WOMEN CHEMISTS OF THE LONDON SCHOOL OF MEDICINE FOR WOMEN, 1874-1947

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In the last two decades of the 19th century and the first decades of the 20th century, 896 British women were members of the Institute of Chemistry and/or the Chemical Society (1). It was the emphasis on the teaching of chemistry at British independent girls' schools up until the 1930s which was the cause of this enthusiasm for chemistry (2). But what became of these women after they had completed their education? In a previous work, we showed that teaching domestic chemistry was one avenue of employment (3). We have discovered that chemistry teaching at the London School of Medicine for Women (LSMW) was another.

During a period when British Medical Schools were a male preserve, with male sports and male culture emphasized (4), the LSMW provided a collegial and non-aggressive learning environment for women medical students. As part of their education, the students were required to take inorganic & analytical chemistry and organic chemistry courses. In their studies, the students experienced a welcoming and encouraging yet rigorous learning environment from the pioneering women chemistry teachers. Here we will bring to light the forgotten saga of the women chemists of the LSMW.

A Brief History of the LSMW

From their inception until the founding of the LSMW, all British medical schools had a men-only policy. As part of the increasingly active women's rights movement, in 1874, a Provisional Council of supporters of a women's medical school was organised (5). The necessary sum to establish "The London School of Medicine for Women" was rapidly obtained. Sympathetic male faculty from other London teaching medical schools offered their services to lecture part-time at LSMW, and the School (Figure 1) opened its doors in the same year. The initial enrollment was 14, increasing the following year to 23.

Figure 1. *The London School of Medicine for Women, ca. 1876 (London Metropolitan Archives)*

Chemistry was part of the program of studies from the beginning, with Charles William Heaton of Charing Cross Hospital as Lecturer. It was noted in the School history that "... the Lectures on Chemistry were given in a room on the left-hand side of the garden entrance to the old building, which was also used for Practical Chemistry in the summer, ..." (6).

Unconnected to any area hospitals, the LSMW initially lacked any opportunity for the students to undertake clinical studies. Fortunately, in 1877 an agreement was reached with the Royal Free Hospital (RFH) to allow the women students access to the RFH wards. In the same year, the University of London admitted women to its medical examinations. Over the following decades, many of the women students of the LSMW received recognition for outstanding performance. For example, in 1881, Mrs. Scharlieb took 1st Class Honours in Materia Medica and Pharmaceutical Chemistry while Miss Tomlinson was awarded 2nd Class Honours in Organic Chemistry. And in 1886, over half of all the honours medical students of the University of London in Anatomy, Physiology, and Materia Medica, were the women students of the LSMW.

In 1896, to indicate the increasingly close relationship with the RFH, the name was changed to the London (Royal Free Hospital) School of Medicine for Women. The number of students increased, and by 1914, there were over 300 women, resulting in an urgent need for additional facilities. Construction was completed in 1916, including new science laboratories. It was reported in the LSMW *Magazine*: "On this (ground) floor is the *Maude du Cros* Organic Chemistry Laboratory and a Chemical Research Laboratory connecting with the Inorganic Department" (7).

***Figure 2**. Women medical students working in the inorganic & analytical chemistry laboratory ca. 1916. (London Metropolitan Archives)*

In 1947, the LSMW was required to become co-educational and the "of Women" dropped from its name. Finally, in 1996, it was absorbed into University College, London, Medical School.

Chemistry at the LSMW

Our particular interest in the Chemistry Department of the LSMW was that, apart from the initial appointment of Heaton, it was exclusively women-staffed until the mid-twentieth century. Each of these women chemists was an incredible character with a driving zeal for chemistry. The interest in chemistry was also apparent among the students, as exemplified by rhymes on chemistry-related topics which periodically appeared in the LSMW *Magazine*. Such a blend of chemistry and poetry was not uncommon in this period as we have discussed elsewhere (8).

The first extract from the pages of the LSMW *Magazine* is a poetic summary of the complete qualitative inorganic table (9) of which we will include only the preamble and the first section (confirmatory tests shown here in italic, bracketed in the original):

A Mnemonic of Inorganic Analysis

If you will learn this little rhyme,
You'll pass First Medical—in time!
Given a salt you do not know
Start analysing, as below.

I. *A* Add HCl, and then you'll get

The metals of Group I., you bet.
Add water, and you'll find the lead
Without a word, has softly fled.
If on this point your partner wrangles
KI will give you golden spangles.
You then proceed to add ammonia,
The silver, you perceive, has flown-i-a!
The blackened mercury will lead yer
To add to this some aqua regia
If stannous chloride's added here
On warming, Hg will appear.

Inorganic qualitative analysis was obviously a significant part of the practical work. The *Magazine* in 1912 carried a series of amusing comments overheard at the LSMW, including this one in the Chemistry Laboratory (10) (italic in the original):

First Year student (*doing chemical analysis*)—Extract from book, "Tests for the carbonates (salts of the hypothetical acid H_2CO_3)".

