Pen portrait - W.E. Knowles Middleton

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It is hard to imagine in this era of rigid specialization a scientist of Knowles Middleton's breed achieving contemporary success. A genuine polymath and fluent in Latin, German and French (Devine, Science.ca website), he published around 100 scientific papers (Thomas, 1998) and 17 books on meteorology, climatology, optics, instrumentation and scientific history. As far as meteorologists are concerned the most important books were *Invention of the Meteorological Instruments* (Knowles Middleton, 1941), *The History of the Barometer* (Knowles Middleton, 1964), *A History of the Theories of Rain and Other Forms of Precipitation* (Knowles Middleton, 1965) and *A History of the Thermometer and its Uses in Meteorology* (Knowles Middleton, 1966). His wide-ranging interests were reflected by memberships of the Inter-Society Colour Council, Optical Society of America, Royal Meteorological Society, Royal Photographic Society and Royal Society of Canada (National Research Council, 1962). A practical man as well as a scholar, he built some of his own furniture at a time when finances were stretched (Devine, personal correspondence).

William Edgar Knowles Middleton was born on 23 June 1902 in Walsall, West Midlands, son of Richard Edgar Middleton and Margaret Jane (nee Knowles). Known as 'Bill', he emigrated to Canada with his family at the age of nine when his father – a chemist from Leipzig University – bought a farm in Saskatchewan, moving to Regina in 1918. In 1921, he commenced studies at Purdue University but lack of money forced him to return home after two years and find employment, despite being financed by his mother's typing work. In 1925, he recommenced his studies, now at the University of Saskatchewan – working on survey crews to subsidize his education – and he graduated with a BSc in May 1927 (Knowles Middleton, undated). He was already noted as a student with wide-ranging interests – his graduation photograph's citation noting, 'Seldom has the Goddess of Genetics permitted the existence of an individual possessing as many admirable characteristics as this versatile physicist... he has already attained prominence in dramatics, art, writing and science. A great sense of humor, a keen mind, and a knowledge and interest in every subject have made him welcome to any company.' (University of Saskatchewan Archives, 1927). With the help of a bursary from the National Research Council of Canada (NRC) he obtained his MSc from Saskatchewan in 1929 (Thomas, 2001; Bacon, 2005). An affectionate citation accompanies his MSc graduation photograph:

'"Bill" smokes a pipe and goes to Mess Dinners.

"William Knowles Middleton" smokes a pipe, carries a cane and goes to tea-parties and concerts.

"Middleton" smokes a pipe, wears a Lab coat and chases atoms and fearful formulae all over the Physics Building.

"Knowles Middleton" smokes a pipe, wears stout, well-polished Oxfords and calls down the wrath of his ancestors and the Gods of Capitalism on all unbelievers.

"Edgar Middleton" smokes a pipe, plays the violin, draws, paints, writes poetry and composes sonatas.

But there is only one W. E. K. M.' (University of Saskatchewan Archives, 1929)

On leaving university he worked as a researcher and salesman for the Gypsum, Lime and Alabastine Company in Toronto but the Great Depression was to change the course of Knowles Middleton's career. Only recently married to Dorothy Day from Saskatoon, he was made redundant in 1930 but fortunately was offered jobs by Kodak, NRC and the Meteorological Service of Canada (MSC) in Toronto – he chose the latter. The 1930s saw an explosion in the demand for aviation meteorological services and Knowles Middleton trained as a forecaster. When, by 1932, funding cuts due to the Depression virtually eliminated this work (although the demand for forecasting for other purposes continued to grow) MSC decided to lay the foundations for recovery by increasing attention on training, research and development (Thomas, 1971a). In 1932 he was employed as a station inspector and travelled to the Canadian Arctic on the *RMS Nascopie* during the Second Polar Year, publishing reports on the climate of Canada's eastern Arctic and Atlantic coasts. At this time his first notable foray into instrument development was made, when he devised equipment to be used during motor-car traverses to measure surface temperatures, co-authoring the classic, seminal paper *Temperature Profiles in Toronto* (Knowles Middleton and Millar, 1936), one of the first on urban temperature mesoclimate. 1932 also saw the birth of a son and a daughter, John and Diana.

