



## **GIRL WANTED** Physics, Maths and Chemistry Required

written and researched by Robyn French



#### Published and distributed by:

#### Victorian Women's Trust @VicWomensTrust

a. 9/313 La Trobe Street
Melbourne 3000
p. 03 9642 0422
e. women@vwt.org.au
w. www.vwt.org.au

This project was undertaken by the Victorian Women's Trust with research, writing and referencing provided by Robyn French, 2020. All images, except author photo, courtesy of Peter MacCallum Hospital Library.

The Victorian Women's Trust respectfully acknowledges the wisdom of Aboriginal and Torres Strait Islander peoples and their custodianship of the lands and waterways.

WARNING: Aboriginal and Torres Strait Islander readers are warned that the following material may contain images and voices of deceased persons.

PLEASE NOTE: This material is intended for reference only.

**GIRL WANTED** 

# **GIRL WANTED** Physics, Maths and Chemistry Required

written and researched by Robyn French

#### VICTORIAN WOMEN'S TRUST

#### GIRL WANTED

## CONTENTS

Acknowledgements	4
Foreword	5
Introduction	7
Girl Wanted: Physics, Maths and Chemistry Required	11
Radiotherapy: The New Weapon Against Cancer	11
Personal and Family Circumstances Forge Career Paths	14
Trainees Today, Teachers Tomorrow	16
Behind the Scenes: Working with Radiation	18
High Energy Technology	20
Radiation: A Dangerous Business	24
Sorrow and Strength: Caring for the Terminally III	26
A Tourist Overseas	28
She Works Hard for the Money	28
Women Lead the Way	29
Work Life Balance and Evolving Careers	31
Retro Respect	32
Chasing the Dream	33
End Notes	35
References	36

## Acknowledgements

I would like to express my appreciation to the those who have assisted me in many ways. Special thanks to Carol Booth; Ailsa Hales; Julie James; Jewel Lobbe; Annette Samuels and Vivienne Leo, for sharing their reminiscences of the 1950s.

Many thanks to library and administrative staff at The Australian Society of Medical Imaging and Radiation Therapy, in particular Jo Hitchin, to the staff at Matheson Library Monash University and Royal Melbourne Hospital library. Special thanks to Smaro Lazaridis for assistance with access to Peter MacCallum Cancer Institute archives.

I am most grateful to The Victorians Women's Trust for encouragement, support and editorial advice, in particular Maria Chetcuti, Mary Crooks, Casimira Melican, and Janya Clemens.

Thank you to many others have shared information, insight and editorial advice - Glenn Trainor, Christopher Talbot, Sylvia Van Dyk PhD, Dr Tegan French, Robyn Elliott

Robyn French

## Foreword

In 2002, I wrote a speech to mark the closure of our pioneering exhibition, Ordinary Women, Extraordinary Lives, after it had toured Victoria as part of Centenary of Federation celebration events. Back then, I argued that `one measure of human rights equality lies in the truthfulness of the public record. When women were accorded a proper part of this record, when their enormous contribution to families, communities and societies are accurately represented, they will have achieved an inclusiveness that is a pre-condition of equality.'

It's fair to say that in the time since, we have gone to as many lengths as possible to redress the public record; to rightly place the contributions of women in appreciative public gaze. We have done this creatively, using any means we can and at low cost because being a not-for profit organisation we commonly have only modest resources at our disposal. From major exhibitions like Ordinary Women, Extraordinary Lives and book launches, to backing pioneering film productions and preparing our own published initiatives, we have sought to bring women's untold stories of the past into the present – knowing that this will assist, in step-by-step progress, to achieve full gender equality in the future.

So much of this effort has been aided and abetted by deploying the talent, passion and imagination of volunteers who join our endeavours at the Victorian Women's Trust. Working by the principle of reciprocity, our volunteers are lined up on tasks which value-add to their personal and professional experience; and in turn value-add to the work of our organisation.

When Robyn French joined us, she started to undertake a variety of tasks. Having learnt more of her background and experience, it wasn't long before we hit on an idea we felt had great merit. How about we get Robyn to tell her story, and that of others, of young women who had become radiation therapists in the 1970s?

In an era where girls are successfully completing secondary schooling and tertiary training and moving in growing numbers into various professional careers, it is important that we take opportunities such as with this volunteer work by Robyn, to highlight previous journeys into relatively unknown territories such as radiation therapy; to trace the work of women who had come before her in the 1950s in advancing cancer treatment in Victoria. This storytelling acts as further stimulus for women to realise their dreams and aspirations to work in science and technology; to realise their talents and capacities; and make meaningful contributions to their world.

In closing, efforts such as Robyn's also come about because of the positive support from people external to the Trust. Robyn was able to interview people who had worked in the field, including at Peter Mac and we thank them for taking the time to reflect on their experience and help bring about the story. I would also like to acknowledge Trust staff: Maria Chetcuti for managing Robyn's volunteer engagement, Cas Melican and Claire Duffy for editing support; and Janya Clemens for formatting and designing the final product.

Mary Crooks AO Executive Director February 2021

#### GIRL WANTED

#### Introduction



In February 1974, I arrived in Melbourne at the age of eighteen to commence training as a therapy radiographer. Fresh off the plane from country Tasmania I headed straight to Melbourne's major cancer treatment centre the Peter MacCallum Hospital. I was lucky to encounter a workplace that was friendly and supportive as I was keen to find out more about this career where I would study radiation physics, anatomy and physiology and radiation biology. I can see now that I was young and adventurous and that my journey was not dissimilar to the first young women who entered the technical field of radiotherapy.

