



The Queer History of Physics: A First Encounter

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Abstract

The contributions of queer people to the scientific endeavour are minimised and have been historically erased. This problem is especially acute in physics where overt discrimination and poor representation contribute to a lack of queer people in the field. In this work, we discuss the methodological challenges of evaluating the historic contributions of queer people to physics research and education using the example of radio astronomer Ruby Payne-Scott (1912-1981). We propose an analytical framework based on the discursive constructed sexuality and gender which allows for an historically grounded interpretation of sexuality and gender while accounting for changing sociocultural norms.

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1 Introduction

The history of queer people in the sciences is fragmentary and concealed in the margins of the material record. It is unsurprising that queerness is forced into the margins considering science as a collection of methods, institutions, ideas and values primarily concerned with the ratioc and empirical exploration and categorisation of the natural world, the European and British tradition of which began to crystallise among the privileged classes in the seventeenth century. The scientific tradition of the United Kingdom is the antecedent of the colonial scientific tradition in Australia today, given that English and European scientists were among the colonists who invaded the Australian continent at the end of the eighteenth century and began the occupation that continues today [1].

This paper is concerned with the queerness within this narrow scientific tradition and explores the possibilities and limitations of queer history through the radio astronomer Ruby Payne-Scott (1912-1981). Since this research was carried out without the direct involvement of queer Indigenous people, an examination of the relationship between these people and the Traditional Knowledge of First Nations peoples is beyond the its scope. We use the definition of Traditional Knowledge given in Ref. [2].

We begin to examine the historical relationship between queerness and the sciences in the colonial nation of Australian by discussing the relationship between queerness and English law. This relationship contextualises the interactions between queerness and Australian law. In English law, the earliest legal reference to sodomy dates to the late thirteenth-century treatise *Fleta* which recommended death for sodomites [3]. At the time, England had both ecclesiastical (religious) and common-law (secular) courts and the English "would have been subject equally to the summons and the sentences of both" [4]. In practice sodomy was dealt with by the ecclesiastical courts [5]. However, in 1533 a secular law against "abominable vice of buggery" was enacted by Henry VIII's minister Thomas Cromwell [6] as part of the sovereign's anti-clerical measures. Writing for the Gay and Lesbian Archives of the Pacific Northwest, George Painter states that the enactment of secular laws against sodomy were "all due to the particular religious preference of the monarch occupying the throne at the time", with the statute being repealed by Queen Mary I and re-enacted and made permanent under Queen Elizabeth I [7]. So the criminalisation of sodomy began as religious matter only to be later secularised, moving from a crime against the Church to the state by the early seventeenth century.

In the seventeenth and eighteenth century, buggery and sodomy covered a range of non-procreative sexual acts such as anal sex, oral sex and sex outside of marriage, likely owing to their origin as religious offences. These laws were also not gender or sexuality specific, though in practice mostly men were charged [7]. In 1716/7 an English court ruled in *Rex v. Wiseman* that the anal penetration of a woman by a man constituted an act of buggery [8]. Sodomy only became a gender specific crime in 1781 when a law passed requiring "emission of semen" for an act of sodomy to occur [7]: this law begins the process of narrowing sodomy to a crime which only certain people could perform. Four-hundred years of obscure laws on what constituted sodomy meant that many heterosexual and non-heterosexual acts could be considered crimes. So the sodomy for which many convicts were transported to the Australian colonies [9] is not automatically descriptive of sexual intimacy between men, but instead of actions which subverted the sexual norms of the time. In Australia, Britain and elsewhere, later laws begin target the homosexual instead of the act of sodomy. This shift criminalises a specific type of person rather than a specific type of act which (re)constructs queer people are a separate and lesser 'species' compared to the non-queer. The descents of these British colonial laws are still in place in former colonies such as Malaysia [10].

