

The Nobel Prize in Physics 2008



and the B FACTORIES



The Nobel Prize in Physics 2008 was awarded to

Makoto Kobayashi
High Energy Accelerator Research Organization (KEK),
Tsukuba, Japan

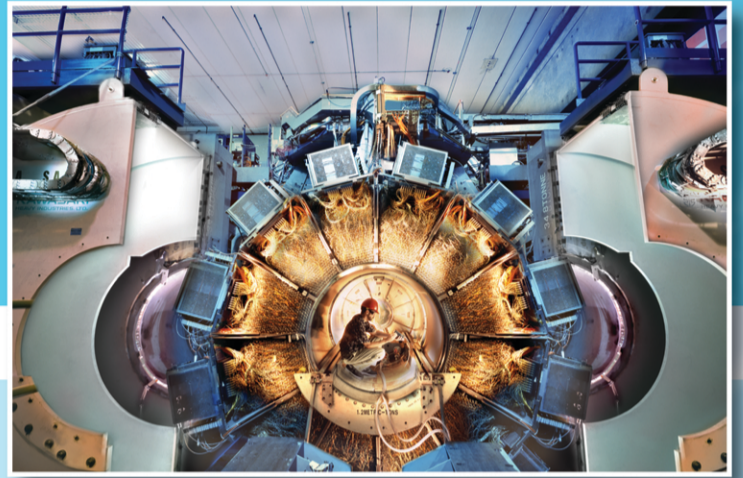
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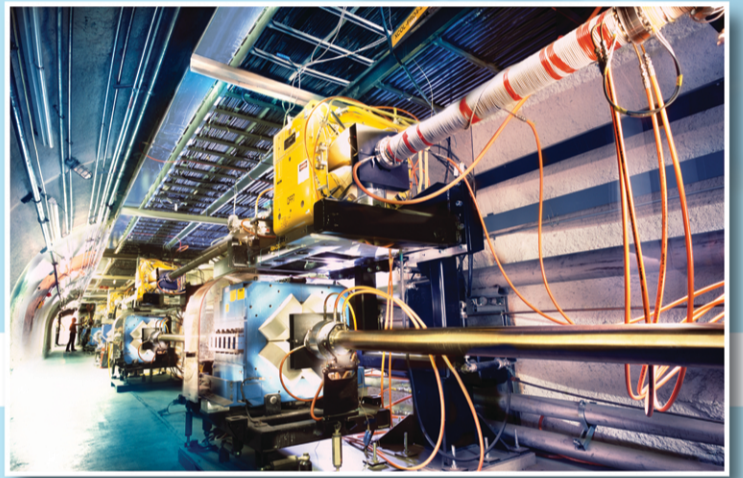
Toshihide Maskawa
Kyoto Sangyo University; Yukawa Institute for Theoretical Physics (YITP)
Kyoto University, Kyoto, Japan

and to Yoichiro Nambu, Enrico Fermi Institute, University of Chicago, IL, USA
"for the discovery of the mechanism of spontaneous broken symmetry in subatomic physics."

"for the discovery of the origin of the broken symmetry which predicts the existence of at least three families of quarks in nature"



BaBar



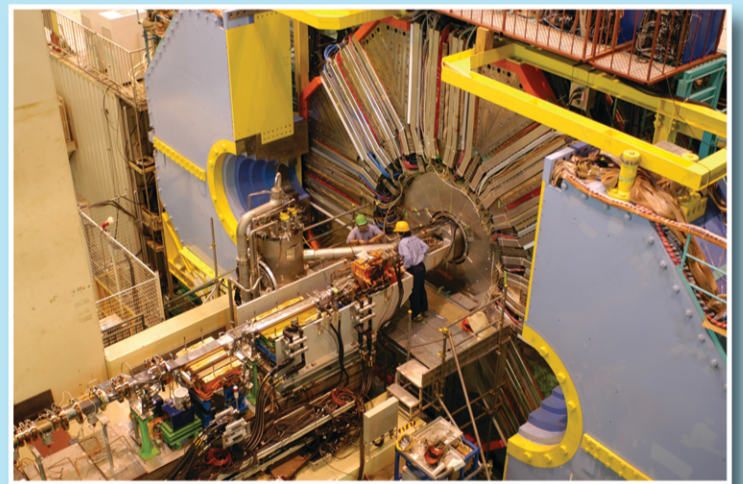
PEP-II

Broken Symmetries Predicted Extra Quarks

Matter and antimatter are nearly exact opposites of each other. But this near-perfect symmetry is broken in nature as we observe it. In 1972, Kobayashi and Maskawa discovered that the root of the mystery could be explained by the properties of quarks, the fundamental constituents of protons and neutrons, but only if there were three more types of quarks than had previously been observed. At that time, experimenters had seen the up, down, and strange quarks, but the charm, bottom, and top would not be discovered until later.

B Factory Experiments Confirmed the Predictions

Experiments at the B factories in the United States and Japan in the early 2000s made detailed investigations of billions of high-energy particles containing bottom quarks. International Collaborations at the B factories made numerous measurements of the parameters of the Cabibbo, Kobayashi, and Maskawa (CKM) mixing matrix and confirmed the precise links of these with the observed differences between matter and antimatter. The B factories each consist of an accelerator and a particle detector. At the SLAC National Accelerator Laboratory in California, USA, the PEP-II accelerator provides the collisions observed by the BaBar detector. At KEK in Tsukuba, Japan, the KEK-B accelerator supplies the Belle detector with the particles needed for these studies.



Belle

"Please accept our deepest respect and gratitude for the B factory achievements. In particular, the high-precision measurement of CP violation and the determination of the mixing parameters are great accomplishments, without which we would not have been able to earn the Prize."

小林 祐 (Makoto Kobayashi)

益川 敏英 (Toshihide Maskawa)

KEK-B

