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Ladies, Gentlemen, and Scientific Publication at the Royal Society, 1945-1990

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Abstract: This paper extends the scholarship on gender and scientific authorship by exploring women's involvement in editorial decision-making. Prior to 1945, women scientists could submit their work to the journals of the Royal Society, but they were excluded from all editorial and evaluation roles: such gate-keeping roles were reserved for Fellows of the Society. We draw upon the Society's archive to examine the experiences of female authors, referees, and communicators in the period after women were admitted to the Fellowship. We investigate the involvement of women in both anonymous roles (e.g. as referees), and in publicly-visible positions of editorial responsibility (e.g. as communicators, and committee chairs). We reveal that women were better represented in both types of roles in the 1950s than in the 1970s and 1980s. These findings are pertinent to current debates about bias in the peer-review system, and the gendering of academic reward and recognition structures.

Keywords: The Royal Society; History of publishing; Peer-review; History of science; Women in science; Peer Review; Unconscious Bias; editorial practices; academic rewards; higher education

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Introduction

It is often argued that one of the issues underlying women's limited success in terms of promotions and publication rates in academia is the paucity of women participating in the processes by which scholarship is evaluated (Hancock & Baum 2010; Kasten 1984; Park 1996, Bosquet, Combes & Garcia-Penelosa 2013; Baker 2012; de Groot 1997). This paper will focus on the editorial and reviewing work that is key to academic publishing. Our analysis of women's participation in the editorial and publication processes of the Royal Society of London adds a historical dimension to contemporary debates about the role of gender in the peer review system, and in academic evaluation and knowledge-production more generally (Bernstein 2015; Wennerås & Wold 1997; Katz, Gutierrez & Carnes 2014).

Great efforts have been made in recent years to achieve gender balance in publicly-visible roles of scholarly evaluation, such as university recruitment and promotions panels, and grant-funding panels. Schemes such as Athena SWAN and Juno have helped raise awareness, but they have no leverage over the world of scholarly publishing, where journals are managed by a myriad of learned societies, university presses and commercial firms. Many organisations have voluntarily improved diversity on their journal editorial boards, but boards are merely the tip of the iceberg. Hidden behind scholarly norms of confidentiality and anonymity, vast numbers of academics act as referees, or peer reviewers, of papers submitted for editorial consideration (Scholarly Communication and Peer Review 2015).

This confidentiality also means that little is known about the gendered aspects of refereeing. However, a growing number of studies suggest that editorial decisions are implicitly biased towards papers by apparently-male authors, regardless of the gender of the editors, board members or referees themselves (Holroyd, Scaife & Stafford 2017; Lee, Sugimoto, Zhang & Cronin 2013). Such findings are a particular concern for those disciplines in which 'single blind' review is the norm (e.g. most of the natural sciences), and is leading to experiments both with 'double blind' review (anonymization of the author, as is the norm in many humanities disciplines) and

'open' peer review (where the names of author and referee are both made public, along with the report).

Using historical archival material, we consider an editorial process where women had been structurally excluded from positions of editorial decision-making until 1945. We examine what happened once women were (theoretically) admitted to positions of editorial responsibility. Our behind-the-scenes story reveals two historical phases in women's participation in the editorial processes of scholarly journal publishing, and indicates that progress has not always been upwards.

The Royal Society, founded in 1660, is one of the oldest learned societies in the world, and election to the Fellowship has been seen as a significant accolade for scientists since the mid-nineteenth century (Hall 2002). The Society is also the publisher of the world's oldest-running scientific journal, the *Philosophical Transactions*, founded in 1665, and published since 1887 in separate series for physical sciences and biological sciences (A and B). Since 1831, the Society has also issued the *Proceedings of the Royal Society* (split into series A and B in 1905) for shorter papers (Fyfe, Mcdougall-Waters & Moxham 2015). By the 1940s, the growing competition from specialised disciplinary journals, and faster-publication journals, meant that the Society's journals were no longer the most efficient way to communicate research to one's disciplinary colleagues, but their historic prestige and reputation for selecting high-quality original works ensured that they remained a high-status option.

Publishing at the Royal Society was routinely assumed to be a masculine enterprise, as is clear from a 1938 anniversary address by the then-President of the Society, Sir William Henry Bragg:

When a man submits a paper to the Society he is, in the first place and quite rightly, anxious for the satisfaction of showing what he has done to those who will understand it. Another reason, which has certainly grown in strength of recent years, is that he wants to establish his reputation and position. Doubtless, he has also the wish that his work may be of service, though this desire may be relatively less obvious even to himself.¹

There had never been any formal exclusion of women as authors in the Society's journals, and since the 1890s, there had been a steady trickle of papers by women scientists. Bragg was certainly well aware of the growing number of women

scientists, not least because the majority of his research students were female (Glazer 1947: 2).² Nevertheless, he was addressing the all-male Fellowship of the Royal Society, and was well aware that almost all of the papers the Society published were still written by men. All the editorial decisions were also made by men, because these roles were restricted to Fellows of the Society.

Our paper investigates the period after 1945, when the first two women were elected to the Fellowship: biochemist Marjory Stephenson and Bragg's former student, the crystallographer Kathleen Lonsdale. They were followed by a small number of other women (including, in 1947, mathematician Mary Cartwright and crystallographer Dorothy Crowfoot Hodgkin), thus creating a select group of women scientists with the right to participate in the various aspects of the Society's editorial gate-keeping and evaluation. We investigate the extent to which these early women Fellows did in fact participate in editorial roles, and consider the way that participation was seen by themselves and by others.

The early women Fellows quickly became involved in the invisible role of refereeing, and both Cartwright and Lonsdale took on positions of public responsibility within the Society's publishing affairs in the 1950s. Later women, however, appear to have been both less visible and less involved in the Society's publishing activities. In the 1970s and 1980s, the increasing number of women in the Fellowship actually coincided with a proportional decline in the involvement of women both as authors, and as referees or communicators of papers submitted to the Royal Society. And although the late 1980s and 1990s saw some women take on senior roles in the Society at large, including the vice-presidency of the Society, no women Fellows held a role of public responsibility for publishing until the twenty-first century. We explore this particular combination of visibility and invisibility by problematizing the 'gentlemanly' self-perception of the Royal Society, its Fellowship and staff.

Women and Science Publishing

Historical scholarship on women's involvement in scientific publishing has focused on their role as authors. Although scholars have revealed a small number of women who had decision-making responsibilities in literary publishing (Fahnestock 1973; Carney 1996; Brake, Bell & Finkelstein 2000), there are very few women who are known to have taken on such roles in any area of non-fiction publishing, not least,

in science. There has been significant scholarly interest in women authors of popular science in the long nineteenth century, but until the late nineteenth century, very few women had the education or opportunities to contribute to active areas of scientific research (Gates 1998; Gates & Shteir 1997; Lightman 2007; Abir-Am & Outram 1987; Neeley 2001; Secord 2015; Gould 1997). Much of what is known about the publishing activities of women scientists in the early and mid-twentieth century is scattered among biographical studies of individual women, and has yet to be synthesised into a bigger picture of women's experiences of scholarly publishing as authors, let alone as editors or referees (Ferry 1998; Hodgkin 1975; Strbánová 2016; Ogilvie 2004; Maddox 2003).

Since the 1990s, there has been growing interest from sociologists in women's involvement in scholarly publishing, as part of a wider investigation of gender inequality in academic – and especially scientific – careers. Scholars have investigated factors, such as marital status and number of children, that are believed to affect women's scientific authorship. Authorship, i.e. the list of publications, is widely treated as a measure of research productivity and a key determinant of career success (Grant & Ward 1991; Ward, Grant & Gast 1992; Stack 2002; Fox, Fonseca & Bao 2011; Fox 2005; Frietsch, Haller, Funken-Vrohlings & Grupp 2009). The more recent awareness of 'implicit bias' in evaluation and selection processes – including peer review of grant applications and journal papers – has generated a substantial number of case studies using statistical analysis to identify gender bias (Lee, Sugimoto, Zhang & Cronon 2013). What we are still missing, however, is a detailed understanding of how women gain access to editorial decision-making roles, and how they act in those roles. Our paper is a first step in that direction.