Student (*much worried, to demonstrator*)—"Please, Arthur (stores person) hasn't got hypothetical acid, or any of its salts; what *am* I to do?"

Organic chemistry became an additional prerequisite of the University of London Faculty of Medicine degree in 1903. A poem based upon Longfellow's Hiawatha, satirically described the additional course requirements (11), of which the organic chemistry segment is quoted here:

Hiawatha, Medical Student

Then they (members of Senate) spake again: "Tis little,
This is altering very little!
We must not be Medes and Persians.
What is left?" Then simultaneous
From all lips the words "Organic
Chemistry of Carbon Compounds!"
And the Institute walls trembled
and the lions at the entrance
Roared in unison "Organic—"
So they slipped the word Organic
In among the Pre. Sci. subjects,
An important alteration
Born of heaven-sent inspiration.

Organic chemistry was also the subject of a later poem (12), of which the first verse is given here:

Thoughts on Organic Chemistry

Awful stinks and stenches,
Cleaning up of benches.
("Don't put the burner on, the ether'll catch alight.")
Complicated formulæ,
Acids, salts and alkali,
Working out of problems that take you half the night.

Lucy Boole

The first woman to hold a position in the Chemistry Department of the LSMW was Lucy Everest Boole (13). Born in Cork in 1862, she was one of the five daughters of the mathematician, George Boole. Though having had little formal education, Lucy Boole obtained admittance to the School of the Pharmaceutical Society in 1883 (14). After passing the examinations, only the second woman to do so, she became the first woman researcher in pharmaceutical chemistry. Working with Professor Wyndham Rowland Dunstan at the Pharmaceutical Society Laboratory, in 1889, Boole developed a procedure for the analysis of tartar emetic. The procedure, published in the *Pharmaceutical Journal* (15), was in use as the official assay method until 1963.

In 1891, Boole was appointed Demonstrator in Chemistry at the LSMW under Heaton. Shortly after, as a result of Heaton's ill-health, she took over his duties. Upon his resignation in 1893, Boole was appointed to his position of Lecturer in Chemistry. Unfortunately, later in 1893, deteriorating health caused Boole to submit her own resignation. Wishing to keep her, the Council of the School divided her duties, assigning her as Teacher of Practical Chemistry (13), while hiring Clare de Brereton Evans (see below) to be Lecturer in Chemistry.

Boole was elected the first woman Fellow of the Institute of Chemistry in 1894. The other organization, the Chemical Society, barred women from membership, and in 1904, she was one of the 19 women petitioners for admission (16). Boole died in December 1904 at the age of 42. Included in her Obituary was a comment from one of her former students (17):

> Miss Boole was no believer in 'cram-work,' it was the real deeper meaning of her science that she cared about; and while she taught us with conscientious care the facts necessary for us to know for our examinations, those who knew her well realised that to her that part of the subject was only the threshold to an inner world of knowledge untouched by examination requirements.

Clare de Brereton Evans

To take over the lecturing on chemistry, the LSMW hired Clare de Brereton Evans. Also an activist for women's rights, Evans, too, was a signatory on the 1904 petition for the admission of women to the Chemical Society (16). Born ca. 1865, Evans had been educated at Cheltenham Ladies College (CLC) and had also obtained a B.Sc.(London) in 1889 while at CLC (18). She had then moved to London in 1894 to commence research with Henry Armstrong at the Central Technical College. Her research with Armstrong resulted in her being awarded a D.Sc. degree in 1897, the first woman to receive that degree from the University of London.

From the early 1900s, Evans combined her LSMW teaching with part-time research at University College, London, under Sir William Ramsay. Ramsay had many of his research group, including Evans, searching for new chemical elements. In 1908, she claimed to have isolated an unknown metal from the mineral thorianite (19). Unfortunately, this was not the case. In 1912, she resigned her position at LSMW so that she could devote

herself full-time to her research (20). Nothing is known of Evans after this period.

Sibyl Taite Widdows

Sibyl Widdows dominated the LSMW Chemistry Department for 40 years. Born in 1876, she was educated at Dulwich High School, one of the girls' schools which emphasized chemistry in its curriculum (2). Widdows then obtained a 1st class honours degree in chemistry at the women-only Royal Holloway College of the University of London in 1900 (1). The following year, she was appointed Demonstrator in Chemistry under Boole and in 1904, took over Boole's position of Teacher of Practical Chemistry following Boole's death.

Widdows was another signatory on the 1904 petition for the admission of women to the Chemical Society (16). Promoted to Lecturer in Inorganic Chemistry in 1912, following Evans' departure, Widdows was appointed Head of the Chemistry Department in 1935, though she had been acting head for many years previously.

