

## Chapter 2

# Ruby Payne-Scott: the Early Years: 1912–1938, Ancestors, Childhood, Secondary School and Sydney University

### Ruby Payne-Scott's Paternal Ancestors in the UK

Thanks to census data, birth, death and marriage certificates, and the occasional public notice in a local newspaper, we can in fact trace Ruby Payne-Scott's paternal ancestors back three generations to the United Kingdom.<sup>1</sup> What we find is a history of men trying their hand at a number of professions with perhaps limited success, and women giving birth to children well into their thirties, with extended families who tended to stay nearby and remain connected as younger generations were born and raised.

We start in the early nineteenth century with Ruby's paternal great-grandparents in the town of Tiverton, in the County of Devon, England. Tiverton is an old town on the River Exe, in the southwest of England, once a flourishing centre of the wool industry. Due to industrialization and competition from abroad, however, the wool trade declined in the late eighteenth century. Things picked up again in 1815 with the opening of the John Heathcoat and Co. lace-making factory, which utilized new machinery and the recently popularized synthetic dyes. Here we find Ruby's great-grandfather, John Scott, who made a living as a dyer in the lace factory.

John Scott was born in 1801, and in late 1830 he married Margaret Payne, who was born in 1808. John and Margaret had four children; Martha, Henry, Mary and Hubert. The eldest son, Henry Thomas Scott<sup>2</sup> was born on 18 May 1835. Ruby's own grandfather, Hubert Payne Scott was born 8 years later in 1843, in the family home at 41 Peter Street in Tiverton.

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<sup>1</sup>Details of Payne-Scott's ancestors researched by Dr. Elizabeth Hall. Much of the Tiverton information was contributed by Cedric Ashton, Research Assistant, Tiverton Museum.

<sup>2</sup>Henry Scott had a most remarkable life. Like his younger brother, he became a physician. He was widowed in 1868 when his wife Sarah and daughter Margaret (born c. 1860) died in the Chincha Islands, off the coast of Peru. There is no information as to why the family was in South America. Henry then apparently remarried in the mid-1870s and became a clergyman in Swettenham in Cheshire. His name was still registered in the medical register. His second wife was Annie with a son William, born c. 1878. In the 1881 and 1891 census records the family was living in Cheshire. He last appeared in a census record of 1901, visiting Mannington Bruce in Wiltshire.

At the time of the 1851 census Martha, aged 18, was single and still living at home, Henry, aged 16, was a pupil-teacher,<sup>3</sup> and Mary and Hubert, aged 12 and 8 respectively, were still at school. By 1861, we can see from the census data that John Scott must have passed away, but that Ruby's great-grandmother, Margaret, was still living at the same address, along with Hubert, who by then, aged 19, was listed as the head of the household, and a grain merchant by trade. From that same census we see that another "Payne" family was living next door, most likely Margaret's brother, Frederick.

The next we see of Hubert in public records is in the 1871 census which shows him living with a Sarah Payne, probably his maternal aunt, in Marylebone, a neighbourhood in central London. He may have been studying medicine at the time, and at some point courting his future wife, Agnes Dupuy. Agnes, born in 1847, was living with her widowed mother, Maria, at their home on George Street, in Croydon, a neighbourhood in south London. Though we have no idea how they met, the couple married in early 1872, in Hanover Square, which is in Mayfair, the neighbourhood adjacent and to the south of Marylebone. 1872 was an eventful year for Ruby's grandparents; apart from getting married at the start of the year, Hubert became licensed to practise as a homoeopath by the London Society of Apothecaries in December.

By 1881 Hubert was a general practitioner by trade. There in their home at 8 Amherst Road, in New Cross, part of the borough of Lewisham in the southeast of London, Hubert and Agnes had three children: Margarita, born in 1875; Valerie Violet, born in 1877; and Ruby's father, Cyril Herman, born in 1880. They also shared their home with Agnes's mother, Maria, whose age, health and role in the family is unknown, though, if she were still spry enough, she would have been ideally placed to help with the three children.

## Emigration to Australia by Hubert and Agnes Scott

What happened next is not clear, but by 1886, when we next catch a trace of Hubert in public records,<sup>4</sup> he, his wife Agnes, and only two of their children, Valerie Violet and Cyril Herman, are in Australia. Agnes's mother, Maria, is not listed, and more tellingly, neither is their eldest daughter, Margarita. No records are found for Margarita either in Australia or the UK, and one can only assume that the child died before reaching the age of ten. Between 1886 and 1903, Hubert practised at various addresses in Sydney; beginning with 181 Macquarie Street, which was and

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<sup>3</sup>A student-teacher would still be a student but assisting in the education of younger children. Henry was fortunate in attending the well-known Blundell's School, which had links to colleges at Cambridge and Oxford, and at the age of 28 he became a licentiate of the College of Physicians.

