



KUNGL.
VETENSKAPS-
AKADEMIEN

THE ROYAL SWEDISH ACADEMY OF SCIENCES



Alfred Nobel and the Nobel Prizes

GSI, April 26, 2016

A handwritten signature in cursive script, likely belonging to Björn Enkblom, the former Chairman of the Nobel Committee.

Stockholm City Hall
December 10, 2015



Alfred Bernhard Nobel



Born October 21, 1833
in Stockholm,
Died December 10, 1896
in San Remo

Chemist, inventor, engineer,
entrepreneur, armaments
manufacturer, author and
pacifist.

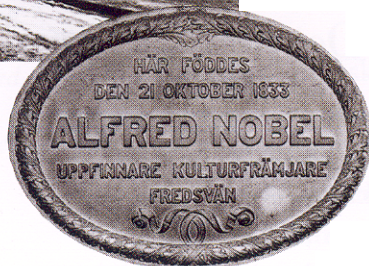
102

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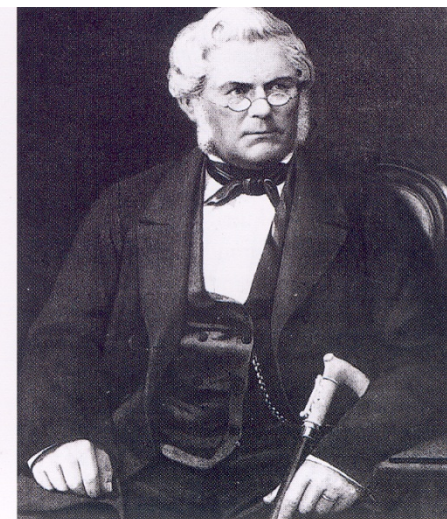
Nobelium



Norrländsgatan 11
Stockholm, Sweden



Karolina
Andriette
(Ahlzell)
(1805-1889)



Immanuel
(1801-1872)

Fonderies & Ateliers Mécaniques Nobel (& Fils)

1842-1863



24 Peterburgskaya Embankment



- 1842 the family reunited in St. Petersburg
- Private teachers. At 17 fluent in Swedish, Russian, French, English and German
- Interests: English literature, poetry, chemistry and physics.
- Studied chemistry for prof. N.N. Zinin
- Sent abroad for two years for further training in chemical engineering in Sweden, Germany, France and United States
- In 1850 he worked in Paris with prof. T.J. Pelouze
- There he met Ascanio Sobrero, the inventor of nitroglycerine

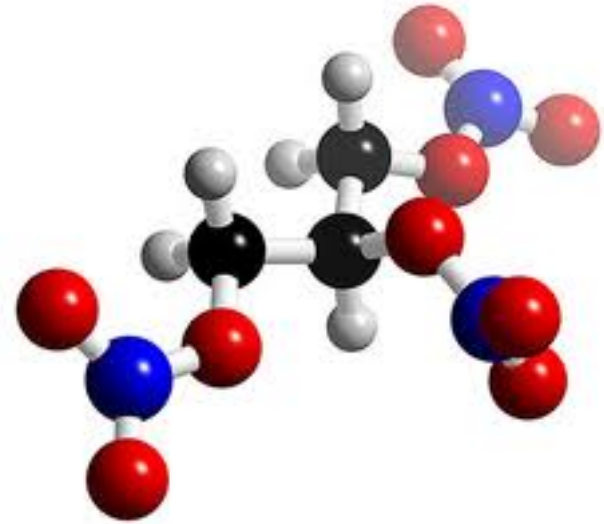
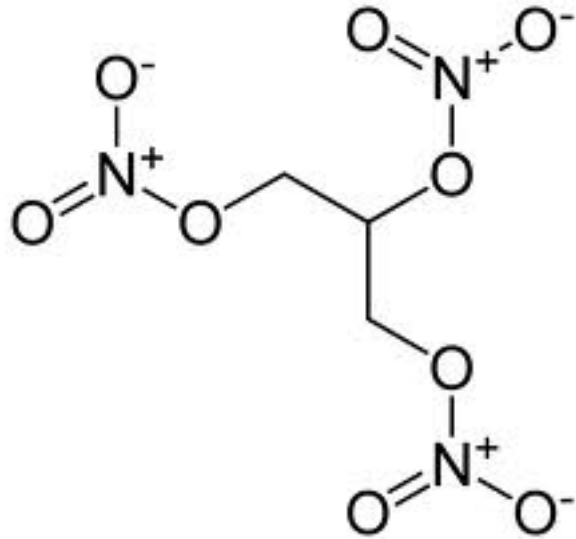


Nitroglycerin

(*glyceryl trinitrat, propyl-1,2,3 trinitrat*)

Invented 1847 by Ascanio Sobrero, Uni. Turin

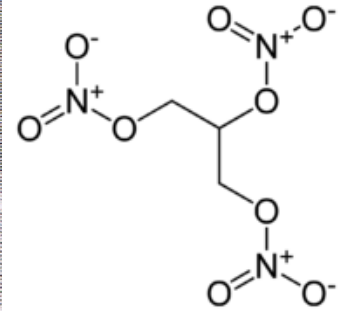
Back to Russia
1852, moved to
Sweden 1863



Ascanio Sobrero



Heleneberg in Stockholm



Saturday September 3, 1864

Nitroglycerin incorporated in kieselguhr
(diatomaceous earth) becomes safer and more
convenient to handle. This mixture was patented in
1867 as

DYNAMITE



Detonator (blasting cap)

Alfred Nobel built factories and laboratories in some 90 different palces in more than 20 countries. He had 355 patents.

He kept a permanent home in Paris 1873-1891. He travelled a lot and when he was at home he was working in his lab.

This influenced, of course, his private life and at an age of 43 he felt as an old man.

Bois de Boulogne
Paris



WOMEN



1873

PARIS



"A very wealthy, cultured, elderly gentleman, living in Paris, desires to find a lady also of mature years, familiar with languages, as secretary and manager of his household", (1876).



Bertha (Kinsky von Chinic und Tettau) von Suttner



1905

The Nobel Peace Prize
1905 was awarded to
Bertha von Suttner.

Author of "Lay Down
Your Arms"



Sofie Hess

BADEN BY WIEN

BOFORS



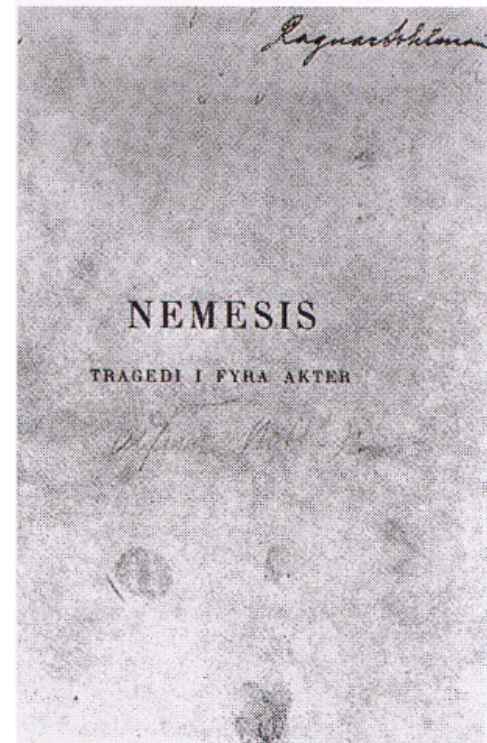
1893
Björkborn



SAN REMO

1890





Published in Sweden, 2003
Swedish-Esparanto

My dynamite will sooner lead to peace than a thousand world conventions. As soon as men will find that in one instant, whole armies can be utterly destroyed, they surely will abide by golden peace.

