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Early years of the International Conference of Women Engineers and Scientists: Shaping transnational collaboration in the Cold War era, 1964–1975

Emily Rees Koerner and Graeme Gooday

> Gone were the many diverse people from all corners of the world. Now, we were a Conference.
>
> Ruth Schafer, The Conference Story: Recollections of the First International Conference of Women Engineers and Scientists, June 1964.[1]

> It is also important that our conference is held in Poland, a socialist country. It justifies the need for international cooperation among countries of different social and economic systems.
>
> Maria Milczarek, welcoming address at the fourth ICWES, 1975.[2]

Introduction

In studying women's role in the history of twentieth-century science, we cannot limit our scope to either the abstract academic or fundamental natural sciences, or to just the familiar countries of our own origins. This paper examines instead the historical value of seeking out women's roles in the important intersection between the more practical sciences and the world-building profession of engineering within a transnational context. As we have argued elsewhere, this domain of useful techno-sciences was both less exclusionary of women and manifested the kinds of transnational collaboration previously seen in women's peace movements of the early twentieth century.[3] In this chapter, we go further to explore – as the above quotations indicate – how such collaborations could cross all the extreme political polarities of the Cold War: from the military–industrial complex of the capitalist USA, to the socialist domains of the Soviet bloc that emerged from the ashes of World War II.[4]

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So how did women in engineering and science collaborate across borders in the second half of the twentieth century? As previously discussed by Gooday and Rees Koerner, one of the most distinct modes of this kind of collaboration was – and continues to be – the International Conference of Women Engineers and Scientists (ICWES), an ongoing international gathering to discuss contemporary issues in the fields of engineering and applied science, and the promotion of women's place within them.[5] Instigated by the USA's Society of Women Engineers (SWE), the conference first took place in 1964, where nearly 500 women with backgrounds in science and engineering, from around thirty-five countries across the world, came together in New York.[6] Although not originally envisaged by the USA hosts as a transnational series, since 1964, a total of eighteen meetings have been held in different continents every three to four years, with attendees from multiple countries, constituting a crucial meeting point for women in engineering and applied science.[7] Yet only a small amount of academic attention has been paid to either the initial formation or the long-term continuation of these conferences, despite their status as exemplars of transnational collaboration and science and engineering diplomacy led by women during the Cold War.[8]

This chapter examines the first four conferences held in New York, USA, in 1964; Cambridge, UK, in 1967; Turin, Italy, in 1971; and Krakow, Poland, in 1975 – the largest of the four gatherings, with 600 (mostly Polish) attendees.[9] These spanned what has too often been over-simplistically represented as the 'Iron Curtain' to demonstrate women's peaceful and productive collaboration during the most intense Cold War competitions over nuclear arms and Space Race technology. Specifically, we suggest that it was by the third and fourth meetings that the three characteristic themes of ICWES meetings were established: i) the enhancement of women's position in science and technology; ii) the deployment of engineering and applied science to promote equality and well-being in all nations, especially for food supply and infrastructure; and iii) an initial welcome that highlighted the host nation's accomplishments on these first two points, and sponsorship by leading political figures and national industries.

On average, women from thirty different countries attended each of the first four conferences, although which thirty countries participated varied with each meeting: South American nations were most visible in ICWES 1 (USA); African nations were first apparent at ICWES 2 (UK); and only at ICWES 4 (Poland) was there broad participation from Eastern European nations, with the USA constituency (44 attendees) for the first time overshadowed by a large majority of native (Polish) participants (423 attendees).[10] Given such variation of constituencies between meetings, we cannot glibly describe their geographical scope as global. Yet these meetings certainly brought into dialogue a multiplicity of national perspectives on women's

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prerogatives in engineering and applied science, guided by the overarching goals mentioned above. They thus bring more explicitly into relief the cultural variations of women's standing in STEMM than previous nationally focused stories.[11] Our aim is to analyse the first four ICWES conferences as an example for how we can situate such national histories in both local and global contexts.[12]

This chapter will show how the organization and running of those first four ICWES meetings relied not just on the host nation's resources but both on transnational cooperation and, especially from the second meeting onwards, the enabling impetus of individual women (e.g., Ira Rischowski). Specifically, we show that the planning and programming of successive meetings relied on the national-level organizations for women in science and engineering most prominently in eight countries: Brazil, France, Italy, Japan, the Philippines, Poland, the UK and the USA. This transnational networking became an integrative mechanism for the continuation of the conferences in the Cold War context, until it was succeeded in 2002 by a new oversight organization: the International Network of Women Engineers and Scientists, which was set up (in Canada) to manage future ICWES gatherings. While our chapter does not take the ICWES story into the twenty-first century, nor does it cover the entire Cold War period, it certainly follows recent scholarly trends in challenging the dichotomous 'Iron Curtain' discourse, to show that ICWES enabled more free exchange of STEMM knowledge between 'East' and 'West' than in the fraught espionage-prone domains of nuclear weaponry and space rocketry.[13]

Finally, we argue below that ICWES's aims of peace and progress, as well as its focus on women as professionals, situated ICWES within a broader historical trend for women's organizations to pursue irenic goals, such as the Woman's International League for Peace and Freedom, which was founded in 1915.[14] And in more concrete ways, we can note that the early ICWES conferences made ties with other comparable global women's learned organizations, such as the International Federation of University Women (IFUW), founded in 1919; indeed representatives from the International Federation of Business and Professional Women and the International Council of Women attended the first four ICWES conferences. Alliances between international women's organizations were thus a crucial part of ICWES's history; it cannot be told as a story of ICWES emerging as if in isolation.