<sup>4</sup>In 1886 an entry in the *Australian Medical Directory* has been located: "Scott, Hubert Payne, 181 Macquarie Street, Sydney, NSW, LSA (Licentiate of the Society of Apothecaries), London."



**Fig. 2.1** The house of Hubert Scott (the grandfather of Ruby Payne-Scott) and his family from 1897. The house at 76 Edgeware Road, Newtown, Sydney, in late 2006 is shown. Photo by and permission given by Jan Christensen

is a fashionable location for the medical profession. This address on Macquarie Street appeared in medical registries up to 1897, in addition to other Sydney locations on King Street (1896, 1899) and George Street (1900, 1903).<sup>5</sup>

It is hard to know if the family would have lived in the same location as the address listed for Hubert's medical practice. We see a great moving about from one address to another in Sydney until 1902. In 1897, Hubert Scott was listed in residence at 76 Edgeware Road in Newtown, near The University of Sydney. This house as it appeared in 2007 is shown in Fig. 2.1. In 1898, a listing at 3 Trafalgar Street, Newtown (Fig. 2.2, as it was in 2007) appeared, while the next year a new address at 63 London Street was published. In 1900 and 1902, a listing on Marrickville Road in Marrickville was published.<sup>6</sup>

It is then, in 1903, that we find the mysterious disappearance of Hubert Scott from all public records. He neither appears in medical directories nor the electoral rolls. Very strangely, however, there is no record of his death. Agnes is listed in the postal directory as a music teacher, implying that she now needed to support

<sup>5</sup>The following is a quotation from Dr. Elizabeth Hall: "1886–1892: the Scotts have only a single address. According to Alyson Daley, the Librarian at the Royal Australian College of Physicians, it was not unusual at the time for medical men to live over their surgeries. In 1893 two addresses appear and after 1896 Hubert seems to have given up his Macquarie-Street address. As Marrickville Council Rate Books do not indicate whether a building was used for private or professional purposes, it is not clear whether or not Hubert was practising from home."

<sup>6</sup>All the address information referenced in this section was gathered by Dr. Elizabeth Hall from the Sands Directory, Directory of New South Wales, Medical Registers, Council Rates Books and Electoral Rolls.



**Fig. 2.2** The house of Hubert Scott and family from 1898. The house in Newtown, Sydney at 3 Trafalgar Street in late 2006 is shown. Photo by and permission given by Jan Christensen

herself, which corroborates the notion that Hubert had left the family. Also in 1903, Agnes and the two children, Valerie and Cyril, suddenly adopt the hyphenated name “Payne-Scott”. By this time, the children were adults; Valerie would have been about 26 and Cyril 23. Valerie may have moved into her own home, as we have a listing for only Agnes and Cyril living in “Pretoria”, a house at 75 London Street in the neighborhood of Newton.<sup>7</sup> Cyril and Agnes would remain physically close over the next 3 years, as Cyril remained a householder at 75 London Street, while Agnes took up residence with a housemate, Mrs. Sarah King, in the adjoining house around the corner, at 49 Liberty Street (Fig. 2.3). Agnes would remain at that

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<sup>7</sup>The following is a quotation from Dr. Elizabeth Hall: “76 Edgware Road, 3 Trafalgar Street, 63 London Street and probably Arundel Terrace, all rented by Hubert, are modest three-bedroom residences. ‘Pretoria’ at 75 London Street, is larger and more imposing. This was rented by Cyril. It is mentioned in a history of the area but there is no indication of whether or not it was used commercially. Agnes is shown as living there in 1903 but Hubert’s name does not appear in connection with it or at any future address occupied by the family.”