Testament

Jag underskrifvad Alfred Bernhard
Väbel förklarar härmed efter moget
beträckande min yttersta vilja i afseende
i den egendom jag vid min död kan ef-
terlemnna vara följande:

Allur hela min återstående ^{realisubon.} förmögenhet förfogas
på följande sätt: Kapitalen, af utredningskommis-
sionens testamnets till säkra värdepapper, skali utgå en
fond hvars vänta ärligen utdelas som friskolorning
åt dem som under det förlöpne året hafva gjort min-
stheten den största nytta. Rintan delas i fem lika
delar som tillfalla: en del den som inom fysiska
område har gjort den värtigaste upptäckt eller uppfin-
ning; en del den som har gjort den värtigaste kemiska
upptäckt eller förbättring; en del den som har gjort den
värtigaste upptäckt inom physiologien eller medicinens
domän; en del den som inom litteraturen har producerat
det största och i idealiskt riktning; och en del åt den
som har verkat mest eller bäst för folkens förbättrande
och uphöfande eller minskning af strömda armars
samt tillhanda och uphöfande af fridolingspresser.
Prisen för fysik och kemi utdelas af Svenska Vetem-
skapsakademien; för physiologiska eller medicinska
arbeten af Carolinska Institutet; (Straksborn) för liti-
ratur af Akademien i Stockholm samt för pedago-
giska ett utskott af fem personer som utgås
af Norska Stortinget. Det är min uttryckliga
vilja att vid prisutdelningarna intet afseende
fästas vid några slags nationalitetsförhållanden
såvida att den värdigaste erhåller priset an-
tragen kan är Skandnavor eller ej.

Detta testamente är skrivit det enda giltiga
och upphäfer alla mina föregående testamentariska
bestämmelser om sådana skulle förefinnas efter min död.

Skatteligen anordnar jag såsom förutseende min
uttryckliga önskan att vilja att efter min död
föreläsningens uppkäras och att sedan detta skett och
tydliga döds-testament af kompetenta läkare instyggat
och förklarad i saklig cremationsugn.

Paris den 27 November
1895

Alfred Bernhard Väbel

The whole of my remaining realizable estate shall be dealt with in the following way: the capital, invested in safe securities by my executors, shall constitute a fund, the interest on which shall be annually distributed in the form of prizes to those who, during the preceding year, shall have conferred the greatest benefit on mankind. The said interest shall be divided into five equal parts, which shall be apportioned as follows:

one part to the person who shall have made the most important discovery or invention within the field of physics;

one part to the person who shall have made the most important chemical discovery or improvement; one part to the person who shall have made the most important discovery within the domain of physiology or medicine; one part to the person who shall have produced in the field of literature the most outstanding work in **an ideal direction**; and one part to the person who shall have done the most or the best work for fraternity between nations, for the abolition or reduction of standing armies and for the holding and promotion of peace congresses. The prizes for physics and chemistry shall be awarded by the Swedish Academy of Sciences; that for physiological or medical work by the Caroline 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 elected by the Norwegian Storting. It is my express wish that in awarding the prizes no consideration whatever shall be given to the nationality of the candidates, but that the most worthy shall receive the prize, whether he be a Scandinavian or not.

*Paris Dec 27 November
1895
Alfred Bernhard Nobel*



On December 10, 1896 Alfred Nobel died in his home in San Remo. In his will he left 31 million SEK (today about 265 million dollar) to fund the prizes.



Ragnar Sohlman



Bofors

The Nobel Prize Awarding Institutions

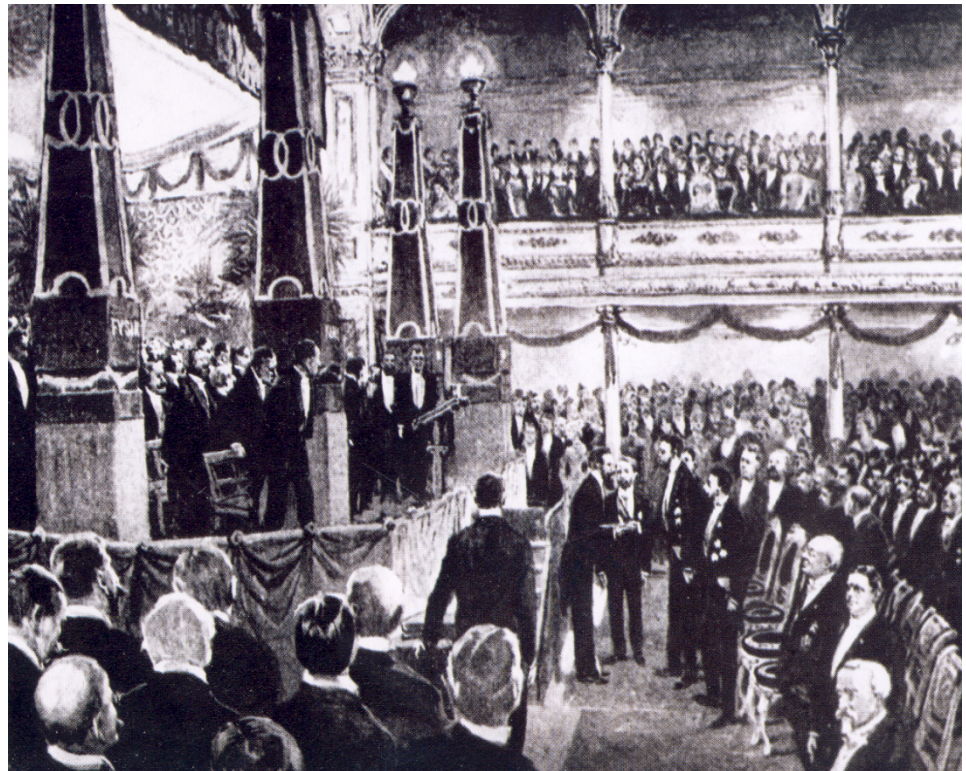
•Physics	The Royal Swedish Academy of Sciences
•Chemistry	The Royal Swedish Academy of Sciences
•Medicine	The Nobel Assembly at Karolinska Institutet
•Literature	The Swedish Academy
•Peace	The Norwegian Nobel Committee

1901

"in recognition of the extraordinary services he has rendered by the discovery of the remarkable rays subsequently named after him"



Wilhelm Conrad Röntgen



HOW ?

The Nobel Committee for Physics

- 5 members (3 years, max. 9 years)
- Chairperson, max. 3 years
- Adjoint members (1-4, change each year)
- Secretary (no time limit)

