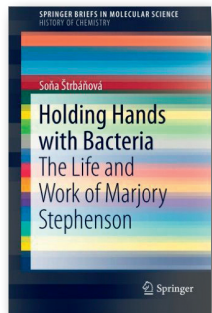


'Holding Hands with Bacteria: The Life and Work of Marjory Stephenson'

Soňa Štrbáňová (2016) DOI 10.1007/978-3-662-49736-4



The Czech scholar, Soňa Štrbáňová, has written a delightful biography of the pioneering biochemist and microbiologist Marjory Stephenson (1885-1948), a founding figure in her subject and one of the first two women elected to be a fellow of the Royal Society. Although quite short, this is the first full biography of Stephenson and it catches effectively her work and her personality and puts them in the context of the times she lived in.

For a girl in the late 19th century, Stephenson was fortunate to be encouraged to study and to take the opportunities then available for women's education. By 1903 she was studying chemistry and biology at Newnham College Cambridge and soon after was earning her living as a Lecturer at a College of Domestic Science and then at 'King's College for Women' (later Queen Elizabeth College of London University). In 1911, she was invited to UCL by Robert Plimmer (a founder of the Biochemical Society) to join him in his research and to teach nutritional biochemistry. Soon after that, she was awarded a prestigious Beit Research Fellowship. But World War 1 intervened, and Stephenson volunteered to run kitchens and nutritional services supporting troops in France and later in Salonika; she was clearly a good manager, improviser and organizer and was awarded the MBE for this war work. At the war's end she reactivated her Beit Fellowship and moved to Cambridge to join the growing focus of biochemical research there, stimulated by F. Gowland Hopkins. Although she initially continued in nutritional research, by 1921 she switched to study bacterial metabolism and it was her work in this field over the next quarter-century that made her name and established bacteria and other microorganisms as ideal model organisms for biochemical – and later genetic – research.

Štrbáňová traces the development of Stephenson's research from the early introduction of techniques such as working on washed suspensions ('resting cells') and the development of nutrient 'balance sheets' to analysis of intracellular enzymes, some – such as lactate dehydrogenase – already known in higher organisms, and others entirely novel – such as the enzymes involved in reducing formate to methane. A development from this work was the realization (though not the terminology) that some enzymes are constitutive while others are only found after exposure to the appropriate nutritional conditions; this latter group were defined as 'adaptive'. During the 1930s, Stephenson and her students and colleagues popularised *E. coli* as a model organism and characterised extensively the phenomenon of enzyme 'adaptation', laying the foundations for the work of Monod and colleagues (from 1940 onwards) that underlie our current understanding of the regulation of gene expression.

Stephenson regularly reviewed the field of bacterial metabolism for Annual Reviews of Biochemistry and produced in 1930, 1939 and (posthumously) in 1949, three successive editions of her major

textbook 'Bacterial Metabolism'. These volumes consolidated her position as an international authority but did not consolidate her professional position or her funding. The account of Stephenson's relationships with the MRC and with Cambridge University is among the most interesting aspects of Štrbáňová's biography. From the early 1920s, Stephenson had received personal salary funding from the MRC and from 1929 was appointed a member of MRC 'External Staff'. The MRC then, as now, ran much of its research through 'Units' embedded in universities and clearly regarded their funding of Stephenson as their major investment in bacterial metabolism – but they could not bring themselves to provide consistent technical support or to appoint her as a Unit Director. So they did not formally establish her operation as a Unit and Stephenson conducted a polite but pointed war with the MRC over the lack of formal recognition for her operation; Štrbáňová gives a wry account of this, based on MRC archives and Stephenson's personal correspondence. (Immediately after her death, the group was formally established as a Unit and Stephenson's former student, Ernest Gale – almost 30 years her junior – was appointed as its Director!). Similarly, although Stephenson taught bacterial metabolism and supervised Cambridge PhD students throughout the 1920s and '30s, the University only recognised the subject and appointed her to a Readership in 1947!

It was only after World War 2, during which Stephenson had redirected the research of her group to topics of immediate national importance, that formal honours came her way. She had been active in discussions with a wide range of medical, industrial, academic and agricultural microbiologists that led to the formation in 1945 of the Society of General Microbiology (renamed last year as the Microbiology Society) and she became its second President in succession to Sir Alexander Fleming. And in 1945, when the Royal Society finally acknowledged that its exclusion of women had been illegal for some years, Stephenson was one of the first two women elected FRS.

Throughout the biography, Štrbáňová uses primary sources (correspondence, MRC archives, Newnham College Archives) not only to trace Stephenson's career but also to point up her striking personality – modest and unassuming but self-confident in her abilities, unpretentious and a derider of pretension in others, an able organizer, a caring and supportive research supervisor and someone who engaged with wider world affairs without wearing her political heart on her sleeve. During the 1930s, she was active in ensuring that biochemists from Germany and Central Europe could find positions in Britain, including the Czech scholars Waelsch and Kleinzeller, and most notably Hans Krebs. As early as April 1933, when Jewish academics were beginning to be dismissed from academic posts in Nazi Germany, Stephenson wrote to Otto Warburg in Berlin enquiring about Krebs' situation and offering her support. As a result, Krebs was able to come to work in Cambridge in June 1933 (bringing with him Warburg manometers, then novel instruments for metabolic research), and this began a lifelong working relationship between Krebs and Stephenson based on good-humoured mutual respect.