Women at the Royal Society

In order to understand women's involvement in Royal Society publishing activities, we need to understand the overall context of gender at the institution. From its beginnings in 1660, its Fellows had been male. During the eighteenth and nineteenth centuries, a handful of women were acknowledged in work reported to the Society, and two women – Caroline Herschel in 1787 and Mary Somerville in 1826 – published papers in their own right in the *Philosophical Transactions*. Some of the later, and more specialised, learned societies – including the Zoological Society (founded 1826) and the Geographical Society (1830) – admitted women to their

membership from their foundations; and more societies followed suit in the later nineteenth century. But the Royal Society did not.

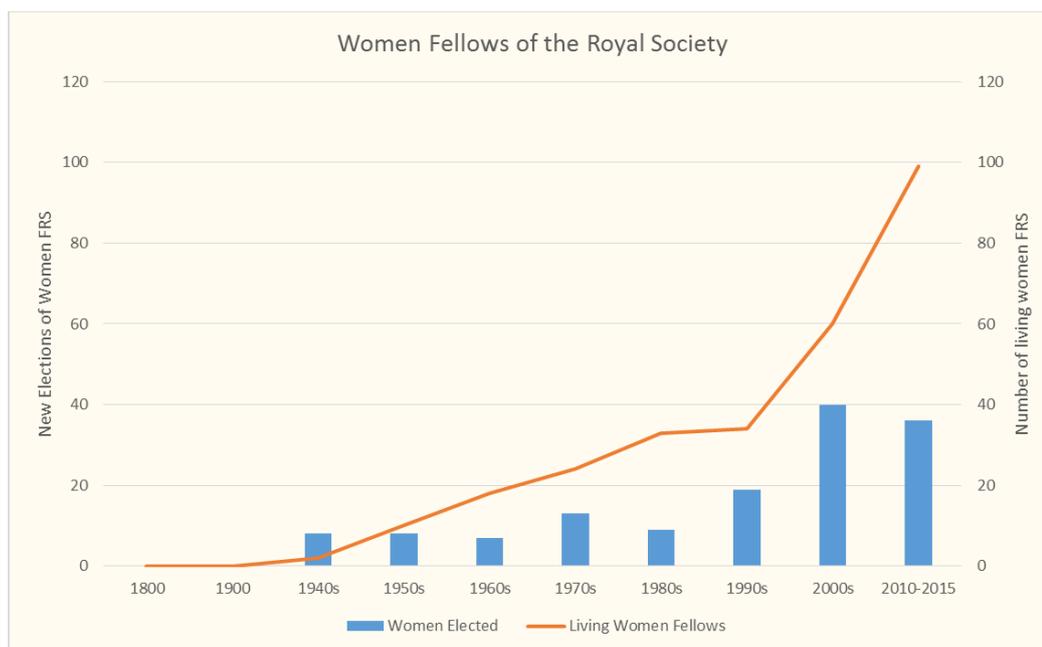
There was no statute explicitly excluding women from the Royal Society, but powerful cultural traditions ensured that no women were proposed for Fellowship until Hertha Ayrton's nomination in 1902. Ayrton's list of published papers made her scholarly credentials clear, but the Society took legal advice on the eligibility of nominating a woman. The lawyer advised that a woman who was married could not become a Fellow of a royally-chartered body, without a change in the charters. Ayrton went on to become the first woman to read a paper in person to the Society (in 1904) and was awarded the Society's Hughes Medal in 1906, but she was never made a Fellow (Mason 1991).

Sex or marriage ceased to be a bar to admission to chartered societies after the 1919 Sex Disqualification (Removal) Act (9 & 10 Geo. 5c. 71), but even so, it was not until 1944 that two more women were finally nominated for the Fellowship.³ Due to wartime conditions, the Fellows voted by post on the admission of women; and Kathleen Lonsdale and Marjory Stephenson were duly admitted in 1945 (Mason 1992). Stephenson died a few years later, but Lonsdale would go on to become an active referee for the Society. As is well-recognised, however, the admission of Stephenson and Lonsdale did not mark the start of a flood of women into the Fellowship. As Table 1 shows, there was steady but slow growth until the 1970s, and there has been a more recent phase of steeper growth since the 1990s. In 1955, there were just ten women in the Fellowship, and that had only risen to thirty-something women in the 1980s and 1990s; they made up around 3% of the living Fellows. As Joan Mason notes, by far the majority (over 80%) of the women elected in the first fifty years were in the biological sciences (Mason 1991: 214).

Table 1⁴

Decade	New Elections of Women FRS	Year	Number of Women FRS Living
1940s	8	1945	2
1950s	8	1955	10
1960s	7	1965	18
1970s	13	1975	24
1980s	9	1985	33
1990s	19	1995	34
2000s	40	2005	60

[Or, Graph 1]



The presence, or not, of women in the Royal Society Fellowship matters to our investigation of their role in editorial evaluation practices because, until the late twentieth century, the Royal Society's editorial system restricted key roles to its own Fellows.

- Authors could only submit papers to the Society with the support of a Fellow, known as a 'communicator' (until 1990)
- Referees were virtually always Fellows of the Society (until the late 1960s).
- The committee chairs (later, associate editors) responsible for editorial management in particular subject disciplines were always Fellows.⁵

This system was central to the identity of the journals as *the Royal Society's* journals, and it intentionally kept editorial responsibility within the 'club'. The exclusion of scientists who were not Fellows of the Society undoubtedly affected many male scientists and most non-British scientists. It also structurally prevented women scientists participating in decision-making at one of the most prestigious publication outlets in science.

Methodology

We seek to investigate how, and to what extent the new women Fellows after 1945 were able to take advantage of the roles now accessible to them, and what their experiences of those roles were. More generally, we consider the effects of the

gendered editorial system in use at the Royal Society until 1990. We do this by drawing upon historical archival material in the Royal Society's archives. The richness of the Society's archive is a unique resource for studies of academic journal publishing, both because of the long historical period covered, and for the variety of material surviving. This includes formal committee minutes; ledgers registering the editorial progress of every submitted paper; correspondence between Society officers, referees, and editorial committee members; and an extensive collection of manuscript referees' reports, starting from 1832. The official minutes, memoranda and officers' reports tend to preserve the polite atmosphere of the Society, and rarely shed much light on the subjective processes (gendered or not) involved in editorial evaluation and knowledge-production. We have used the editorial registers to trace the general trends of female participation, and to identify the most active individuals; and we have used the referees' reports, on both accepted and 'withdrawn' (i.e. rejected) papers, to gain a closer insight into the gendered aspects of refereeing.

To understand the Royal Society's attitude to its women authors, referees and Fellows, we find it helpful to problematize it as a 'gentlemanly' space. Historically, the term 'gentleman' was tied to a socially-elite group of men, those of 'gentle birth' or of a 'superior position in society'. Such men usually had sufficient independent means that they did not engage in trade or labour, though members of the traditional professions could be complimented by designating them as 'gentlemen'. For the first two centuries of the Royal Society's existence, the majority of its Fellows were aristocrats, independent gentlemen, and members of the professions; they were quite literally 'gentlemen', in the socially-elite sense. But the term is also linked to the qualities and behaviour supposedly exhibited by such men, including 'chivalrous instincts' and 'fine feelings'; and it is in this sense that the Royal Society in the twentieth century continued to be a 'gentlemanly' space (Oxford English Dictionary, especially meanings 1a, 1c, 3a & 4a).

The significance of gentlemen in the making of modern science has long been recognised by historians of science, most notably in Steven Shapin's work on the importance of gentlemanly qualities of civility, virtue and truth-speaking among the Fellows of the seventeenth-century Royal Society (Shapin 1994: chapter 2); and in Morrell and Thackray's work on the British Association of the Advancement of Science, founded partly as an alternative to the Royal Society in providing leadership for British science in the early nineteenth century (Morrell & Thackray 1981). These

works emphasise both the social background and the codes of polite behaviour of the 'gentlemen of science' involved in the Royal Society (Ellis 2016).

