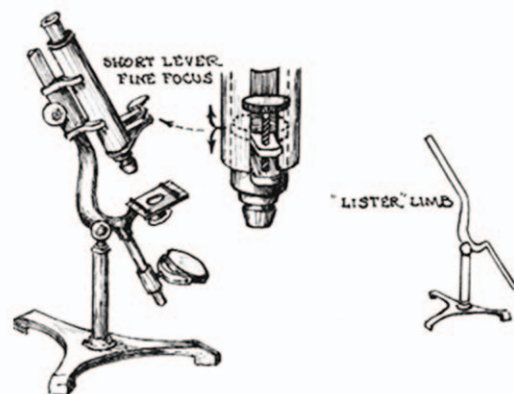


Figure 8 - the fine focus mechanism and Lister limb invented by Lister.

physicist and optical scientist who laid the foundation of modern optics [12]. He greatly improved the ability of microscopes magnification power. He formulated the Abbe Limit or Resolution Limit of microscopy which is determined by the wavelength of light and the numerical aperture of the lens used: $d = \lambda / 2NA$, where d is the spatial resolution possible, λ is the wavelength of light and NA is the numerical aperture. Abbe produced microscopes with significantly higher magnification than that achieved by van Leeuwenhoek. Furthermore, Zeiss and Abbe produced microscopes that could be afforded by many scientists, opening up microscopy-based research broadly. The basic structure of the modern light microscope has finally emerged in about 1880 (Figure 9). The development of the modern light microscope led to a revolution in research in microbiology and medicine towards the end of the 19th and the beginning of the 20th century.



Figure 9 - Zeiss Microscope 1879, with Abbe's optics.

Investigation of the microscope inherited from the Wellcome Laboratories

To investigate the microscope subject of this article, I have tried to answer the following questions:

1. Who was the manufacturer of this microscope?
2. When was it manufactured?
3. How was it brought to Sudan?
4. What was it used for?

First question: Who made the microscope?

The answer was simple because the microscope is signed by R and J Beck (Figure 10). Unfortunately the serial number could not be identified. R & J Beck was a renowned optical manufacturer in Britain [13]. In 1843 the nephews of J. J. Lister, Richard Beck and Joseph Beck founded this optical company (named R and J Beck) in London and then they established partnership with a famous instrument maker, James Smith as Smith and Beck. When Smith retired in 1865, the name of the company reverted to R and J Beck. This company figured very prominently in the history of microscopy and made significant contributions to the development of light microscope.



Figure 10 - Signature on the microscope by R& J Beck Ltd.

Second question: When was it manufactured?

The description of this type of microscopes first appeared in the Journal of the Royal Microscopic Society (JRMS) in 1898 as follows [14,15]:

“British Students” Microscopes.— This name is given by Messrs. R. and J. Beck to their new forms of Students’ Microscopes, two of which are here figured. By making large numbers of these instruments, and by the extensive use of machinery in their production, Messrs. R. and J. Beck consider that they have brought out an excellent class of low-priced Microscope.[Fig 114], (Figure 11 in present article), which shows the cheapest of the set, has a sliding coarse adjustment. Its stand is a solid heavy tripod, with a spread of 6 in. between each foot. It has a joint for inclination, and the fine-adjustment is regulated by a micrometre-screw and large milled head. The large square stage has a distance of 2.5 in. from centre of stage to limb, and allows a very large culture-plate to be examined. The under-stage is provided with a fitting of the full size, and is furnished with an improved form of iris-diaphragm enlarged or contracted by means of a handle-shown in the figure. Each instrument is provided with a plane and concave mirror. An Abbe form of condenser at once converts the instrument into a very efficient Microscope for bacteriology and other high power study. [Fig 115], (Figure 12 in the present article) shows a more expensive form of the same instrument. The difference is partly in the coarse adjustment, which here is a spiral rack and pinion. The draw-tube is engraved in millimetres, and at once records the exact amount of mechanical tube-length in use. Another addition is a rack and pinion focussing and screw centering substage; the milled head of the focussing substage pinion is extended beyond the legs of the tripod, thus placing the focussing adjustment of the substage always within easy reach, even when the instrument is used in a vertical position. By these means all the requirements for the very highest power work are secured, and the very best condensers and highest power object-glasses can be successfully manipulated...