The contrast between contemporary and historic sexual norms shows that sexual norms vary with time, place and culture. A person's sexual attraction and the genders to which it applies may be an innate and spontaneous characteristic but it does not necessarily follow that a person's sexuality is so, for sexuality encloses both sexual attraction and how a person

relates to that attraction as well as how that attraction relates to their social communities. These intersecting relationships form a nexus which is embedded in its historical context; this conclusion leads the queer scholar Nikki Sullivan to conclude that sexuality is “not natural, but rather, is discursively constructed” [11]. So while sapphist, dyke or lesbian, may refer to the same underlying attraction, these can also be viewed as constituting different (but overlapping) sexualities. In particular, we can see from the shared terminology and behaviour that these sexualities are connected, and that this connection forms a continuity of understanding which stabilises a sexuality through time. This applies to heterosexual attraction as well, since the idea of this sexuality as ‘correct’ or ‘natural’ is itself an act of creative categorisation. Related arguments apply to the construction of gender and hence it may be similarly regarded [12].

Therefore, while searching for queerness through different historical contexts cannot be based on contemporary categories, genders and sexualities which are subversive with respect to norms of their historical context are likely to be interrelated and to have comparable experiences to queer people today. So within a given cultural context these historically subversive expressions are likely to be the antecedents of contemporary queerness through a chain of interconnected and overlapping sexualities. Considering these historically subversive expressions of gender and sexuality as queer grounds the queerness as an historical category in observable expressions of subversion, while still being sensitive to changing social norms and to historic self-identification.

2 Data Collection

In Ref. [13] it was noted that there has been a steady increase in work to address the (in)visibility of queer histories in heritage collections and institutions. In Australia, the Victoria & Albert Museum established an LGBTQ working group in 2006 and in 2022 the National Gallery of Victoria hosted the exhibition “Queer” which gathered around 400 pieces from across their collections. However, Freeman notes, these exhibitions offer a superficial introduction to these materials and does little to challenge the entrenched limitations and challenges in accessing the materials out of which history is constructed [13]. These exhibitions are the current best-case scenario for queer history, outside of community specific organisations such as the Australian Queer Archive (AQuA). These archives are limited to donated material and rely on the volunteer labour of the community to operate.

Historically, Australian universities and scientific institutions rarely spoke openly about queer employees; today visibility is increasing but in a limited capacity and with varying reliability. These institutions tend only to display queerness on significant occasions such as Pride month and these displays are typically short lived and confined to social media, outreach web pages or to occasional talks at workshops or conferences. While important, such displays are insufficient to address complexity of queer histories and identities. They are typically promotional, designed to draw in the untapped market of queer talent. So such displays shy away from addressing institutionalised discrimination or from institutional support for exclusionary policies. Ignoring these cases undermines the efficacy of queer visibility and is misleading. In Ref. [13] this was summarised by: “Rainbow flags abound but the catalogue is silent.” [13]

In part, this silence is the result of the historic need for safety in concealment: letters, diaries and other personal records may be edited by the author to obscure queerness or curated by another agent such as the family, publisher or employer. This editing may occur if these records survive at all. Institutional records such as those held by universities, research centres and government departments tend to be more complete and accessible compared with personal records. However, these archives exist to serve institutional needs; Gina Watts writes: “records are most stable when they were created by institutions that have the means and motivation to protect them” [14]. These institutions had no motivation to protect records of queerness until it became profitable to display a rainbow flag. Amy Stone writes of the “structural forces that marginalized queer communities historically” as agents who have also “hidden and ob-

scured queer history” [15]. These ”structural forces” are the institutions of power; they are the government, the courts, the universities and the laboratory

While government archives often hold records of queerness they hold these records as evidence of government activities, not as evidence of the lives and experiences of queer people [13]. So the government archive is primarily populated with arrests, prosecutions and breaches of ’morality’ laws. This means only queer people who were caught and charged are recorded, biasing the evidence. For example, men dominate government records of queerness since there was no Australian law which explicitly prohibited sex between women and these women were not in the habit of having sex in public [16]. Furthermore, government records are also arranged to serve the institution and so disregard queer people who might search for their history.