Even then the common career choices for young women such as nursing, teaching or a job at the bank seemed limited. None of these was right for me, but studying science offered some intriguing possibilities. I dreamt of pursuing a science-based career and was fortunate to grow up in a family where gender never restrained my educational or career expectations. The small country high school I attended offered me the choice of studying typing or science. I didn't even consider the former and still type with two fingers.

Therapy radiographers are the professional cousins of radiographers and nuclear medicine technicians. All are allied health professionals using radiation to combat disease. The role of a radiation therapist differs from the others in that it is concerned not with the diagnosis of disease and broken bones, but uses radiation to treat cancer.

It was just 26 years earlier that the first young women began their careers when the Cancer Institute was formed at Royal Melbourne Hospital in 1948. Later, the Cancer Institute became a part of the Peter MacCallum Hospital. In 1974 there were still glimpses of those early days. I encountered a building, people and some technology that retained strong links to the 1950s and 60s. Unlike the women who trained then, I was no longer required to wear a hat and gloves on my way to work, but I was issued with a slide rule and crisply starched white uniforms just as they would have been. When I joined, Jean Milne was Head of Department. I noticed her decency and compassionate approach to patient care but did not fully realise then her significant contribution to the use of radioisotopes in Australia. I guess it was unusual then, for the boss to be a woman but it seemed perfectly natural to me.

Technology had certainly progressed by 1974 and there were four linear accelerators available at Peter Mac, to treat the growing number of cancer patients. The accelerators were enormous and unwieldy by today's standards. A few old but reliable deep (DXRT) and superficial therapy (SXRT) machines, reminiscent of a bygone era, were still in use. CT scanning and computers would soon revolutionise how radiation therapy treatments were calculated and planned, but that was a few years away. All the calculations were still done using a slide rule.

Even in the 1970s young women left work when they had families. I also noticed some older women among the staff who had returned to work as their children became more independent. These women had trained in the 1950s and it was my privilege to work with many of them throughout my career, to get to know them and to hear their stories of training and working in radiotherapy in the pioneering days.

Predominately women were recruited and it emerged that many of the recruits had attended Mac.Robertson Girls' High School. My curiosity was aroused. How were they recruited, and why were the majority of recruits young women? How did this workplace have a predominately female senior staff?

After retiring as a radiation therapist in 2018, I have had the wonderful opportunity to volunteer at the Victorian Women's Trust. I appreciate the various ways the Trust has made efforts to place women's contributions on the public record. With this in mind, discussion about young women in science and technology careers and reflection on my own working life prompted an interest in learning more about the young women who trained in the technical career of radiotherapy in the 1950s, their stories and the contribution they have made to cancer treatment in Victoria.

#### GIRL WANTED

My curiosity about the early years of radiotherapy led me to meet and interview six women who had trained and worked in the 1950s. I soon found myself on a journey of discovery, travelling across Melbourne with recorder and notebook at hand. Sharing cups of tea and hearing stories and reminiscing about their working lives. The intelligence, curiosity and pragmatism of the women I interviewed was evident. I hadn't thought volunteering could be such fun!

It can be easy to compartmentalise women in health professions as fulfilling a traditional role as carer and comforter. When I was working with radiation I knew that care must be based on a sound understanding of science and technology. While I have not attempted to record a detailed history of the pioneering days, I hope that sharing the memories and insights from these interviews does trigger greater public recognition and interest in the experiences of young women at work in such a specialised technical profession.

#### Robyn French

Retired radiation therapist and VWT volunteer



Robyn French at work as a radiation therapist, 1976

#### VICTORIAN WOMEN'S TRUST

### Girl Wanted: Physics, Maths and Chemistry Required

It was 1951. Ailsa, in her final year at Mac.Robertson Girls' High School recalls an announcement which came over the PA system, 'Jobs have been offered to learn how to become ... a therapy radiographer. Those people interested come to the headmistress's office. "I thought, that sounds a bit interesting."' The prerequisites were matriculation level Physics, Maths and Chemistry. Young women were being recruited for a new technology-based profession.

Jewel, also a student at Mac.Robertson Girls' High School shares a similar memory. 'They sent a letter to the school that the Cancer Institute had started in '48, they needed technical staff and very quickly. They came to the senior Science classes and we asked the mistresses, "What's radiotherapy" and they said, "radio is x-ray and the therapy part was treating."'

I have had the opportunity to talk to some of the women who were the pioneers of this profession in Victoria in the 1950s. Known then as radiotherapy technicians, or therapy radiographers, then in later years as radiation therapists they have shared the stories of how they were recruited and trained, their experiences working with the evolving technology, and caring for the thousands of patients that they encountered.

### Radiotherapy: The New Weapon Against Cancer

At the end of the 19th century scientific discoveries were made that would create a revolution in medical diagnosis and treatment. Radium had been discovered by Marie and Pierre Curie in 1898. This followed the discovery of x-rays by German physicist Wilhelm Roentgen in 1895. X-rays could be used to expose the bones of the skeleton in an image, and radium revealed its power to affect living tissue. The medical profession soon found ways to utilise these powerful new weapons to fight disease.