Over the course of the nineteenth and early twentieth centuries, the Royal Society's social demographic changed: there were far fewer members of other professions, or members of the nobility;⁶ and its Fellows were increasingly employed as university professors or other research scientists. Nonetheless, the Society continued to be seen – and to see itself – as a gentlemanly space. Scientist and commentator John Ziman celebrated the gentlemanliness of scientific research in his 1960 radio broadcast, 'Gentlemen or players?', when he argued that scientific enquiry 'can never be a job, to be performed at piece rates or by the hour'. Rather, it must 'be done for its own sake'. And thus, according to his cricketing analogy, scientific researchers were gentlemen, not players (Ziman 1981)⁷ (Ziman would become a Fellow of the society in 1967.) The Society's office staff saw the flip-side of this self-image, when they recalled the 'gentlemanly' appearance of certain actions yet described the atmosphere at the Society as 'a musty old boys club', and dominated by 'the old boy network.'⁸

With its Fellows-only social spaces and activities, the Society shared some features with London private clubs. Its interior was adorned with portraits and busts of eminent deceased men (although there are now 25 portraits of female scientists in the Society, with two more being commissioned). Its dining clubs were male-only, by tradition rather than rule, until the mid-1970s; the historian of one such club described the admission of women to the club having 'ended the era of the Club as a male preserve and thus ends this history' (Allibone 1976: 429). Women were welcomed as guests at the Society's formal social events, such as the annual soirees and dinners, but this was primarily intended for wives rather than female colleagues, and it was a dispensation that appears to have been granted anew every year.⁹

We are not the first to problematize the term 'gentleman', which has been critically explored in popular culture¹⁰ and by historians of gender. Scholars of masculinity have debated the emergence of the 'new man' in the nineteenth century, investigating how a longer history of manliness expressed through institutional power hierarchies, such as the military, became a performance of politeness, style, and proper behaviour (as well as participation in the domestic sphere in a manner clearly demarcated from the feminine). Chivalry towards women became an important part of that performance (Cohen 2005; Carter 2001; Connell & Messerschmidt 2005;

Rosenberg 2004; Williamson 2016; Tosh 2017; Malchow 1992; Hall 2013). What we can draw from these scholars' work on masculinity is that there is nothing 'gentle' about the history of 'gentlemen'. This was clearly demonstrated by Cain and Hopkins in their discussion of how the financial interests of privileged and polite 'gentlemanly capitalists' drove imperial expansion and exploitation in late Victorian Britain (Cain & Hopkins 1987).

Within the marble hall of the Royal Society, too, the term 'gentlemen' needs to be seen as damaging in its sheltering of obvious power beneath the polish of a stylish, polite man. Fellows of the Society in the twentieth century may not have been gentlemen in the socially-elite sense, but they still prided themselves on their gentlemanly behaviour. This included the behaviour appropriate to the reasoned discussion at Society meetings, and to the constructive criticism to be offered in referees' reports. But this public 'gentlemanliness' masked the clear power exerted by Fellows over outsiders, whether defined by gender, nationality or educational standing. This power was concentrated through self-replication, as new Fellows can only be proposed by existing Fellows. The power tended to be traditional and conservative, whether in the selection of Fellows or, as the Society's secretary admitted in 1892, in the selection of papers for publication (Waterson & Rayleigh 1892).¹¹ Drawing on Balin *et. al.*'s work, we also explore how it had the effect of some women Fellows choosing to 'become gentlemen' in order to adapt to the prevailing culture at the Society (Balin, Bartow, Fine, Guiner & Stachel 1997).

Institutional Structures

The fact that only two women had published in Royal Society journals before 1880 reflects women's historical exclusion from higher education and advanced study. By the end of the nineteenth century, however, women were being admitted to degrees at a small number of universities, and to non-degree studies at other universities. At the Royal Society, the emergence of this new generation of academically-trained female researchers is apparent in the steady trickle of papers submitted from the 1900s onwards by authors whose names were marked by 'Miss' (rather than 'Mrs').¹² Many of these women came from the female-only Newnham and Girton colleges; and many were involved in suffragette or women's rights groups, or volunteered for working-class women in some capacity.

By 1939, women comprised a quarter of the total UK student body, though most were studying Arts degrees (Dyhouse 1995). Women continued submitting to the Society in low numbers. After the war, a masculinisation of the technical disciplines resulted in fewer UK women studying the sciences at university than there had been in the 1920s (Edgerton 2005: 177). In the United States, also, the proportion of women PhDs and faculty in the sciences plummeted between 1930 and 1960 (Schiebinger 1993: 14-15). Thus, although women authors were no longer a rarity at the Royal Society in the 1940s and 1950s, as Table 2 shows, there were still very few of them.

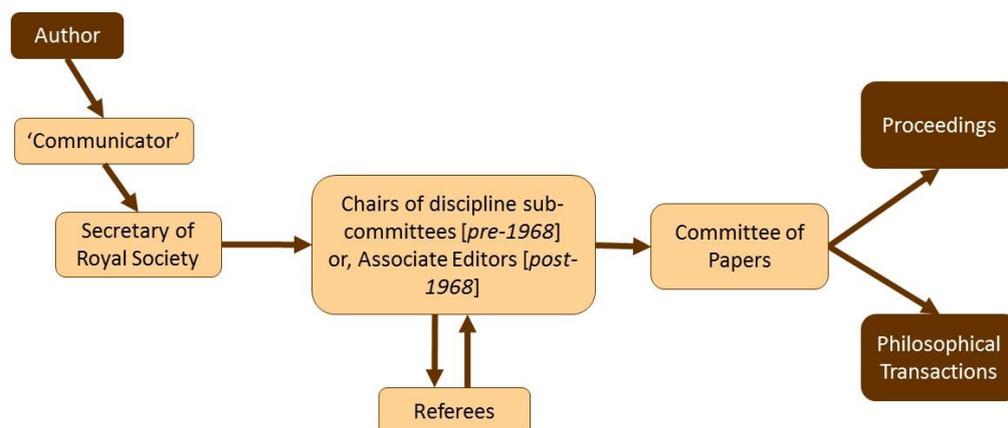
In a reversal to the Society's general patterns of authorship, most of the women submitting papers were in the biological sciences. Far fewer were in the physical sciences, though crystallography was something of an exception to this rule, perhaps due to the supportive presence in the Society of Lawrence Bragg, J.D. Bernal, Kathleen Lonsdale and Dorothy Hodgkin.

Table 2¹³

Sample Year	Total Papers Submitted to Royal Society	Papers submitted by women	% submitted by women
1925	235	17	7%
1935	335	13	4%
1945	105	4	3%
1955	352	14	4%
1965	362	18	5%
1975	400	28	7%
1980	336	24	7%
1985	309	12	4%

By the time women were admitted in 1945, the Royal Society's editorial system was a complex mix of historic legacy and more recent additions (Fyfe & Moxham 2016). Figure 1 represents the editorial process as it operated between 1896 and 1990.

Figure 1



Decisions were made collectively and not by a single editor. Reports from specialist ‘referees’ had become part of the editorial process for the Society’s *Transactions* in the 1830s; but during the twentieth century, refereeing became standard for the *Proceedings* as well (although it would not become standard practice at scientific journals more generally until the 1960s and 1970s). Another notable feature arises from the historical insistence that papers were only accepted for consideration if they came from known, trusted sources (Fyfe & Moxham 2016).¹⁴ In practice, that meant, first, that papers had to be communicated to the Society via one of its Fellows; and second, that the identity and status of the author were evaluated. The Society thus had an explicit gate-keeping system; and it operated what would later become known as single-blind refereeing, rather than double-blind (Pontille & Torny 2014). Many different people were involved in editorial decision-making at the Royal Society, and, apart from the administrative support, they were all Fellows of the Society. We will now look at the gendering of each of the key roles in turn.

a) Communicators

The original insistence on having all papers communicated by a Fellow had been a means of vouching for the social and scholarly respectability of an author who was an outsider. But by the twentieth century, the act of communicating a paper was understood to entail vouching for its contents: Fellows were expected ‘to ascertain that the paper is a fit and proper one to be communicated.’¹⁵ We might conceptualise

this as a requirement that papers by outsiders required a testimonial, or an advance referee report, from an insider. Names of communicators were printed on the published paper, so the act had implications for public reputation, not just reputation within the (private) society.

By the mid-twentieth century, the Fellows who were most active in communicating papers by outsiders were those who ran research laboratories, and thus had a steady stream of junior scholars working with them. These men might communicate four or five papers a year. In the 1940s and 1950s, this group included crystallographer Lawrence Bragg, chemist Eric Rideal and physicist Nevill Mott, all affiliated with Cambridge. Few woman scientists were in this type of position until the later twentieth century. Kathleen Lonsdale appears to have been the most active of the female Fellows in this respect, but she rarely (if ever) communicated more than one paper a year in the 1950s and 1960s. By the 1970s and 1980s, very few female Fellows appear to have acted as communicators: there were none in 1975 or 1985, and just one, Helen Muir, in 1980.

