



Federal Ministry

Republic of Austria

Climate Action, Environment,

Energy, Mobility,

Innovation and Technology

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Quantum Leaps: small and/or big? AT-Scientists and/or the Nobel Prize

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BMK

Vienna, 12nd of April 2023

Agenda

Quantum Leaps

And the Nobel Prize goes to ...

Prizeless – The Shoulders of Many

Q&A

Quantum Leaps



• Quantum Leap - small



<https://www.faz.net/aktuell/wissen/physik-mehr/praezisionsmessung-wie-viel-wiegt-ein-quantensprung-16780117.html>

= the absolute smallest change possible in nature!!!

- **Quantum Leap - big**

But:

in a »System Atom« it stands for a

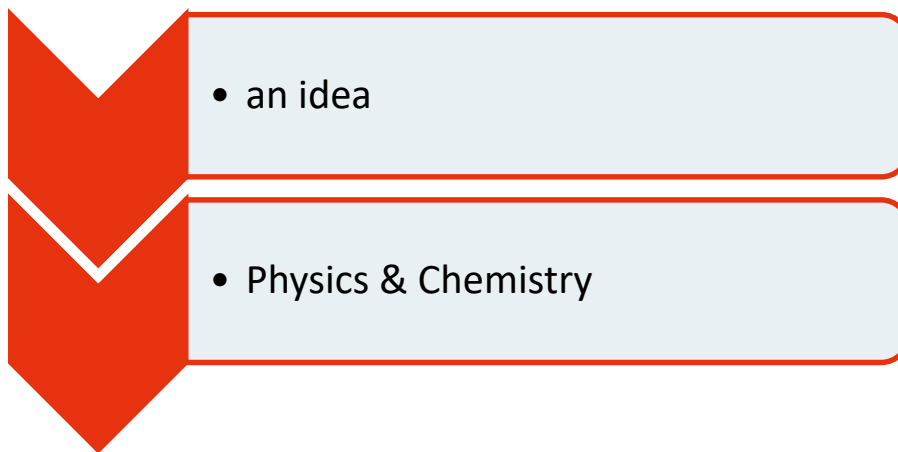
Fast + Fundamentale Change!

<https://www.faz.net/aktuell/wissen/physik-mehr/praezisionsmessung-wie-viel-wiegt-ein-quantensprung-16780117.html>

**If you want to bring a fundamental change in people's belief and behavior...
you need to create a community around them,
where those new beliefs can be practiced and expressed and nurtured.**

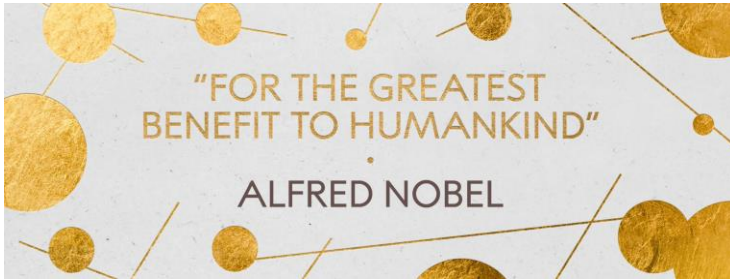
Malcolm Gladwell

And the Nobel Prize goes to ...



• THE Nobel Prize – an idea

<https://www.nobelprize.org/>



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The interest is to be divided into **five equal parts** and distributed as follows: one part to the person who made the most important **discovery** or **invention** in the field of **physics**; one part to the person who made the most important **chemical discovery** or **improvement**; one part to the person who made the most important **discovery** within the domain of **physiology** or **medicine**; one part to the person who, in the field of literature, produced the **most outstanding work in an idealistic direction**; and one part to the person who has done the most or best **to advance fellowship among nations, the abolition or reduction of standing armies, and the establishment and promotion of peace congresses**. The prizes for physics and chemistry are to be awarded by the Swedish Academy of Sciences; that for physiological or medical achievements by the Karolinska Institute in Stockholm; that for literature by the Academy in Stockholm; and that for champions of peace by a committee of five persons to be selected by the Norwegian Storting. **It is my express wish that when awarding the prizes, no consideration be given to nationality, but that the prize be awarded to the worthiest person**, whether or not they are Scandinavian.