As early as 1904 radium plaques were used at Melbourne's St Vincent's Hospital to treat superficial skin cancers and other blemishes. Then in 1928 the Australian Government purchased 10 grams of radium for medical and scientific use. Ionising radiation could be produced electrically as x-rays, and radiotherapy began to emerge as an alternative to surgery to treat cancer. Some radiotherapy services were available in Victoria, with a small number of treatment machines operating in Victorian hospitals, however progress towards the establishment of radiotherapy services accessible to all Victorians was disjointed and slow up until the late 1940s. After World War II, Victorian hospitals, community organisations and the state government were finally able to bring to fruition the dream of a publicly funded oncology centre. Cancer cases were on the rise and there was a growing demand for services, equipment and staff.

As a pathologist at the Royal Melbourne Hospital and Dean of the Faculty of Medicine, Dr Peter MacCallum had been a leading advocate for a centralised cancer centre and for the expansion of radiotherapy services. It was under his guidance that a radiotherapy centre known as the Cancer Institute was first established at the Royal Melbourne Hospital with Dr Rutherford Kaye Scott as Medical Director. In 1952 the Cancer Institute moved to Lt Lonsdale Street, and became an integral part of the Peter MacCallum Hospital.

The therapeutic effects of ionising radiation could be harnessed in different forms, each form suited the various treatments of different cancers. Ionising radiation is emitted from radioactive substances such as radium in the form of gamma rays. Radium was available and could be used to create radon gas which was pumped into seeds or needles then applied directly to the skin, surgically implanted or placed internally to treat tumours.

lonising radiation could also be produced electrically in the form of x-rays. The machines used to produce therapeutic beams were similar to those used to take diagnostic x-rays, but able to produce stronger more penetrating beams.



Therapeutic machines were known as orthovoltage or deep therapy (DXRT) machines and the radiation produced was measured in kilovolts. Megavoltage beams, described in millions of volts, produced in a linear accelerator came later in the mid-1950s.



Raie Graham demonstrating the use of radiotherapy equipment to prospective trainees

Training was available for diagnostic radiographers, but treating cancer needed a new set of skills and expertise and the demand for those skills was growing fast. It wasn't nursing expertise that was required, but a special mix of technical ability based on an understanding of the physics of radiation, a good knowledge of anatomy and physiology, a sound understanding of radiation safety, the ability to position the patient with care and accuracy and the organisational skills to manage both patient needs and the technical requirements of the equipment.

An adventurous spirit was also important as these were pioneering times and, in the years ahead there would be many improvements made in techniques, equipment and knowledge of oncology and radiation biology. We shouldn't forget that these trainees would be spending each day with those whose lives had been tragically affected by a cancer diagnosis. A kind heart and the personal capacity to cope with the human suffering were absolute necessities.

## Personal and Family Circumstances Forge Career Paths

Staff were needed and young women in particular were encouraged to apply. It has been my privilege to meet with some of these women, now in their eighties, and the stories of how they were recruited are often similar. Many were recruited from Mac.Robertson Girls' High School or one of the other select entry Melbourne public schools, or private girls' schools.

Agnes Scott, the sister of Dr R Kaye Scott, was a teacher at Mac.Robertson Girls' High School and it seems that she was influential in promoting radiotherapy as a career to the 'MacRob' girls. Girls also came from University High School and Methodist Ladies' College.

Attending these schools was the pathway to a university education in the 1950s. You had to be intelligent and dedicated to secure a place, but that didn't mean that you would be able to continue to university. Many families could not afford to provide a university education for even the most gifted child and felt that it didn't make good financial sense for girls to receive a tertiary education.

Two of the women I interviewed recalled that accident and illness in their families made it impossible for them to attend university. Ailsa tells the story of her parents, who were farmers in the Riverina district in NSW. Her father was killed in a horse-riding accident, so they left the farm, eventually going to live with her grandmother in Malvern. She didn't want to be a nurse because the long night shifts would make it difficult for her to care for her mother who was ill.

One woman recalled that her father had an accident which meant he was unable to work for some time. Her mum wanted her to go to university, but it was an expense the family could not afford as her father was not working. She believes she was encouraged to do radiotherapy because of her family's financial difficulties. It would allow her to have an education and enter a profession and would provide some extra income for the family. Carol recalls that university at that time was expensive. 'My parents couldn't support me through university.' Her parents were practical though, 'They said get something, so you have a qualification for later. It's alright if you're married but you never know what's going to happen down the track.' Carol tells me that her father heard about radiotherapy through a friend who worked at the radiation laboratory. 'He came home and said that sort of job might suit me, a bit scientific, a bit working with people. It sounded alright and we looked at prerequisites; you needed matriculation Physics and Maths.'

Regardless of each girl's family situation I sensed an adventurous spirit amongst these women. They all aspired to entering a profession and had the academic ability to support that dream. They knew very little about radiotherapy before attending the interview, or information evening, then took up the opportunity with enthusiasm. Remember that this is the 1950s and radiation is not well understood in the community apart from the horror of nuclear bombs.



High school students attend a Careers Day

Jewel was still a schoolgirl when she went for an interview. `Dr R Kaye Scott, the first director of the Cancer Institute, interviewed us at the Royal. We were all there in our school uniform, grey lisle stockings, grey gloves and our hats somewhat crumpled.'

## Trainees Today, Teachers Tomorrow

The student experience was similar to the apprenticeship style of training common in technical professions of the time, with most of the day working and learning on the job with some formal lectures and night classes. Ailsa was a student in 1952 and remembers attending night classes at Melbourne Tech (now Royal Melbourne Institute of Technology), and some in-house lectures which were 'a bit spasmodic.' Organised internal training at the Cancer Institute with dedicated tutors didn't happen until 1958. Trainees worked all day 8:30-5pm then went to Melbourne Tech at night from 7-9pm several times a week. The job required stamina.