**Fig. 2.3** The house at 49 Liberty Street, Newtown in 2006. This house was the home Agnes Scott for some years into the twentieth century. After 1903 she was Agnes Payne-Scott, her new name. Her son (the father of Ruby Payne-Scott) lived nearby until moving to Grafton, New South Wales, a few years later (perhaps circa 1908). Photo by and permission given by Jan Christensen, late 2006

address, even after Cyril moved on until 1911, when she would move to 12 William Street in Ashfield, a neighbourhood to the west of “Pretoria” in Newtown.<sup>8</sup>

Some time later, Cyril moved some 600 km to the north to an address in South Grafton, New South Wales, an area near the coast in northern NSW, 340 km south of Brisbane.<sup>9</sup> His mother, and most likely his sister, remained in Sydney. He met his wife, Amy Neale<sup>10</sup> in Grafton and they were married on 15 November 1910 at the Church of England in South Grafton. The next day, an article in the local newspaper, *Grafton Argus*, under the heading “Wedding Bells”, mentions that it “. . . was the scene of an interesting wedding. . . . Mr. and Mrs. Payne-Scott are spending the honeymoon in the north”. It lists Amy’s older sister, Ruby Pearl Neale, as the bridesmaid, and Cyril’s occupation as “accountant”.

<sup>8</sup>From 1919 to 1921 Agnes lived at 8 Holborow Street, Croydon, Sydney. On 6 February 1921, her death was registered in Croydon by her daughter Valerie (1877–1948). Hubert P. Scott’s whereabouts remained a mystery; the marital status was left blank on Agnes’s death certificate. In addition, her burial location remains a puzzle; the death certificate stated that burial was at Gore Hill, Sydney; however, the cemetery has no record of the grave. We know little of Ruby’s aunt Valerie Violet either, aside from her name appearing on a copy of Robert Louis Stevenson’s *The Child’s Garden of Verses* given to a young Ruby as a birthday present.

<sup>9</sup>He appeared on the electoral roll in 1909 as: “Cyril [sic] Payne-Scott, Thorough [sic, in fact ‘Through Street’ in South Grafton] Street, Clerk.”

<sup>10</sup>Amy was a school teacher born 1875 in Picton, NSW. Her parents were William Neale, an auctioneer born in 1840, who most likely died before 1910, and Ada Mary Moffitt, born 1846.

## Ruby's Early Childhood

Two years after the nuptials, our protagonist, Ruby Violet Payne-Scott was born, on 28 May 1912. She was followed a year later by her younger brother Henry, on 8 June 1913. Ruby was named after both her maternal and paternal aunts, Ruby Pearl Neale and Valerie Violet Payne-Scott. Ruby was born at Runnymede Private Hospital, a maternity clinic on Fitzroy Street in South Grafton owned by Dr. Henry. The birth certificate was signed by Dr. Earle Page, Australia's shortest serving Prime-Minister<sup>11</sup> and Nurse Riordan. The hospital from circa 1910 is shown in Fig. 2.4. It is likely that the young Payne-Scott family lived with Amy's mother in "Uloom", the elegant Neale family house on Bent Street in Grafton, shown in Fig. 2.5.<sup>12</sup>

By 1915, although several members of the Neale family continued to live in Grafton, the Payne-Scott family seems to have moved again. The details of this



**Fig. 2.4** The maternity hospital where Ruby Payne-Scott was born on 28 May 1912, Runnymede Private Hospital, South Grafton, New South Wales. Dr. Earle Page was the attending physician. Photo, circa 1910, courtesy of Frank Mack, President of the Clarence River Historical Society in Grafton. Permission given by Mack

<sup>11</sup>Probably Page was a visiting physician at the Runnymede Private Hospital as he owned his own hospital, Clarence House on Through Street, South Grafton. Sir Earle Page (1880–1961) was born in Grafton; after finishing medical school in Sydney he opened the hospital in 1903. He was a member of the Australian Federal Parliament from 1919 to 1961. When Lyons died in 1939, Page was appointed Prime Minister and served for 20 days (7–26 April 1939). Page was a minister of Health from 1949 to 1956.

<sup>12</sup>Details about South Grafton and the Neale family provided in 2007 by Frank Mack, President of the Clarence River Historical Society, founded in 1931 by Dr. Earle Page. Mack wrote an article about Payne-Scott in the 18 November 2006 Clarence River Historical Society Newsletter (No. 94).





**Fig. 2.5** A modern day view (circa 2007) of the house “Uloom” in Grafton where the Payne-Scott family lived for a few years with Amy Payne-Scott’s family (Neale) after 1911. Photo courtesy of and permission given by Frank Mack

portion of their life remain quite uncertain. Based on family memories,<sup>13</sup> it is likely that the family lived for some years in the rural town of Coonabarabran, NSW (the future home of the Anglo-Australian Telescope towards the end of the twentieth century at a distance of 450 km from Sydney). However, no archival evidence of the family can be found in Coonabarabran. There is no trace of them in the electoral rolls, school records or copies of local newspapers.<sup>14</sup> At the time of the move, Ruby was about three and Henry two. Thus valuable information about Payne-Scott’s early school years is missing. A possible reason may be that the children were home-schooled. Her brother, Henry, told a Royal Australian Air Force psychiatrist<sup>15</sup> in late 1942 that he was schooled by his mother, a trained school teacher, at home until he was about ten, i.e., about 1923 or even 1924. Henry’s troubled war record is described in Appendix N; from a time starting in the mid- to late-1930s until his death in 1970, he and his sister were estranged with little or no contact. A possible reason for this is described in Appendix N.