It is important to emphasize that many of the national organizations active in peacefully sustaining ICWES – such as SWE and the UK's Women's Engineering Society (WES) – were created for women in engineering rather than scientists. Yet since histories of women in engineering are often marginalized in favour of women scientists (or elided in histories of science without proper demarcation), another key mode of collaboration that we

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consider is that between scientists and engineers, extending the work carried out by the national networks of women STEMM practitioners that emerged in the early to mid-twentieth century.[15] As we have explored elsewhere, it is in the arenas of engineering and applied science that evidence of the labour of women – and, more specifically, women of colour – can be more readily found, thus making it all the more important to remedy this marginalization within the scholarship.[16]

In that regard the ICWES meetings are particularly revealing; while ICWES 1 (USA) was established to look at the deficit of women engineers and scientists in Western nations in particular, it was clear at ICWES 4 (Poland) that the Eastern European socialist/communist nations sought to represent themselves as having 'solved' the challenge of recruiting and sustaining women in STEMM through their rigorous socialist principles of workplace gender equity and collective childcare. Thus, while the agenda of the first meeting was initially set by the USA's Society of Women Engineers, the character and prerogatives of ICWES gatherings developed a pattern by the Polish meeting of 1975 showing how nation-specific agendas of technoscience could nevertheless be harmonized into a broader statement of women's understated role in technoscience, without any single Cold War nation or ideology being dominant – exemplified by the fact that the USA conceded its early steering of ICWES to a politically heterogeneous alliance of nations.

Responding to the Soviet Union: The first ICWES in New York, USA, 1964

The first ICWES in 1964 was hosted by the USA's Society of Women Engineers at a historical juncture when more women than ever before, in a range of different countries, were entering into the fields of engineering and applied science. As Laura Puaca's work has shown, one key context for this recognized by SWE was women's extensive participation in communist Russia: by 1963, 30 per cent of the Soviet Union's engineers were women, an order of magnitude greater than most Western nations.[17] And in that same year, Russia's first female astronaut, the engineer Valentina Tereshkova, demonstrated that communist technocracy could extend women's prerogatives beyond the Earth's surface too (continuing the USSR's startling lead in the 1957 launch of *Sputnik*, the world's first artificial satellite).[18] Although the proportion of women was still relatively low in Western nations, both that Cold War context and the processes of decolonization and modern industrialization brought opportunities for women's training and education, as well as initiatives to change the perception of which careers were open to women.[19] From a variety of causes, the second half of the twentieth century

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saw a growing need for trained engineers and scientists to assist in the (re-) building of many different nations. This ranged from the provision of basic infrastructure pertaining to water and electricity to the building of rockets to be sent into space.[20]

Where there were difficulties in recruiting men to engineering positions, women were called upon to fill the skills gaps. In many countries there were recruitment drives to get more girls and women into training programmes in these fields to create workforces fit for national needs. The Cold War context certainly galvanized more activity: Puaca has argued that SWE actively capitalized upon associated 'emergency mentalities' to engage more government organizations and educational authorities in their quest for the US government to encourage more girls and women into engineering.[21] And thus it is no surprise that the US president actively welcomed the first ICWES gathering in 1964 (see below). Despite such drives, however, the reality of discrimination faced by women who aspired to be astronauts and engineers in NASA has been documented by Marie Lathers, while the invisibility of the African American women employed by NASA in crucial calculations of rocket trajectories has been brought to prominence in the popular book *Hidden Figures: The American Dream and the Untold Story of the Black Women Who Helped Win the Space Race*.[22] While it was the Space Race with the USSR which prompted this less-visible form of technocratic inclusivity in the USA, neither the Space Race nor the internal US politics of race were mentioned at ICWES 1. As will become apparent, it was left instead to the communist countries participating in ICWES meetings to highlight their more developed capacity to educate, equip and enrol women for roles in engineering and applied science, with British commonwealth initiatives to support women's training in former African and Indian colonies relatively modest by comparison.[23]

Having only previously held national conferences for women engineers in the USA since its foundation in 1950, it is within this multifaceted global context of growing women's participation that SWE's leaders decided to hold an international conference for women engineers and scientists in 1964.[24] At a time when new hard Cold War and post-imperial borders were being enacted and new forms of national sovereignty re-established for many countries, it is noteworthy that the ICWES 1 organizers aligned this event with the growing irenic culture of internationalism; subsequent organizers continued this focus on cross-cultural exchange by holding the fourth conference in Poland in 1975, a then-communist-run country behind the so-called Iron Curtain.[25]

The date of the first ICWES was chosen by SWE to coincide with an event far from the hostilities of the Cold War: the 1964 World Fair in New York. Ruth Schafer, the chair of the first ICWES, later wrote that the aims of the

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conference spoke to a USA-centric modus operandi: the organizers 'wanted to further the aims of the SWE' by alerting 'guidance counsellors, educators, and the public' of the imperative to encourage women into engineering. And to do so SWE revealingly now had 'to learn from the International Delegates' what conditions in their own countries had provided 'an encouraging atmosphere for women to obtain and use technical educations'.[26] As then-President of the USA Lyndon B. Johnson echoed in his telegram to the conference, printed at the start of the proceedings, the USA had 'lagged behind many European countries in its utilization of the abilities of women in the professional fields, particularly scientific research, engineering, law and medicine'.[27] This patriotic 'utilization' rhetoric to recruiting skilled labour helped to ensure that the SWE conference organizers received funding from both government organizations and businesses. Funding for ICWES 1 was provided by the National Science Foundation, the USA's Asia Foundation and the Engineers Joint Council, among others.[28]

To challenge the conservative gender norms of 1960s America, the conference had to be recognized by 'high-level representations from the United States Government, the state of New York and the city of New York'.[29] Thereafter, it was common for high-ranking figures from government to provide an opening speech at ICWES meetings or to attend parts of the conference, as in the case of the third conference in Italy, where the undersecretary to the Ministry of Public Works attended the final part, while government representatives were present in Poland too.[30] Such appeals to the bastions of traditional institutions of governance show the ICWES 1 organizers' wish for the conference to sit within the mainstream. This is a contrast perhaps to the newly emerging Women's Liberation Movement in the USA, which came to be associated with second-wave feminism, which often took a more grassroots approach.