***Figure 3**. Sybil Taite Widdows in the research chemistry laboratory. (London Metropolitan Archives)*

Her obituarist, Phyllis Sanderson, described Widdows as follows (21):

> ... Of miniature stature, alert and sprightly, Miss Widdows possessed such vitality and drive that it seemed a store of dynamite must be housed within her small frame.
>
> As with all who have a gift for it, she loved teaching and did so with untiring verve, never despairing even of the slowest of her flock.
>
> ... Practical classes, certainly no play time, held an element of excitement (possibly mixed with terror) that kept everyone on their toes; for S. T. W. would systematically work her way down the laboratory, visiting student after student to ensure that each in turn was fully understanding what they were doing. Suddenly a loud scream of dismay would ring out and all would shudder, knowing full well that some unfortunate student had uttered an appalling chemical howler or had committed some dangerous crime such as heating an inflammable liquid with a naked flame. Near neighbours of the offender would immediately rush off to recharge their wash-bottles or busy themselves at the fume-cupboard hoping (in vain) to escape the deadly searching questions so soon to reach them.

The students also composed songs about their instructors. We include here two verses about Sibyl Widdows, the first from 1923 (22) and the second from 1929 (23):

> A general Chemmy favourite is Miss Widdows, B.Sc.,
> She mothers all the students and invites them all to tea,
> So why not all be medicals—and she might ask you too,
> And put you through your paces at the L.S.M.W.
>
> My name is Sybil Taite Widdows, I'm the fiend of the Chemistry Lab.
> Whenever I smell the H_2S, it gives my heart a stab,
> My students will not concentrate on anything I say,
> I urge them to economise a hundred times a day.

In addition to teaching, Widdows was an active researcher, authoring at least 12 publications involving analytical chemistry of biological relevance. For example, in the LSMW *Magazine* of 1921 it was commented that (24):

> Miss Widdows (Chemistry Department) is determining the calcium content of the blood under various conditions, to see what may be the limit of physiological variation during menstruation and pregnancy. She is hoping to extend these determinations to various pathological conditions, with a view to finding whether the calcium content of the blood may be used as a diagnostic factor.

Widdows subsequently turned her attention to breast milk as this letter to the Editor of the *British Medical Journal* indicates (25):

> For some time at this school a group of workers has been investigating breast milk, from both biochemical and chemical aspects. ... It has now been decided that this investigation should be extended to include secretions occurring before parturition, during menstruation, and other instances of mammary activity. As such cases are infrequent, may we ask the help of your readers in giving us the opportunity of getting into touch with women in whom the breasts become active before parturition, or independently of pregnancy?

Retiring in 1942, Widdows died in 1960. Sanderson remarked (21):

> As so many of her contemporaries, she was an ardent feminist and willingly sacrificed her own career as a chemist for the cause most dear to her heart, the training of women doctors at Hunter Street [LSMW], the only training ground in Medicine open to women in England at the time.

Phyllis Sanderson

Widdow's successor as Head of Chemistry in 1942 was Phyllis Sanderson (26). Born in 1901 at Hove, Sussex, she was educated at Brighton and Hove High School, another British girls' school which emphasized chemistry in its curriculum (2). Sanderson completed her B.Sc. degree in chemistry at University College, London in 1924. After one year of postgraduate study at the Children's Hospital, London, she was appointed Demonstrator in Chemistry at the LSMW.

In addition to teaching, during the 1930s, Sanderson undertook research with Professor Vincent Briscoe at Imperial College, London, on industrial dusts, especially chemical aspects of silicosis in miners, resulting in 11 publications. She was awarded a Diploma of Imperial College for this work. At LSMW, Sanderson was promoted to Senior Demonstrator in 1933; Assistant Lecturer in 1934; and Lecturer in 1946. Her later research was undertaken at University College, London, for which she was awarded a Ph.D.

Sanderson also undertook research on the nature of heterocyclic organic compounds, but later in her career, the history of chemistry became her major research occupation. In her obituary it was noted (26):

> It was typical of her sense of justice that in one of these studies she should have rescued from oblivion a hitherto obscure 18th Century scientist, William Cruickshank, by re-establishing his claims to several important discoveries that had been erroneously ascribed to another investigator.

Sanderson died in 1965.

Anne Ratcliffe

Following behind Sanderson career-wise was Anne Ratcliffe, the last of the women Lecturers at the LSMW (27). Born in 1896, Ratcliffe also obtained her degrees at University College, London, a B.Sc. Honours in chemistry, and later in life, an M.Sc. in 1939 on sterols and carbohydrates in certain fungi. She was appointed to the position of Demonstrator in Chemistry in 1929, being promoted to Senior Demonstrator in 1940; Assistant Lecturer in 1945; Lecturer in 1947; and finally Senior Lecturer in 1949.