<sup>13</sup>Interview with Peter Hall, February 2007. His mother had vivid memories of coming home to Coonabarabran from Sydney in the late 1920s on school holidays. She described the animals on their property (cats, dogs and rabbits) and visits from relatives from Grafton who complained about the summer heat in this inland community.

<sup>14</sup>With the assistance of Dr. Ann Savage of Coonabarabran, contacts were made with the Local Family History Group of Coonabarabran and a letter to the *Coonabarabran Times* was placed in early March 2007; no information about the Payne-Scott family could be elicited. Additional contacts were made with several individuals in the area (Judith Hadfield and Jean Dow); again no trace of the family could be established in Coonabarabran in 2007.

<sup>15</sup>For Sgt. Henry Payne-Scott’s war record (NAA: A9301, 20769), see Appendix N.

## Secondary School Education: Sydney

Ruby Payne-Scott must have been a noticeably bright child, and her parents must have planned to give her every opportunity they could for a good education, even if they could not afford to pay for her schooling at an elite private school. We can see this by the path her schooling took once she reached her pre-teens. Generally, a young person would attend school in Australia until the age of 14, at which point she/he would sit the examination for an Intermediate Certificate. One could not, however, enter University with an Intermediate Certificate. To do that, one would have to stay in school for another 2 years and pass the examination for a Leaving Certificate. Provided the requisite matriculation subjects had been taken, entry into university was then possible. When Ruby's parents moved to the remote country town of Coonabarabran, there would have been fairly limited educational institutions, and even her mother Amy's dedication and training as the children's at home teacher would have taken them only so far.

While her parents and brother remained in Coonabarabran, Ruby went off to attend the Cleveland Street School<sup>16</sup> in Sydney. From her Intermediate Certificate<sup>17</sup> of 1925, we can deduce that she would have been living in Sydney to attend the school from 1923 to 1925, making her eleven at the beginning and just reaching 13 by graduation, a younger age than average. It is possible that she lived with her maternal Aunt, Eva Mary Neale<sup>18</sup> while living in Sydney. This would emphasize both a level of trust in extended family to care for children, as well as a fostering of independent thought and behaviour for the sake of education and reaching one's highest potential. Ruby certainly did reach for her highest potential. She achieved excellent marks with As in five subjects: English, Maths I, Maths II, French and Botany; and Bs in History, Geography and Latin. There was a report on 7 May 1924 in *The Sydney Morning Herald*, the major Sydney newspaper, that "Among girls who have gained noteworthy examination results [from Cleveland Street High School] were ... Ruby Payne-Scott".<sup>19</sup>

It would appear the family moved back to Sydney in 1925, when her father, Cyril Payne-Scott, reappeared on the electoral rolls. We can assume she moved back into her parents' home once they returned to Sydney. In 1925, Cyril was recorded as

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<sup>16</sup>In 1912 or 1913, Cleveland Street High School became an Intermediate High School for both boys and girls. In 1929 (after Payne-Scott had left), the school became an Intermediate High School for boys only with the girls transferred to schools at Crown Street and Marrickville; the Cleveland Street name was maintained at the Crown Street site (letter from Margaret Giannasca of Cleveland Street High School to Peter Hall, 8 March 1999).

<sup>17</sup>Susan Brian obtained a replacement Intermediate Certificate in August 2008 from the New South Wales Board of Studies.

<sup>18</sup>Eva Mary Neale was a younger sister of Amy Neale, born in 1881 in Grafton, died in 1953 in Sydney. She was a witness at Ruby's very private wedding in 1944.

<sup>19</sup>Article received from Margaret Giannasca, School Promotion, Cleveland Street High School, Sydney, February, 1999.



running a mixed business at 118 Liverpool Street, Enfield.<sup>20</sup> The next year he was reported as having an additional address at 6a Burwood Road, Burwood.<sup>21</sup>

With an Intermediate Certificate completed, Ruby was able to aim higher in the hierarchy of Sydney public schools. The Cleveland Street Intermediate High School would have acted as a feeder school for the prestigious Sydney Girls High School (SGHS), especially for girls from the country.<sup>22</sup> Many of the public high schools in Sydney at the time were sex segregated; SGHS was one of the outstanding public high schools for girls in Australia. With a strong background from SGHS, Ruby was well positioned to begin a university course in science.