Stephenson clearly possessed a self-deprecating wit and made many contributions to the Cambridge Department of Biochemistry's house magazine 'Brighter Biochemistry' (1923 – 1931) including a droll mock book review of her own 'Bacterial Metabolism' and an

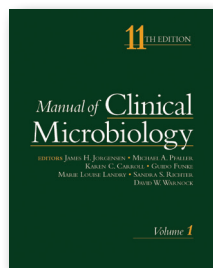
essay 'Down the Microscope', parodying 'Alice in Wonderland', which includes a delightful sketch of herself (as Alice) shaking hands with a polite bacterium. One of the most appealing aspects of Štrbáňová's excellent biography is the way in which she brings out Stephenson's character and her impact on others. For example D.D. Woods, a PhD student of Stephenson's and later Professor of Microbiology at Oxford, recalled that he was inspired to work in microbial metabolism as an 18-year-old in 1930, when he heard a BBC radio talk by Stephenson entitled 'How Microbes Live' in a series of radio talks 'Biochemistry: what it is and what it does.' How times have changed, you might think! But many contemporary women biochemists may feel that not enough has changed and that the frustrations and obstacles that Marjory Stephenson faced are not (like radio talks on biochemistry!) a thing of the past.

Soňa Štrbáňová's achievement in this outstanding biography is that she stimulates thought on all these issues while giving a full and well-illustrated account of the life, work and times of her subject.

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Manual of Clinical Microbiology Volumes I & II

James H. Jorgensen (2015), 11th Edition, Volume 1 and 2, ISBN-10: 1555817378, ISBN-13: 978-1555817374



Manuals of Clinical Microbiology I & II is unequivocally the A to Z of clinical microbiology as every subject imaginable from "Abiotrophia to Zygomycetes" is covered. As books, they are behemoths. That the manuals take up so much space is not surprising; every conceivable classical microbiological technique is here, neatly dovetailing with contemporary techniques in molecular microbiology

which together, characterise, classify and identify the most obscure microorganisms and their metabolites. Some of these techniques are state of the art: matrix-assisted laser desorption ionisation (MALDI-TOF) for the analysis of proteins, polymerase chain reaction (PCR) amplicons and microbial metabolites. Other important methods such as 16S sequencing and microbiome analysis have revolutionized the identification of lineages within species and can precisely identify base pair differences between genes. In these manuals, there is a comfortable acknowledgement of classical microbiological methods at work and homage is paid to classical microbiological methods which are the backbone of contemporary microbiology practices.

Not being intended to be read from cover to cover, these books should be used for referencing and fact finding. However, a chapter on Bioterrorism is edifying from a historical perspective; apparently

this form of warfare was prevalent centuries ago. In the 1300s, Tartars catapulted *Yersinia pestis* riddled corpses into besieged cities to start epidemics. In the 1760s, British soldiers gave native Indians smallpox-riddled blankets to reduce their numbers in order to illegally seize their lands. Indeed, as recently as 20-30 years ago, the USA legislated for the acquisition, transfer and use of bioterrorism agents after a white supremacist fraudulently obtained *Yersinia pestis* from a Biotechnology company. Thankfully, these threats are not prevalent in today's society.

The gut microbiome is cited as the forgotten organ and is currently a hot topic as perturbations in microbiome consortia are believed to contribute to several debilitating diseases/disorders such as Crohns Disease, ulcerative colitis, type 2 diabetes and obesity. With as many as 10^{12} bacteria per gram, the main bacteria in the gut comprise the phyla Bacteroidetes and Firmicutes and depending on diet and weight, bacterial levels fluctuate, leading to perturbations in gut function. Metagenomics has revolutionised this aspect of molecular microbiology and provides insights into hitherto unknown interactions between these bacteria and adjacent human cells.

Volume II contains extensive sections on mycology, how to grow and characterise yeast isolated from clinical samples. One section that will resonate with those of us allergic to work on Mondays is the notion of "Sick Building Syndrome" (SBS). Cited as indoor environments suspected of causing health problems for occupants, mycotoxins are proposed as one possible source of this malady. Supposedly emanating from *Aspergillus*, *Penicillium* and *Alternaria* spp to name but a few, there is no concrete proof these mycotoxin producing fungi are responsible. Indeed, the evidence suggests otherwise, mycotoxins are not volatile, some conditions are not conducive for mould growth thereby limiting mycotoxin production and some fungi differ in their abilities to produce mycotoxins. So feeling glum on a Monday morning is likely to be purely psychosomatic, but not something clinical microbiology can fix.

In some parts of the manuals, there is a dearth of images and figures which can be slightly numbing to the brain. However, where there are images, they are striking. For instance who knew *Yersinia enterocolitica* and *Yersinia pseudotuberculosis* could be so spectacular on sheep blood agar. Similarly, the geometric uniformity of gastroenteritis viruses is almost artistic: images include the norovirus which afflicts hospitals and emergency departments. This review does not do justice to these manuals. The accumulated knowledge is exhaustive which is why these books take four years to update and complete. Suffice it to say, every clinical microbiology laboratory ought to have these manuals in its clinical armoury. ■

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