Such overtly feminist campaigning is rarely visible in the publicly accessible records of the ICWES meetings. Indeed, the only exception we have thus far located is Rita Levi-Montalcini's paper to ICWES 3 (Turin, 1971) on 'Women scientists and the Women's Liberation Movement'. On that occasion this Jewish Italian erstwhile refugee from fascist persecution in World War II outlined what she saw as the 'depressing' persistence of sexist bias against women's participation in STEMM. The most successful female practitioners had declared to her their 'total indifference and almost annoyance' towards the Women's Liberation Movement, claiming that they had never suffered 'discrimination', and thus shunned any radical moves to eliminate sex discrimination in science.[31] Nevertheless, it was thus very revealing that a subsequent male speaker at the same conference session, the Italian undersecretary of the Ministry of Public Works, Vincenzo Rosso, felt compelled to conclude his account of the importance of female emancipation for human

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progress with a stark warning to 'women against being dragged away into extreme movements which can often lead to a fierce feminism'.[32]

Still, it is important to note that in the 1960s and 1970s even the act of holding a conference dedicated to women in science and engineering could be read by those attending as a radical act, since at the time such spaces primarily dedicated to discussion of women's agency and achievements in STEMM were rare. This is a point highlighted in a post-conference article in *The Woman Engineer* reporting on the third ICWES in Turin, 1971: 'This conference was attended by delegates from more than 30 nations from all over the world: nothing unusual for an international congress except that nearly all these delegates were women, highly qualified in some branch of science and technology.'[33]

Another relevant point to remark on is that the context of the women's movement/third-wave feminism is only broadly applicable in certain countries, with other countries undergoing their own transformations in terms of gender relations and gender in the workplace. ICWES's international nature perhaps made it a forum for discussion and comparison, rather than a platform for one version of feminism. This is particularly relevant for the fourth ICWES, held in socialist Poland in 1975, where organizers were keen to emphasize that equal opportunities for women were embedded within the country's governing principles, as will be explored in more detail in a later section.

Continuing the conference: The second ICWES in Cambridge, UK, 1967

Despite the importance of the first ICWES for initiating and laying the pattern for future conferences, SWE did not, in fact, initially conceive of it as the beginning of an international series of conferences, rather as a one-off gathering. Reports at the time suggest that the idea for a second conference was only born during the first conference, with delegates from the UK offering to host the next gathering. As Ruth Schafer later reported, several days into the evidently successful first conference there was 'eager whispering' about possible future developments. Several 'enthusiastic people' were already asking, 'When and where will there be a Second Conference, Ruth?' Her invariable answer was, 'Patience, let's have this one first.' But towards the end of the conference, as the Friday lunch neared, such tension could be contained no longer: 'Isabel Hardwich, bless her, grabbed the mike and shouted, "You're all invited to England in' 67." Pandemonium!'[34]

In contrast to the initial US-centric aims of the conference's beginnings, the planning notes for the second conference, which was organized

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primarily by the UK's Women's Engineering Society (WES), showed a more overtly internationalist approach: 'By holding another conference within such a comparatively short time, it is anticipated that a genuine international movement among women engineers may be set in motion' and 'as an isolated occurrence this [ICWES] could pass away and no more need have been heard, but, as the beginning of a movement, its effect could be continuing'.[35] The commitment of the WES delegates to hold a second conference meant that an International Continuing Committee with ten area representatives was formed to decide where later conferences would take place.[36] The proceedings from the first four conferences document the countries that put themselves forward to host the subsequent meeting, which were then voted on by country representatives, deciding the outcome of the location.

WES's ability to lead a second conference was, arguably, not surprising. As one of the older organizations committed to women and engineering – it was founded in 1919 – it was also, always, an outward-looking organization, with members from around the world and frequent reports from overseas about women in engineering.[37] Indeed, one of the key members of the second ICWES organization committee was German Jewish refugee Ira Rischowski, who found her home in the UK and in WES after she fled Nazi Germany in the 1930s. Furthermore, the second conference was better attended by women engineers and scientists from African nations: at ICWES 1, only Morocco, until 1956 a French colony, had been represented among African countries. Largely due to the persistence of Commonwealth-based links, following the independence of several nations from British colonial rule, many more were in attendance at ICWES 2: Ghanaian zoologist Leticia Obeng, Ugandan mechanical engineer Miriam Muwanga and Nigerian physicists Ebun Adegbohungbe and Deborah Ajakaiye were all listed as delegates and speakers, offering their perspectives on their work in their respective countries. The ICWES meeting in Cambridge could well be viewed as a mode of post-Empire diplomatic relations between Britain and the Commonwealth, and it is notable that all these women had received part of their educations at British universities, marking a further point of interaction between the former colonies and Britain in the form of educational exchange.

Broadening the management of ICWES

While it may seem that SWE and WES – two well-established organizations for women in engineering from then-leading global powers – dominated the early history of ICWES, this did not last. In fact, the subsequent ICWES proceedings and other documents show that the continuity and success of the conference depended upon the participation of several other organizations

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from around the world in ways that gradually shifted control of ICWES away from SWE and WES. The organization of the first two ICWES meetings did indeed require close cooperation with national organizations across the globe, including le Cercle d'études des femmes ingénieurs de l'Association des Françaises diplômées des universités, the Society of Japanese Women Scientists and the Women Chemical Engineers of the Philippines.