Using institutional archives is necessary for longitudinal work since their records are the most complete and stable. However, in Ref. [13] it was found that the lack of consistent, accurate and useful metadata in institutional archives makes finding queer subjects in these collections challenging. One common method for archival research is to search for a subject’s name [17, 18, 19]. However, this method has limited utility since foreknowledge of a subject is required and tends to yield less novel results. Another possible method for finding data is by provenance searching of individuals or organisations [13, 18, 19]. However, queer subjects are rarely organised into neatly categories by providence because queerness is often incidental to the organising principle of the records. Despite this limitation on providence searching, one possible avenue which remains largely unexplored is to search for specific intersectional and sociocultural factors which are often coincident with queerness [13].

3 Ruby Payne-Scott (1912-1981)

Ruby Payne-Scott was a pioneering Australian radio astronomer, who worked on solar observations and military radars. In 1945 to 1947 she and her collaborators discovered three of the five categories of solar bursts originating in the solar corona and made major contributions to radio astronomy techniques [20]. In particular, in 1947 she and her collaborators formulated the Fourier Synthesis technique, laying the foundations for much of modern astronomy [21].

The Fourier synthesis technique relates the magnitude of the varying component of the measured power of a radio source to the Fourier transform of the distribution of power across that source. While an indefinite number of distributions have identical Fourier components at one frequency, Payne-Scott and her co-authors write: ”[i]t is possible in principle to determine the actual form of the distribution in a complex case by Fourier synthesis using information derived from a large number of components” [22]. Her co-author J. L. Pawsey was ”averse to mathematics” [20] so it is likely that she composed the equations. In 1947, they used the path difference between solar radio waves reflected from the ocean and those that travelled directly to the instrument to measure the radio power of the sun. Martin Ryle took this principle and used the path difference between two instruments to formulate the Aperture Synthesis technique, which is now widely used in astronomy. Aperture synthesis makes possible combining the signals from signals from multiple similar instruments such that they mimic a single large instrument. Ryle was awarded the 1974 Nobel Prize for the development of Aperture Synthesis [23], an award he shared with Antony Hewish, who received it for Jocelyn Bell’s discovery of pulsars [24].

Payne-Scott was born on 28 May 1912 in Grafton, New South Wales. She moved to Sydney in the 1920s and attended Sydney University (SU), graduating in 1933 with a First-Class Honours in mathematics and physics. She was the third woman to graduate from SU with such a degree. In 1936 she completed her MSc, working at the ill-fated Cancer Research Committee (CRC) at SU. She earned a Diploma of Education in 1937 and worked as a teacher for two years before becoming a librarian from 1939 to 1941 at Amalgamated Wireless, Australasia. In August 1941 she began working for the secret Division of Radiophysics of the Council for Scientific and Industrial Research (CISR, 1941-1949). CISR became Commonwealth Scientific and Industrial

Research Organisation (CSIRO) in 1949. In Ref. [20] her wartime research is divided into two categories. The first is the establishment of accurate standards for radio engineering and equipment testing for wartime use; the second is a description of the theory and application of the detection of weak radar signals. From 1948 to her departure from CSIRO in 1951 she made major contributions to the development of the swept-lobe interferometer and used it to provide the first evidence for the motions of solar outbursts [20].

In 1950, CISRO management discovered she had been married in 1944 to Bill Hall in secret and so she was moved into a temporary position for which she would have to re-apply every year [20]. She was stripped of her pension contributions for her previous nine years of employment due to a clause in CSIRO's superannuation act which read: "A female officer who marries after the commencement of this section shall for the purposes of this Act be deemed to have resigned from the date of her marriage" [20]. At the time, Payne-Scott was pregnant and had recently miscarried [20]. She resigned in 1951. She took a teaching position in science and mathematics in 1963 where she remained until 1974 [20]. She left her teaching position in part due to interpersonal conflicts, but it is likely that her developing Alzheimer's disease played a role. Ruby Payne-Scott died in 1981.

Numerous recollections of Payne-Scott are detailed in Ref. [20]. She considered wearing shorts "quite appropriate attire" for her work despite the objections of her supervisors [21]; many of the men naturally wore shorts. At a CSIRO meeting concerning their discriminatory smoking policy in which men were permitted and women were not, she attended smoking a cigarette [21]. For her radical feminist and communist politics she was known as "Red Ruby" [25]. While making the first solar radio observations of the sun at Dover Heights, the physicist Gordon Stanley painted "Men Only" on the only toilet door in an attempt to intimidate Payne-Scott who he disliked [20]. She went in laughing [20].