Julie commenced training in 1956 and recalls, 'That was how the training was done. We studied at what was the Melbourne Tech. We did Physics, Anatomy and Physiology, and then we did Clinical Pathology at the hospital. There was also radiotherapy practice training. It was a two-year fairly intensive course, and to be a member of the Australian Institute of Radiographers you had to have a year of supervised practice. That was the third year.'

Lectures were held in conjunction with radiography students for the first year then radiotherapy subjects were studied in the following years. Annette recalls, 'It wasn't till I got to Melbourne Tech that Physics became really exciting.'

Students learnt on the job, working with a qualified staff member. When students became qualified, they took on the role of supervising and training the next cohort of students.

In-house training became more formal from 1958 when Jocelyn Murray (nee Gray) became the first radiotherapy tutor at the Cancer Institute. Lectures were held in Radiotherapeutic Practice with some Pathology, Physiology and Physics. This included an understanding of the radiotherapy techniques, principles of positioning the patient and directing the beam, calculating doses and calibration and basic care of equipment. When asked about the machines

and technical aspects of the job, Carol replied, 'They were interesting, because I wanted to know how things worked.'

Many of the very ill patients received treatment using deep x-ray therapy and Julie recalls her first clinical experiences, 'My first posting was on the palliative-care machine. I was dealing with the terminally ill before I was 18..

By the mid-1950s student intake was about fifteen each year, mostly women with only a small number of men. In a 1963 newspaper article, 'Millions in her Hands' the Head of Department Jocelyn Murray (nee Gray) described the attributes of a radiotherapy technician as 'having a well-ordered mind and sense of responsibility' and being invariably female, as she goes on to say 'there will be more girls needed each year.'



To gain experience in all aspects of the work, students were rostered to various departments including Physics, Radioisotopes, Radon, Deep X-Ray and Megavoltage Planning, Superficial X-Ray Therapy (SXRT), Deep X-Ray Therapy (DXRT) and Megavoltage Therapy (MVT).



Radiation technicians at work in the Physics Department

## Behind the Scenes: Working with Radiation

The initial stage of the radiotherapy process involved the doctor (radiotherapist) prescribing treatment site, type of beam and dosage. The radiotherapy technician working in the planning department then established an ideal position for treatment. The patient's shape and size were recorded using malleable lead wire, which was then transferred to a sheet of paper. The angles of the beams were determined, then factors applied to compensate for depth, distance and variations in the patient's anatomy. Archives reveal intricate examples of these carefully plotted dose distributions.

Prior to 1952 a small cohort of radiation technicians in particular Raie Graham (nee Opie) were responsible for this work. In 1952 the Physics Department was established, and these calculations or 'dosimetry' were done by technicians



Display of equipment used for positioning patients and examples of plotted dose distributions



#### Physics Department 1958

rostered there. A photo from 1958 of the Physics staff shows a large group of the mainly female technicians in crisp white uniforms, engineers in grey dust coats and a small group of physicists.

Julie had an affinity for modelling and calculating and was one of the technicians rostered to the Physics Department. 'Radiation therapy planning was extremely labour intensive, because of all the calculations and modelling that had to be done manually, using a slide rule and a bunch of isodose curves.' Apart from the calculations required for the deep x-ray therapy and megavoltage therapy treatments some technicians had specialist roles calculating doses for radon or radioisotope treatments.

Australia had 10 grams of radium and Julie recalls that the Victorian component was `stored in a tin shed at Melbourne University behind lead bricks'. Radium decays slowly with a half-life of 1600 years. It was used to produce the safer radon gas which has a half-life of less than 4 days, making it much safer to transport. The radon gas was pumped into gold seeds or needles to be used for treatment of skin, gynaecological and other tumours. Julie recalls working as the radon technician, `l used to do the calculations and check it and then go into theatre to assist with the insertion and implanting of the radioactive sources.'

Radiotherapy technicians also monitored treatments using radioisotopes. Radioactive iodine was used to treat thyroid tumours and Jewel recalls Jean Milne collecting data for thyroid uptake tests.

Delivering the treatment using the deep therapy machines was physically and mentally demanding, requiring speed and accuracy. There were always two people on each deep therapy machine. One setting up and the senior one checking. Ailsa remembered, 'We had to carry huge cones of lead across from the bench and attach them to the machine and get them lined up and make sure it wasn't going to fall on the patient.' The operators had to close heavy lead doors every time they left the control room. After each treatment the radiotherapist then made accurate records of each treatment in a logbook.

Jewel talks earnestly about the difficulties of using the cumbersome deep machines to treat breast patients, as some patients needed treatment to the adjacent lymph nodes in the neck as well as the breast. Her discussion of the consideration about which angles to use and the concerns about the junctions between the radiation fields was intense.



Deep x-ray therapy was used for treating breast cancers, bone and children's cancers, and for the treatment of many advanced cancers while superficial x-ray therapy was used primarily for treating skin cancers.

## High Energy Technology

The Metropolitan-Vickers linear accelerator which arrived at Peter Mac in 1956, and another unit installed in Brisbane at about the same time were the first linear accelerators in the Southern Hemisphere.



Using the back pointer to position the patient for deep x-ray therapy

Jewel recalls how revolutionary the introduction of megavoltage therapy was. 'Using the very much softer beams [of deep therapy] was a challenge.' Previously the heavy machine was hoisted out of the way and the patient turned over to allow treatment from different angles. Now the patient could remain in the one position and fewer beams could be used. Treatments were much faster and more accurate.