Upon Ratcliffe's retirement in 1961, Phyllis Sanderson wrote of her character (27):

> That she is an inspired and tireless teacher was quickly realised by students ... Patient and kind though she is, however, Miss Ratcliffe would not tolerate shoddy work or bad manners ... She is one of those rare beings possessed of extreme intellectual honesty. Rather than risk passing on often erroneous textbook information to a student she would take infinite trouble reading original papers on the subject, and never would she say she understood anything unless she had probed to the depths and considered it from every possible angle.

Other Women Chemistry Staff

During Evans' Lectureship, it was Norah Ellen Laycock who held the position of Demonstrator from 1906 to 1916 (28). Laycock obtained her B.Sc. degree from Royal Holloway College in 1901. In 1916, she was appointed as Assistant Lecturer in Biology, remaining in this position for 25 years. In the same 1916 issue of the LSMW *Magazine*, it was reported that the new Demonstrator in Chemistry was Miss Y. M. D. Cooper (28), though no other information could be found about her. About the same year, Mrs. Effie Isobel Stirling-Taylor was appointed to the Chemistry Department, retiring in 1936, though the position was not specified (29).

Because the Chemistry Department was, in many ways, an add-on to the LSMW, it was poorly documented, except for the Lecturers. In the photo below of the full Chemistry Department Staff of 1916, we see that there were five members: Effie Isobel Stirling-Taylor; Mrs. Matthews; Miss MacKenzie; May Williams; and Sibyl

Taite Widdows. Curiously, Miss Cooper is not listed, unless she was now under the married name of Matthews.

Figure 4*. Photo of the Chemistry Staff of the LSMW, 1916: Miss Widdows (seated center); from left to right, Mrs. Stirling-Taylor; Mrs. Matthews; Miss MacKenzie; and Miss M. Williams. (London Metropolitan Archives)*

The only other individual for whom we have any information is May Williams (1). Williams was born in 1886, and educated at Notting Hill High School, yet another British girls' school which emphasized chemistry in its curriculum (2). She entered Royal Holloway College in 1905, completing a B.Sc. in chemistry in 1909. She was appointed as Demonstrator in 1909 and promoted to Senior Demonstrator in 1920, and to Assistant Lecturer in 1921. In 1922, Williams received an M.Sc. in chemistry based on her research on quinoline derivatives. At her retirement in 1946, it was commented (30): "Miss Williams' brilliant gifts as a teacher, her renowned patience with the students to whom chemistry was no easy subject ... will be greatly missed."

Commentary

We have shown here that the Chemistry Department of the LSMW was a unique "haven" of employment for women chemists. It enabled the women medical students to feel at home in a supportive yet rigorous educational environment. This "golden era" came to an end with the change in status to a co-educational institution and subsequent merger into University College, London. As a result, this avenue for employment of women chemists ceased to exist.

Of note, all of the women of whom we have educational information (apart from Boole) attended girls' schools which emphasized chemistry as part of the curriculum. Several obtained their first degree from Royal Holloway College, one of the women's colleges of the University of London, while the others obtained their degrees from University College, a co-educational college of the University of London in close proximity to the LSMW.

In our view, it is unfortunate that the importance of such institutions as the LSMW have been totally lost from history. This research was undertaken so that the LSMW women chemists can claim their rightful place in the historical record of women in science.

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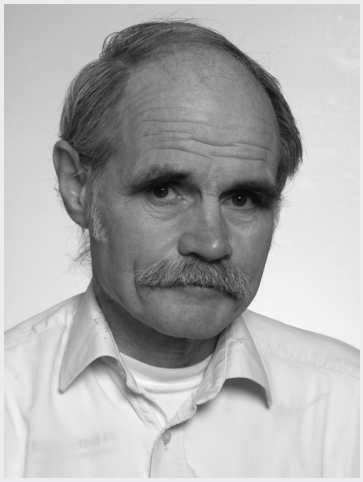
Bulletin for the History of Chemistry Best Paper Award for 2016



The winner of the Best Paper Award for 2016 is Professor Helge Kragh of the Neils Bohr Institute in Copenhagen. The paper was "From Cosmochemistry to Fuel Cells: Notes on Emil Baur, Physical Chemist," *Bull. Hist. Chem.,* **2015**, *40*(2), 74-85.

Kragh graduated from the University of Copenhagen in 1970 with master's degrees in physics and chemistry. He served as a High School teacher from 1970-1987, but in 1978 he followed his true love and pursued a doctorate in the history and philosophy of science at Roskilde University Center (Dr. Sc. 1981). He was appointed Associate Professor at Cornell University from 1987-1989 in the history of physics. His final post was as Professor in the History of Science Department at Aarhus University, Denmark, from 1997-2015. He has served as President of the European Society for the History of Science. He has been very active in the study of the history of physics, chemistry and astronomy. He is also a recognized scholar in the area of the interaction of religion and science.