The transnational ICWES Continuing Committee scrutinized a range of bids after each conference on who might run the next international gathering in three or five years' time. Each ICWES meeting was then run by the successful host country's national organization for women in engineering and/or science. For example, the Associazione Italiana Donne Ingegneri e Architetti (AIDIA) took over the running of the third conference in Turin, Italy, while the Central Technical Organization (NOT) and the National Council of Polish Women managed the fourth conference in Krakow, Poland. The proceedings from the third conference in Italy indicate that there were fourteen national organizations represented, from Brazil, France, Germany, Greece, India, Italy, Japan, Mexico, Poland, Portugal, Switzerland, the UK, the USA and the USSR. The transnational nature of ICWES appears to have depended upon the collaboration of various national organizations, each of which brought its own representation and national perspective into dialogue with its counterparts from around the world.[38]

Such collaboration was not only transnational but also interdisciplinary. While women's organizations for engineers were more prevalent, the ICWES meetings were also a place where women from across engineering and scientific fields – and their various organizations – came together. As noted in the introduction, engineering and applied science were the focus of ICWES gatherings, not the abstract and typically theoretical 'pure science' long privileged within histories of science. Indeed, the practical forms of 'applied science' are often where the work of women and other marginalized groups was typically called upon by the industrial or industrializing states, as evidenced at early ICWES meetings.[39] Unlike international initiatives in, for example, high-energy physics, that had no direct humanitarian applications,[40] the transcultural, discursive world of ICWES centred on creating and sharing knowledge that would be directly useful for human well-being.

Formulating long-term ICWES goals for peace: ICWES 3 and 4

Having been established as a conference over the eleven years covering the first four meetings, how did the leaders of the ICWES gatherings arrive at some continuing long-term goals for it? To some extent, the first conference

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in the USA set the internationalist tone; whereas Ruth Schafer privately focused on SWE's inward-looking motives, the SWE president in 1964, Aileen Cavanagh, offered a more global approach to focusing the work of male and female engineers and scientists on the 'future needs of humanity'. Alluding to the Space Race and projects of global exploitation so obviously shunned at ICWES 1, Cavanagh noted that while some 'are striving to conquer outer space and attempting to unlock the mysteries and vast resources of the oceans and the bowels of the earth', others were taking a very different approach: ICWES's core constituency was instead 'working daily to nurture the hopeful spirit of life among the world's people'. It was in that vein that Cavanagh argued that 'technical progress properly applied' could still be a 'strong force for good'; the goal was to 'increase human dignity and to ease the burdens of hunger, ignorance, and despair' that afflicted so many people throughout the world in the 1960s.[41]

This tone is then echoed at the subsequent meetings in a variety of ways: in the conference proceedings for the first four ICWES meetings certain concepts come to the fore in the opening addresses, illustrating an investment in progress, lack of selfishness, public service and an orientation towards a better future. In her opening address at the third ICWES in Turin, Italy, in 1971, for example, the lead organizer Anna Amour contrasted these guiding concepts to the (implicit harms of) so-called technological progress wrought in the Space Race and nuclear warfare:

> We are here planning for progress, and not just the scientific and technological progress which has launched men on the moon or in the infinitesimal secrets of the atoms, but a real full progress that will help men and women to proceed along the way of civilisation and to eliminate dangers of destruction that we are facing because of some imbalanced scientific and technological achievements.[42]

It is interesting to note here Amour's contrast between perceived successes of human ingenuity, such as landing a man on the moon, and the more genuine idea of 'real full progress'; the aim of the conference was not gratuitous scientific and engineering progress but rather a practicable project that could eliminate the pressing global problems of that era. It suggests that they see women as able to play a mitigating role against 'imbalanced scientific and technological achievements' (perhaps largely conducted by men), to achieve something different, pertaining to a different model of progress. Similar sentiments were repeated at the fourth ICWES in Poland, which was centred on technological achievement and the welfare of all nations. The keystone message was expressed as 'the conviction that science and technology should serve mankind in satisfying its needs' and that 'the contribution of women to the successful solution of this problem seems to be of paramount importance'.[43]

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The proceedings of ICWES 3 cite the final conference resolutions made in Turin, stating the now-developed themes for the conference going forward, marking out the importance of this meeting for the cementing of a particular format. This included the two strands 'planning for progress' and 'women's professional and family duties', framing the two main prerogatives of what the conferences had thus far and would go on to explore. It ends with a pledge from the 'women engineers and scientists from 32 countries' gathered in Turin to 'dedicate their efforts' to improving 'the quality of human life' through 'the responsible use of scientific and technological achievements', once again reiterating the above message.[44]

As alluded to earlier, by the third and fourth ICWES meetings, clear links also became apparent between ICWES and contemporary conferences working towards similar global aims. For example, the third ICWES set its resolutions to align with the 1972 Stockholm Conference on the Human Environment, while the proceedings of the fourth ICWES make mention of the UN's International Women's Year in 1975, the World Women Congress in Berlin, the World Conference of Women in Mexico and the Conference of Security and Peace in Europe (held in Helsinki). With these multiple modes of collaboration, the organizers – and the organizations involved – might be seen to be enacting women-led Cold War science and engineering diplomacy, with a clear set of diplomatic principles to advocate for, which, unlike more conventional modes of science diplomacy, were not directed by one national agenda.[45] Ito and Rentetzi, for example, recognize a recent focus on the 'important roles played by non-governmental actors' in Cold War technoscience.[46] As the next section will demonstrate, ICWES's transnational mode of diplomacy manifested itself in practical ways across Cold War divides.

Crossing the 'Nylon Curtain' into Poland: ICWES 4

As highlighted in the introduction, ICWES came into being at a time of shifting geopolitical terrain, particularly in light of the Cold War, thus we might see these connections to other international organizations and events as one of the ways in which the ICWES conference organizers saw the conference as situated within a wider global picture. It begs the question, therefore, to what extent ICWES was an active response to some of these challenges and how they were defined and expressed in the conference discourse. From analysing the proceedings and other available conference documents, a defining feature of the ICWES conference discourse appears to be a non-direct approach to politics, what we might instead interpret as diplomacy. There is very little mention of contemporary political situations, except in an oblique

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way, for example, through the mention of poverty, hunger, lack of infrastructure or non-specific references to space travel and the potential vagaries of technological development when carried out with the wrong intentions.[47] Instead, as already alluded to, there is an emphasis on progress, as well as a commitment to peace.