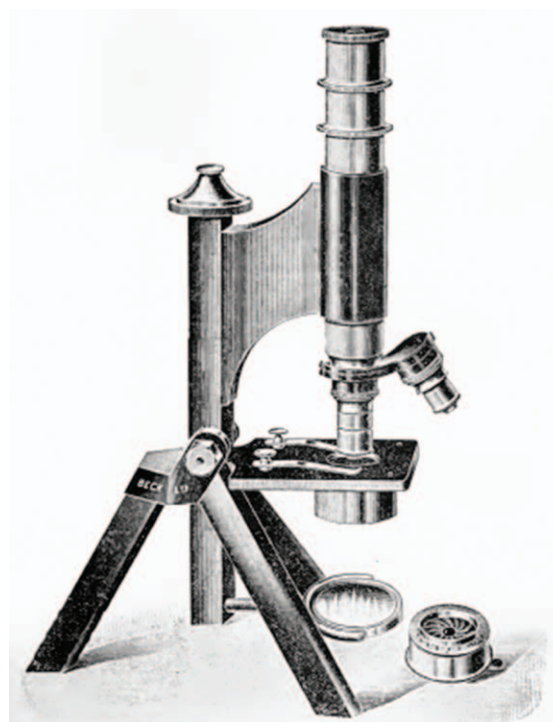


Figure 11 - A cheaper variant of the “British Students” microscope published in JRMS, 1898.

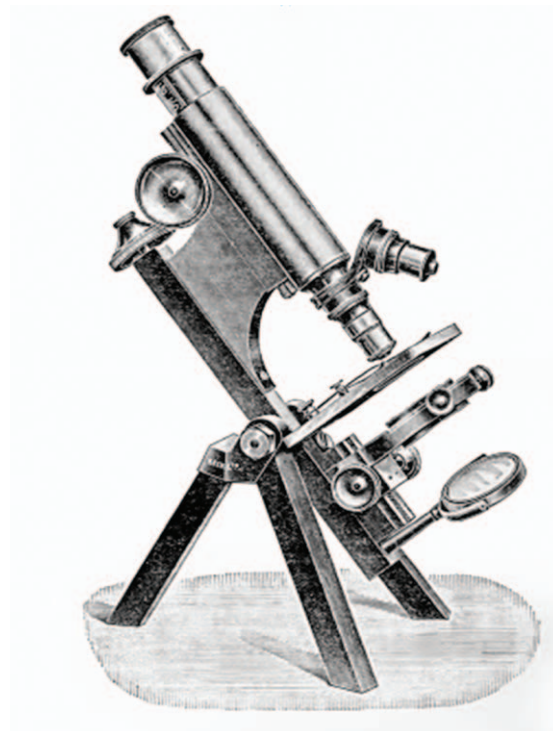


Figure 12 - A more expensive variant of the “British Students” microscope published in JRMS, 1898.



Figure 13 - The cover page of *Nature* of 20 April 1899 showing advertisement for an identical microscope as “the “British Students” microscope [16].

Third question: How was this microscope brought to Sudan?

The fact that the microscope was in the inventory of the laboratory indicates that it was a legacy of the Wellcome Tropical Research Laboratories in Khartoum (1903-1934). The microscope was being promoted by the manufacturer and it was the type of

equipment available in London when the laboratories were being established [16]. In the First Report of TRLK, the Director of the laboratories stated that he inspected the equipment provided by Wellcome to the laboratory in London in 1902 before leaving to Sudan [17]. The microscope is probably part of the first donation by Wellcome to establish the laboratories.

Fourth Question: What was it used for?

The description of the microscope at the time indicates that it was designed for the general bacteriological work. The tripod portable design is also similar to that proposed by Sir Ronald Ross (1857-1932), who was the discoverer of the malaria parasite. Ross designed the portable microscope made by C Baker of High Holborn in London for the use of officers in the Indian Army Medical Service, and was specially designed for the diagnosis of malaria. In 1896 the microscope was featured in the Journal of the Royal Microscopical Society [18]. It appears that the microscope was most probably used by one of the mobile units of the laboratory for the general microbiology investigations.