Annette remembers the introduction of megavoltage. 'The big difference between deep and megavoltage was the length of time the treatments took. The time for each beam was so much shorter. For the deep treatments, the patient had to keep still for a long time.'



Met-Vickers 4 Mev Linear Accelerator



The linear accelerator produced 4 mega electron volt (4 MeV) high energy beams which enabled more effective treatments of tumours deep in the chest or pelvis with fewer side effects and with much shorter treatment times. Greater accuracy was also achieved as the edge of the beam was more clearly defined.



Megavoltage required the development of new techniques and changes in planning procedures. Almost all the calculations and mapping required before a patient commenced treatment were now done in the newly created radiotherapy planning section, staffed entirely by the radiation technicians. Increasingly complex calculations were required to account for the effect of the different tissue characteristics or inhomogeneities such as bone and lung on the absorbed dose deep in the chest or pelvis. A radiotherapy 'simulator' was introduced to enable mock-ups of the treatment angles and patient position before the treatment commenced.

Memoranda and detailed instructions from the senior physics technician Raie Graham (Opie) document some of the advances in radiotherapy practice that occurred during the 1950s, such as the replacement of the Roentgen with the RAD as the unit of absorbed dose.

Location devices such as the pin and arc and tangent leveller became available and enabled greater accuracy. Ground breaking techniques such as barotherapy were trialled.

Barotherapy was a technique which aimed to maximise the effect of radiation by giving the radiotherapy treatment while the anaesthetised patient was in a hyberbaric chamber, with oxygen at 4 atmospheres. The angles and measurements for this treatment were complex and the chamber restricted the directions from which the beams could be aimed. Speed was paramount as the patient could only be anaesthetised for a limited time. It was often tumours around the face and neck which were targeted using this technique, so great accuracy was required to give high doses to the tumour while avoiding other sensitive structures such as the eyes and spinal cord.

The Cancer Institute Board report of 1956 records nine deep x-ray therapy machines, three superficial x-ray therapy machines and one brand new 4 MeV linear accelerator. The Radiotherapy Department was a hive of activity. In 1953 there were 37,466 individual radiation beams deivered at the Cancer Institute alone, which doubled to 74,031 in 1957.<sup>1</sup>

## **Radiation: A Dangerous Business**

Julie has memories of collecting dust and rainwater from the tower on the corner of William and Lt Lonsdale Sts and using Geiger counters to check for any radioactive fallout from the atomic testing in the Pacific that took place between 1946 and 1965.

In 1954 the United States exploded the first Castle Bravo thermonuclear weapon at Bikini Atoll. Castle Bravo, the fifth largest nuclear explosion in history did not go to plan, creating an enormous mushroom cloud, and significant fallout across 18,000 square kilometres of the Pacific Ocean with devastating outcomes for the local population. It is no surprise that there was growing community concern about the dangers of radiation and the threat of nuclear war.

In Melbourne, the powerful therapeutic effects of radiation were being harnessed for the treatment of cancer. Julie commented, 'We had radiation protection as good as you could get it at Peter Mac. It wasn't very good, but it was better than most.' Great care needed to be taken to ensure the safety of staff and patients.

Jewel remembers clearly the differences in the treatment rooms. 'The orthovoltage units only needed barium sulphate plaster in the rooms for shielding and lead lined doors and lead glass windows.'

This contrasted with the new linear accelerator which had to be housed in a specially constructed concrete bunker. Staff left the room to operate the machine, so it was always important to have visual access to the patient. A special window '3 feet of water between lead glass' was used to view the patient. Television arrived with the 1956 Olympics and in later years the patient could be viewed using closed-circuit TV.



The Roentgen simply defined the dose at a point in air, whereas the RAD is a unit of absorbed dose and accounts for the density of the different body tissues such as bone, lung or muscle.



Decompression chamber used for barotherapy treatment

Doctors inserted tubes containing radon internally to treat uterine and cervical cancers. Working with the radon sources was one of the high-risk areas. Julie recounts her common-sense approach when the radiation dosimeter of the doctor who used to go to the Royal Women's Hospital recorded 'the most extraordinarily high level'. 'I was sent up there, first of all to take scintillation counters with me to measure the replacement of interuterine tubes. I took one look on the first day I walked into [the operating theatre] and the sources were sitting in a lead box just on a trolley, completely unprotected.' Over the next few weeks she carried lead bricks with her, built a screen around the radioactive sources and was relieved to find that his exposure went down. Julie laughs when she remembers travelling between Peter Mac and the Royal Women's. 'The scintillation counters were so unstable they had to be calibrated every use, so I used to take the Victorian radium standard with me, which meant the car would have a big sign on the front saying, "Danger this car is carrying radioactive material. In case of accident, please contact ...", so the driver had a lovely time because everyone had to get out of his way.'



In a radiotherapy department, the risk of unsafe exposure is minimised by careful design of treatment rooms and regular monitoring of staff using dosimeters.

Understanding of the dangers of working with radiation was evolving rapidly. In the mid-1950s the concept of 'maximum permissible dose' replaced 'tolerance dose' as the way of understanding safe radiation limits. This meant the maximum dose for those working with radiation was cut drastically. Julie was shocked when she realised it was now considered safe to work as the radon technician for only one year and 'I'd been doing it for 18 months.'