His researches led to him being offered the post of honorary lecturer in the Department of Physics at the University of Toronto in 1933, which he held until 1939. His principal studies were into optics and visibility but he also lectured to the meteorology Masters students on instrumentation (Devine, 2005). In 1935, he published *Visibility in Meteorology, the Theory and Practice of the Measurement of the Visual Range* (Knowles Middleton, 1935) with the University of Toronto Press, with a second edition in 1947. In 1936 he joined the Optical Society of America; on 17 November 1937 he was elected a member of RMetS (RMetS files) and transferred to the Canadian Branch on its formation in 1939, holding the post of President in 1945 and 1946. Knowles Middleton was an influential member of the Branch, being present in the group photograph of RMetS and the American Meteorological Society in Toronto 28/29 August 1939 where the official announcement of the Branch's formation was made (CMOS History webpage; CMOS Photo Archive webpage a). He transferred back to RMetS when the Canadian Branch was dissolved at the end of 1966 and retained membership until 1978. During the 1940s, Knowles Middleton continued work in the field of instrumentation within MSC whilst continuing to lecture, being active in leading research and development, with R.C. Jacobsen, into the Canadian radiosonde, an automatic weather reporting buoy, a new thermometer screen ventilating system and a new cloud-height sensor (Thomas, 1971b). He was elected Fellow of the Royal Society of Canada in 1943 and when, in 1946, a

dedicated Instrument Division of MSC was formed, he was appointed as its first Chief.

In 1941 *Invention of the Meteorological Instruments* was first published by the University of Toronto Press, containing chapters on barometers, thermometers, rain gauges, humidity and evaporation instruments, wind vanes, anemometers, sunshine recorders, meteorographs (early Automatic Weather Stations), the measurement of upper-air winds and clouds and early radiosondes; with 224 figures, mostly old line-drawings, and with just a few photographs of the later instruments. Today the book is mainly of interest to historians of meteorology, no longer having practical use as a handbook, but as a record of early meteorological instruments and of their evolution it is unique and invaluable. The book reappeared in second and third editions in 1943 and 1953, the latter co-authored with Athelstan F. Spilhaus, being reprinted in 1965. In 1969 it was published by Johns Hopkins Press, Baltimore, with Knowles Middleton as the sole author again.

As the Second World War ended and the reduction in military requirements caused a reduction of staff within MSC, Knowles Middleton appeared to be secure and unaffected. Shortly after taking over the Instrument Division, however, he left the Meteorological Service in 1946, taking up the position of Research Officer in the Photometry and Optical Instruments Section of the Physics Division of the NRC in Ottawa, specializing in colourimetry – a change in direction which obliged him to decline the nomination of first President of the International Meteorological Organization (IMO) Commission for Instruments and Methods of Observation in 1947, accepting instead an ordinary position on the Commission (CMOS Photo Archive webpage b). During his tenure at NRC, his knowledge was brought to bear on several Canadian Standards Association committees: the Defence Research Board, the American Society for Testing Materials, the Illuminating Engineering Society, the US Armed Forces – NRC Vision Committee and committees of the IMO/WMO – a quite remarkable scope of expertise. These years were punctuated by awards and fellowships: an Honorary Doctorate of Science from Boston University in 1957, the Frederic Ives Medal from the Optical Society of America in 1959, followed by a Fellowship in 1960. Knowles Middleton also produced around 30 papers on visibility and the optical properties of the atmosphere and, in 1952, he published *Vision in the Atmosphere* (Knowles Middleton, 1952). By 1962 he was Head of his Section and took early retirement in 1963 (Figure 1).

Retirement allowed him to concentrate efforts on further study. In 1964 he wrote *The History of the Barometer*, published by Johns Hopkins Press with a second printing in 1968 (the publication rights are now with Baros Books, Trowbridge, UK, who published a copy in 1994). This book elaborated, considerably, on the chapter on barometers in *Invention of the Meteorological Instruments*, with 489 pages (23 pages being index), making it his longest. There were 207 figures, again mostly old line-drawings. The same atmosphere fills its pages, emanating detail and precision and time spent in careful research in museums and around Europe. Some of the illustrations of instruments now look more like Heath Robinson contraptions than the cutting-edge technology they would once have been (Figure 2). Looking at the mechanical complexity of these instruments, it is also interesting to reflect on how the same things can usually now be done with a small electronics board and a compact sensor, all at a fraction of the cost; the complexity and clever design is now invisible, reduced to microscopic levels in the bland little nondescript components. But who would forego the beauty of a mercury barometer, or a Campbell Stokes sunshine recorder? Some of the designs illustrated are very complex and even a bit difficult to understand at times. Mostly the book follows the progress of mercury barometers and it is not until page 396 that we get to aneroid instruments, the penultimate figure being of a capacitive aneroid sensor in a tuned-grid, triode valve, oscillator circuit. Knowles Middleton seems quite at home with these electronics and, if he had so chosen, he could probably have progressed with ease to describe the electronic instruments of the second half of the twentieth century. It seems he chose to do something different instead.