The discourse around peace and progress is noticeably prevalent at the fourth ICWES in Poland. As the opening quotation indicates, there was a conscious recognition of Poland's status as a communist nation, and the need for cooperation between countries with different economic and social systems. In opposition to the hostile rhetoric apparent on both sides of the Cold War divide, the president of the Polish Women's Council, Maria Miczarek, called for collaboration and unity. The final words of her opening speech quoted the motto of the 1975 International Women's Year: 'Development–Progress–Peace'.[48] As suggested in the introduction, this speaks to recent research on the Cold War which has argued that there was much more exchange between East and West than the hostile rhetoric would suggest, leading some scholars to reframe the overly rigid framing of the 'Iron Curtain' in more porous, flexible terms as the 'Nylon Curtain'.[49] Concurrently, there was a concerted effort to draw attention to women's established place within the social and working fabric of the country: 'Polish women participated actively in the rebuilding of our country, developing the socialist economy, science and culture.'[50]

We can see her speech as a response to the need expressed by Ruth Schafer and Lyndon B. Johnson in 1964 for the USA to learn from other nations on how to include more women in engineering and science: Miczarek said directly that 'the participants of the conference will have the opportunity to find out for themselves how far we have succeeded in Poland'.[51] The contrast between Western nations and those under socialist governments in Eastern Europe was sharply noted in a report from the fourth ICWES on the numbers of women engineers in different countries: it stated that 16 per cent of engineers in Poland were women, while in the USSR it was 39 per cent, compared to 1–4 per cent in USA, Canada and the UK.[52] Revealingly, at ICWES 4, the high importance of women's participation was brought up front to be the first major topic: section 1 of the conference was dedicated to 'contemporary sociological problems of women engineers and scientists', ahead of sections on the environment and transport, nutrition, supply and equipment problems, computer science and materials and engineering.

It could be argued that, from ICWES's outset, the Soviet bloc was keen to use the conference as a platform for promoting its socialist egalitarian version of progress. At all four of the first conferences there were papers from speakers representing the USSR, including from the Soviet Women's Committee, commenting on the USSR's success in integrating women into

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engineering and applied science. At the third ICWES, for example, one paper focused on how the USSR provides women with the ability to work and to be mothers. In contrast to papers from other nations, largely highlighting what was preventing women taking part in the professional workforce, these papers aimed to show other nations what communism could do for women.

While many of the statistics and parts of the presentations might have held true, it is important to note that the Soviet Women's Committee was, according to the *Encyclopedia of Russian Women's Movements*, a 'government mouthpiece' and 'propaganda tool' that was actively involved in international and regional women's organizations and conferences to highlight women's success and happiness in the USSR.[53] Whether or not women in the USSR fully experienced the transformations propounded by such governmental mouthpieces has been called into question, with research indicating that the lived reality of women was at times very far removed from the rhetoric.[54] Despite the intentions of ICWES to be a non-political space, there is evidence that it, at times, served the political agendas of certain nations, something that could bear greater scrutiny in further research.

Conclusion

The wider purpose of ICWES as it reached maturation in the mid-1970s can be found encapsulated in the resolutions formulated at the end of the fourth ICWES in Poland:

> Despite the fundamental differences in life-style of the peoples, and despite the basic dissimilarity of the actual tasks which are performed under different social and political conditions, there are several common, important problems to be solved by mankind.
>
> Among these problems are: the prevention of war and, in particular, of world-wide nuclear war, the protection of the natural environment, reasonable utilization of natural resources, the struggle against starvation, destitution and maladies suffered in many parts of the world, the elimination of disproportional economic and cultural development.
>
> The methods of solving these problems must vary from country to country. However, under the conditions of progressive détente and peaceful technical knowledge is always in keeping with her human respect for society and we ask you to propagate this idea wherever may be. While working for the development of her own country, she must also consider the good of all mankind.[55]

Within the allusions to the Cold War, the message is clear: that nations have to work together and that difference can, and should be, for the benefit of all

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human life. This chapter set out to examine how women in engineering and applied science collaborated across borders in the second half of the twentieth century, locating the study in the previously overlooked International Conference of Women Engineers and Scientists, positioning the conferences as an example of women-led science and engineering diplomacy.

The conference, though situated within a wider context of women's professional and peace-oriented organizations, formed something rare in its focus on women in the engineering and scientific professions, drawing together various national organizations set up during the twentieth century to support women in their endeavours in these fields. As we have seen against the backdrop of the Cold War, the conference sought – albeit within a relatively mainstream manner and with the support of traditional bastions of power – to champion the role that applied science and technology could play in solving the various global issues, including hunger, lack of infrastructure and gender inequality. As the chapter has also drawn attention to, this was a double-way utilization, with the 'traditional bastions of power' opportunistically using the conferences as spaces to promote their own agendas or learn from other countries how best to tap into women as an underused labour resource. However, despite this utilization approach, the early conferences' dominant focus on peace and progress meant that they offered an alternative discursive space within the science and engineering domain, going against an approach to science and engineering that furthered hostile agendas in the form of the Space Race and the production of military equipment.

Traces of the geopolitical context are evident in the creation and maintenance of the first four ICWES meetings. The first conference was managed and held in the USA and was defined by a somewhat USA-centric agenda to improve the US's own practices by learning from others, perhaps to ensure that it did not lose competitive edge. The more outward-looking WES from the UK ensured the conference continued for a second time and onwards to the current day, but only with the support and cooperation of several other national organizations. It was at the third and fourth ICWES meetings, in Italy and Poland respectively, that the values and ideals of ICWES were formulated, and more alignment with the broader international situation is evident. This chapter has highlighted the significance of the fact that the fourth ICWES took place in a socialist country, and it has suggested that, as a group of women, the ICWES organizers and attendees sought to offer an alternative narrative to conflict and division, superseding imposed nationalistic barriers, aligning with other concurrent internationalist efforts happening in other disciplines/spheres.