Thus, even after the admission of female Fellows in 1945, virtually all women scientists wishing to submit to the Royal Society continued to have to do so through a male intermediary.

b) Editorial committees

When a paper was submitted to the Royal Society, its receipt was formally entered in the relevant ledger of the 'Register of Papers' for the physical or biological sciences. It was then under the supervision of the appropriate honorary secretary, who took ultimate responsibility for corresponding with authors, organising and chasing referees, and presenting paperwork (and recommendations) to the Committee of Papers. The Committee of Papers (whose membership was identical to that of the Society's 21-person governing Council) formally made all editorial decisions until its abolition in 1990.

However, it is clear from the pages of the 'Register of Papers' that, in the twentieth century, the Committee was being used merely as a ratification body in all but the most awkward of cases. Decisions were actually being made earlier in the process. Since 1896, the honorary secretaries had been assisted by the members of discipline-focused 'sectional committees': they advised on the selection of referees, received the reports, and generated editorial recommendations. The chairs of these ten or a dozen committees could be seen as acting as subject editors for their fields, and in

1968, this function was formally transferred to a group of Fellows now designated as Associate Editors. When considering a paper for publication, the honorary secretary consulted with the chair of the relevant sectional committee (or, later, the relevant Associate Editor). Editorial recommendations emerged from this consultation.

The mathematician Mary Cartwright (later Dame Mary) was the first woman to serve on a sectional committee, that for mathematics, in 1950 (Yearbook 1950: 8). Cartwright also became the first woman appointed to Council, serving a term from 1956-57 (Yearbook 1956: 8)¹⁶, and was subsequently appointed to the Publications Committee 1959-62, where she served alongside the two secretaries, the treasurer and seven other Fellows (Yearbook 1959: 75; Hayman 2000). Cartwright is also well-known for her roles at the University of Cambridge, as Mistress of Girton College from 1949, and on a variety of high-profile university committees from the 1950s until her retirement in 1968, among them a term as President of the London Mathematical Society in 1951. Cartwright was, however, the exception. No other woman served on the Publications Committee during its period of existence until 1990. No woman became an Associate Editor, while that position existed between 1969 and 1990. The first female Editor would only be appointed in 2008.

c) Referees

As Table 3 shows, very few papers were refereed by women.

Table 3: Women Referees¹⁷

Sample Year	Papers Refereed by women	% of all papers refereed by women
1945	1	0.95%
1955	10	2.84%
1960	4	1.19%
1965	10	2.76%
1975	1	0.25
1980	0	0
1985	1	0.32

To our surprise, the very first women referees we have found pre-date the admission of female Fellows in 1945. Botanist Agnes Arber (Packer 1997) refereed a paper in 1939,¹⁸ as did cell biologist Honor Fell in 1945.¹⁹ However, these instances fit with a wider pattern. Scattered through the Society's Register of Papers, there are a handful of examples of non-Fellows being called upon as referees in the late nineteenth and early twentieth centuries. These were almost all men who became

Fellows shortly afterwards, and whom we may, therefore, surmise to have been well-networked with existing Fellows of the Society.²⁰ Arber and Fell both went on to become fellows, in 1946 and 1952 respectively.

Much of the refereeing activity by women in the 1950s and 1960s was single-handedly due to Kathleen Lonsdale. She wrote 8 reports in 1955 (of 10 written by women) and 10 reports the following year (of 12 written by women). This level of refereeing activity stands out, even among the male Fellows. In any given year most male Fellows did no refereeing, and the most common number of reports (for those who did any at all) was just one.

The fact that Lonsdale (as a crystallographer) was a physical scientist may be significant. The Society received far more submissions (almost three times as many) in the physical sciences as in the biological sciences at this time; and the Fellows in charge of the editorial process for the physical sciences tended to consult more referees per paper. There was, therefore, more refereeing work needing to be done in the physical sciences. The most active referees in 1950 included the physicists Rudolf Peirls (19 reports) and Paul Dirac (12 reports), and the chemists Meredith Gwynne Evans and Harold W. Thompson (11 reports each). None of the biological scientists that year wrote more than 3 reports, and this might explain why the botanists Agnes Arber and Helen Porter, and biochemist Rosalind Pitt-Rivers appear to have done relatively little refereeing. But even so, Lonsdale's level of activity sets her apart from her disciplinary colleague Hodgkin, and from Cartwright.

Table 3 also strikingly suggests that papers submitted to the Society were *less* likely to be refereed by a woman in the 1970s or 1980s than they had been in the 1950s and 1960s. This is despite the fact that there were three times as many women in the Fellowship by then, and also the fact that the editorial guidelines had been relaxed in 1969 to allow Associate Editors to select referees who were not Fellows of the Society. And yet, with implicit permission to select referees from the entire world of science, the Royal Society's editorial team appear (presumably unconsciously) to have used that licence to choose even more male referees... We do not have any information on the number of women scientists (Fellows or not) who may have been asked, but declined to act.

d) Office Staff

Administrative support was provided by the paid staff of the Society. From the start of the twentieth century, there have been women working in the Society's office,

in addition to those who did the cleaning and household duties (Gay 2013). The number of paid staff grew through the twentieth century, and staff would later describe the office of the early noughties as 'dominated by women'. They joked that it would have been nice to have a man around once in a while, though they were in no doubt that the society they were working for, especially the Fellowship, 'was male'.²¹

Attitudes to the female office staff in the 1960s can be illustrated by the short poem by Lawrence Bragg, in which he responded to the arrival of an early electronic (rather than human) computer (Grier 2005):

Our brand new computer (sic.)
Replaces ten girls
The office is muter
but buzzes and whirls

Our brand new computer
By one man is run
Its gender is neuter
The girls are much cuter
And also more fun²²

For Bragg, the women employees were characterized as 'girls': they were seen as 'cute' and 'fun', a lively part of the Society, but not quite part of the adult (masculine) crowd.

Despite the undoubted presence of women in various departments of the Society (including membership, international relations, and accounts), relatively few women appear to have worked in the Publications department. Most of the administrative support for the editorial side of the publications was provided by the Assistant Secretary (from 1947 to 1976, David Christie Martin (Massey & Thompson 1978) and the Assistant Editor (Ronald Winkworth 1937-retirement 1944; Jock C. Graddon 1944-retirement 1972; William Gerry Evans c1975 (but first joined Royal Society 1947)- retirement 1983). However, in the 1980s, Vivienne Clarke was Head of Sales and Marketing, and Ruth Glynn Head of Publishing for about three months, the latter of whom recruited many of the current publishers at the Society and thus ushered in an era where technical expertise became important.²³

Women at the Society in the 1950s and 1960s

We will now look more closely at the editorial participation of the early women Fellows, in particular, Kathleen Lonsdale and Dorothy Hodgkin. We will also look at other women's experiences of refereeing, communicating, writing and doing editorial work in the 20th century, in order to track the many different ways in which they were received and participated at the Society.

a) Communication

None of the women Fellows communicated many papers. Lonsdale and Hodgkin forwarded one manuscript per year at most during the 1950s. They were both known supporters of women scientists. As a wife, mother and researcher, Lonsdale had a strong awareness of the positive and negative aspects of a career in science as a woman; she once advised other women researchers 'not [to] care if she is regarded as a little peculiar' (Hodgkin 1975). Lonsdale forged strong friendships with men and women in science, often supporting female PhD students and investing emotionally in their success (Baldwin 2009). Hodgkin also cared deeply about her students, and fought to get more women into her university (Ferry 1998). A bulky section of Hodgkin's archived papers contains career files of scientists who did doctoral or postdoctoral research with her, with the attached invariably complimentary references that she always took time to carefully write out. She was, the cataloguer of her papers in Oxford noted, 'exceptional in the number of female scientists she trained.'²⁴ But although both Lonsdale and Hodgkin did communicate papers to the Royal Society for other women in their field, the small numbers make it difficult to support an argument that either was intentionally promoting female-authored manuscripts.