2012

Per
Delsing

Börje
Johansson

Lars
Brink

Olle
Inganäs

Lars
Bergström

Anne
L'Huillier

Björn
Jonson

Olga
Botner



September 2011



Nomination for the Nobel Prizes

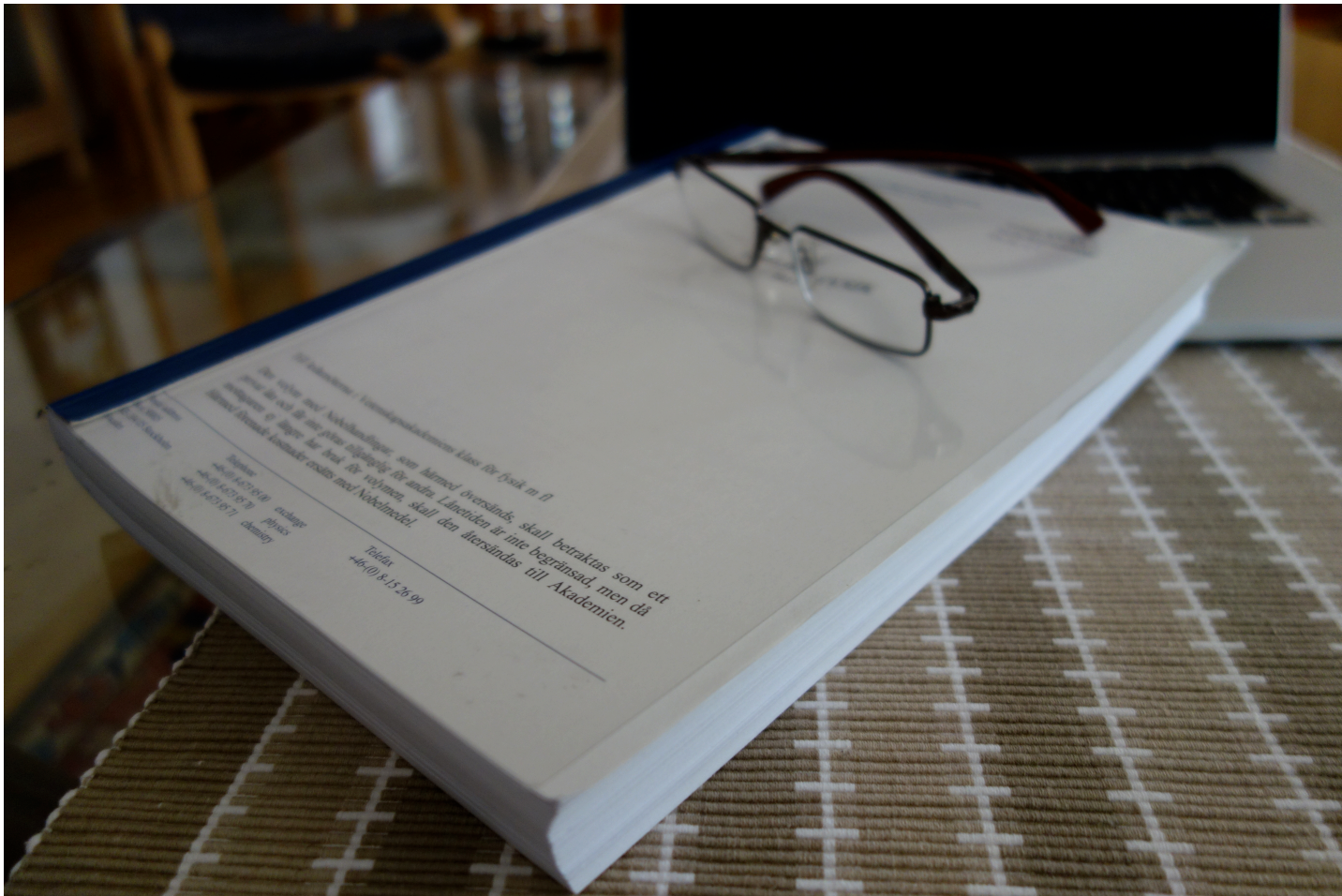
Each year the respective Nobel Committees send individual invitations to thousands of members of academies, university professors, scientists from numerous countries, previous Nobel Laureates, members of parliamentary assemblies and others, asking them to submit candidates for the Nobel Prizes for the coming year. These nominators are chosen in such a way that as many countries and universities as possible are represented over time.

- Invitations to nominate (sharp deadline, February 1):
 - Members of KVA
 - The Nobel Committee
 - Earlier Nobel Laureates
 - Professors of Physics in the Nordic Countries
 - Professors of Physics at selected Universities (new every year)
 - Selected scientists (max. 8 years)

2012

2012-02-01
Nominations
examined

Nominations shall be in the
hands of the Committee
latest at 24.00 on January 31



Typically 400 to 500

2012

2012-02-01
Nomineringar
granskas

2012-02-29
Experts are
selected

The Committee examines the nominations in detail during February and at its next meeting experts are proposed. These are then discussed with the Physics Class. Letters to experts are sent out shortly after the meeting.

2012

2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

During the spring the
Committees for Physics,
Chemistry and Medicine
meets.

2012-04-20
Deliberations
Chemistry
and Medicine

2012

2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

2012-04-20
Deliberations
Chemistry
and Medicine

2012-06-04-05
Hearing and
meeting with
Class III

The Committee studies the reports. Discussions about the main lines of writing the "Kapprocken". Meeting with Class III



535

2012

2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

2012-04-20
Deliberations
Chemistry
and Medicine

2012-06-04-05
Hearing and
meeting with
Class III

Summer holidays



Well.....

2012

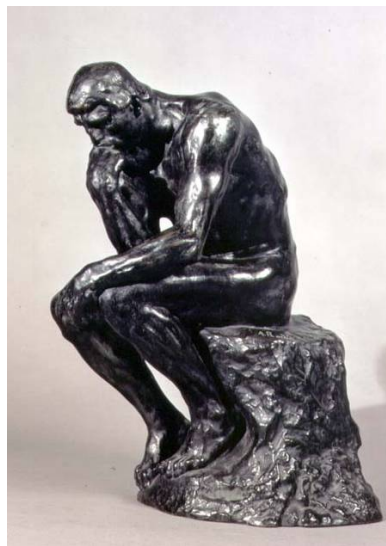
2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

2012-04-20
Deliberations
Chemistry
and Medicine

2012-06-04-05
Hearing and
meeting with
Class III

2012-08-07-08
The Committee
meeting



SAN REMO



Villa Nobel



2012

2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

2012-04-20
Deliberations
Chemistry
and Medicine

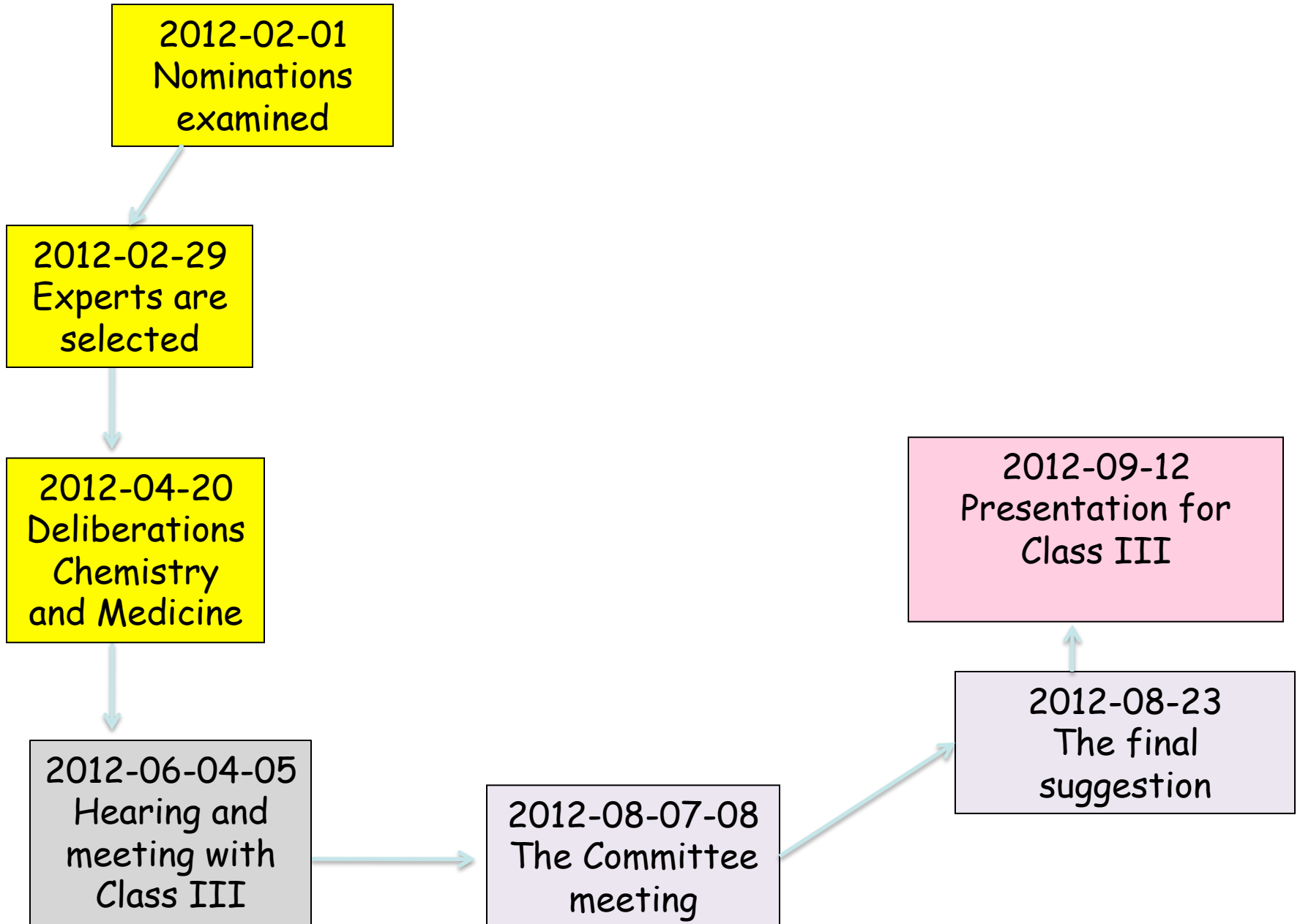
2012-06-04-05
Hearing and
meeting with
Class III