<https://www.nobelprize.org/alfred-nobel/full-text-of-alfred-nobels-will-2/>

• The Nobel Prize – for Physics / Austria



Bild: Nobel Prize Outreach / Nanaka Adachi (2022)

1933 - Erwin Schrödinger - “for the discovery of new productive forms of atomic theory”

1936 - Victor Franz Hess - “for his discovery of cosmic radiation”

1944 - Isidor Isaac Rabi - “for his resonance method for recording the magnetic properties of atomic nuclei”

1945 – Wolfgang Pauli - “for the discovery of the Exclusion Principle, also called the Pauli Principle”

2022 – Anton Zeilinger - “for experiments with entangled photons, establishing the violation of Bell inequalities and pioneering quantum information science”

2023 - Ferenc Krausz - “for experimental methods that generate attosecond pulses of light for the study of electron dynamics in matter”

• The Nobel Prize – for Chemistry / Austria

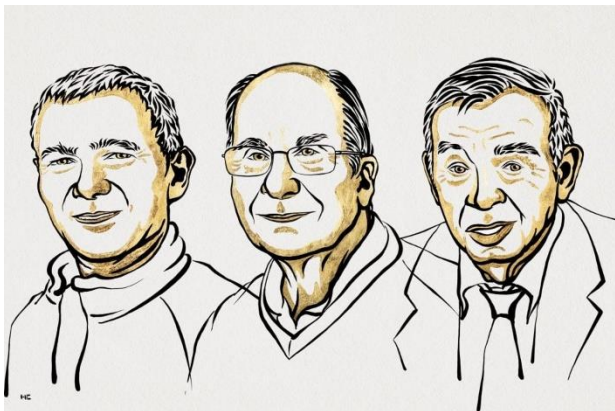


Bild: Niklas Elmehed © Nobel Prize Outreach

2023 - Moungi Bawendi, Louis Brus & Aleksey Yekimov
“for the discovery and synthesis of quantum dots”

1923 - Fritz Pregl - “for his invention of the method of micro-analysis of organic substances”

1925 - Richard Zsigmondy - “for his demonstration of the heterogenous nature of colloid solutions and for the methods he used, which have since become fundamental in modern colloid chemistry”

1938 - Richard Kuhn - “for his work on carotenoids and vitamins”

1939 - Leopold Ružička - “for his work on polymethylenes and higher terpenes”

1962 - Max Ferdinand Perutz - “for their studies of the structures of globular proteins”

1075 - Vladimir Prelog - “for his research into the stereochemistry of organic molecules and reactions”

1998 - Walter Kohn - “for his development of the density-functional theory”

2013 - Martin Karplus - “for the development of multiscale models for complex chemical systems”

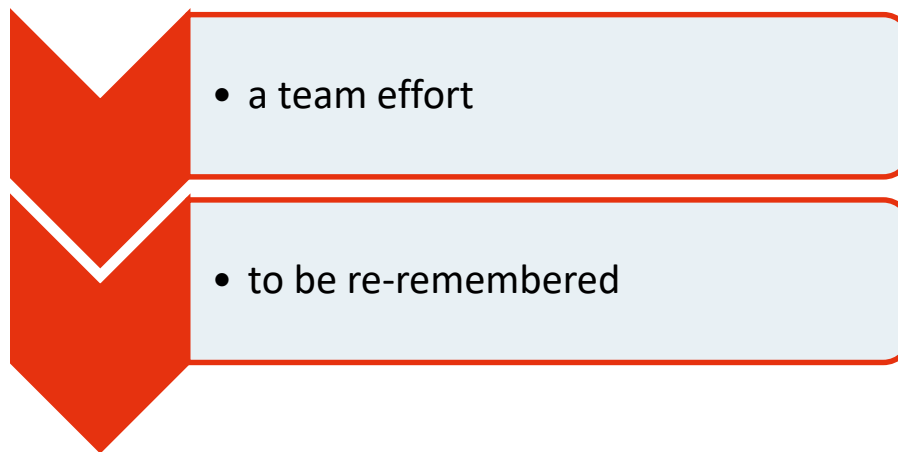
• The Nobel Prize Laureates

When asked what he would say to a student who had experienced a failure, physics laureate **Pierre Agostini** advised finding out why the problem occurred and fixing it. “I have one experiment back in ‘79 that worked the first time, but this is usually not the case. **We have to try again.**”

