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WORLD YEAR OF PHYSICS 2005

The General Assembly of the United Nations,

- *Recognizing* that physics provides a significant basis for the development of the understanding of nature,
- *Noting* that physics and its applications are the basis of many of today's technological advances,
- *Convinced* that education in physics provides men and women with the tools to build the scientific infrastructure essential for development,
- *Being aware* that the year 2005 is the centenary of seminal scientific discoveries by Albert Einstein which are the basis of modern physics,

1. *Welcomes* the proclamation of 2005 as the International Year of Physics by the United Nations Educational, Scientific and Cultural Organization;

2. *Invites* the United Nations Educational, Scientific and Cultural Organization to organize activities celebrating 2005 as the International Year of Physics, collaborating with physics societies and groups throughout the world, including in developing countries;

3. *Declares* the year 2005 the International Year of Physics.

This resolution was approved by acclamation on the 10th of June, 2004.

Albert Einstein's *ANNUS MIRABILIS*

In 2005 the whole world commemorates the centenary of the publication of Einstein's famous papers. In 1905, the 26-year-old clerk of the Swiss patent bureau in Bern, Albert Einstein, published 5 works relating to three fields of theoretical physics: quantum theory (the photoeffect), statistical physics (diffusion and Brownian motion), and, lastly, the field presently known as the 'special theory of relativity'.

Over a period of 7 months he presented his Doctoral Thesis and sent to the leading European physics journal *Annalen der Physik* four papers with a total volume of 43 pages. In each of these papers he came up with ideas which were truly radical for that time. Later on it was generally recognized that these revolutionary papers largely determined the development of physics in the XXth century, and 1905, the year of Einstein's creative outbreak, has gone down in history as his *annus mirabilis*[1]. The publication chronology of that remarkable year and exact references to Einstein's papers are given below.

March: A Einstein "Über einen die Erzeugung und Verwandlung des Lichtes betreffenden heuristischen Gesichtspunkt" (On an Heuristic Viewpoint Concerning the Production and Transformation of Light) *Ann. der Physik* **17** 132 (1905). Here, Einstein framed a new interpretation of Max Planck's idea of energy quanta and for the first time came up with the hypothesis of light quanta, which were later referred to as photons, and in fact invoked the notion of the dual (wave-particle) nature of light. His theory provided an explanation for such phenomena as the photoelectric effect, photoionization, etc., which were not described by the old electromagnetic theory of light. This work, in particular, laid the groundwork for photochemistry, and in 1921 Einstein was awarded a Nobel Prize in physics "for his services to Theoretical Physics, and especially for his discovery of the law of the photoelectric effect."

April: A Einstein "Eine neue Bestimmung der Moleküldimensionen" (A New Determination of Molecular Dimensions), Inaugural Dissertation (Zürich: Zürich Universität, 1905). In this work, a relation was established between a particle's mobility in a liquid and the diffusion coefficient (the Einstein relation). This work was approved as Einstein's doctoral thesis and was published in *Ann. der Physik* in 1906.

May: A Einstein "Über die von molekülarkinetischen Theorie der Wärme Geforderte Bewegung von in Ruhenden Flüssigkeiten suspendierten Teilchen" (On the Motion — Required by the Molecular Kinetic Theory of Heat — of Small Particles Suspended in a Stationary Liquid) *Ann. der Physik* **17** 549 (1905). This paper explained that the reason for the chaotic motion of microscopic particles in a liquid, which was observed by Robert Brown, resides in their collisions with the surrounding molecules of the liquid, and a statistical theory of this effect was proposed. It was thereby proved that atoms and molecules are real objects rather than merely a convenient working hypothesis, which was the conviction of the majority of contemporary physicists.

June: A Einstein "Zur Elektrodynamik der bewegter Körper" (On the Electrodynamics of Moving Bodies) *Ann. der Physik* **17** 891 (1905). In this revolutionary paper he outlined the special relativity principle, which generalized the Galilean mechanical relativity principle to arbitrary physical phenomena, and postulated the constancy of the velocity of light in free space. Radically new notions of space–time were derived from these two postulates, as were new laws of motion, which are the generalization of Newton's laws and pass into them in the case of low velocity bodies.

September: A Einstein "Ist die Trägheit eines Körpers von seinem Energieinhalt abhängig?" (Does the Inertia of a Body Depend Upon Its Energy Contant?) *Ann. der Physik* **18** 639 (1905). This paper was concerned with one of the most significant inferences from the special theory of relativity. It arrives at an affirmative answer to the question posed in the title and establishes the mass–energy relation in terms of the speed of light, which was subsequently expressed by Einstein in the form of the famous formula $E = mc^2$. This great formula underlies numerous effects of nuclear physics and is, in particular, employed to calculate the energy balance of nuclear reactions.

Physics–Uspekhi plans to reflect the celebration of the World Year of Physics on its pages throughout 2005. The corresponding materials will come under the heading of Annus Mirabilis.

[1] *Annus mirabilis* (lat.) — 'a miraculous year', a memorable year. We are reminded that *anni mirabiles* is encountered in the literature with reference to the years of 1665–1666 in Isaac Newton's life as well.

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