Figure 14 - A drawing of the portable microscope by Baker, published in Journal of the Royal Microscopical Society 1896 [18].



Figure 15 - Ronald Ross, with the portable microscope which he designed for the Indian Army.



Figure 16 - The portable microscope made by Baker (1891-1910), currently exhibited in the Science Museum, London [19].

CONCLUSIONS

By tracing the origins of one microscope, I hope this article serves to highlight the historical value of the relics of Wellcome Tropical Research Laboratories in Khartoum (1903-1934). The instruments used in the early years of these laboratories need to be collected and preserved. I would suggest that the present-day laboratory administration should play the lead in this effort. Restoration of old instruments like

microscopes needs special skills, patience and money. Improper restoration attempts could easily destroy the instruments [20]. The first step would be to locate these instruments and collect them and preserve them till the opportunity for proper restoration is found. I hope this microscope will serve a nucleus for a collection to be kept by the Central Laboratories in Khartoum.

REFERENCES

1. Abdel-Hameed A A. The Wellcome Tropical Research Laboratories in Khartoum, 1903-1934: an experiment in development. *Med Hist.* 1997 Jan; 41(1): 30–58.
2. Cummins L. Third report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College Khartoum. London: Baillière, Tindall & Cox; 1908. Kala-azar in the Anglo-Egyptian Sudan 1908; 100–106.
3. Ann Crichton-Harris. *Poison in Small Measure: Dr. Christopherson and the Cure for Bilharzia.* Brill 2009. ISBN 10: 9004175415 ISBN 13: 9789004175419.
4. Neave S. Report of Travelling Pathologist and Naturalist. Second Report of the Wellcome Tropical Research Laboratory in Khartoum 1906; 183-204.
5. Neave S. *Leishmania donovani* in the Sudan. *Brit Med J* 1904; 1: 1252.
6. Greater Ancestors. Manuscripts for Building a Heat Ray. Available at: <http://greaterancestors.com/manuscripts-for-building-a-heat-ray/>) Accessed on 5 June, 2016.
7. Khan SA .Medieval Arab Contributions to Optics. *Digest of Middle East Studies.* Spring 2016; 25(1):19–35 <http://onlinelibrary.wiley.com/doi/10.1111/dome.12065/full>.
8. American Physical Society. This month in physics history. Available at: <https://www.aps.org/publications/apsnews/200403/history.cfm>. Accessed on 5 June, 2016.
9. Fun science gallery. Leeuwenhoek Microscope. Available at (http://www.funsci.com/fun3_en/antoni/vlen.htm). Accessed on 5 June, 2016.
10. Optical Microscopy Primer. Hooke microscope. Available at (<https://micro.magnet.fsu.edu/primer/museum/hooke.html>). Accessed on 5 June, 2016.
11. Encyclopaedia Britannica. <http://global.britannica.com/biography/Joseph-Jackson-Lister>.
12. Important ZEISS Figures, Ernst Abbe. Available at: http://www.zeiss.com/corporate/en_de/history/founders/ernst-abbe.html. Accessed on 5 June, 2016.
13. R. and J. Beck. Grace's Guide to British Industrial History. Available at: http://www.gracesguide.co.uk/R._and_J._Beck#cite_note-2. Accessed on 5 June, 2016.
14. Index of Microscopes and Accessories for the Journal of the Royal Microscopical Society: 1878-1907. Available at: <http://www.antique-microscopes.com/jrm/maker-index.html>. Accessed on 5 June, 2016.
15. Anonymous. Summary of current researches, *Journal of the Royal Microscopical Society* 1898. 671 - 73.
16. Advertisement ,*Nature* 1899, Vol 59 No 1538:1
17. Balfour . Introduction , First Report of the Wellcome Tropical Research Laboratory in Khartoum p 9 - 13, 1906.
18. Nelson E.M. New portable microscope Summary of current researches, *Journal of the Royal Microscopical Society* 1896. 351 .
19. Science Museums, Blythe House, London, Portable Microscope 1891 - 1910. Object No. A55232.
20. Anonymous. Restoring: My Advice about Restoring Instruments MICROSCOPEANTIQUES. COM 201315-, Accessed at <http://www.microscopeantiques.com/aboutrestoring.html>.