From a consideration of the immense volume of newly discovered facts in the field of physics, especially atomic physics, in recent years **it might well appear to the layman that the main problems were already solved** and that only more detailed work was necessary. **This is far from the truth**, as will be shown by one of the biggest and most important newly opened fields of research, with which I am closely associated, that of cosmic rays. (**Victor F. Hess**)

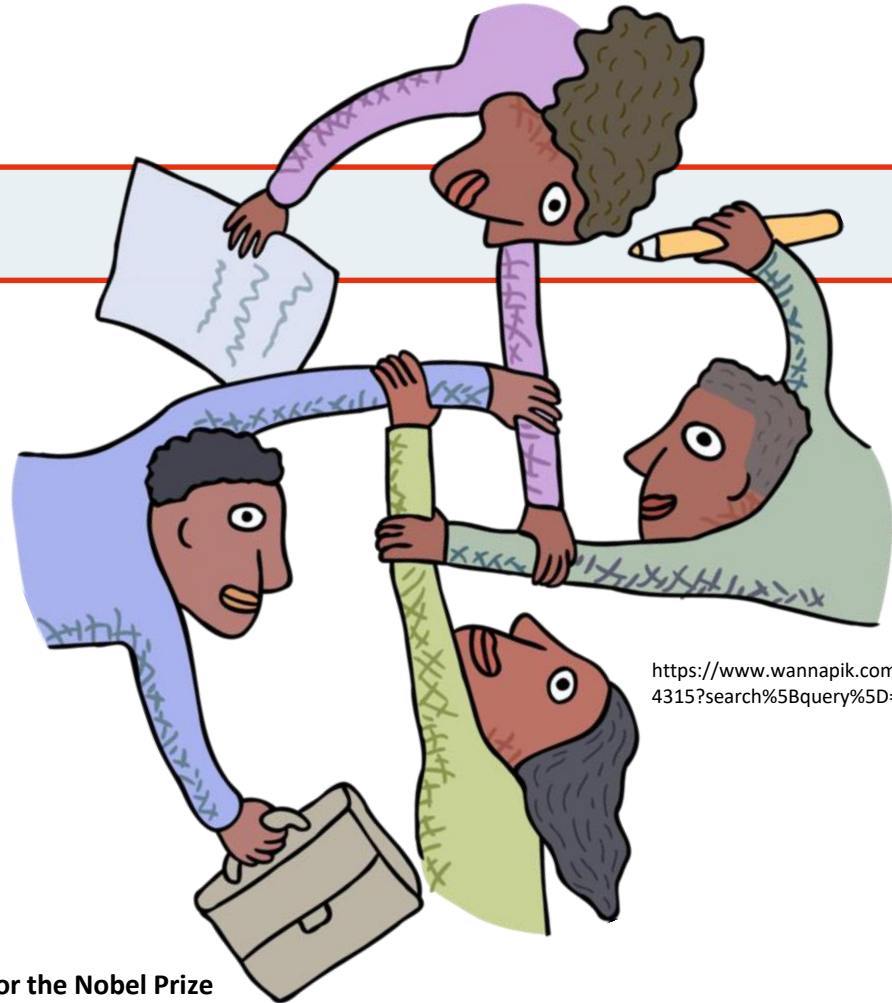
It is inevitable that many ideas of the young mind will later have to give way to the hard realities of life. But these realities will make themselves felt soon enough and while I am certainly not asking you to close your eyes to the experiences of earlier generations, **I want to advise you not to conform too soon and to resist the pressure of practical necessity. Free imagination is the inestimable prerogative of youth and it must be cherished and guarded as a treasure.** (**Felix Bloch**)

Prizeless – The Shoulders of Many



- A team effort

care to join?



<https://www.wannapik.com/vectors/4315?search%5Bquery%5D=s>

• Frauen & Quantum – ..., 2024, ...