The SGHS records indicate that Ruby entered the school on 9 February 1926 and finished her Leaving Certificate with honours in late 1928, when she was only 16. She was not quite 17 when she entered the University of Sydney in early 1929 (Fig. 2.6).<sup>23</sup> The final school report for Ruby at SGHS was indeed impressive with a pass at almost the highest level possible: first class honours in Maths I and Maths II and Botany. Her grades in English, Latin and Mechanics (Physics) were at the A level, while her only B was in French.<sup>24</sup> Apparently Payne-Scott repeated the last year at SGHS, at first glance a surprise for such a bright student; it was the practice in those days for a younger student to stay at school an extra year in order to enhance the chances of an improved exam result and thus a scholarship to university.

Ruby left behind two articles in the SGHS publication, *The Chronicle*, in 1927. In the November 1927 issue she wrote an article about the “Pictures in the Library”, in which we are given a piece by piece tour of the classic reproductions hanging in the school library, complete with the expectedly prosaic 15-year-old’s opinions on each. Earlier, in June 1927, she had written a rather cute primer on how to succeed at SGHS, in rhyming verse:

TO A SYDNEY HIGH GIRL

(With apologies to Mr. Rudyard Kipling)

If you are always listening when you should be,  
 And keeping very quiet and very still;  
 If you can always see whate’er you should see  
 And tackle mathematics with a will;  
 If you can wait, and not be tired of waiting,

<sup>20</sup>This building was later demolished; in 2007 there was no indication of the structure. When Payne-Scott entered Sydney Girls’ High School in early 1926 the address listed was her father’s shop at 118 Liverpool Road. Ruby’s Leaving Certificate of late 1928 listed the updated address, 156 Liverpool Street. Also her brother was pursuing the Intermediate School Certificate at a school in Summer Hill, only 5 km distant (NAA: A9301, 20769).

<sup>21</sup>The Burwood Road business was a china, glass and earthenware shop which existed for 1 year. The Liverpool Street address was also reported in 1928 and 1929. The Liverpool business continued until 1932–1933 or possibly longer.

<sup>22</sup>Based on an interview in 1999 with Shirley Hoskin, the archivist of SGHS.

<sup>23</sup>The date of this photo is uncertain.

<sup>24</sup>Much of the information about schools in Australia was provided by Rita Nash. Information about Sydney Girls’ High School from Norman (*The Brown and the Yellow: Sydney Girls’ High School 1883–1983*, 1983).



**Fig. 2.6** Ruby Payne-Scott in the 1920s. Bill Hall family collection, used by permission of Peter Hall

Although you're squashed in the Assembly Hall;  
 If you can work, and still not work be hating,  
 And yet on Wednesdays chase a hockey-ball;  
 If you are ready for examination  
 And need not cram your work right at the end;  
 If you can face that awful French dictation  
 As though it were your loving, kindly friend,  
 If you come first or last, although you've hard tried  
 And yet not let a change come o'er your face;  
 If you can lose just on the very last stride,  
 And yet can cheer the winner of the race;  
 If you can work, and yet find time for playing;  
 If you can play, and yet find time for work;



**Fig. 2.7** The Payne-Scott family lived in Chatswood (10 Warrane Road) after about 1936; Cyril, Amy, Ruby and Henry (born 1913) were listed as living at this address in the late 1930s; Henry, an accountant, was estranged in later years from his sister. Ruby (University Demonstrator) was listed as living here from 1936 to 1938. Photo by and permission given by Jan Christensen, late 2006

If you are always ready for essaying  
 Your task, and do not any duty shirk;  
 It does not matter whether you are clever,  
 It does not matter if you are a fool,  
 If you are all this, yet exams not weather,  
 Still will you be a credit to your school.  
 R. Payne-Scott (5B)<sup>25</sup>

By 1936, Cyril and Amy moved to 10 Warrane Road in Chatswood (see Fig. 2.7), a Sydney suburb on the north shore. Cyril's occupation was listed as homeopathist, a return to the occupation of his father. There was no indication of a separate address for a medical practice. At this address Henry (accountant; see Appendix N for a description of the life of her estranged brother), and Ruby (demonstrator at The University of Sydney) were also listed, Henry for the years 1936, 1937 and 1939, Ruby for the years 1936–1938. Ruby left for Adelaide in 1938 and returned to Sydney in mid 1939 (see Chap. 3). Cyril died in 1942,

<sup>25</sup>The Leaving Certificate was taken in the fifth year of high school, thus the Fifth Form, now year 12 in NSW. "5B" was the level below "5A" of the Fifth Form classes.

followed by the death of his wife Agnes in 1943. Thus at the time of the marriage of William Hall and Ruby Payne-Scott on 8 September 1944, both parents of the bride were listed as deceased. At a rather early age in young adulthood, Ruby had no surviving parents.