Figure 1. Official retirement photograph of WE Knowles Middleton taken in 1963 by the National Research Council. (©NRC, Canada.)

In 1965 there followed *A History of the Theories of Rain and Other Forms of Precipitation,* published by Oldbourne, London. With 223 pages it is the shortest of the four books described here, perhaps because it has no figures, except for the front cover of an aneroid barometer scale pointing to 'Rain'. Perhaps the lack of figures is because this book is not about how rain is measured (whereas his other books were essentially about instruments), but about how rain forms and the complex story of how we gradually learnt of the processes involved. Probably, of all his books, this one still has the most relevance today since there is no technology in it that can date. It is about ideas, dealt with in Knowles Middleton's detailed and carefully crafted way.

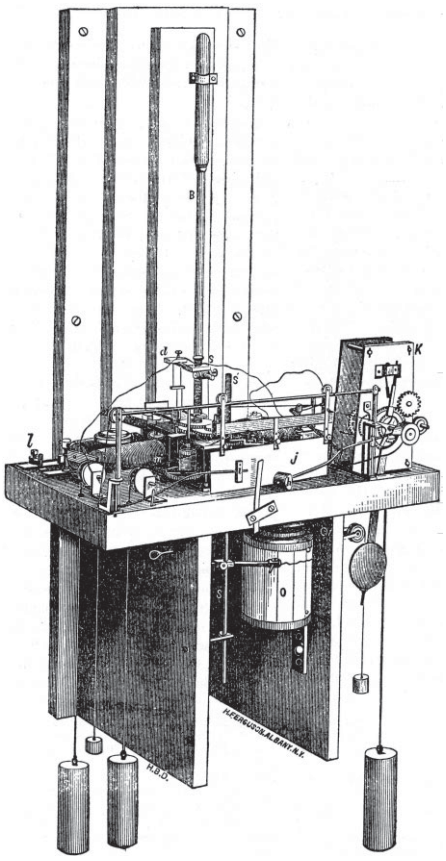

Figure 2. Line-drawing of a barograph by WE Knowles Middleton, from The History of the Barometer. *(© Baros Books, Trowbridge, Wilts.)*

Finally, in 1966, Johns Hopkins Press published Knowles Middleton's *A History of the Thermometer and its Uses in Meteorology*. Relatively short again, at 249 pages, there was, however, a return to his former concern with measurement and instruments, with the same style as in his first two books described above. We get a very good introduction to the development of the early thermometers, with all the many contributors discussed in detail, from Amontons to Thompson. The question of scales and fixed points and who invented the centigrade scale are all dealt with and it is well worth reading for these clarifications alone. The final chapter is a good summary of the various screens and shelters that were developed in the nineteenth century to protect thermometers from radiation and rain.

In 1967 he returned to Canada from Europe, taking up the post of Professor Emeritus and Honorary Lecturer in the Department of History of Medicine and Science at the University of British Columbia until 1978, being further honoured in 1976 by an honorary Doctorate of Science from McGill University. 1979 saw, perhaps, his greatest recognition when CMOS awarded him the Patterson Medal in recognition of distinguished service to meteorology in Canada, its highest award. It is perhaps surprising to find that Knowles Middleton does not appear to have ever been a member of CMOS, or its predecessor CMS (Rutherford, 2007). His final recognition came in 1996 when he was made an Honorary Member of the American Meteorological Society. He died peacefully in his sleep at the age of 95 on 30 January 1998 at his home in Edmonton, Alberta, Canada. He was survived by his wife and both children.

It is difficult to overestimate the importance of Knowles Middleton in his fields of interest. His books on instrumentation were standard texts for many decades and have only been superseded in the last 10 years or so; his books on optics have yet to be replaced. In reading all of these books, one values the subtleties of history that Knowles Middleton explains. You come away from them not only knowing a great deal about the topic but also with a strong feel about the author, about the people who did the work that he is describing and of the times during which the work was done. For anyone looking for help with modern instruments, his books provide no answers, but Knowles Middleton explains his reluctance to move into the modern era by saying that once the electronic phase began he was left behind by the technology and felt that his readers would be also. Transistors and integrated microelectronics were still some way off, but soon to change everything radically. One feels, however, that Knowles Middleton would have enjoyed seeing it all and would have written authoritatively about the latest technologies. Knowles Middleton has not been as fully recognized in meteorology as he should have been. Hopefully this article will go some small way to correcting this.

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University of Saskatchewan Archives. 1929. Graduation photograph of WE Knowles Middleton. *The Greystone 1929.* [14 November 2007–Tim Hutchinson, Archivist].

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