Dagmar Bruß (* 1963) Hélène Bouchiat (* 1958)
Francesca Ferlaino (*1977) Michelle Yvonne Simmons (* 1967)
Grete Hermann (1901–1984) Eva Weig (* 1973) Bianca Dittrich (* 1977)
Cécile DeWitt-Morette (1922–2017) Claire Gmachl (* 1967)
Lene Hau (* 1959) Chiara Nappi (* 1948) Élisabeth Giacobino (1046)
Bertha Swirles Jeffreys (1903–1999) Deborah Jin (1968–2016)
Shirley Ann Jackson (* 1946) Susanne Yelin (* 1968)
Renata Ernestowna Kallosch (* 1943)
Olga Kocharovskaya (* 1956) Barbara Kraus (* 1975) Corinna Kollath (* 1976)

• to be re-remembered: Ilse Meitner (1878-1968)



Schriften (Auswahl)

- Wärmeleitung in inhomogenen Körpern. Hölder in Kommission, Wien 1906, OCLC 162935454 (Dissertation: aus der II. physikalischen Institut der k. k. Universität in Wien, vorgelegt in der Sitzung am 22. Februar 1906, 13 Seiten).
- Über die Absorption der α - und β -Strahlen. In: Phys. Z. Band 7, 1906, S. 588–590.
- Über die β -Strahl-Spektren und ihren Zusammenhang mit der γ -Strahlung. In: Zeitschrift für Physik. Band 11, 1922, S. 35–54.
- Über den Aufbau des Atominnern. In: Die Naturwissenschaften. Band 15, Nr. 16, 1927, S. 369–378, doi:10.1007/BF01504760.
- Der Zusammenhang zwischen β - und γ -Strahlen. In: Ergebnisse der Exakten Naturwissenschaften. Nr. 3, 1924.
- The status of women in the professions. In: Physics Today. Band 13, Nr. 8, 1960, S. 16–21.
- Wege und Irrwege zur Kernenergie. In: Naturwissenschaftliche Rundschau. Band 16, 1963, S. 167–169.

Bild: Wikipedia Gemeinfrei oder [CC BY 3.0](#)

• to be re-remembered: Lucy Mensing (1901-1995)



Schriften

- *Zur Störungsmechanik der Molekülmodelle*. Zeitschrift für Physik, Band 34, 1925, S. 602–610
- *Beitrag zur Theorie der Verbreiterung von Spektrallinien*. Zeitschrift für Physik, Band 34, 1925, S. 611–621 (aus der Dissertation)
- *Die Rotations-Schwingungsbanden nach der Quantenmechanik*. Zeitschrift für Physik, Band 36, 1926, S. 814–823
- *Über die Dielektrizitätskonstante von Dipolgasen nach der Quantenmechanik*. Mit Wolfgang Pauli. Physikalische Zeitschrift, Band 27, 1926, S. 814–823
- *Die Intensitäten der Zeemankomponenten beim partiellen Paschen-Back-Effekt*. Zeitschrift für Physik, Band 39, 1926, S. 24–28
- *Zur Theorie des Zusammenstoßes von Atomen mit langsamen Elektronen*. Zeitschrift für Physik, Band 45, 1927, S. 603–609
- *Zur Theorie der Kopplungsverbreiterung von Spektrallinien*. Zeitschrift für Physik, Band 61, 1930, S. 655–699

Bild: 1928. Dr. Dorothea Roloff, Dresden - <https://blog.muenchner-stadtbibliothek.de/lucy-mensing-vergessene-mathematikerin-femaleheritage>

• Sometimes: THE Alternative

- In honor of: **Cécile DeWitt-Morette**
 - notable scientist, founder of École de Physique des Houches
- “Cécile DeWitt-Morette / School of Physics Houches” Prize
 - French Academy of Sciences
 - Created: 2019



Bild: <https://cerncourier.com/a/invigorating-french-particle-physics-cecile-dewitt-morette-1922-2017/>



Graphics: <https://gdmissionsystems.com/about-us/engineering/quantum> & <https://quantumdelta.nl/> & Foto: D. Ehlers



**If you think you understand quantum mechanics,
you don't understand quantum mechanics.
(Richard P. Feynman)**

**We are stuck with technology
when what we really want is just stuff that works.
(Douglas Adams)**

**We can only see a short distance ahead,
but we can see plenty there that needs to be done.
(Alan Turing)**

**If you are always trying to be normal,
you will never know how amazing you can be.
(Maya Angelou)**

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III/5 – Digital and key technologies for industrial innovation

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