It also became apparent that the alignment of ICWES with governing bodies and institutions set it apart from other women-led movements. Later

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in the 1960s, and throughout the 1970s, many explicitly feminist organizations took an active form of protest against the kinds of traditional institutions that were welcomed at the ICWES gatherings, as these were often seen to be the oppressors of women. In this way, ICWES differs from other (Western-led) feminist movements; while it was governed by principles that can be understood as feminist – furthering the cause of women and promoting their equality – it was not an early part of the feminist movements, nor did it express its cause in the language of feminism that was developing at the time.[56] This aligns with Pamela Mack's contention that 'the fight for equality [in the USA] succeeded in bringing more women into engineering, but those women did not bring many feminist ideas with them'.[57] Instead, the conference and its organizers appear to have chosen a more 'mainstream' approach, aiming to work with governments and institutions, rather than seeking to disrupt, as would become the norm with rallies, sit-ins, protests and marches organized by women as part of the burgeoning civil rights movement.

The extent to which the discourse of ICWES matched up to its effects has been beyond the scope of this chapter to explore, but questions can be raised in this direction: how effective was ICWES as a mode of transnational science and engineering diplomacy? There are further questions about the limitations of ICWES, especially in terms of who was and was not included and why some countries were more actively involved than others. In its arguably traditional approach, could it be said to have served a hegemonic, Western agenda, rather than challenging it? Clearly there are other modes of transnational collaboration between women in engineering and applied science that can be explored alongside ICWES. Further research could, for example, look for points of transnational interaction that were not centred in Western locus points, as ICWES was, such as those that have been found between the USSR and Africa in the field of architecture in the twentieth century.[58]

Notes

1 R. I. Schafer, *The Conference Story: Recollections of the First International Conference of Women Engineers and Scientists*, June 1964, 20 (Society of Women Engineers archives, Wayne State University, LR001689/2/3).
2 M. Milczarek, 'Welcoming address', *Proceedings of the Fourth International Conference of Women Engineers and Scientists*, 1975 (Institution of Engineering and Technology archives, NAEST 132/4.1.5).
3 G. Gooday and E. Rees Koerner, 'Formulating a transnational history of women in engineering and applied science', *Women's History Today*, 3/4 (Summer 2022), 4–13.

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4 For the historical literature on (Western) women as peacemakers, see note 14 below. For the anti-nuclear 'Pugwash' movement launched in 1957 and led by (mostly) male scientists from both sides in the Cold War, see J. Rotblat, *Scientists in the Quest for Peace: A History of the Pugwash Conferences* (Cambridge, MA: The MIT Press, 1972).

5 Gooday and Rees Koerner, 'Formulating a transnational history'. See also I. Vardi and L. Smith-Doer, 'Women in the knowledge economy: Understanding gender inequality through the lens of collaboration', in D. L. Kleinman and K. Moore (eds), *Routledge Handbook of Science and Technology Studies* (Abingdon: Routledge, 2014), pp. 388–405.

6 *Proceedings of the First International Conference of Women Engineers and Scientists*, 15–21 June 1964, I-4, https://uihistories.library.illinois.edu/REPOSITORYCACHE/156/d5ne15BSVY0hV4ogbAmN6p592koYodSl607Z2in6km8aHI1y4S15vb3R58qwP34ra4tJ4nx1TJgHk55V7f17K3l8FSw6XNK5mjz39ERv2o9_3409.pdf (accessed 21 April 2022).

7 While the conference name suggests ICWES meetings were for scientists and engineers, the majority of papers and discussion points concerned the practical applications of science, rather than relating to 'pure science', thus applied science is perhaps the more accurate terminology.

8 Most references to ICWES relate to the first conference in the USA in 1964, in relation to histories of the USA's Society of Women Engineers, for example, M. W. Rossiter, *Women Scientists in America: Before Affirmative Action 1940–1972* (Baltimore, MD and London: The Johns Hopkins University Press, 1995). A more comprehensive, descriptive overview of the management and content of the conferences, and the formation of INWES, can be found in M. Frize, C. Deschênes and R. Heap, *Women's Contribution to Science and Technology through ICWES Conferences* (Cham: Springer Nature, 2023).

9 Proceedings of ICWES 6 (unpaginated) give estimates for the overall attendance at successive meetings: ICWES 1 (USA): 500; ICWES 2 (UK): 300; ICWES 3 (Italy): 200; ICWES 4 (Poland): 600; ICWES 5 (France): 150; ICWES 6 (India): 300.

10 Attendee information is available in the conference proceedings for ICWES 1–6, which were accessed at the IET archives, London. For ICWES 4, see data in *Proceedings*, pp. 69–99.

11 See, for example: L. M. Puaca, *Searching for Scientific Womanpower: Technocratic Feminism and the Politics of National Security, 1940–1980* (Chapel Hill: University of North Carolina Press, 2014); A. S. Bix, *Girls Coming to Tech! A History of American Engineering Education for Women* (Cambridge, MA: The MIT Press, 2014); A. Canel, R. Oldenziel and K. Zachmann (eds), *Crossing Boundaries, Building Bridges: Comparing the History of Women Engineers, 1870s-1990s* (Amsterdam: Harwood Academic, 2005); B. Zengin, *Women Engineers in Turkey: Gender, Technology, Education and Professional Life* (Saarbrücken: Lambert Academic Publishing, 2010); C. Franchini, 'Women pioneers in civil engineering and architecture in Italy: Emma Strada and Ada Bursi', in M. Groot, H. Seražin, E. M. Garda and C. Franchini

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(eds), *MoMoWo: Women Designers, Craftswomen, Architects and Engineers* (Ljubljana: Založba ZRC, 2017), pp. 82–101; M. Hicks, *Programmed Inequality: How Britain Discarded Women Technologists and Lost Its Edge in Computing* (Cambridge, MA: The MIT Press, 2017).