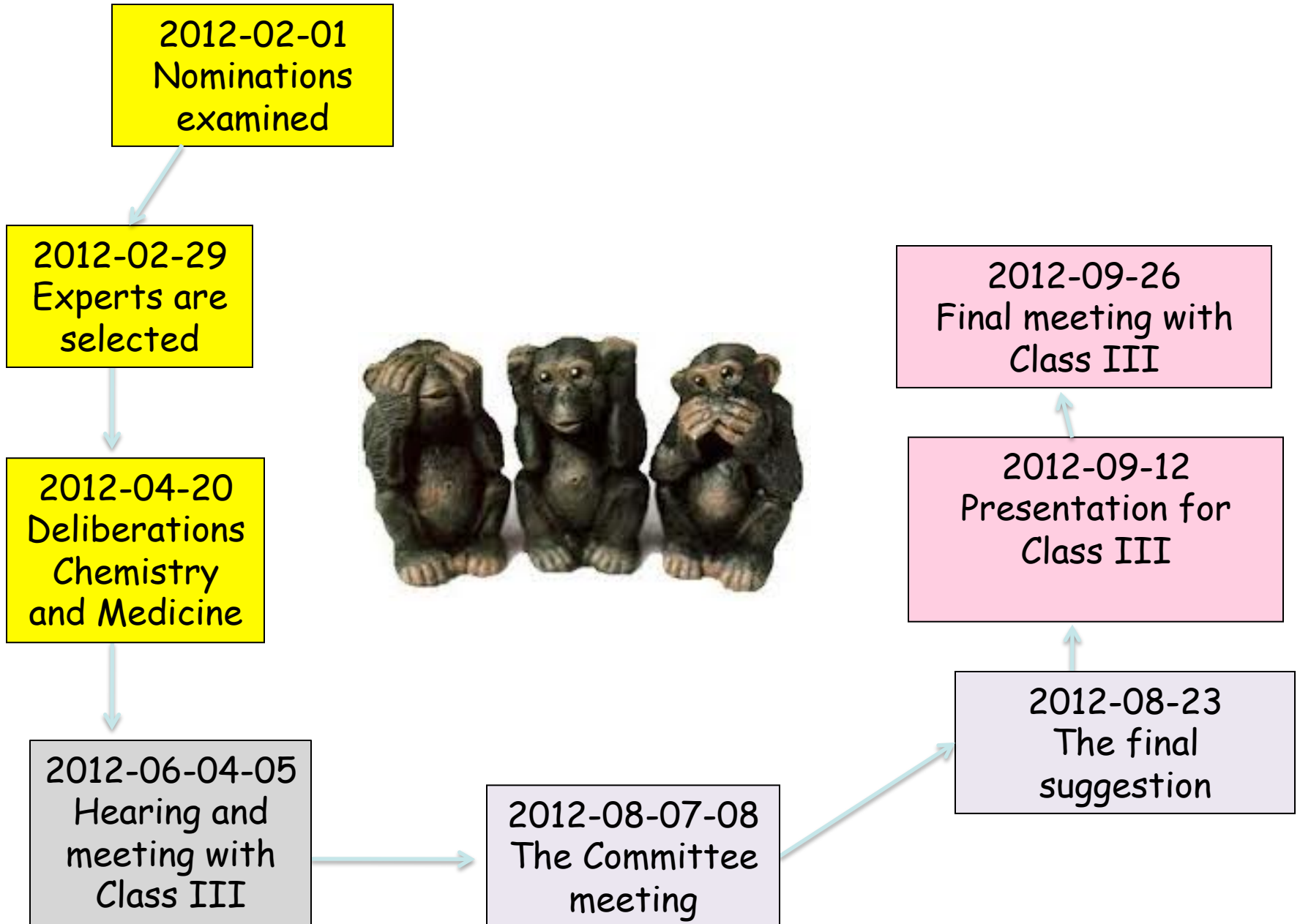
2012-08-07-08
The Committee
meeting

2012-08-23
The final
suggestion

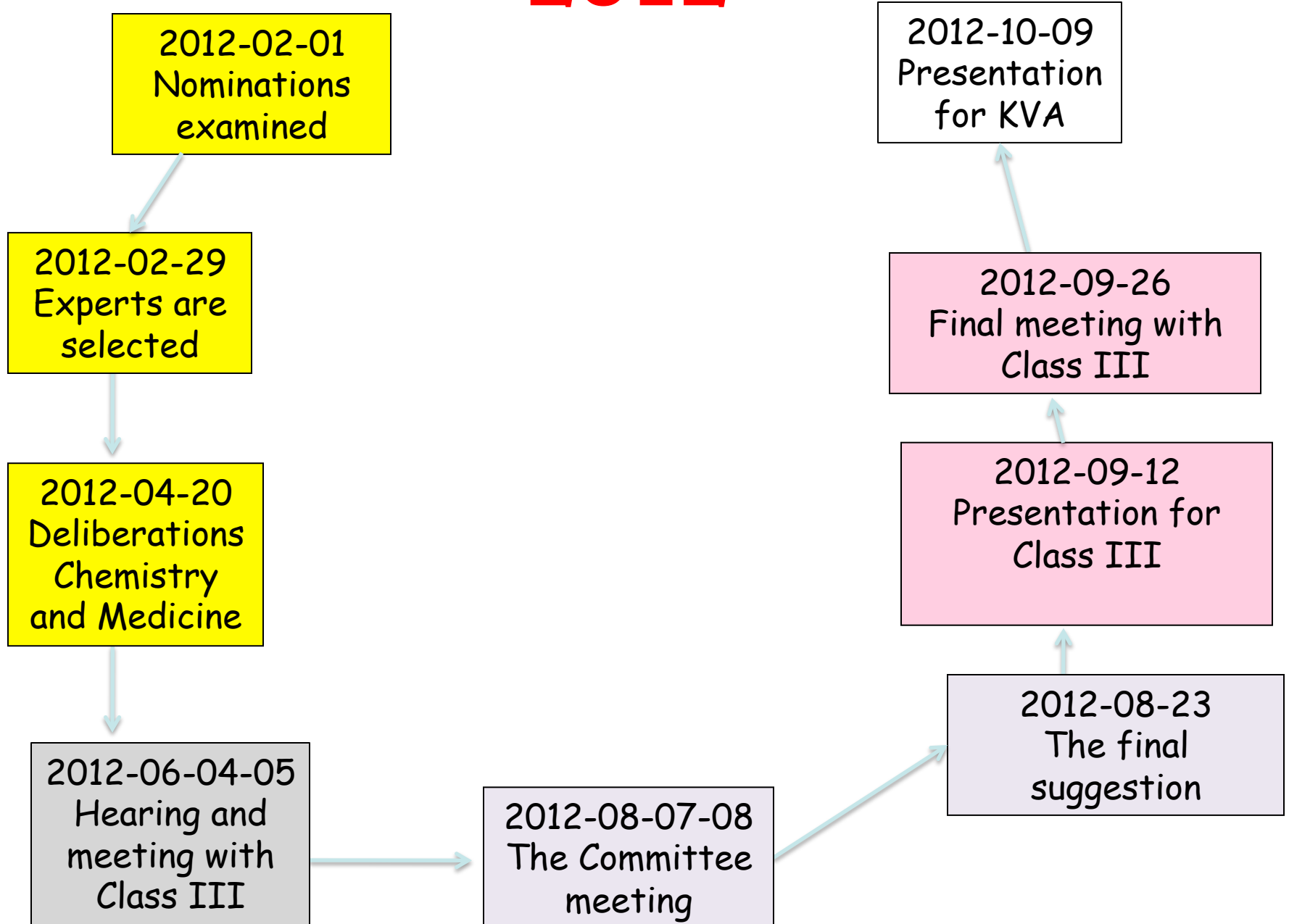
2012



2012



2012



2012



2012-02-01
Nominations
examined

2012-02-29
Experts are
selected

2012-04-20
Deliberations
Chemistry
and Medicine

2012-06-04-05
Hearing and
meeting with
Class III

-Is this Prof. Haroche?
-Oui.
-Dear Prof. Haroche this is a
very important telephone call to
