Fair or Unfair: Should these Women have received the Nobel Prize, Too?

Objective
Students will learn about the lack of recognition that plagued the careers of women scientists, while at the same time developing reasoning and debating skills.

Introduction
The Nobel Prize, established in 1895 from an endowment in the will of dynamite-discoverer Alfred Nobel, is perhaps the most prestigious prize in science. Great celebration, as well as great scandal, surrounds the yearly prize announcements. It has been argued that Lise Meitner, Chien-Shiung Wu, Marietta Blau, and Jocelyn Bell Burnell have been unfairly denied the Nobel Prize that had been awarded to their male colleagues. But were their contributions significant enough to merit equal recognition? You decide!

Instructions
Information is provided about four cases where the Nobel Prize for Physics or Chemistry was given to a man but not his female collaborator. Students should divide into small groups and, using the information provided as well as their own research, prepare a case arguing for or against the fairness of the awards. Each group will debate their case either with the other team or in front of the rest of the class. The question should then be put to a vote, with three possible outcomes:

1. The Nobel Committee made the right decision and the Prize was correctly awarded
2. The Nobel Committee did not award the Prize correctly and the female scientist should have been the recipient of the award
3. The scientists involved both qualified and contributed equally and the award should have been shared

It should become clear that none of these cases are simple and none have an obvious answer. In almost every case, legitimate arguments could be made for each of the three outcomes. The cases under consideration include:

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<td>1950</td>
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In Class Time
45-90 minutes

Prep Time
30 minutes

Materials
- Photocopies of case studies
- Internet access

Prepared by the Center for History of Physics at AIP
Case study: Lise Meitner
1944 Nobel Prize in Chemistry awarded to collaborator Otto Hahn

- Meitner and Hahn worked together for nearly 15 years until 1920 when they decided to separate their research. During the years they worked together, they had an extremely close professional relationship but a far more formal personal one:

  “There was no question of a closer relationship between us outside the laboratory. Lise Meitner had a strict, ladylike upbringing and was very reserved, even shy. I used to lunch with my colleague Franz Fischer almost every day and go to the café with him on Wednesdays, but for many years I never had a meal with Life Meitner except on official occasions. Nor did we ever go on a walk together. Apart from the physics colloquia that we attended, we met only in the carpenter’s shop [the only place Meitner was permitted to work]. There we generally worked until nearly eight in the evening... One or the other of us would have to go out and buy salami or cheese before the shops shut at that hour. We never ate our cold supper together there. Lise Meitner went home alone and so did I. And yet we were really very close friends.”

- Hahn respected her and her research but would be unlikely to defend her when others questioned her ability, despite the fact that she was nominated for the Nobel Prize 13 times throughout her life. By colleagues and peers (including Albert Einstein) she was seen as far more capable and the principal figure in their collaborations.

- In 1934 Meitner recruited Hahn, along with Strassmann, to help her with her work on synthesizing “transuranic elements” (elements beyond uranium in the periodic table). However, after the outbreak of World War II, a distinct divide was seen between “Jewish Physics” and “German Physics”. In this time, many of Einstein’s theories were ignored due to his heritage and Meitner was unable to present her own work. She was forced to move to Sweden in 1938 to ensure that she could carry on working in some capacity. Shortly before she left Germany, they had discovered that they were truly splitting the uranium nuclei in to smaller nuclei.

- While Meitner was in Stockholm, she made further theoretical progress with the discoveries and shared her thoughts with Hahn and Strassmann through her correspondence. At Meitner’s “urgent” request, they carried out the instructed experiments to confirm her theories.

- Before she had a chance to publish the work as her own, Hahn and Strassmann) published their work on fission, with no credit given to Meitner. Hahn was keen to protect both himself and the institute he worked for, given Meitner’s Jewish heritage and the dangerous political climate in Germany at the time.

- When the nuclear bomb dropped on Hiroshima, Meitner became a sought-after source of interviews for news organizations. Hahn resented her newfound recognition and released a statement to the press denying her involvement.

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Case Study: Chien-Shiung Wu
1957 Nobel Prize in Physics awarded to collaborators Tsung Dao Lee and Chen Ning Yang

- Chien-Shiung Wu was a particle physicist who was one of the few scientists asked to stay on at Columbia University after the war and after her work with the Manhattan Project had come to an end. She started studying beta decay, following on from the work of Lise Meitner. Wu “revered” Meitner.
- Many scientists believed she should have received a Nobel Prize for her work on beta decay but it did not qualify as a “discovery of invention”, and therefore did not satisfy the Nobel committee’s requirements. According to a former student of Wu’s, she:

  “straightened up a big mess quite elegantly, but it wasn’t quite a discovery”

- She was approached by Tsung Dao Lee, whom she knew, and his collaborator, Chen Ning Yang, to design and carry out an experiment to see if it would disprove Fermi’s Law of Parity. Her experiment was a success and revealed a huge breakthrough in particle physics. They published their work with Wu as the first listed name in the paper.
- In 1957, Lee and Yang won the Nobel Prize for Physics for their work on Fermi’s Law of Parity. Many people, including Wu herself, believe that she should have been credited by the Nobel Committee.
Case Study: Marietta Blau
1950 Nobel Prize in Physics awarded to collaborator Cecil Powell

- Blau was a research physicist and from 1923 she held an (unpaid) position at the Institute for Radium Research in Vienna. She and Hertha Wambacher, a doctoral student she was advising, were working on development of the photographic method for particle detection. She was identifying alpha particles and protons and attempting to determine their energy.
- They only stopped because Blau was forced to leave Austria in 1938 due to her Jewish background. She migrated to Norway, then to Mexico and the US in search of somewhere suitable to perform research.
- In 1950 Cecil Powell won the Nobel Prize for Physics for

  "his development of the photographic method of studying nuclear processes and his discoveries regarding mesons made with this method"

- Powell only decided to make this his field of research once he had been alerted to Blau and Wambacher's previous research of the topic.
- Blau was also nominated for the 1950 Nobel Prize due to her development of photographic nuclear emulsions but lost by the votes of the Nobel committee.
Case Study: Jocelyn Bell Burnell
1974 Nobel Prize in Physics awarded to collaborators Martin Ryle and Antony Hewish

- Burnell arrived in Cambridge in 1965 and Antony Hewish was preparing to construct a radio telescope with the aim of looking for “twinkling” radio sources.
- She spent her first two years helping to build the telescope, making the cables herself among other duties, and began her true research in 1967 when the telescope was switched on.
- When analyzing the data from the telescope, she came across a small part which did not agree with what she would have expected. She was able to prove that it was coming from stars further away than our own sun.
- She soon realized that the pulses she was seeing on the charts were very evenly spaced and she began to find it in the same area of the sky at varying times.
- These pulses were unlike anything seen from a star before.
- She found another source pulsating even faster, but just as regularly and on the same frequency.
- Hewish published an article detailing the work on pulsars with S.J. Bell listed as the second author of five. The media became obsessed with her story and she received much press coverage for her involvement.
- The 1974 Nobel prize in physics was awarded jointly to Hewish and Sir Martin Ryle, another astronomer for their work in radio astrophysics, with Hewish receiving it for “his decisive role in the discovery of pulsars”
- Burnell never revealed bitterness that she did not become the fifth person to receive a Nobel Prize for her doctoral research and she received many other awards and recognitions throughout her career.

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