

A woman's place is in science



11 February marks the International Day of Women and Girls in Science. We ask what it takes to be considered one.

In December 2013, the United Nations General Assembly adopted a resolution recognizing that gender equality can only be achieved if women and girls have unfettered access to science and technology as an essential tool to their empowerment. The International Day of Women and Girls in Science was born.

Since its first observance in 2016, the day has had an annual theme, and the one for 2023 is 'Innovate. Demonstrate. Elevate. Advance. Sustain. (I.D.E.A.S.)'. Similarly to previous themes, it links gender equity in science to the United Nations Sustainable Development Goals (SDGs). Although the relationship to SDGs around themes such as clean water or clean energy is clear, its connection to SDG 1 – ending poverty – may be less obvious.

A World Bank report found that educating girls is one of the most successful ways to promote economic growth and to end intergenerational poverty (*World Development Report 2012: Gender Equality and Development; World Bank, 2012*). This feels particularly poignant only months after girls and women in Afghanistan were, once again, banned from attending school or university.

To alleviate poverty, girls don't need to study science. But whether they need a formal university education in science and become a professional researcher to earn the moniker 'woman in science' is a less straightforward question to answer.

It is tempting to only include professional scientists in either academia or industry with at least one relevant degree in this definition. After all, modern research is expensive and often requires highly specialized equipment and infrastructure. But the same researchers who have access to all these resources are increasingly discovering that data crowdsourced from citizen scientists are valuable for their research (*Nat. Phys.* **18**, 365; 2022). These people may not do science for a living, but it's hard to dismiss them as not being involved in science.

It is fair to say that in this scenario, it is still professional scientists who draw conclusions and develop ideas. However, it would be wrong to assume that no laypeople have ever made a significant contribution. One example of what one might call a hobby scientist is Hedy Lamarr.

Best known as a movie star during the Golden Age of Hollywood, Lamarr was also the holder of a patent for a "secret communication system" whose principle is still in use today, albeit for different applications. Born in Vienna in 1914, she received no formal scientific education but spent much time with her father, a bank director, who discussed the inner workings of various machines with his naturally curious daughter.

As a teenager, Lamarr fell in love with the theatre and she went on to study acting. She soon starred on stage and screen around Europe before she departed for Hollywood, where she became one of the defining stars of the Golden Age. But she never lost her zest for invention, developing a type of traffic stoplight and a tablet to create carbonated drinks. Reportedly, she even helped aviation magnate Howard Hughes to improve the wing shape of his planes.

Most of this could be dismissed as idle tinkering, and Hughes probably gave her access to his vast engineering resources, but Lamarr's most famous invention happened without him and proved to be far ahead of its time. When World War II broke out, Lamarr wanted to do her bit and asked to join the National Inventors Council. She was promptly denied and told she could make better use of her fame to help the war effort, the reason for which one cannot help but think was also related to her gender.

But Lamarr wasn't easily deterred and set out to create a protocol that would prevent enemy forces from jamming the guidance systems of radio-controlled torpedoes. Her solution amounted to what we now call frequency-hopping spread spectrum – fast changes of a radio signal's carrier frequency between many distinct values across a broad frequency band. These changes aren't random but obey a control code known to transmitter and receiver but not to any eavesdropper, in a similar way as cryptographic keys.

Radio-controlled torpedoes did not come to be used during the war, and the implementation suggested by Lamarr and her collaborators became obsolete soon after. However, a version of the principle she patented is still used every time we connect our laptops to WiFi or switch on Bluetooth or GPS on our phones.

Hedy Lamarr was certainly not a professional scientist, but was she a woman in science? Considering her life-long research activity, the case to include her in this definition is strong. The status and money she earned as a film star may have helped her to realize these projects and is probably why we remember her contributions today. But the reason she worked on these ideas was her passion for science and technology. So, if Lamarr was a woman in science, so ought to be all the girls and women today who make science an important part of their lives, whether or not they choose to pursue it as a career.

Many girls who are interested in science do not grow up to be scientists. There are many reasons for this, but societal perceptions are among them. Women scientists are still seen as the exception – or the odd one out. And who wants to be that? Perhaps broadening our definition of a woman in science can normalize science as a pursuit for girls and women.

For one, it would take the pressure off girls (and indeed all minoritized children) to make science their profession as soon as they show any interest. It ought to be equally laudable to be a lawyer or a plumber who spends her free time learning about cold atoms from books or systematically cross-breeding garden plants, or a high-school student participating in citizen science (see the [Comment](#) by Riccardi in this issue).

The other reason why we ought to adopt a broad definition of a woman in science is that they can become multipliers, sharing their love for the natural world and technology with more and more girls and women. It doesn't always have to be a professional scientist giving a talk in a school.

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