Lyn Brown (1918-) was a librarian and typist at CISRO and, from 1943 to 1951 who knew Payne-Scott well [20]. The two were part of an informal walking group during the war and they camped together over two-day weekends. On one walk she recalled Ruby looking very athletic in "brief and practical shorts" [20]. She married in 1952, and her and Payne-Scott came to live together in Oatley where their children attended the same schools. She reported that Ruby was living "in sin" by cohabiting with Hall, prior to her marriage in 1944.

In bush walking "you share a range of experiences, some very challenging . . . and form close, often life long friendships, irrespective of educational, occupational or social background" [20] and close and intense bonds typically develop between walkers. The role of bush walking in the relationship between Payne-Scott and Brown is unclear. However, Brown began bush walking as a single woman with other young women after her discharge from the army in July 1946 and returned from one trip with her companion "quite late" [20]. In December 1946, Brown recalled how she "[slept] between [Ruby and Bill] to keep warm" [20]. She also recalls that she only considered her future husband a possible partner after "Ruby indicated we would make a good pair" [20].

In 1949, the Commonwealth Investigation Services (CIS) and later the Australian Security Intelligence Organization (ASIO) opened a file on Payne-Scott. This is likely because of her communist politics and her association with secret research [20]. In April 1950, a secret CISRO report to the CIS/ASIO described her as: "a queer girl; a bright student but very erratic ... she is in a Feminist group ... I would not put anything beyond her." It is striking to find her described as "queer" even though it is likely meant in the sense of odd or erratic. Given that we know her dress, her politics and her behaviour as well as her sexuality were subversive enough cause comments by her contemporaries and her biographers. Furthermore, her secret marriage, its discovery and the consequences thereof closely matches the experiences of many queer relationships. So we think it is reasonable to describe Ruby Payne-Scott as queer.

4 Conclusion

The musician and poetess Sappho of Lesbos (c. 630 BCE) is a key cultural ancestor for the non-Indigenous Australian queer community: from her we inherit the terms sapphic and sapphist and from her island, lesbian [26]. Her poetry is fragmentary, preserved either on papyrus or quotations by other ancient authors [27] and the endless (re)interpretability of this fragmentary record is taken as symbolic of queer history. Sappho's fragment 147 is used to articulate the queer longing for history and ancestry, she writes: "someone will remember us / I say / even in another time" [28].

Queer scientists have this longing too. Science has historically been the domain of the privileged, there perhaps an intensification of this longing as a result of the tension between queer people and the history of the institution they occupy. Recovering the queer history of the sciences helps to answer this need. It creates space, continuity and stability for queer scientists in the scientific enterprise. This recovery also helps to ensure an accurate attribution of credit and corrects misapprehensions. It helps to shift institutional attitudes and policies towards a more inclusive and diverse future. It may also force scientific institutions to confront the ways in which they have harmed queer people through their culture, their policies and their choices and to reflect on legacy they have created. Queer scientists are told that we have never been part of science because obscured and edited records to show our absence. When examined though, the absence speaks.

Author Contributions

Eliot Jane Walton: conceptualization (equal); writing –original draft (lead); writing – review & editing function (equal); visualisation (lead); investigation (lead); methodology (lead); validation (lead). Camelia Walker: conceptualization (equal); project administration (equal); writing – review & editing function (equal); visualisation (equal); methodology (equal); validation (equal); resources (equal); supervision (equal). Elliot Freeman: methodology (support). Clare O'Hanlon: data collection (equal). Chloe Mackallah: conceptualization (equal); methodology (equal); funding acquisition (lead); project administration (lead); resources (lead); writing – review & editing function (equal); visualisation (equal); validation (equal); supervision (equal). Mohammad Taha: conceptualization (lead); methodology (equal); project administration (equal); resources (equal); writing – review & editing function (equal); visualisation (equal); validation (equal); resources (equal); supervision (equal).

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