you from Stockholm, Sweden.
Please do not hang up....

2012-08-07-08
The Committee
meeting

2012-10-09
Presentation
for KVA

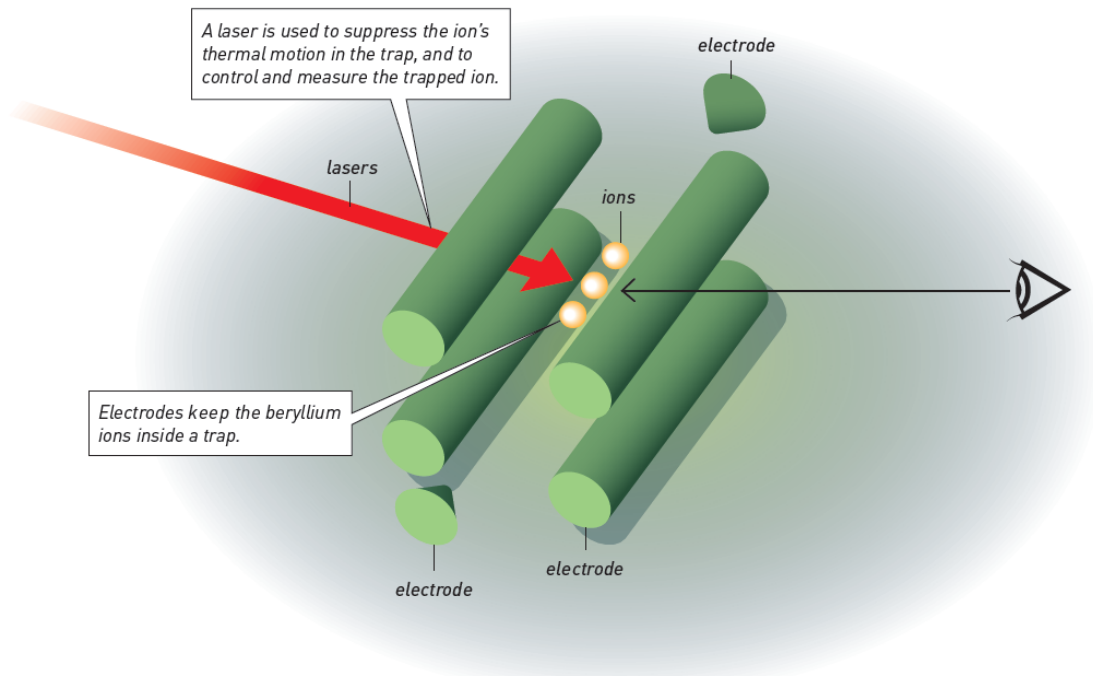
2012-09-26
Final meeting with
Class III

2012-09-12
Presentation for
Class III

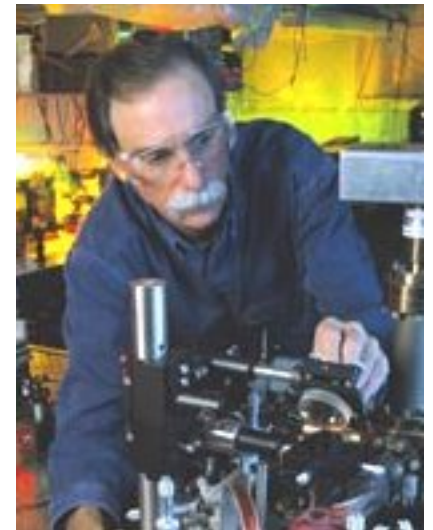
2012-08-23
The final
suggestion

Control of individual quantum systems

Single ions in a trap

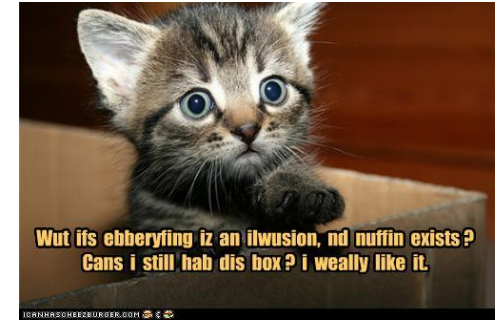
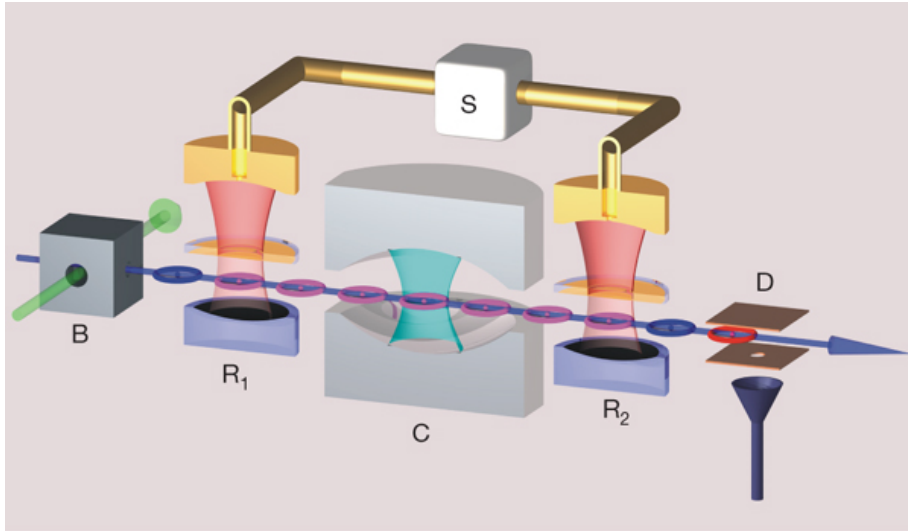