12 G. Y. Shen, 'Women and the transnational dynamics of science education in early twentieth century China: A quiet revolution', *Chinese Annals of History of Science and Technology*, 3: 2 (2019), 62–93; C. Midgley, A. Twells and J. Carlier, *Women in Transnational History: Connecting the Local and the Global* (London and New York: Routledge, 2016); C. von Oertzen, *Science, Gender and Internationalism: Women's Academic Networks, 1917–1955* (Basingstoke: Palgrave Macmillan, 2021). This is also part of a wider trend in science and technology studies; see, for example, J. Krige (ed.), *How Knowledge Moves: Writing the Transnational History of Science and Technology* (Chicago, IL: University of Chicago Press, 2019).

13 See, for example: P. Babiracki and K. Zimmer (eds), *Cold War Crossings: International Travel and Exchange across the Soviet Bloc 1940s–1960s* (Arlington: Texas A&M University Press College Station, 2014); P. Babiracki and A. Jersild, *Socialist Internationalism in the Cold War: Exploring the Second World* (Basingstoke: Palgrave Macmillan, 2016); and J. Mark and P. Betts, *Socialism Goes Global: The Soviet Union and Eastern Europe in the Age of Decolonization* (Oxford: Oxford University Press, 2022).

14 For more information, see: L. K. Schott, *Reconstructing Women's Thoughts: The Woman's International League for Peace and Freedom Before World War II* (Stanford, CA: Stanford University Press, 1997); J. Blackwell, *No Peace Without Freedom: Race and the Women's International League for Peace and Freedom, 1915–1975* (Carbondale: Southern Illinois University Press, 2004); C. C. Confortini, 'Doing feminist peace', *International Feminist Journal of Politics*, 13: 3 (2011), 349–70.

15 Though there have been notable studies of women in engineering in a national context (see note 10 above), conferences – including the one this volume was born out of – and oft-cited literature tend to focus more on science. See, for example: R. Watts, *Women in Science: A Social and Cultural History* (London and New York: Routledge, 2007); C. G. Jones, A. E. Martin and A. Wolf (eds), *The Palgrave Handbook of Women and Science since 1660* (Basingstoke: Palgrave Macmillan, 2022), N.B., this volume does contain one chapter on women in engineering; P. Fara, *A Lab of One's Own: Science and Suffrage in the First World War* (Oxford: Oxford University Press, 2018). There are some exceptions, for example, M. W. Rossiter, *Women Scientists in America* (which contains chapters on women in engineering and SWE); Bix, *Girls Coming to Tech!*; and N. Kodate and K. Kodate, *Japanese Women in Science and Engineering: History and Policy Change* (London and New York: Routledge, 2016).

16 Gooday and Rees Koerner, 'Formulating a transnational history'. This builds on earlier research by Steven Shapin into the 'invisible technicians' working in scientific laboratories in the eighteenth century. See S. Shapin, 'The invisible

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technician', *American Scientist*, 77 (1989), 554–63. Women, however, can be seen to be doubly invisible, since the assumption has tended to be that historically women are largely absent as scientific and/or technological workers.

17 Puaca, *Searching for Scientific Womanpower*, p. 121.

18 B. Evans, *Escaping the Bonds of Earth: The Fifties and the Sixties* (Cham: Springer Science & Business Media, 2009), pp. 52–58.

19 A report printed in the proceedings of the first ICWES indicated the following numbers of women engineers in European countries: England, 149; France, 1,500; Ireland, 3; Italy, 313; Norway, 900; Switzerland, 3 (based on self-reporting from these countries). The report states that the 1960 census showed that 7,000 women were working as engineers (in 1962, there were 615,400 engineers employed in industry in the USA according to an Engineers Joint Council study). For the contrast with Soviet republics, see later in the chapter.

20 Gooday and Rees Koerner, 'Formulating a transnational history'.

21 L. M. Puaca, 'Cold War women: Professional guidance, national defense, and the Society of Women of Engineers, 1950–60', in A. M. Knupfer and C. Wayshner (eds), *The Educational Work of Women's Organizations, 1890–1960* (Cham: Springer 2008), pp. 57–77; Puaca, *Searching for Scientific Womanpower.*

22 M. L. Shetterly, *Hidden Figures: The American Dream and the Untold Story of the Black Women Who Helped Win the Space Race* (London: Harper Collins, 2017); M. Lathers, ' "No official requirement": Women, history, time, and the U.S. Space Program', *Feminist Studies*, 35: 1 (2009), 14–40.

23 Gooday and Rees Koerner, 'Formulating a transnational history'.

24 Bix, *Girls Coming to Tech!*; Puaca, 'Cold War women'.

25 This was part of a growing trend: the 16th International Congress for the History of Science took place in Bucharest in 1981, for example, and this was where the first meeting of the Commission of Women in the History of STM also took place.

26 Schafer, *The Conference Story*, pp. 1–2.

27 Telegram from Lyndon B. Johnson, 17 June 1964, *Proceedings of the First International Conference of Women Engineers and Scientists*, 15–21 June 1964, p. vii.

28 T. Eller English, 'Finding aid for the International Conference of Women Engineers and Scientists Records', SWE archives, Wayne State University, https://reuther.wayne.edu/files/LR001689_guide.pdf (accessed 11 May 2022).

29 Schafer, *The Conference Story*, p. 21.

30 *Proceedings of the Fourth International Conference of Women Engineers and Scientists*, p. 5.

31 R. Levi-Montalcini, 'Women scientists and the Women's Liberation Movement', *Proceedings of the Third International Conference of Women Engineers and Scientists*, 1971, p. 13.

32 V. Rosso, 'Women engineers and scientists for human progress', *Proceedings of the Third International Conference of Women Engineers and Scientists*, 1971, p. 20.

