OUT OF 111 NOBEL PRIZES IN PHYSICS, HOW MANY HAVE BEEN AWARDED TO WOMEN?

GOETTINGEN, 1923

So, you got the highest grade.

REIFEPRÜFUNGSERGEBNIS
ABITUR 1923

1. Maria Goeppert
2. Camilla Huber
3. Lisbeth Schmidt
4. Therese Bauer
5. Ulrich Weber

Yes.

Despite the Frauenstudium closing one year earlier than expected. promise me you will grow up not to be a Frau.

Maria.
1924, UNIVERSITY OF GÖTTINGEN

Therefore, knowing the continuous symmetries of a given system...

we can understand which and how many quantities are conserved...

AMALIE EMMY NOETHER (1882-1935), KNOWN AS THE MOST IMPORTANT WOMAN IN THE HISTORY OF MODERN MATHEMATICS.

I have made my decision, I want to be a Professor.

Are you sure? They say Prof. Noether is not being paid.

And I want to continue in the field of Physics. Don't you think it's more interesting than mathematics?

I will be!

*THE GERMAN LANGUAGE DISTINGUISHES BETWEEN GENDERS. NEVERTHELESS, MARIA SAYS "PROFESSOR" AND NOT "PROFESSORIN" (FEMALE PROFESSOR), USING THE MALE VERSION TO REFER TO HERSELF.
During her studies Maria also gets married to Joseph Edward Mayer, an assistant to Nobel Prize winner James Franck, therefore becoming Mrs.

**Dissertation**

ÜBER ELEKTRONSÄTZE MIT 2 
QUANTENÜBERTRAGUNGEN

MARIA GOEPPIERT-MAYER

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Max Born - Nobel 1954 -

James Franck - Nobel 1925 -

Adolf Otto Reinhold - Nobel 1928 -

Tell us about your PhD thesis: the two-photon absorption process.

An electron in an atom or a molecule has to absorb energy in order to get excited and jump to the next available state. Normally, this happens by absorption of a single photon, i.e., a quantum of light: the electron can jump by an amount equal to the photon energy...

Bell Telephone Laboratories, Murray Hill, New Jersey 1944

**Wolfgang Kaiser**

**Geoffrey Garrett**

However, the electron might absorb two photons at the same time, such that the electron acquires an energy equal to the sum of both photon energies...

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In my dissertation I computed the probability of this process, or its cross section to be precise.

She was right!

In Maria's honor, the unit of measurement for the cross section of this process is named GM (Goëppert-Mayer).
After moving to the United States, Maria has to relocate again several times:

- University of California, San Diego
- Manhattan Project, Los Alamos, February-July 1945
- Chicago University, February-July 1946
- Argonne National Laboratory, July 1946-1960
- Columbia University, New York, 1937-45
- Germany, Summer of 1931-32-33
- John Hopkins University, Baltimore, 1931-37

In 1933, Maria's visits to Germany, to work with Max Born, are interrupted because of Hitler's rise to power. Maria collaborates with Karl Herzfeld and the two of them are active in helping German refugees.

Baltimore, 1937

It happened. They've officially fired me.

But why? Did they give you any official reason?

No, but we know. It's because I'm married to you. A female physicist, full of talent, who undermines the positions of men at the department and whose fault is to have been born German, now that the war is close.

Keep calm, it just means we'll have to move again.
The Mayers moved then to New York in 1937. Maria has an unpaid position at the Columbia University that allows her to have an office. Here, she becomes friends with Harold Urey and Enrico Fermi.

Following Fermi’s advice, Maria studies transuranium elements (heavier than uranium). She predicts they have to form a series like that of the rare earths. This prediction will turn out to be true, too.

After more moves and friendships, in July 1946 the freshly established Argonne National Laboratory offers her a position as Senior Physicist...

But I know nothing about nuclear physics!

...Maria accepts the offer.

Excuse me, there's a long-distance call for Professor Fermi.

Maria, is there any indication of spin-orbit coupling?
Maria, are you all right?

I got it!

Explain it to me tomorrow morning, when you're calmer.
WE DON'T KNOW WHAT MARIA TOLD FERMI, BUT THESE ARE HER WORDS TO EXPLAIN HER MODEL:

Think of a room full of waltzers.

Suppose they go round the room in circles, each circle enclosed within another.

Then imagine that in each circle, you can fit twice as many dancers by having one pair go clockwise and another pair go counterclockwise.

Then add one more variation; all the dancers are spinning twirling round and round like tops as they circle the room, each pair both twirling and circling.

But only some of those that go counterclockwise are twirling counterclockwise. The others are twirling clockwise while circling counterclockwise. The same is true of those that are dancing around clockwise: some twirl clockwise, others twirl counterclockwise.
THE LOCAL NEWSPAPER HEADLINES: “S.D. MOTHER WINS NOBEL PRIZE”. FOR THE JOURNALISTS, MARIA IS STILL FIRST A MOTHER, THEN A SCIENTIST, EVEN AFTER WINNING THE NOBEL PRIZE.

MARIA SHARES THE PRIZE WITH EUGENE PAUL WIGNER (HALF) AND J. HANS D. JENSEN, WHO MARIA SHARES THE SECOND HALF OF THE PRIZE WITH.

OUT OF 111 NOBEL PRIZES IN PHYSICS, ONLY TWO HAVE BEEN AWARDED TO WOMEN.

AS OF TODAY, IT’S BEEN 54 YEARS SINCE THE LAST WOMAN RECEIVED THE PRIZE.

ENGLISH TRANSLATION BY: CLIÓ AGRAPIDIS