Most female authors continued to rely on a supportive male Fellow, either as co-author or as communicator. It was perfectly possible for female authors to have a smooth and successful experience of publishing with the Royal Society. For instance, in early 1960, the Society received a paper on cell differentiation in the developing eye of the fruit fly. It was by two Edinburgh researchers: the professor of animal genetics, Conrad Hal Waddington FRS, and a relatively young researcher named Margaret Perry who graduated from Edinburgh University in the mid-1950s. The paper was sent to UCL cell biologist Michael Abercrombie FRS to review, and Abercrombie had approved it for publication.²⁵ The paper was short enough for the Society's *Proceedings*, and so Abercrombie was the only referee was consulted. Perry

and Waddington's paper appeared in *Proceedings B* in November 1960.²⁶ This was Perry's first paper, and it became one of a series of career-defining moments for her. Her friends described her as 'extraordinarily modest' and 'quiet', but her favourable reception at the Royal Society encouraged to continue her work; by the late 1980s, she had succeeded in hatching genetically-modified chickens at the Roslin Institute (Perry 2009).

A few months after Perry's paper, another paper by a female researcher arrived at the Society. It was the sixth in a series of analyses of the structure of myoglobin by a team working under Lawrence Bragg at the Royal Institution's Davy Faraday Laboratory. This instalment discussed seal myoglobin, and was by Helen Scouloudi. It was communicated to the Society by Bragg, who may have joked about girls being cuter than computers, but, like his father, supported and employed women scientists at his laboratory (Rayner-Canham & Rayner-Canham 2001). This was another short paper for *Proceedings*, and was similarly sent to just one referee, in this case, Oxford-based Dorothy Hodgkin, who wrote: 'I do not at all want to hold up publication of this paper'²⁷; it appeared in *Proceedings A* in October.²⁸ The paper's association with a well-known research group surely eased its passage through the editorial system, as would have the fact that Scouloudi had published in *Proceedings* before.

Scouloudi's 1951 paper had been based on her doctoral research, and was co-authored with her PhD supervisor, C. H. (Harry) Carlisle. Since Carlisle was not a Fellow, however, their paper had been communicated by J.D. Bernal. The fact that Bernal had already communicated a previous paper of Carlisle's (on that occasion, co-authored with Dorothy Hodgkin née Crowfoot, a former student of Bernal's) hints at the tight connections between authors, communicators and referees within this disciplinary community.²⁹

In 1960, however, Scouloudi was sole author of the paper on seal myoglobin. In his covering letter, Bragg (a seasoned communicator) assured the Society's physical secretary that 'the results are of considerable interest'. He also clarified that, 'The research has been carried out in the Davy Faraday Laboratory where Miss Scouloudi is a member of the staff'. This comment may have been meant to emphasise her status as an established staff member (not student), but at the same time, it casually denied Scouloudi's PhD credentials.³⁰

Perry's and Scouloudi's experiences show that female scientists could get published at the Royal Society. Like male scientists who were not (yet) Fellows of the Society, they had to rely on a supportive Fellow as co-author or communicator. The substantial number of submissions to the Society from non-Fellows (far outnumbering the submissions from Fellows themselves) indicate that plenty of male scientists had the networks to do this. The small and relatively stable number of submissions from female scientists, despite evidence of a growing number of women working in scientific research, suggests that most women were not so well networked.

b) Refereeing

As we have seen, Kathleen Lonsdale was more active than most Fellows (male or female) as a referee. Dorothy Hodgkin, Mary Cartwright, Helen Porter and Rosalind Pitt-Rivers were far more typical Fellows, as far as refereeing is concerned, writing a report or two from time to time.

The normal work of a referee included reading the enclosed manuscript, and responding to the questions on the pre-printed form. It might also involve offering feedback to the author, or further correspondence with the secretary, assistant secretary or committee chair. From our examination of surviving referees' reports, it seems that women and men carried out these duties in broadly similar fashion. There are, perhaps, some remarks worth making about the words used. Dorothy Hodgkin in particular often declared herself unsure of her own expertise, and was apologetic. In a note to the Assistant Secretary, D. C. Martin, in 1951 she wrote:

I feel myself rather incompetent about this paper – it seems to me worth while but rather longer than necessary for the matter in it. But Professor Randall [the communicator] is so much the expert in this field. I would entirely accept his view. I am so sorry. I have kept it so long.³¹

Hodgkin operated in a new, cross-disciplinary field, but her self-appraising tone is notable. Similarly, her activity notwithstanding, Lonsdale excused herself quickly from papers beyond her field, writing that she did not have time or expertise. Male referees in the early fifties expressed uncertainty too, but with fewer excuses and certainly fewer statements of 'incompetency.' For example, physicist Otto Frisch excused himself from refereeing a paper in 1951, writing to Martin that:

This paper is currently (17 October 2017) under review at a journal.

Please do not circulate it without the authors' consent.

...the paper by Miss Power on Meson Theory, which you sent me to referee, is quite outside my own line. If you agree, I could pass it on to either Dr J. Hamilton, who is an expert in that field, or, in case he is not available, to Dr N. Kemmer. Please let me know what I should do.³²

But the case is a strange one: it is not at all clear why Frisch's typed letter titles the author (Edwin Albert Power) as 'Miss'.

Hodgkin was also more cautious about expressing her opinion: in 1951, she expressed uncertainty about the length of a paper by Rosalind Franklin, and wrote 'possibly yes' in answer to the question about publication.³³ Yet the first referee (admittedly, Franklin's mentor Bernal) had found it 'admirable and clear', recommending it for publication without any large changes.³⁴

Refereeing at the Royal Society was historically single blind (Pontille & Torny 2014). The form that referees received along with the manuscript had the author's name filled in, along with the manuscript title. On these forms, as in the Register of Papers and in the published version of the article, men's first names were often marked with initials, whereas women's names were usually fully spelled out. The presentation of male names was not standardised in the 1950s and 1960s, but the use of full first names for women does appear to have been standard. And the Assistant Secretary would add 'Miss' or 'Mrs' (and the occasional 'Dr') to the report form, meaning that there was rarely any doubt as to the author's gender.

The presentation of the author's name on the referee report form evidently created a power imbalance between referees and authors, even before the referee started reading the manuscript. However, not all referees paid attention, as in the case of Frisch and the mistaken gender identity of Power. For instance, in 1951, one male referee complained furiously about a paper he 'did not understand', and repeatedly held forth against the shortcomings of an author he assumed was male.³⁵ The authors were actually Miss D.M. (Doris) Jones, Miss P.M.E (Moira) Martin and C. K. (Charles) Thornhill, all reduced by the referee to 'him'. The mistaken pronoun suggests either that the referee paid no attention to the names written on the referee form, or that he assumed Thornhill was the responsible party. Such mistakes happened here and there during the years, but we have not spotted this type of gender confusion in the reports written by female referees.

In contrast to author's names and gender, referees' own identities were kept confidential. In guidance to referees in the early twentieth century, the Society had allowed them to 'state whether you wish such criticisms to be transcribed before communication to the author', to avoid the risk of their handwriting being recognised.³⁶ Later guidelines clearly stated that referees would be anonymous (unless they chose to waive that right).³⁷ This protection was believed to be important in order for the referee to assert his or her honest opinion.³⁸ It was also a way for the Society to shield its referees from critique, and to build a perception of a collective corporate decision-making process, as opposed to individual decisions. The Assistant Secretary would excerpt and paraphrase parts of the referee report intended 'for the author', in addition to deleting any aggressive language, and any information that could reveal the referee's name.

On an institutional level it is interesting to note the care with which the Society chivalrously identified its female authors and accorded them their titles (Miss, Mrs), and to contrast this with the casual neglect visible in the failure to correct male pronouns applied to women serving in editorial roles. For women like Lonsdale, who both published and refereed papers for the Society, a strange double-burden effect often occurred. As an author, her gender was clearly marked; but as a referee and communicator in the 1950s and 1960s, she regularly received letters and forms addressed to 'Dear Sir'.³⁹ We can perhaps appreciate a disinclination to reprint the standard forms addressed to gentlemen referees, but the lack of action suggests that the Society's officers and staff did not seem to think that many women would need the forms. There is no evidence of how Lonsdale, or other female Fellows, experienced this constant micro-aggression; nor any evidence of an attempt to correct it. The forms changed to add 'Dear Sir or Madam' in the mid-sixties, after a review of referee duties led to some streamlining of the referee report forms.⁴⁰ In 1964, referees were asked to confirm their referee duties based on the new system by signing and sending it back to the RS. We have encountered only one such confirmation of duties: by Lonsdale.

The combination of casual neglect of female Fellows and scrupulous demarcation of female authors are aspects of the same bias, so neatly tied up to the Society's own gentlemanly practices, that they can hardly be untangled from the intention of behaving politely to the ladies.