Others relate family concerns. Ailsa recalls her mother phoning the Head of Department concerned about her daughter's exposure. 'She was concerned and didn't understand about the radiation and thought I might be getting too much. It didn't sound good, radiation didn't have good press. So, she rang him up and I was a bit astonished because she was a rather quiet person. I think he must have calmed her nerves. People then didn't understand about radiation. In particular, girls felt pressure to leave work if they became pregnant.'

### Sorrow and Strength: Caring for the Terminally III

Public information about treatment and early detection of cancer was limited. Consequently, many patients presented for treatment when their disease was well advanced. My interviews reveal some sad memories especially of treating children. Their deep concern for the patients is evident. The aim was to deliver precisely aimed radiation, so working with children had many challenges. Ailsa remembered, 'The little boy who was brought in by one of the drivers every day from Essendon and he had to have his treatment on his lungs I think, or liver and he had the biggest blue eyes and a soulful look so your heart was saddened to see him come. He was so good and didn't move.'

There is also a sense that therapists were never overcome by the situation. Jewel said, 'I think I just accepted it. I didn't bring it home of course. One of the first things Dr R Kaye Scott told us was, we were to have two lives and we weren't to take a personal interest in patients, because he pointed out that while you're taking a personal interest, you're getting distracted. Of course, you were very pleasant to people without being affected by the terrible tragedies that were going on. He said to us to go and live our lives, leave it behind every night at 5 o'clock.'



Using a superficial X-ray therapy (SXRT) machine to treat a child's foot

There is another side to this, as most of the women I interviewed expressed real enjoyment in their work. They gained enormous satisfaction from being with and caring for their patients. 'I missed working at the Peter Mac so much, I just loved it. We had a lot of fun even though a lot of things were serious,' declared Ailsa. Annette made a similar comment, 'I liked doing my job. There were times when I had the gripes, but I still enjoyed it. I just liked being with the people.'

## **A Tourist Overseas**

Some women took the opportunity to travel and work overseas. Peter Mac had an international reputation as a leading cancer centre. Annette recalled, 'We didn't have a problem getting a job in those days.'

Annette was only a couple of years qualified when she worked at the Royal Marsden Hospital in London in 1961. She remembers that although it was similar to Peter Mac there were differences. '[Royal Marsden] had a lot of equipment, tangent levellers and back pointers.' These were aids to positioning the patient and directing the beam of radiation. She noted that at Peter Mac the radiation technicians took on some of the tasks that were the responsibility of doctors and physicists in the UK. At Royal Marsden, the doctors did all the marking up of the patient, the physicists were responsible for the planning. This compared to the Melbourne experience where the radiation therapists did both the planning and marking up of the treatment area. She commented, 'I loved it, but I suppose I was a tourist overseas having a good time.'

### She Works Hard for The Money

In Victoria about 90% of the radiation therapists were women. Annette recalls only four men in the department around 1956. This was the 1950s and equal pay for women would not be a reality for more than a decade.

Ailsa commented that at first, she wasn't concerned about how much she was paid, but then recalled a conversation with a male colleague. 'We had a man working with us, and for some reason, he got a lot more than me. I said, "How is this Alan, this is not right". And he said "The men have to pay for the family, so they need a bit more money". I thought "blow that" because my mother was a widow and brought up three children. That's how the times were of course. I remember being cross about that.'

Dr R Kaye Scott wrote in a report to the Minister for Health in 1952. Up to the present it has been almost impossible to enlist junior males into the therapy services, and staffing has depended on female technicians, the advantages of which are ease of employment and cheaper cost.<sup>2</sup>

Jewel remembers being paid, '75% of the male rate. . . I got 3 pound 17s and sixpence when we first started.' She went on to say, 'That was paltry but on the other hand you accepted it. The same as nurses accepted things. Some clown said, "You're dedicated so if you're dedicated you don't need a lot of money because your children can manage without food." It wasn't till later that women started to be paid fairly.'

I sense there are still strong feelings about pay disparity. Annette comments that, 'A qualified [woman] was getting less than a male student who was over twenty-one.' It is important to remember that the qualified woman was the teacher and supervisor.

In the 1960s senior women in radiotherapy lobbied the Australian Institute of Radiography (AIR) for support for equal pay. Apparently, the AIR was unable to support this agenda due to the cost. The women I interviewed recall Jocelyn Murray (nee Gray) being the driving force behind the push for equal pay. She was the first tutor at the Cancer Institute's new radiotherapy training school in 1959 and became Head of Department in 1961.

#### Women Lead the Way

Dr R Kaye Scott expressed a very 1950's view of leadership in his report to the Minister for Health. He comments, 'The Technician in Charge should be a person whose employment is likely to be permanent to the Institute. For this reason, a male candidate is preferred.'<sup>3</sup> His prediction was partly realised, as this position was almost always held by long term employees, but prior to 2005 always by a woman, apart from a short period in the mid-1950s when an Englishman, Walter Gilbert Purssey, was employed to take the helm of the rapidly expanding radiotherapy department. Following his departure in 1959, the locally trained and experienced women again took up the reins. Jocelyn Murray (nee Gray) is one of the women pictured in a photo taken at The Royal Melbourne Hospital in 1950, showing the earliest recruits at the Cancer Institute. Jocelyn Murray had a long and prestigious career at Peter Mac and was Head of Department from 1961 to 1970 then from 1981 to 1997, overseeing many professional and technical developments. She was the first radiation therapist to become a fellow of the Australian Institute of Radiographers (AIR) in 1962.

