

COLLOQUIUM

A New International System of Units in 2018!?

How my Nobel Prize Contributed to this Development

Nobel Laureate

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The International System of Units (SI units) forms the basis for all measurements. With the Meter Convention in 1875 a worldwide system of units was introduced with prototypes for the meter and kilogram kept at the Bureau International des Poids et Mesures in Sevres. Even today the kilogram prototype is by definition the unit of mass whereas the unit of length has been replaced in 1983 by a fixed value for the velocity of light (in combination with the well-known time unit from atomic clocks).

Long-term comparisons of the kilogram prototype with other mass standards indicate, that the prototype is not stable with time so that the General Conference on Weights and Measures at his last meeting in November 2014 published a resolution with the recommendation to define the SI units in terms of invariants of nature; the new definitions will be based on fixed numerical values of the Planck constant (h), the elementary charge (e), the Boltzmann constant (k), and the Avogadro constant (N_A), respectively. A prerequisite for such a change is the precise experimental realization of practical standards on the basis of natural constants.

The quantized Hall resistance (Nobel Prize 1985) plays a crucial role for the implementation of a new SI system since this quantum resistance can be used not only for high precision realizations of electrical standards but also for a new realization of a kilogram by comparing electrical and mechanical forces with the Watt balance.



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11⁰⁰ – 12⁰⁰



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