The Royal Society in the 1970s and 1980s

For women authors submitting to the Royal Society in the 1970s or 1980s, as Table 3 showed, it was actually less likely that any women would be involved in their editorial process than it had been in the 1950s or 1960s. This is despite the theoretical inclusion of non-Fellows in the pool of potential referees, and despite the larger number of women in the Fellowship itself. Some of the women who later became Fellows spoke to us about their experiences as authors in the 1970s. Developmental neuropsychologist Dorothy Bishop (FRS 2014) recalled that in the 1970s she had read an article about bias toward women authors – ‘which I just happened upon by chance’ – so she started publishing as ‘D.V.M. Bishop’ rather than Dorothy; ‘it just seemed a sensible way of avoiding possible bias.’⁴¹ Later in her career she was asked to change it, as it had become the practice of journals to put full names on papers.⁴² Another developmental psychologist, Uta Frith (FRS 2005) remembers that in the 1960s and 70s ‘there was not the slightest suspicion that women authors were unfairly treated by reviewers.’ However, Frith noted that some journals continued the policy of publishing first names for women and initials for men for some decades, until changes led to all genders being identified similarly.

Almost twice as many women were elected to the Fellowship in the 1970s as in the 1960s (Table 1), creating a pool of just over 30 living female Fellows. However, it is less obvious how many of these women were still active. Hodgkin, Cartwright, Pitt-Rivers, Fell and Porter were all still alive, but retired. Four of the new elections in the 1970s were of women who were older than Hodgkin.⁴³ The age of the living women Fellows may help to explain why so few women were involved in refereeing or communicating papers in the 1970s and 1980s. There may have been more women Fellows than ever before, but quite a few of them were (hopefully) enjoying their retirements.

Some of the younger women Fellows certainly did get involved in Society editorial work from time to time. They include Patricia Clarke (biochemist), Winifred Watkins (biochemist), Brigitte Askonas (immunologist), Mary Lyon (geneticist), Anne McLaren (developmental biology), Helen Muir (rheumatologist) and Janet Watson (geologist), all of whom were born before 1930. Clarke, Askonas and McLaren all became heavily involved in Society administration, sitting on Council in the 1980s and holding the role of vice-president of the Society. As such, they all

technically served on the Committee of Papers – but by this period, that had little editorial relevance.

Almost all of these non-retired female Fellows were in the biological sciences. The number of submissions to the Society in biological science had been increasing through the 1970s, so there was – in principle – refereeing work available for the female Fellows to do. And some of these papers were from female scientists: in 1980, for instance, 19 of the biological science submissions had a woman as author or co-author (but only 5 of the physical science submissions). The small number of submissions from women may be connected to the Society's continuing insistence on papers being submitted via a communicator, though it is also tied to the historical lack of recognition of women in the sciences in general. Feminist scholars of science have argued that, as late as the 1990s, women were often prevented from advancing in their chosen field, despite having a PhD, by 'hierarchical and/or territorial segregation', or, if they continued, were less likely to be acknowledged for their work (Rossiter 2001).

The Society's officers were not unaware that the gate-keeping stage of 'communication' might dissuade certain authors from submitting to the Society's journals rather than going elsewhere. But after a brief experiment in 1974, when allowing direct submission to the editorial office resulted in more 'troublesome' papers than good papers, the communicator function was retained.⁴⁴ Because most of the Fellowship was male (we would remind the reader that it is 7% female today), there were very few women scientists in the 1970s and 1980s who could communicate papers for other women scientists. Rheumatologist Helen Muir (FRS 1977) was the only one to actually do so in 1980, and developmental biologist Anne McLaren (FRS 1975) was the only female communicator in 1981.

Women did sometimes referee papers in this period, but years could go by without a single female recorded in the 'referee' column of the Register of Papers, particularly in the volume covering the physical sciences. The volume for the biological sciences lists geneticist Mary Lyon as the only female referee in 1975, and cell biologist Anne Warner as similarly unique in 1985. Most papers, by women and by men, continued to be communicated and refereed by men only well into the 1980s.

Some referee's reports on papers by women reveal possible unconscious biases. Bearing in mind that relatively few papers from women arrived at the Society, we have found only occasional instances of gendered language; maybe only once a year, on average; and in several instances, gender bias may be caught up in wider

disciplinary or methodological biases. One such instance concerns a paper on historical climate change by the UCL palaeontologist, Pamela L. Robinson (1919-94).⁴⁵ Robinson had made her reputation in the late 1950s as a vertebrate palaeontologist, but subsequently became interested in the evidence of global temperature rises and glacial melting (Milner 2004). Her paper outlining a 'new approach to palaeoclimatology'⁴⁶ was sent for review to the founding professor of the school of chemical sciences at the University of East Anglia, Norman Sheppard (FRS 1966), whose obituarist described him as a noted 'gentleman' (Grinter 2015). He recommended against publication – and Robinson subsequently withdrew her paper.

The interest in this case comes from the referee's choice of adjectives, applied to a paper in a controversial topic, from an author whose identity he knew (her name was on the referee report form). He cautioned the author against being 'too ambitious,' suggesting she 'should adopt a somewhat less ambitious plan'. He also critiqued her writing style, suggesting that 'the author should be reminded that colourful or emotional expressions are rarely helpful to a scientific thesis.' (The examples he pulled out were 'winds unfurl, poor and good solar receipt, march of, monotonous climate, beautiful autumnal colours, etc.'). The choice of adjectives such as 'ambitious', 'colourful' and 'emotional', suggest that at least some of the Royal Society's referees exhibited unconscious bias against papers by women.

It was also in the 1980s that the only case (that we have found) of a complaint by female authors against the Society's editorial process occurred. Two US-based female scientists (Cynthia Lance-Jones and Lynn Landmesser) submitted (though a Foreign Member of the Society) a pair of papers on chick embryology. The referee (who was not a Fellow) described it/them as 'rather anecdotal', 'marginal' and 'too enthusiastic' in tone. He admitted that he found 'the solipsistic approach' and 'natural enthusiasm' of the two authors 'distasteful', and advised that a substantial section of the paper was 'uninteresting and does not particularly extend our knowledge'.⁴⁷ The Assistant Secretary was aware that the evaluation of the paper was possibly being affected by the methodological gulf between European and US developmental biologists, and claiming to be unable to locate a neutral referee, he gave the authors the opportunity to rewrite.

Along with their rewritten papers, the authors sent a long letter complaining about the review, 'which we found to be biased'. They acknowledged that their data 'does conflict with the views held by one school of thought in England', and

presented a detailed argument to defend their data from being merely 'anecdotal'. The Assistant Editor William Gerry Evans (i.e. a staff member) sought advice from a senior neurophysiologist on the Fellowship and Associate Editor Fergus W. Campbell (1924-93; FRS 1978) (Westheimer 1995). Campbell acknowledged the 'slight international feud over the interpretation of these methods' but argued that 'the only way truth comes out in science is to let both sides publish and await the passage of time'.⁴⁸ He recommended the rewritten papers be published, and they appeared in *Proceedings B* in 1981.⁴⁹

There were, at the time, no guidelines about the appropriate behaviour, tone, or address for Royal Society referees at the time. Usually, the staff editor managing the process would strip out abusive or unhelpful language before passing the gist of the report on to the authors. It is not clear in this case how much of the referee's report the authors saw, but it was enough to raise questions. This case stands out for the explicit accusation of bias against the referee and/or the process. The formal grounds of that accusation were the international differences in methodology, but it is striking that the only instances we have found of referees expressing their opinions so bluntly about 'emotional', 'anecdotal' and 'enthusiastic' language come in cases involving female authors. It is also striking that the authors did not simply withdraw their paper and take it elsewhere, but complained. (And even more so that they did this without the support of their communicator, who had died in the meantime.) It may also be significant that the authors were based in the USA, where female academics were becoming more activist during the Second Wave feminist phenomena and the Equal Pay legislation of the 1960s and 1970s (Rossiter 1982).