Some, like Isobel Bull, added study and experience in radiotherapy to their existing qualification as diagnostic radiographers. Isobel qualified as a diagnostic radiographer in 1943, gained some experience at the Hobart Hospital in the treatment of skin cancers then went to the Royal Melbourne Hospital. There she qualified in the first radiotherapy course in 1947. She travelled and worked overseas, was an original and active member of the AIR, submitting papers for conferences and publication and winning the Institute's prestigious Wat Vic Award of Merit in 1961. Later she became Radiographer in Charge at the Peter MacCallum Clinic in Launceston.

Raie Graham, one of the earliest recruits, is often mentioned and remembered for her wealth of knowledge. She learnt under the supervision of radiotherapist Dr R Kaye Scott, then took on the role of supervising and teaching the students that followed. She became Senior Physics Technician and the first Head of Department. Raie and Jocelyn both lectured in Radiotherapeutic Practice at RMIT.

Jean Milne is another woman of note. Training in the early 1950s, she became expert in the therapeutic use of radioisotopes and co-authored Australia's first nuclear medicine textbook. She was also Head of Department at Peter Mac from 1970 to 1981.

The influence and leadership of these women did much to establish the profession of Therapy Radiography in Victoria and Tasmania and determined the high standards of radiotherapy treatment that we benefit from today.

#### Work Life Balance and Evolving Careers

Some of the women I spoke to worked in radiotherapy for many years, but part-time work was not always available. Carol recalled, 'There were no provisions for part-time work. Women left when they married. The expectation was that you would.' Leaving work to have a family created an unavoidable career hiatus. They retired when they became pregnant and returning to the workplace later was not always straightforward.

Jewel recalls how circumstances allowed her to re-enter the profession after having a family. 'I started in 1950 then left in '61 to have a family, thinking I would never go back. Then we were called back. I got a letter just before Christmas '69 saying could we work even a few hours a week. I knew she must have been desperate for staff if she was offering part-time.'

Some retrained as teachers, often as a way to better manage work and family commitments. Regardless of the cultural norms of the day some of these women were primary breadwinners and had bills to pay and families to support.

Julie worked in radiotherapy till a friend suggested, "Come along and do the IBM aptitude test." I said, "What's that" and he said, "Like crosswords." So, I thought I'd do it and of course I got the top score possible. The manager said, "We must have him" and he was instructed that it was a her. They put me in the Education Department teaching Computer Programming.' Julie commented that she was the only woman at IBM at the time. Julie went on to run her own business as a computer analyst/programmer, then for Control Data Australia (CDA) which was responsible for computer systems at the Bureau of Census and Statistics and CSIRO. After leaving CDA she was headhunted by Swinburne Institute of Technology and later was Head of School, Information Systems.

As I concluded my interview with Julie, she remarked that she had been thinking about the 'leading role of women in the old Peter Mac', and commented that she may have 'underestimated the influence of women in leadership on her future career.'

#### **Retro Respect**

In the 1950s the expectation of women's role in society was homemaker and mother, and consequently there were limited opportunities for young women to study and work. Generally, it was not recognised that women wanted to work at a level that acknowledged their intellectual ability, or their need to provide financially for themselves and their families.

I recall the magazine articles of the time showing an attractive young woman standing proudly next to her new kitchen appliance, but there are other photos that show an equally attractive girl with a brand-new linear accelerator or barotherapy decompression chamber. There are slide rules, radioisotopes and lead bricks. There is enthusiasm, a sense of adventure. These women loved going to work. They weren't paid well but they enjoyed the challenge, the friendships and the sense of satisfaction that came from caring for others.

Typical of many caring professions the work was poorly paid, and their role was often taken for granted. Caring in that environment meant more than offering a kind word. Accuracy, attention to detail and consideration for safety were essential. I note that one account of these early radiation technicians refers to them as 'handmaidens'<sup>4</sup>, a comment which fails to account for their ability to navigate the changes that rapidly evolving technology brought. These were the people who were able to bridge the gap between machines and humanity.

Some progressed to senior positions, undertook research, wrote and taught. They married, had families, sometimes moved to other careers or continued to work in radiotherapy for 40 years or more.

Curiosity and intellectual ability are characteristics that are as abundant in young women today, as in this group of early radiation therapists. The challenge then was to enable the emerging technology of radiotherapy to provide hope for the growing number of Victorians confronted by a cancer diagnosis. They took on this challenge with enthusiasm and made an enormous contribution to the world-class cancer care that we benefit from today.

#### **Chasing the Dream**

The story of the early radiation technicians reveals how women were able to enter a technical profession and how some women were able to become leaders. They received support and encouragement from parents, and attended a school were female students were encouraged to undertake science and maths subjects. Agnes Scott and science teachers promoted radiotherapy as a career and provided pathways for students to chase the dream of entering a technical profession.



Operating deep x-ray therapy (DXRT)

Research has shown how the attitudes of young women towards Maths and Science subjects is influenced by their parents, teachers and school environments. The self confidence that this support builds is essential in promoting the resilience that young women need to pursue and attain meaningful STEM (Science, Technology, Engineering, Maths) careers.<sup>5</sup>

Pioneering radiation therapists were in the majority, women, so it is likely that they did not encounter the same level of gender bias that existed in other industries. Women were able to attain leadership roles and act as role models. My interviews reveal strong camaraderie, a powerful coping strategy when encountering difficult workplace issues such as pay disputes, gender discrimination and sexual harassment.

