



The Chinese University of Hong Kong
Department of Physics
Science Lecture

**Bose-Einstein Condensation: Quantum Weirdness
at the Lowest Temperature in the Universe***

Professor Carl E. Wieman

Nobel Laureate in Physics 2001,

Director of the CWSEI, University of British Columbia, *and*
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Date: *May 22, 2008 (Thursday)*

Time: *2:30 p.m. – 3:30 p.m.*

Place: *Lecture Theatre L1, Science Centre,
CUHK, Shatin, N.T.*

Abstract: In 1924 Einstein predicted that a gas would undergo a dramatic transformation at a sufficiently low temperature (now known as Bose-Einstein condensation or BEC). In 1995, my group was able to observe this transformation by cooling a gas sample to the unprecedented temperature of less than 100 billionths of a degree above absolute zero. The BEC state is a novel form of matter in which a large number of atoms lose their individual identities and behave as a single quantum entity, the “superatom”. This entity is the atom analogue to laser light, and, although large enough to be easily seen and manipulated, exhibits the nonintuitive quantum behavior normally important only at much tinier size scales. The study and use of the curious properties of BEC has now become an important subfield of physics. I will discuss what BEC is and how we create it. This talk uses interactive animations and is suitable for general audiences.

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Professor Carl E. Wieman received his BS from the Massachusetts Institute of Technology in 1973 and his PhD from Stanford University in 1977. He was at the University of Colorado from 1984 to 2006 as a Distinguished Professor of Physics and Presidential Teaching Scholar. In January 2007, he joined the University of British Columbia as the Director of the Carl Wieman Science Education Initiative (<http://www.cwsei.ubc.ca>); he retains a 20% appointment at the University of Colorado, Boulder to head the science education initiative he founded. These collaborative initiatives are aimed at achieving departmental-wide sustainable change in undergraduate science education. He has carried out research in a variety of areas of atomic physics and laser spectroscopy. His research has been recognized with numerous awards including the Nobel Prize in Physics in 2001. He has worked on a variety of research and innovations in teaching physics to a broad range of students, including the Physics Education Technology Project, (<http://www.colorado.edu/physics/phet>) that creates educational online interactive simulations and studies their effectiveness. He also does research on student beliefs about physics and on problem-solving skills. He is a recipient of the National Science Foundation's Distinguished Teaching Scholar Award in 2001, the Carnegie Foundation's US University Professor of the Year Award in 2004, and the American Association of Physics Teachers' Oersted Medal in 2007. He is a member of the National Academy of Sciences and chairs the Academy Board on Science Education.

卡爾·威曼教授 1973 年畢業於麻省理工學院，獲理學士學位，1977 年獲史丹福大學哲學博士學位。他由 1984 至 2006 年出任科羅拉多大學物理學傑出教授，並曾獲嘉許為模範教師。2007 年 1 月，他加入加拿大英屬哥倫比亞大學，擔任該校卡爾·威曼科學教育計劃 (<http://www.cwsei.ubc.ca>) 主任，但仍保留在科羅拉多大學波爾德分校百分之二十的職務，主持由他創辦的科學教育計劃。這些合作計劃的目的，是要持續改善大學本科生科學教育。他的研究涵蓋原子物理學和激光光譜學的多個領域，屢獲殊榮，包括 2001 年諾貝爾物理學獎。為了向形形色色的學生傳授物理學，他從事各種研究，構思不同的革新，其中包括物理學教育科技計劃 (<http://www.colorado.edu/physics/phet>)，這項計劃創造了多個網上的教學互動模擬系統，並探討它們的成效。他還研究學生對物理學的看法和解題技巧。他在 2001 年獲美國國家科學基金會傑出教師獎，2004 年獲卡耐基基金會頒發美國大學教授年獎，2007 年又獲美國物理學教師協會奧斯特獎章。他是美國國家科學院院士，並擔任該院科學教育委員會主席。