Another notable feature of the 1980s at the Royal Society is that the long-standing preference for using initials instead of forenames for men had hardened into a standard practice. (Knights of the realm were exceptions: thus, Sir Bernard Katz, Sir Nevill Mott, Sir James Lighthill). From the early 1970s, the Society's editorial publishing office staff received complaints about this practice, but understood it as a 'gentlemanly' attitude.⁵⁰ As we have seen, at least some women scientists carefully disguised their gender behind initials and succeeded in being published without their gender being made apparent, but the stimulus to change appears to have come from male authors, rather than females. On Valentine's Day 1990, a member of staff wrote to one of the newly-appointed editors: 'Will it be acceptable, please, for authors to be allowed the form of name they prefer (i.e. men allowed forenames, or even Nick for

Nicholas), although still excluding degrees and sundry names after their names?' This would help disambiguate authors, but would also mean that women would not be singled out with first names anymore. The response from the editor was quick and clear. He wrote in capital letters: 'YES.'⁵¹

1990 and beyond

The years around 1990 marked great changes for the Society's publishing division, introducing not just a clean modern look for the journals, but separate editors for each journal, a new management structure, and the removal of the requirement to have papers communicated via Fellows. In principle, submission to the Royal Society's journals was easier and more open than ever before. There was no more default gendering of names, either in the published version or during the editorial process, and there was sufficient political correctness for standard letters to be addressed 'Dear Sir or Madam'.

Since 1990, there has been vastly increased awareness of the lack of diversity in STEM generally, and at the Royal Society specifically. The Society appointed its first female editor in 2008, when Georgiana Mace (FRS 2002) became editor of *Transactions B*. She was followed by Linda Partridge (FRS 1996), although at the time of writing, all the editors are once again male. Both staff and senior Fellows of the Society claim to have been trying to recruit more female editors, but without success. The chair of the Publications Board in the 2010s, Michael Brady (FRS 1997), said 'I'm very very much aware of it, Council is too.' And yet, he reported:

I've tried on several occasions... when someone stepped down as a journals editor..., our first port of call was to bring in a woman.... With [one journal], we approached 3 women all of whom turned it down. They turned it down on the perfectly good reason that they were already busy as hell. I wanted [XXX] to do it and she thought about it and said she couldn't take it on.⁵²

Reflecting on this, Brady also remarked: 'It's generally easier to twist a bloke's arm, than to twist a woman's. I'm always reluctant to twist a woman's arm.'

Busy women scientists may be reluctant to take on substantial editorial roles, but the Society has had somewhat more success appointing women to the new editorial boards which now support each journal. Initially, after 1990, these boards

had a small membership, but during Georgina Mace's tenure as editor, membership of the editorial board for *Philosophical Transactions B* expanded to over fifty scientists, only a few of whom were Fellows. The Society's diversity statistics today claim that 45% of associate board members for the journals are women.⁵³ Yet even so, when Spencer C.H. Barrett (FRS 2004) became editor of *Proceedings B* in 2015, he thought the 24% of women on the editorial board was not good enough, and purposefully recruited 24 women for the 25 vacant positions in 2017, which resulted in an increase to 39% in 2017 (Barrett 2017).⁵⁴ But although he did not find it impossible to find well-qualified women scientists, he too noted that 'many qualified females are overcommitted. Some very suitable women turned us down for editorial positions because they were already departmental chairs or were otherwise busy with committee work.'⁵⁵ In 2017, the computer scientist Wendy Hall (FRS 2009) was elected as the new chair of the Publishing Board. She is the first woman ever to head a publication-related committee, board, or sub-committee at the Royal Society.

Conclusions

This paper has analysed the gendering of the Royal Society's editorial processes, through exploring the participation of women Fellows in such roles as communicator and referee, as well as the experiences of women authors. Unpicking the complex networks of personal and institutional relationships, biases, and subjectivity embedded in peer review and publishing is a difficult task. However, we wish to point to a couple of findings that stand out.

The first is related to the idea of the 'gentleman', a label that seems at once to protect and promote any person connected to it. In the Royal Society's vision of itself as a 'gentlemanly space', we observe an excuse. Often, when invoking the gentlemanly atmosphere or attitude in the Royal Society's history, what is really meant is a men's club. Chivalry does not excuse biased behaviour, and the 'gentlemanly' label should ring warning bells, rather than be taken as a symbol of respectability. Claims of chivalry have distracted attention from inequality and bias on a personal and institutional level, as is clear in the Society's historical lack of action towards matters of diversity. Although the individuals and institutional structures involved with publication at the Society rarely explicitly treated women poorly, they nevertheless failed to correct micro-aggressions such as presumed gender and paternalistic structures (Ahmed 2012).

Second, the argument that women's career development has been hindered by the relative lack of women participating in the evaluation process has recently driven a move towards including more women (and minority groups) in the visible stages of editorial evaluation. The Royal Society's historical publishing practices offer ambivalent evidence on this matter. Once elected to the Fellowship, women scientists were able to participate in, and negotiate, the paternalistic, traditional, and hierarchical systems of evaluation at the Society. They approached their evaluating roles at the Royal Society with great care and professionalism, and did not revolutionize the ways in which things were done. In this sense they became 'honorary men' or 'gentlemen', respected for their correct qualities by their male colleagues, whilst acting like most Fellows by not, overall, being very active in the publishing work of the Society at all (Bagilhole 1993).

Third, the editorial role that women Fellows most often took on was that of referee, rather than that of communicating, although this distinction is more apparent in the 1950s than in the 1980s (when so few women did either). Communicators received some public recognition for their work (by having their name printed on the published paper), but even though some of these women Fellows are known to have been personally supportive of other women scientists, they do not appear to have used their privileged access to push women authors into the Royal Society's editorial system.

Fourth, refereeing is relatively unrewarding in terms of public recognition and reward, because the work done is hidden behind the cloak of confidentiality. The Society's insistence on the anonymity of the referees was part of the creation of a collective, institutional editorial responsibility, but one of its consequences was that most of the involvement of women in the Society's editorial processes in the 1950s and 1960s, was invisible.

Fifth, we have found little evidence that women scientists approached their evaluation roles in a radically different way to men, beyond some diffidence in claiming expertise. But we have noted some women authors in the 1980s being critiqued for stereotypical feminine traits of emotion, enthusiasm, and anecdote.

Sixth, we have uncovered evidence to suggest that in the 1980s, there was less participation of women Fellows in the editorial process and more gender bias in the evaluation process, than there had been in the 1950s. This should be a cause of significant reflection for all those seeking to level the gendered playing field by

involving more women in the selection and evaluation processes. There were more women in the Royal Society in the 1980s than in the 1950s. But they seem to have played little role in communicating or refereeing papers, or in serving on publication committees. Whether they were not asked, or whether (like many of the male Fellows) they preferred not to be involved, is not currently clear. It may be the case that the women who were most willing to be involved in Society life were snapped up for roles that were seen as even more important than publications – as with the three women who served as vice-president in the 1980s and early 1990s. Either way, it suggests that the Society needed a lot more women, to ensure that enough of them were willing and available to perform editorial roles.

2016 would set a new record in admitting thirteen women (26% of the new intake), but the current 111 women Fellows are still just 8% of the living Fellows.⁵⁶ The Society is committed to increasing diversity in STEM by seeking out participation from underrepresented groups, in order to build and develop a world in which studying and working in science is open to all.⁵⁷ Yet, the history of male-dominated publishing seems to haunt the Royal Society. In the nuance between institutional discrimination, often historically rooted, and unconscious bias, we may find some answers to why it is that even with the best, most progressive intentions, the Royal Society is still acting like a gentleman. Lessons from history can perhaps help to re-write the next steps, especially in terms of who gets to speak and write on behalf of science.

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Notes

¹ William H. Bragg, 'Anniversary Address by Sir William Bragg, O.M, at the Anniversary Meeting, 30 November 1938', *Proceedings of the Royal Society A*, Volume 169, issue 936 (December 1938), 14.

² Bragg's own laboratory at the Royal Institution was, judging by Lonsdale's files of correspondence received, one of the few to recognise that it might wish to recruit scientists of either gender. Letters to Lonsdale from President of Industrial Cellulose Research Ltd Sigmund Wang (9 April 1957), the European Research Association (8 May 1957), and William L. Bragg from the Davy Faraday Laboratory (undated). File H335-336 in Box K. Lonsdale H330-H352, UCL Collection.

³ The Society took a second legal opinion in 1922 which stated unequivocally that both married and unmarried women were eligible for election. This was reported to Council 5 July 1923, minute 16. Four women were nominated in 1944. Harriett Chick's certificate lapsed in 1949 and was not renewed. Irene Joliot-Curie and Frederic Joliot were jointly nominated as Foreign Members in 1944. Both were Nobel Laureates. Frederic was elected in 1946. Irene Joliot-Curie lapsed. See MS/719.