## Bachelor of Science in Physics at the University of Sydney

Ruby began her studies at The University of Sydney in early 1929, before reaching her 17th birthday, with a merit-based bursary award and Science Exhibition scholarship from the University. She was an outstanding student, with an impressive record<sup>26</sup> throughout her stay. She did the normal B.Sc. degree course in physics in 1929, 1930 and 1931 gaining outstanding marks; she had high distinctions in mathematics in all 3 years and in physics in 1930 and 1931. In 1932 she completed the Honours Physics course with first class honours. The Honours degree was awarded at the beginning of 1933.<sup>27</sup> In 1932, Ruby Payne-Scott started the Honours Course in physics. In 1931, she shared the Deas Thomson Scholarship (after the 19th century Vice-Chancellor and later Chancellor of the University of Sydney Sir Edward Deas Thomson) with Reginald Healy for the ‘greatest proficiency in Physics III’ (her course in 1931). She also was awarded the Walter Burfit scholarship for excellency in Physics III. Both awards required that the recipient be an honours student at the University of Sydney.

Ruby was only the third woman to receive a degree in physics at The University of Sydney,<sup>28</sup> and in fact the 90th individual to receive a physics honours degree from The University.

We know little of her experiences at The University of Sydney. From discussions with her son, Peter Hall,<sup>29</sup> in later years, we know that she found the mathematics lectures by H.S. (Horatio Scott) Carslaw (1870–1954) especially stimulating. Payne-Scott remembered that Carslaw read letters from his former student John C. Jaeger (1907–1979), while Jaeger was a student at Cambridge (UK) in the early 1930s. Later in her life, Payne-Scott and Jaeger became friends and colleagues, and shared a passion for cats.<sup>30</sup>

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<sup>26</sup>Letter from Renata Mancini of The University of Sydney Archives to Peter Hall, March 1999.

<sup>27</sup>The Honours degree in physics required an additional year.

<sup>28</sup>Edna Briggs (*née* Sayce) in 1917, Phyllis Nicol in 1926, Payne-Scott in 1933 and then Joan Freeman-Jelly in 1940 (see also Hooker 2004).

<sup>29</sup>Interview 12 February 2007.

<sup>30</sup>For Jaeger’s life summary see Paterson (1982). Carslaw and Jaeger collaborated on a number of well-known applied mathematics books, including the well known second edition of *The Conduction of Heat in Solids* (Carslaw and Jaeger 1947). See Chap. 15 for more details about Payne-Scott and Jaeger.

In the final year of Payne-Scott's honours course, she published a short article in *Nature* entitled "Relative Intensity of Spectral Lines in Indium and Gallium" (Payne-Scott 1933). It is likely that this short paper represented a portion of the research for her honours physics project. There is a single reference to a paper by O.U. Vonwiller (1882–1972) (*Physics Review* of 1930 with a discussion of similar results for thallium), who had suggested the project. He was a Professor of Physics at Sydney from 1923 to 1946. This paper by the 21-year-old physicist consisted of an analysis of photographic spectra of the two elements (and alloys of indium with lead) in the range 4,033–4,511 Å. The short note presents the line ratios of the doublets of indium and gallium under various conditions; there is essentially no discussion of the results. The connection with Professor Vonwiller probably led to Payne-Scott's position at the Cancer Research Committee in the years 1932–1935.

## Master of Science and the Cancer Research Committee at The University of Sydney

Ruby Payne-Scott began her association with the ill-fated Cancer Research Committee of the University of Sydney (CRC) most likely in late 1932, continuing for 3 years.<sup>31</sup> The M.Sc. degree was awarded in February 1936 and her thesis was published in *The British Journal of Radiology* in December 1937, having been submitted 13 months earlier.<sup>32</sup> It seems likely that she supported herself financially through the Cancer Research Committee in parallel with her position as a Demonstrator/Tutor in the School of Physics, while she completed her research for the M.Sc.