Today's young women have strong imperatives to work, including the need to provide financially for themselves and their families. Their intellect and life experience are valuable resources that our society needs, to solve emerging economic, health and environmental issues. Yet recent studies show as few as 24% of high-school-aged girls hope to work in a STEM career compared to 41% of boys.<sup>6</sup>

The Office of the Chief Scientist's 2016 report Australia's STEM Workforce states 'only 16 per cent of the qualified STEM population are women'<sup>7</sup> and 'across all sectors, women represent only 27 per cent of the STEM workforce.'<sup>8</sup> Recent research also notes that 'Among those women who are both qualified and employed in STEM roles, representation in higher paid roles remains low.'<sup>9</sup>

The lack of young women employed in traditionally male-dominated STEM careers appears not to be linked to ability but associated with self-confidence and gender stereotypes. Women account for more than 40% of graduates in Mathematics and Science yet only 25% have qualifications in IT and 6% in Engineering.<sup>10</sup>

Schools, families and industry have a significant role to play in harnessing the intellect and creativity of the next generation of physicists, engineers, scientists and technicians. Creating environments that promote the study of science and mathematics in schools, raising awareness of the financial benefits of science and technology careers and providing girls and young women with the self-belief to pursue these careers is essential for all our futures.

Robyn French

## End Notes

- 1. Cancer Institute Annual Report 1954-1957, Peter MacCallum Cancer Centre Archives.
- 2. Kaye Scott, R 1952, Report to Minister for Health, Peter MacCallum Cancer Centre Archives.
- 3. Kaye Scott, R 1952, Report to Minister for Health, Peter MacCallum Cancer Centre Archives.
- 4. Sandeman, T F 2008, *The Peter Mac: A Personal Reminiscence*, Docuscope, Cheltenham East Vic, p 45.
- 5. Oakes, J 1990, 'Opportunities, Achievement, and Choice: Women and Minority Students in Science and Mathematics', *Review of Research in Education*, 16, pp 153-222.
- Youth Insight 2020, Youth in STEM Research 2019/20, Dept of Industry, Innovation and Science, https://www.industry.gov.au/data-and-publications/youth-in-stemresearch-2019-20, p 3.
- 7. Office of the Chief Scientist 2016, *Australia's STEM Workforce: Science, Technology, Engineering and Mathematics*, Australian Government, Canberra, p 12.
- 8. Office of the Chief Scientist 2016, *Australia's STEM Workforce: Science, Technology, Engineering and Mathematics*, Australian Government, Canberra, p 8.
- 9. Professionals Australia 2018, *All Talk: Gap Between Policy and Practice a Key Obstacle to Gender Equity in STEM: 2018 Women in STEM Professions Survey Report*, p 23 www. professionalaustralia.org.au/professional-women/.
- 10. Office of the Chief Scientist 2016, *Australia's STEM Workforce: Science, Technology, Engineering and Mathematics*, Australian Government, Canberra, p 13.

#### VICTORIAN WOMEN'S TRUST

#### **Reference List**

Australian Society of Medical Imaging and Radiation Therapy Archives, *The Radiographer* 1948-1963, Folio 1-11.

- Bull, I. 1962, Why do Radiotherapy?, *The Radiographer*, Folio 9, Vol 3, page 6.
- Gray, J.R. MIR 1960, The Radiotherapy Technicians at the Cancer Institute, The Radiographer, Folio 8, Vol 3, page 21.
- Wat-Vic Award of Merit-Isobel Bull 1961, The Radiographer, Folio 9, Vol 3, page 36.

Oakes, J 1990, Opportunities, Achievements and Choice: Women and Minority Students in Science and Mathematics, *Review of Research in Education*, vol16, pp153-222.

Office of the Chief Scientist 2016, Australia's STEM Workforce: Science, Technology Engineering and Mathematics, Australian Government, Canberra

Peter MacCallum Cancer Centre Archives;

- Annual Reports 1949-1962.
- Lowe, T E. 1982, The Origins of The Cancer Institute.
- Photograph collection.

Professionals Australia 2018, *ALL TALK Women in STEM Professions Survey Report*, www. professionalaustralia.org.au/professional-women/.

Radiotherapy ephemera from the R. Kaye Scott archive, 1924-1988, Monash University, Matheson Library, Melbourne.

- Kaye Scott, R. 1953, *Training for staff of Cancer Institute*; Report of Cancer Institute Board to Minister of Health from date of establishment 1949 to 1952.
- Kaye Scott, R. 1954, Preliminary School for Trainee Technicians.
- Kaye Scott, R. 1953, Report of the Activities of the Thyroid Panel Royal Melbourne Hospital.
- The Change from Roentgens to RADs 1957, Physics Dept. memorandum

Russell, E. 2009, Peter Mac Our History, History @ Work.

Sandeman, T.F. 2008, The Peter Mac, A Personal Reminiscence, Docuscope, Melbourne.

Wikipedia contributors 2020, Castle Bravo, *Wikipedia, The Free Encyclopedia*, : https://en.wikipedia.org/w/index.php?title=Castle\_Bravo&oldid=966160570

Youth Insight 2020, *Youth in STEM Research 2019/20*, Dept of Industry, Innovation and Science, https://www.industry.gov.au/data-and-publications/youth-in-stem-research-2019-20.

Zeldin, A. Pajares, F. 2000, "Against the Odds: Self-Efficacy Beliefs of Women in the Mathematical, Scientific, and Technological Careers." *American Educational Research Journal*, Vol 37, No 1, pp 215-246.



## VICTORIAN WOMEN'S TRUST