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33 R. West, 'An opinion of the purpose and achievements of TICWES', *The Woman Engineer*, 11: 3 (Winter 1971), 22.
34 Schafer, *The Conference Story*, p. 26.
35 Executive Committee Minutes for the Second International Conference of Women Engineers and Scientists (Institution of Engineering and Technology archives, London, NAEST 92/15/2/1).
36 Eller English, 'Finding aid'.
37 G. Gooday, 'Internationalism and the UK's Women's Engineering Society (WES)', Electrifying Women blog, 21 April 2020, https://electrifyingwomen.org/internationalism-and-the-uks-womens-engineering-society-wes/ (accessed 21 April 2022).
38 It is worth noting that Isabel Hardwich from WES was a leading figure in the early ICWES meetings and became the president of the International Organizing Committee of ICWES.
39 For more detailed discussion of the speakers and topics of papers at the early ICWES conferences, see Gooday and Rees Koerner, 'Formulating a transnational history'.
40 Shiv Visvanathan's description of the founding of the high-energy physics laboratory CERN – a far more widely known international postwar trans-European project – may well have epitomized what he calls 'the internationalism of pure science'. S. Visvanathan, *Carnival for Science: Essays on Science, Technology and Development* (Oxford and New York: Oxford University Press, 1997), p. 176.
41 A. Cavanagh, 'Official opening', *Proceedings of the First International Conference of Women Engineers and Scientists*, 15–21 June 1964, I-4.
42 A. Amour, 'Opening address', *Proceedings of the Third International Conference of Women Engineers*, 1971.
43 *Proceedings of the Fourth International Conference of Women Engineers*.
44 *Proceedings of the Third International Conference of Women Engineers*.
45 For recent literature on science and engineering diplomacy, see, for example: M. Adamson, 'Science diplomacy at the International Atomic Energy Agency: Isotope hydrology, development, and the establishment of a technique', *Journal of Contemporary History* 56: 3 (July 2021), 522–42; B. Amadei, 'Engineering for peace: Challenges and opportunities', in *2018 World Engineering Education Forum: Global Engineering Deans Council (WEEF-GEDC)* (Albuquerque, NM: IEEE, 2018), pp. 1–6; S. Arapostathis and L. Laborie, 'Governing technosciences in the age of grand challenges: A European historical perspective on the entanglement of science, technology, diplomacy, and democracy', *Technology and Culture*, 61: 1 (2020), 318–32; S. Kunkel, 'Science diplomacy in the twentieth century: Introduction', *Journal of Contemporary History*, 56: 3 (July 2021), 473–84; Z. Li, F. Cui and Z. Wang, 'A discussion on practices and characteristics of science and technology diplomacy in twentieth-century China', *Cultures of Science*, 6: 2 (June 2023), 186–98; S. Robinson, M. Adamson, G. Barrett, L. Lund Jacobsen, S. Turchetti, A. Homei, P. Marton, et al., 'The

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globalization of science diplomacy in the early 1970s: A historical exploration', *Science and Public Policy*, 50: 4 (14 September 2023), 749–58.

46 K. Ito and M. Rentetzi, 'The co-production of nuclear science and diplomacy: Towards a transnational understanding of nuclear things', *History and Technology*, 37: 1 (2 January 2021), 10.

47 At a meeting of the national representatives on 9 September 1975 where thirty-two countries were represented, chaired by Isabel Hardwich, a special statement from the representatives of the United Kingdom said: 'The Representative of the U.K. expressed very strongly her belief that the conference papers should be non-sectarian and non-political'; *Proceedings of the Fourth International Conference of Women Engineers*, 1975, p. 47.

48 Miczarek, *Proceedings of the Fourth International Conference of Women Engineers*, p. 33.

49 György Péteri refers to the divide as a 'nylon curtain' rather than an iron one, while Michael David-Fox writes of it as a semi-permeable membrane. See G. Péteri, 'Nylon Curtain: Transnational and transsystemic tendencies in the cultural life of state-socialist Russia and East-Central Europe', *Slavonica*, 10: 2 (2004), 113–23; M. David-Fox, 'The Iron Curtain as semipermeable membrane: Origins and demise of the Stalinist superiority complex', in Babiracki and Zimmer (eds), *Cold War Crossings*, pp. 14–39.

50 Miczarek, *Proceedings of the Fourth International Conference of Women Engineers*, p. 32.

51 Miczarek, *Proceedings of the Fourth International Conference of Women Engineers*, p. 33.

52 *Proceedings of the Fourth International Conference of Women Engineers*.

53 N. N. Corigliano and C. Nechemias (eds), *Encyclopedia of Russian Women's Movements* (Westport, CT and London: Greenwood Press, 2001), p. 174.

54 See, for example: J. Laycock and J. Johnson, 'Creating "New Soviet Women" in Armenia? Gender and tradition in the early Soviet South Caucasus', in C. Baker (ed.), *Gender in Twentieth-Century Eastern Europe and the USSR* (Basingstoke: Palgrave Macmillan, 2017), pp. 64–78.

55 *Proceedings of the Fourth International Conference of Women Engineers*, pp. 50–51.

56 For example, Betty Friedan's seminal feminist text *The Feminine Mystique* was published in 1963, one year before the first ICWES was held.

57 P. E. Mack, 'What difference has feminism made to engineering in the twentieth century', in A. N. H. Creager, E. Lunbeck, C. R. Stimpson and L. Schiebinger (eds), *Feminism in Twentieth Century Science, Technology and Medicine* (Chicago, IL: University of Chicago Press, 2001).

58 Ł. Stanek, *Architecture in Global Socialism: Eastern Europe, West Africa and the Middle East in the Cold War* (Princeton, NJ: Princeton University Press, 2020). See also C. Katsakioris' chapter 'The Soviet-South encounter: Tensions in the friendship with Afro-Asian partners, 1945–1965', in Babiracki and Zimmer (eds), *Cold War Crossings*, pp. 134–65.

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