The history of the CRC has been presented in detail by Hamersley (1988) and summarised by Hooker (2004). The Cancer Research Committee had been formed in the early 1920s at The University of Sydney to foster research on the treatment of cancer. As Hamersley has pointed out, its history, from 1922 to the end of the enterprise in April 1938, was characterised by internal bickering and debate. Certainly the inexperience of this set of Australian academics in funding, supervising and running such a research institute played a role in the ultimate failure of the CRC.

In the late 1920s, the opportunities for physics graduates were enhanced by the need for an understanding of the physics of X and gamma rays. As Hamersley points out:

For physicists this national ferment [new interest in the treatment of cancer by the use of X-rays] created some unique opportunities and challenges. Their participation in the

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<sup>31</sup>Based on the in-house journal, *The Journal of the Cancer Research Committee of the University of Sydney*, 1 October 1938, article by Vonwiller.

<sup>32</sup>The publication lists Payne-Scott's affiliation as Demonstrator in Physics, School of Physics, University of Sydney.

national cancer effort encouraged the perception – new for Australians – that physics, traditionally one of the abstract sciences most remote from them, had something to contribute in matters of central human and societal concern. A limited number of new career openings for physicists also appeared, as a nation-wide scheme for providing physical services for radiotherapy, based on the physics departments of the state universities, gradually evolved. Finally, for physicists in the major centres of Sydney and Melbourne, there was the prospect of obtaining from cancer funds support for basic and applied research in radiation physics . . . [this] could bring significantly nearer realization of emerging ambitions to establish physics as a viable research discipline in Australia.

The CRC would have been an ideal place for a young physicist to gain professional experience and connections, earn a livelihood, and still work towards a higher university degree. Unfortunately, the CRC was almost completely devoted to researching the work of one medical doctor, Wanford Moppett. In 1924, Moppett tried out a new theory of radiation therapy on chicken eggs that were in fact cracked open at the top to allow the extremely weak radiation into the embryo. After much criticism from the larger cancer research community it was found that any effect upon the chicken eggs was probably caused by long exposure to a contaminated environment rather than the radiation Moppett used.<sup>33</sup>

By the time Ruby Payne-Scott joined the CRC in 1932, the rationale for the research flagship of the enterprise was collapsing. What's more, in May 1934, the Director of Research, H.G. Chapman, committed suicide amid accusations of financial malfeasance and there were also increased doubts about the reality of the Moppett Effect. In August 1934, O.U. Vonwiller and D.A. Walsh became the supervisors of research for the Cancer Research Committee. When the institute was closed in April 1938, Vonwiller wrote the apologia in the last issue of the in-house journal on 1 October 1938,<sup>34</sup> placing much of the blame on the misdirection of Chapman. As Hamersley has pointed out, the entire edifice established in the 1920s was flawed in contributing to this “collective folly”. Even Vonwiller had played a role in committing resources to investigate the Moppett Effect.

The circumstances in which Payne-Scott joined the Cancer Research Committee are unknown.<sup>35</sup> We can surmise that with her previous advisor, Vonwiller, as the de facto director of the CRC for the final years 1934–1938, Payne-Scott was given a part-time appointment to support her research for her master's degree. On 10 December 1936, Payne-Scott and W.H. Love submitted a short research note, “Tissue Cultures Exposed to the Influence of a Magnetic Field”, to *Nature* which was published on 15 February 1936. The goal was to investigate the influence on normal cells cultivated in vitro by a strong magnetic field. Thus 8–9 day old chick

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<sup>33</sup>Hamersley (1988) has pointed out that a number of investigators found that the changes might have been due simply to fungi or spore-forming bacteria in the exposure in the air, passing through the holes cut through the egg shells to allow the low energy X-rays to pass into the interior of the egg.

<sup>34</sup>*The Journal of the Cancer Research Committee of the University of Sydney*, 1 October 1938, article by Vonwiller.

<sup>35</sup>In her application for a CSIR position in 1941, Payne-Scott described her association with the CRC as a two year fellowship; however, Vonwiller's article lists a 3 year period, 1932–1935.



embryos were exposed to a 5,000 gauss field. After an exposure of 3–6 h “the exposed cultures exhibited no visible abnormalities in the arrangement of chromosomes in the dividing cells”. There were some connections to the methodology of the Moppett effect experiments; however, no claim of a positive effect was made. Love had been a long time employee of the Cancer Research Committee; Hamersley reports joint experiments carried out by Love and Moppett in 1927 on “further egg control experiments” related to the Moppett effect.<sup>36</sup>

Payne-Scott had one additional publication in 1936: “Notes on the Use of Photographic Films as a Means of Measuring Gamma Ray Dosage” (Payne-Scott 1936). This paper was not mentioned in her master’s thesis and was apparently a small project performed in parallel with her major research project.