D.J. Wineland

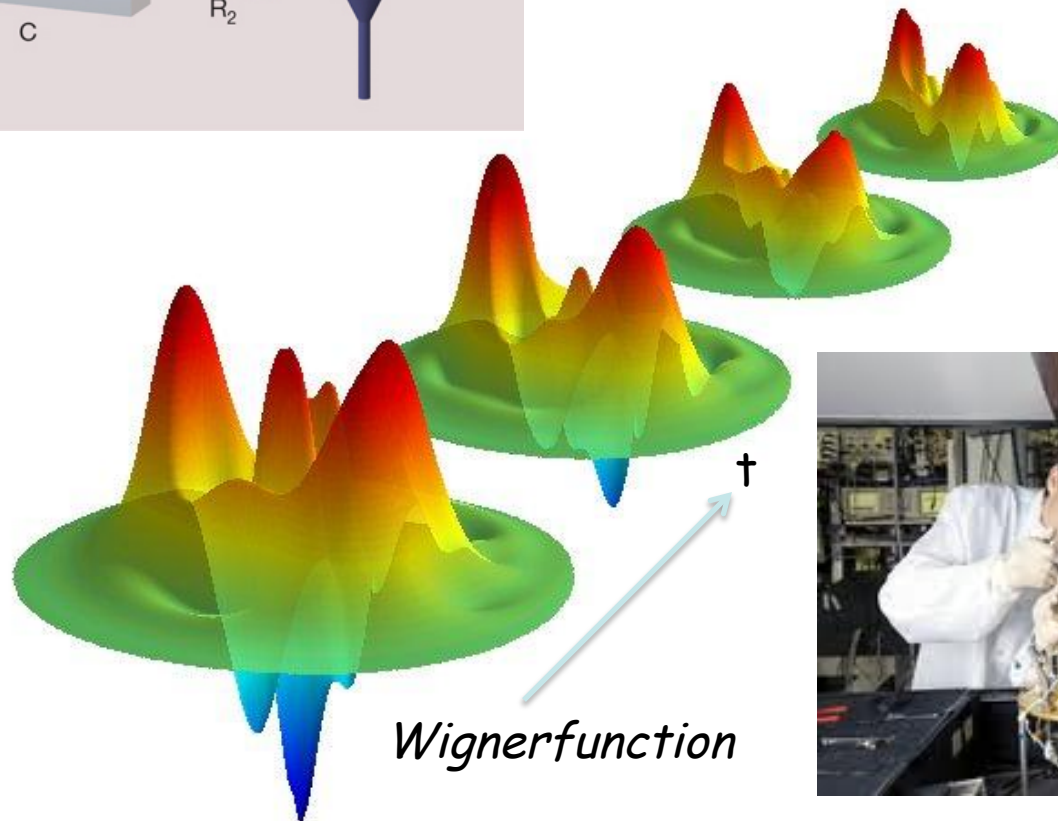


Control of individual quantum systems

Single photons in a trap



S. Haroche



Press Conference





Serge Haroche
Collège de France and
École Normale
Supérieure,
Paris, France



David J. Wineland
National Institute of Standards and
Technology (NIST) and University of
Colorado Boulder, CO, USA

*"For ground-breaking experimental methods
that enable measuring and manipulation of
individual quantum systems."*



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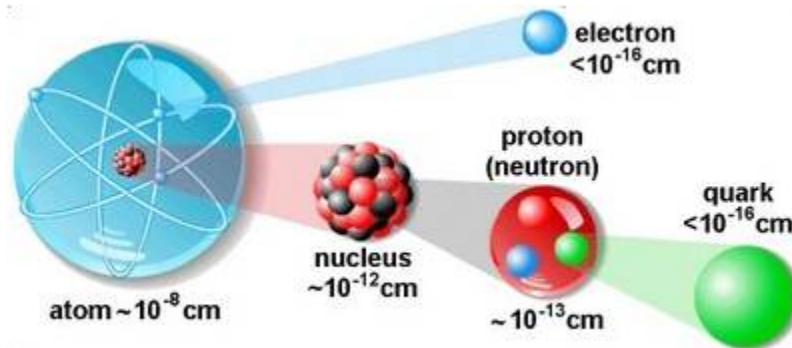
LIGHT IS A
PARTICLE!



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Your Majesties, Your Royal Highnesses, Ladies and Gentlemen,

*In his epilogue at the Master's Degree Celebration in Lund 1820, Professor
Esaias Tegnér – also a famous poet and author – said*

*This is Man's wonderful ability:
to be able to grasp the inner essence of phenomena,
not what they appear to be, but what they mean,
and the reality that we see with our eyes
is a symbol only of something higher.*

*What is it that our eyes see? It is light. Everything we see around us –
colours, shapes, and objects – comes from light that strikes our eyes.....*



Professeur Haroche, au nom de l'Académie Royale des Sciences de Suède, j'ai le privilège de vous transmettre mes plus chaleureuses félicitations pour votre travail exceptionnel. Je vous demande maintenant de bien vouloir vous avancer pour recevoir votre prix Nobel des mains de Sa Majesté le Roi.



Professor Wineland, on behalf of the Royal Swedish Academy of Sciences it is my privilege to convey to you my warmest congratulations for your outstanding work. I now ask you to step forward to receive your Nobel Prize from the hands of His Majesty the King.



Front



Back

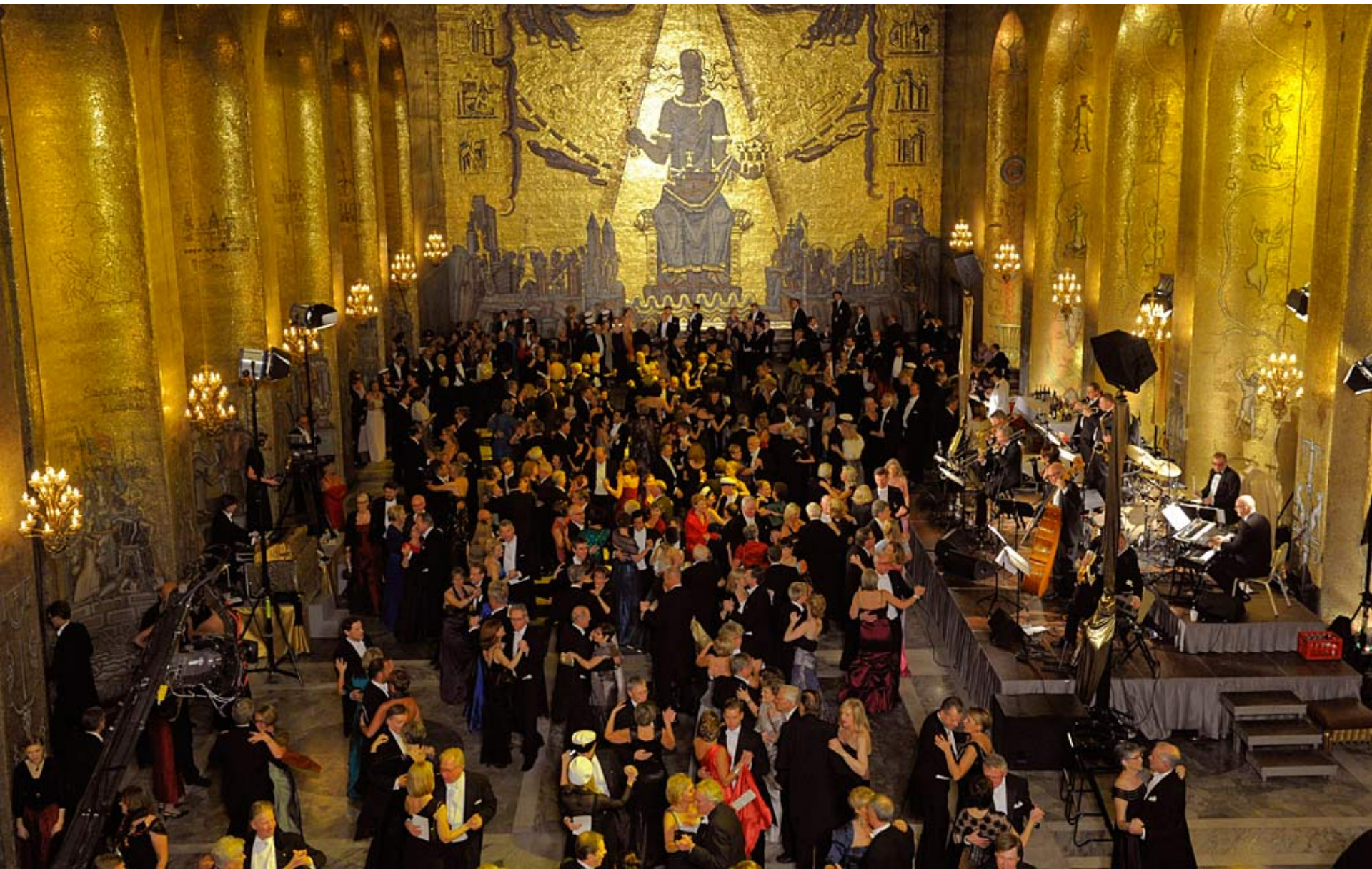
“Inventas vitam juvat
 excoluisse per artes”

“inventions enhance life
 which is beautified through
 art.”