⁴ This analysis is based on the Royal Society's directory of fellows.

⁵ After 1990, Editors were appointed for each journal. The editors of the scientific journals have continued to be fellows (but since 2008, it has been recognised that the history of science journal, *Notes & Records*, ought to be edited by a historian of science, and thus, not by a fellow).

⁶ Some scientists were ennobled (e.g. William Thomson, Lord Kelvin); and there were some aristocrats who were actively involved in the sciences (e.g. the third and fourth Earls of Rosse, and the third and fourth Lords Rayleigh).

⁷ Broadcast on the BBC Third Programme, 27 March 1960.

⁸ Interviews with former Royal Society staff, who worked there from the 1970s till present day. All interviews were conducted by Røstvik at the Royal Society in 2015-2017, and have been anonymised where deemed necessary.

⁹ See, for instance, Circular notice to the fellowship, 'Anniversary Dinner 1949' (1949), in Royal Society Archive [hereafter, RS], London.

¹⁰ For instance, in analyses of the *Buffy the Vampire Slayer* episode, 'Hush' (tenth episode, season four. Written and directed by Joss Whedon. Originally aired 14 December 1999. Production by Mutant Enemy Productions, US.). In this episode, 'the
Røstvik and Fyfe, v12 34

Gentlemen' are silent creatures who steal people's voices, and carry out their crimes with grimacing smiles and in tailored suits.

¹¹ The secretary, Lord Rayleigh, introduced the belated publication of a paper on kinetic theory of gases, that had been rejected by referees in 1845.

¹² In the 1880s and 1890s, Mrs Sidgwick, Mrs Huggins and Mrs Ayrton were repeated authors at the Society. Eleanor Sidgwick was principal of Newnham College, and wife of philosopher Henry; Margaret Huggins was a spectroscopy expert, and wife of FRS astronomer William; Hertha Ayrton, engineer and mathematician, and wife of FRS engineer William.

¹³ We have analysed the Royal Society's 'Register of Papers' (RS MS/611 ff) at five-year intervals, 1945 onwards.

¹⁴ This was a legacy of the Society's tradition of reading papers at meetings and only later considering them for publication.

¹⁵ 'Explanatory Notes on the Procedure relating to the reading and publication of papers', as printed in the Society's *Year-Books* from 1896 onward (e.g. 1896-97, p.67).

¹⁶ The next woman to serve on Council was then Dame Kathleen Lonsdale, as Vice-President from 1961-62.

¹⁷ Source: RS Register of Papers (manual and automated counts).

¹⁸ Arber refereed an unpublished paper, 'Triassic inflorescences from South Africa and their significance in the floral morphology of the angiosperms'.

¹⁹ Fell refereed a paper that was published in *Proceedings*: 'Effects on Embryonic Development of X-Irradiation of Rabbit Spermatozoa in vitro'

²⁰ For instance, physicist Charles Galton Darwin refereed in 1921 and was elected in 1922; and chemist Ronald Norrish refereed in 1935 and was elected 1936.

²¹ Interview with Debbie Vaughan, who has worked in sales and marketing in the publishing department since 1970s, interviews at the Royal Society in 2015.

²² Sir Lawrence Bragg quoted in Allibone, *The Royal Society and Its Dining Clubs*, 402.

²³ We have unfortunately been unable to talk to either of them about their time at the Society.

²⁴ Paul Newman (cataloguer of Hodgkin's papers, Bodleian, Oxford), note to Section H of the Dorothy Hodgkin papers.

²⁵ Referee report by Michael Abercrombie (29 February 1960), RS RR/1960, Deepstore off-site archives of the Royal Society, London.

²⁶ C.H. Waddington, Margaret M. Perry (sic.), 'The Ultra-Structure of the Developing Eye of *Drosophila*', *Proceedings of the Royal Society: Biological Sciences* vol. 153, issue 951 (29 November 1960).

²⁷ Hodgkin report on A78, 1960-05-02, Referee Reports 1960A, RS RR/1960.

²⁸ Helen Scouloudi, 'The Crystal Structure of Myoglobin. VI. Seal Myoglobin', *Proceedings of the Royal Society A* Vol. 258 issue 1293 (October 1960).

²⁹ C.H. Carlisle and Helen Scouloudi (1951), 'The Crystal Structure of Ribonuclease. I' *Proceedings A* 207, pp. 496-526; C.H. Carlisle and Dorothy Crowfoot (1945), 'The Crystal Structure of Cholesteryl Iodide' *Proceedings A* 184, pp. 64-83.

³⁰ Bragg to WVD Hodge, 1960-04-05, with Referee Reports 1960A, RS RR/1960.

³¹ Note from Dorothy Hodgkin to DC Martin (12 April 1951), Referee's Report box 1951.

³² Letter from O.R Frisch to DC Martin (9 June 1951), Referee Reports and letters regarding paper no. A 118 by Miss Power, Referee's Report box 1951.

³³ Referee's report by Dorothy Hodgkin (12 April 1951), Referee Reports regarding paper no. A 55 by Rosalind E. Franklin, RR 1951 (on "Crystallite growth in graphitising and non-graphitising carbons").

³⁴ Referee's report by John D. Bernal (15 March 1951), Referee Reports regarding paper no. A 55 by Rosalind E. Franklin, RS RR 1951.

³⁵ Referee's report (9 May 1951), RS RR 1951.

³⁶ Letter to referees, included in RS Council Minutes 6 Dec. 1894, and apparently used until the 1930s.

³⁷ Meeting of the Publications Management Committee, 7: Anonymity of referees, 28 November 1989, RS CMB/367.

³⁸ For example, in a meeting of the Publications Management Committee, 28 November 1989, the point was made that 'without anonymity the distinction between referee and Editor was blurred, as the scientific arguments should be between the author and the Editor, not the author and the referee: the referee's function was to advise, the Editor's to decide.' Ibid.

³⁹ See for example RS Referee Reports B-side 1950-1951.

⁴⁰ See for example RS Referee Reports withdrawn A-side 1964-1965.

⁴¹ Email from Dorothy Bishop, 1 November 2016.

⁴² Email from Dorothy Bishop, 2 November 2016.

⁴³ Florence Rees (b.1906), Mary Parke (b.1908), Elsie Widdowson (b.1906) and Janet Vaughan (b.1899).

⁴⁴ Meeting of the A- and B-side associate editors about Standing Order 32, 28 January 1977, Royal Society Archives off-site material, RS box RMA/729 (11/2/7/2).

⁴⁵ Paper number A222 for series A 1971, RS Referee Reports withdrawn 1970s.

⁴⁶ A222 – 1971 ‘A New Approach to Palaeoclimateology’

⁴⁷ Report on papers B97 and B98, RS RR/1980B.

⁴⁸ Campbell in undated note to to Evans, 1980, in RS RR/1980B, file for B97 and B98.

⁴⁹ Cynthia Lance-Jones, Lynn Landmesser, ‘Pathway Selection by Embryonic Chick Motoneurons in an Experimentally Altered Environment’, *Proceedings B* Vol 214, issue 1194 (9 December 1981).

⁵⁰ Interview with Royal Society publishing staff, who worked in the Society’s publications from 1970s – 1991, interview at the Royal Society 2015 and 2016.

⁵¹ RS CAX/other/06 Editor of *Transactions A*: Professor Frank Smith’s papers from the 1990s: Letter to Smith from Goatly (14 February 1990).

⁵² Michael Brady interview, 23 January 2017 via Skype

⁵³ When we checked these numbers against the current webpage listings of the editorial boards, we found a lower number. The Royal Society staff also now decline to reveal gender statistics that might identify any individuals, in a move to respect the privacy of trans and gender non-conforming individuals who serve the Society.

⁵⁴ Spencer Barrett interview, via email, 28 May 2017.

⁵⁵ Ibid.

⁵⁶ Royal Society, ‘Diversity Data Report 2016’, PDF (June 2017): <https://royalsociety.org/~media/policy/topics/diversity-in-science/2016%20Diversity%20data%20report%20FINAL.pdf?la=en-GB> (accessed 26 June 2017); See also the Royal Society’s fellowship register: <https://royalsociety.org/fellows/fellows-directory/> (accessed 26 June 2017).

⁵⁷ Royal Society, ‘Pride and Prejudice: Breaking Down Barriers in Science’, booklet from third annual Diversity conference, 2015.

This paper is currently (17 October 2017) under review at a journal.
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