The M.Sc. paper presented by Payne-Scott was dated 28 February 1936 with a striking change to the title. The original title of “On the Amount and Distribution of the Scattered Radiation in a Medium Traversed by a Beam of X or Gamma Rays” shows that the words “On the Amount and” are crossed out and the hand-written words “The Wave-Length” have been substituted. The corrected title is thus “The Wavelength Distribution of the Scattered Radiation in a Medium Traversed by a Beam of X or Gamma Rays”. The paper (with the latter title) was submitted to the *British Journal of Radiology* on 17 November 1936 and published in Volume X, New Series, No 120, December 1937 with essentially no changes from the thesis. The final sentence is “These investigations were commenced while the author was attached as physicist to the Cancer Research Committee of the University of Sydney”.

The publication summarized a theoretical treatment of the variation in the amount of scattered radiation as a function of primary wavelength and an investigation of the spectral distribution of the scattered radiation. Compton scattering, in which the incoming photons lost energy to the target electrons, produced a complex mixture of primary and scattered radiation. Payne-Scott wrote, “This softer radiation [Compton scattered] may, under certain circumstances amount to a larger proportion of the total radiation absorbed at a point, and thus may be of considerable importance in the study of the biological and other effects of the radiation”. Since the scattering properties of water closely matched those of a biological tissue, Payne-Scott evaluated a number of the quantities derived for the scattering process for the particular medium of water. In addition, much of the experimental work available in 1936 was based on observations of radiation scattered from water phantoms (items substituted for real tissues in order to test the efficacy of the X-ray or gamma ray imaging). The comparisons were carried out for wavelengths of 17.1 X.U. (the Siegbahn scale) (0.017Å), 50 X.U. (0.050Å), 200 X.U. (0.2Å)

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<sup>36</sup>Hamersley has described how Love attempted to replicate Moppett’s work without any success. He then turned to another radio-biological topic for his thesis. Hamersley has also brought to our attention the fact that in 1933 Payne-Scott worked with The University of Sydney physicist, G.H. Biggs, in running the radon plant, extracting radon and placing this into sources to be used for medical therapy. Hamersley has also pointed out that every laboratory where this type of work was done was later on found to be seriously contaminated with radioactive radon.

and 400 X.U. ( $0.4\text{\AA}$ ), corresponding to gamma rays from radium, hard X-rays, hard-medium X-rays and medium-soft X-rays. It is noteworthy that none of the references in the paper referred to work done in earlier periods at the CRC. Thus, there was no apparent connection with the earlier discredited research of this institute. The mathematical skills that were to serve Payne-Scott well in her later scientific career at CSIR and CSIRO from 1941 to 1951 were clearly evident in this publication. “She was one of the very few people who had any association with the Sydney University Cancer Research Committee who produced any good substantial work.”<sup>37</sup>

In the October 1938 article by Vonwiller, he specially praised Payne-Scott’s research. After providing a detailed summary of the thesis, he added:

Besides her routine duties Miss Payne-Scott did some original experimental work bearing on radiation measurement, and made an important and difficult theoretical investigation on the problem of quality and intensity of scattered radiation . . . Miss Payne-Scott must be credited with an important contribution, useful both for the results obtained and for the indication of methods of attack to be followed.

Payne-Scott undoubtedly saw the end of the CRC on the horizon in the course of 1935–1936. With her M.Sc. completed, and her current work situation crumbling, it would have made sense for the ever energetic Payne-Scott to go the extra mile and earn a Diploma of Education in 1937. We can imagine that the need for financial security during the lean years of the Depression may have also been responsible for her acquisition of a teaching degree. Conventional wisdom in those years was for young people to obtain a safe, and if possible, permanent position of employment. Also, we must remember that Ruby’s own mother had been a school teacher, and it is doubtful that Ruby Payne-Scott was naïve about the career opportunities for women in the sciences at that time. The option of teaching was an extremely practical career choice on her part. Indeed she was to spend two periods as a secondary school teacher, 1938–1939 at Woodlands School (Chap.3) and 1963–1974 at Danebank School (Chap.14).

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<sup>37</sup>H. Hamersley communication, 27 November 2006.



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Under the Radar

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