The Banquet - City Hall of Stockholm





Nobel Prizes in Physics

Nobel Prize in Physics has been awarded 109 times to a total of 201 Nobel Prize winners from 1901 to 2015. John Bardeen is the only Nobel Laureate who has been awarded the Nobel Prize in Physics twice, in 1956 and 1972. This means that a total of 200 scientists so far have received the Nobel Prize in physics.

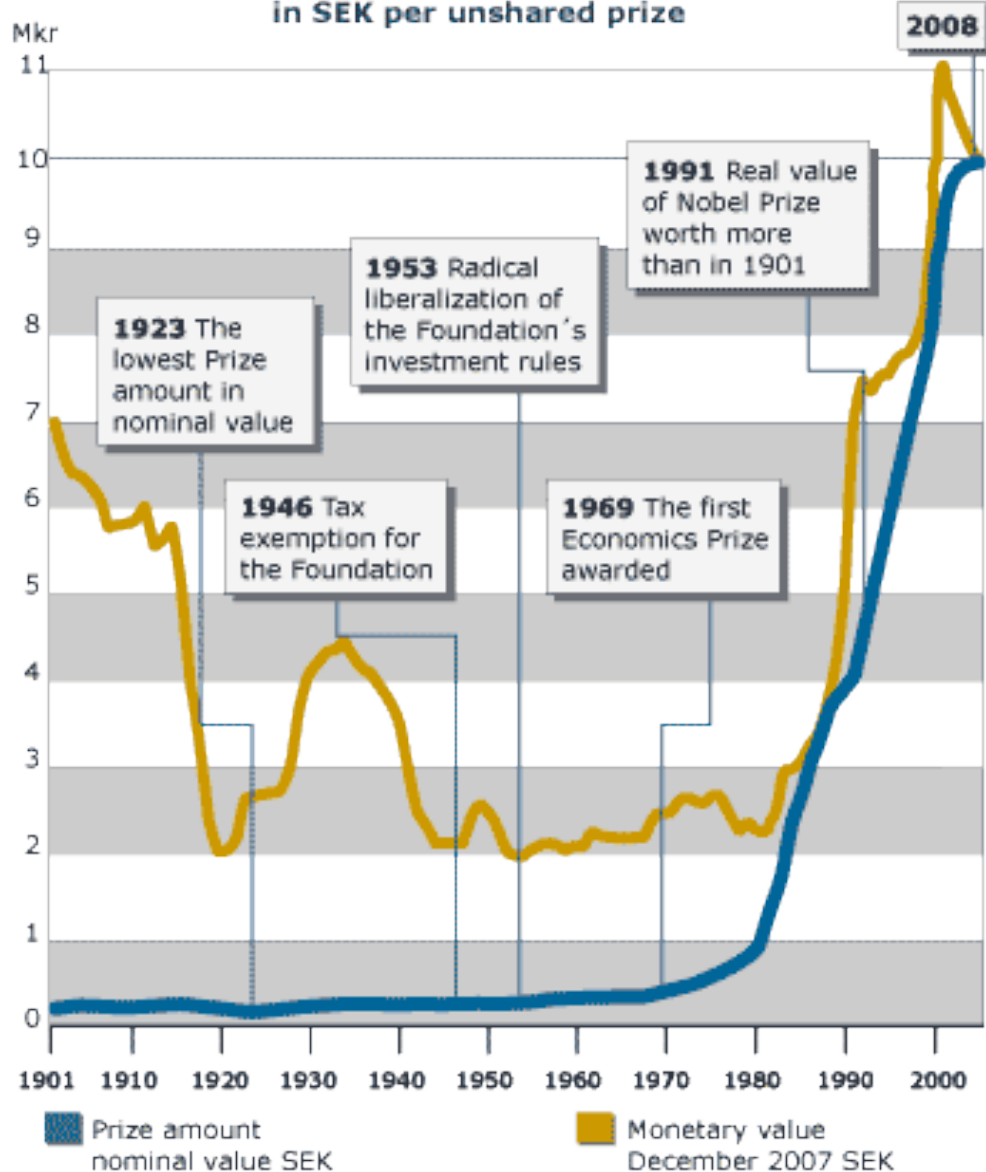
Only two women have so far received the Nobel Prize in Physics, Marie Curie (1903) and Maria Goeppert Mayer (1963)

47 prizes have been given to **one** laureat.

32 prizes have been shared by **two** laureats.

30 prizes have been shared by **three** lauriats.

Diagram comparing the nominal (monetary) Prize amount since 1901 with its real value in 2007 terms- in SEK per unshared prize



8 000 000 SEK =
985 000 \$

Das Gesetz von der Äquivalenz von Masse und Energie ($E = mc^2$)

In der vor-relativistischen Physik gab es zwei voneinander unabhängige Erhaltungssätze, die strenge Gültigkeit beanspruchten, nämlich

- 1) den Satz von der Erhaltung der Energie
- 2) den Satz von der Erhaltung der Masse.

Der Satz von der Erhaltung der Energie, welcher schon vom 17. Jahrhundert an seiner vollen Allgemeinheit als gültig anerkannt wurde, entwickelte sich im 19. Jahrhundert wesentlich als eine Folge eines Satzes der Mechanik. Man beobachtet ein Pendel, dessen Masse zwischen den Punkten A und B hin und her schwingt.

In A (und B) verschwindet die Geschwindigkeit v , und die Masse erhöht sich höher als in dem tiefsten Punkte C der Bahn. In C ist diese Erhöhung verloren gegangen, dafür aber hat die Masse hier eine Geschwindigkeit v . Es ist, wie wenn es sich um die Umwandlung von Masse in Energie und umgekehrt nichts veränderte. Die exakte Beziehung ist

$$m \cdot g \cdot h = \frac{mv^2}{2}$$

wobei g die Beschleunigung der Erdbeschwerkung bedeutet. Das ist dasselbe, was man dabei sieht, dass diese Beziehung unabhängig ist von der Höhe oder Pendel und überhaupt von der Form der Bahn die welche die Masse gefolgt wird. Interessanterweise: Es gibt ein etwas (nennbar als Energie) die während des Vorgangs erhalten bleibt. In A hat die Energie eine Energie der Lage oder „potentielle Energie“ und in C eine Energie der Bewegung oder „kinetische Energie“. Wenn diese Auffassung das Wesen der Sache richtig erfasst, so muss die Summe

$$m \cdot g \cdot h + \frac{mv^2}{2}$$

immer für alle Zustände denselben Wert haben, wenn man nur m und v die Höhe über C und mit v die Geschwindigkeit mit v in dem beliebigen Punkte der Bahn. Dies enthält schon die Idee der Energie. Dieses Gesetz gibt den Satz von der Erhaltung der mechanischen Energie. Wie aber, wenn das Pendel schließlich durch Reibung zum Stillstand gekommen ist? Davon später.

Bei der Entdeckung der Wärme - Leistung aus einer geschlossenen Zylinder aus gelochtem Eisen unter Zugrundelegung der Annahme dass die Wärme ein unzerstörbarer Stoff sei, der vom wärmeren zum kälteren Stoff fließt. Es schien einem, dass die Erhaltung der Wärme zu gelau. Andererseits aber wurde seit unendlichen Zeiten Erfahrung gemacht, nach denen durch Reibung Wärme erzeugt wird (Zündung der Indianer). Nachdem sich die Physiker lange dagegen



im 17. Jahrhundert

205



KUNGLIGA SVENSKA
VETENSKAPS-AKADEMIEN

har vid sitt sammanträde den 9 November
1922 i enlighet med föreskrifterna i
det av

ALFRED NOBEL

...independent of the value
which, after a possible
confirmation, may be attributed
to the theory of relativity and
gravitation give the prize, which
for 1921.....



ALBERT EINSTEIN

för hans förtjänster om den teoretiska fysiken
särskilt hans upptäckt av lagen
för den fotoelektriska effekten.

Stockholm den 10 December 1922

Kgl. Vet. Akad. Berätt.

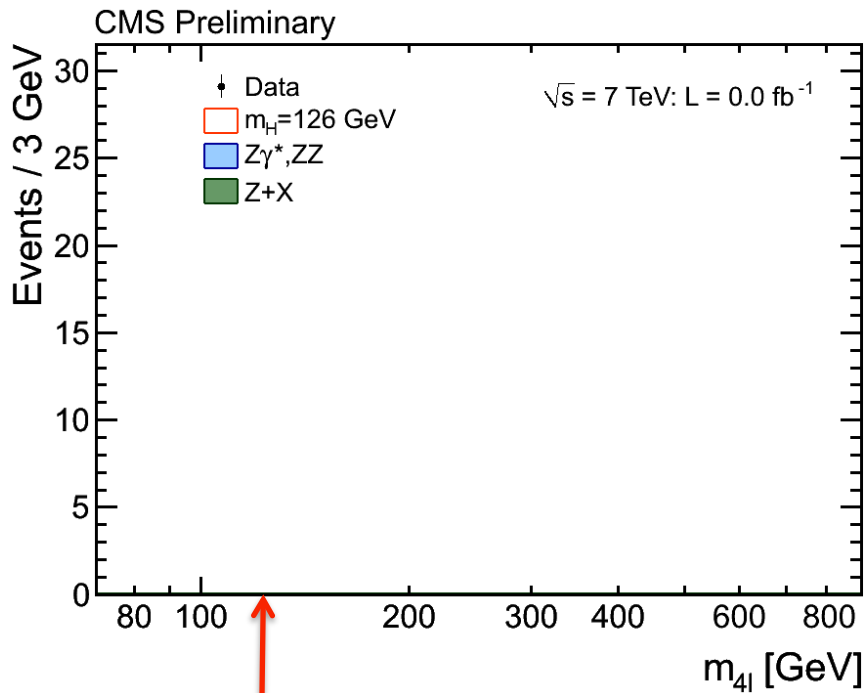
...for his contributions to the
theoretical physics and
especially for his discovery of
the law for the photoelectric
effect.



11 July 1923



4 juli, 2012



BEH



François Englert, Peter W. Higgs

Fabiola Gianotti



Isamu
Akasaki
30/1 1929

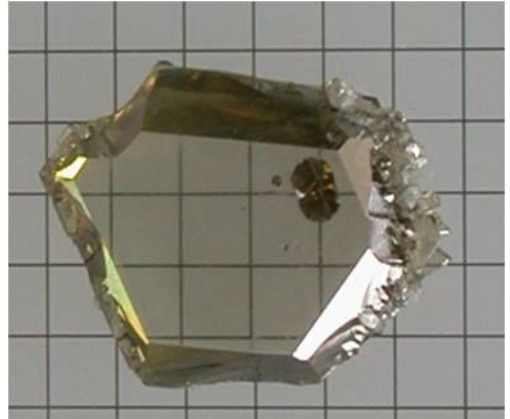
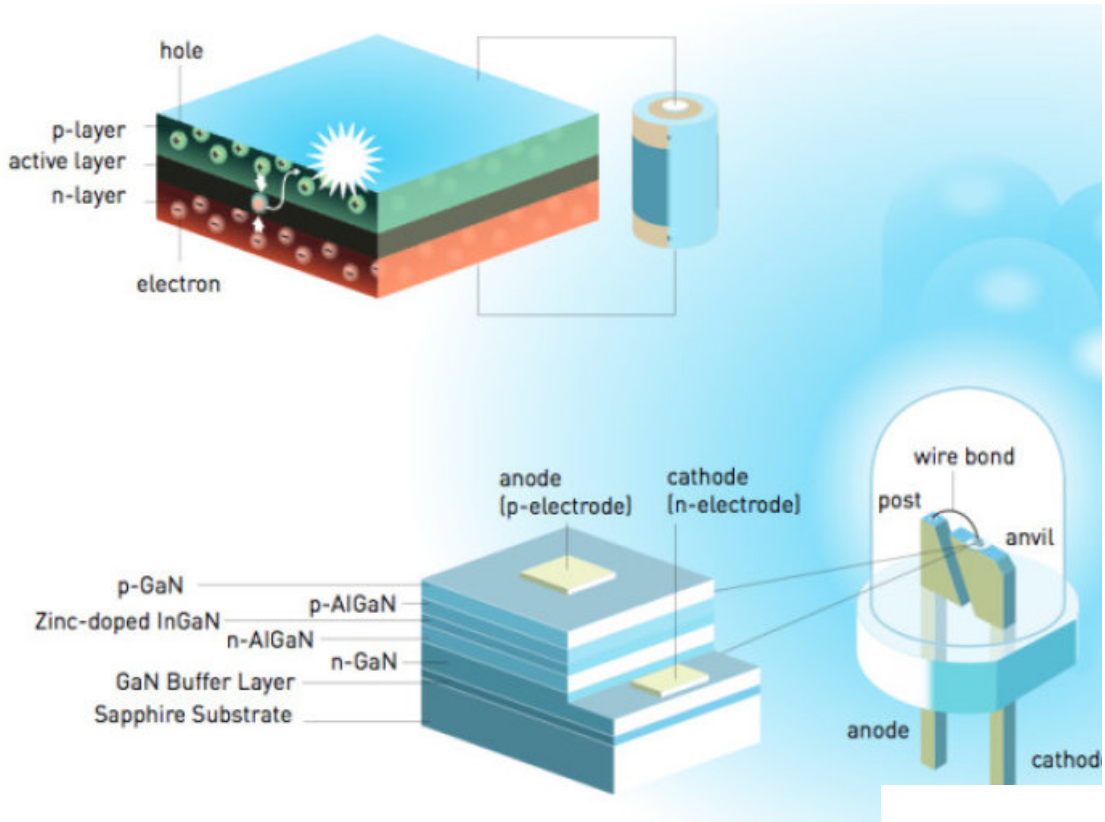


Hiroshi
Amano
1960



Shuji
Nakamura
22/5 1954

"for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources".



GaN crystal

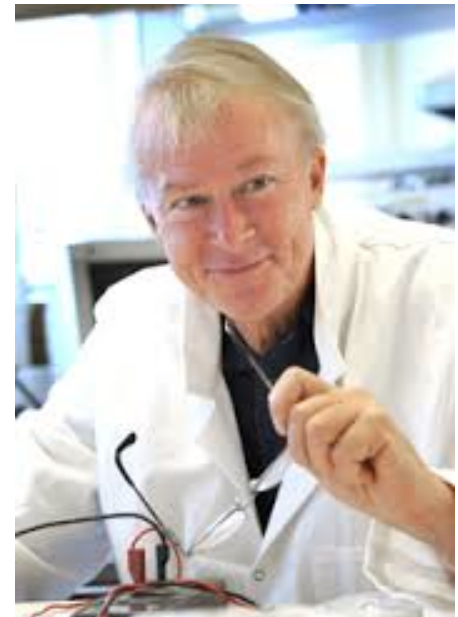
Group →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Fl	115 Uup	116 Lv	117 Uus	118 Uuo
Lanthanides	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu			
Actinides	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr			

GaN

InGaN

InGaNAs

Olle InGaNÄs





Takaaki Kajita



Arthur B. McDonald



G.T. Ewan



KUNGL.
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THE ROYAL SWEDISH ACADEMY OF SCIENCES

Thank you!