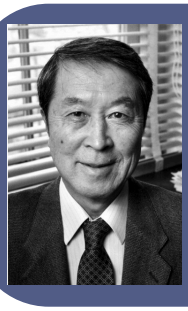
BROKEN MIRROR SYMMETRY (2008)

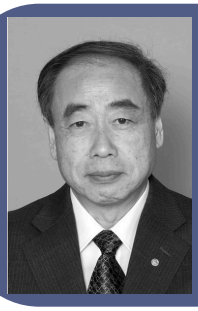
Physics constantly relies on grand truths (symmetries) to make larger statements about the universe. But, to simplify these truths, asymmetries must be identified. Mirror symmetry was interesting as it had already been in contest since the 1956 Nobel Prize.

By: Rishit and Grace



Yoichiro Nambu: Enrico Fermi Institute, University of Chicago

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



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

Mirror symmetry was broken in the 1956 Nobel Prize, when researchers determined that weak force differed in the mirror display.

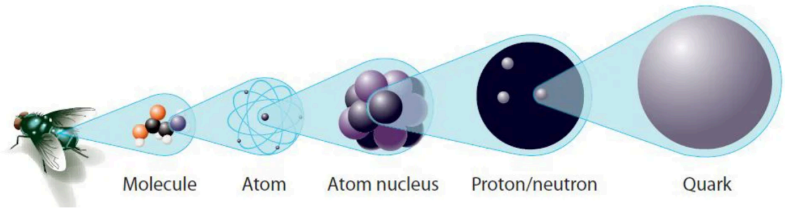
WHAT DID THEY FIND OUT? (SECTION 1)

Kobayashi and Maskawa found that the mirror symmetry was broken under certain probabilities due to the quarks (sub-particles of the protons and neutrons) interacting in certain ways under certain conditions with antiquarks and made a 3 x 3 matrix representing the probabilities to differ.

Mirror symmetry is the claim that all events occur in the same way in the real world and in the mirror world, and there is no way to tell which one you are in.

WHAT DID THEY FIND OUT? (SECTION 2)

To build on this discovery, Nambu looked to introduce the idea of spontaneous symmetry violations, where quarks would randomly change from a symmetric system to an assymetric system, which could then be used to explain how mass was assigned to different particles.



Importance:

This explains how mass was assigned to different particles at the big bang by confirming that there was a Higgs field that contained Higgs particles before the big bang. Higgs particles are important as they have unique and even properties (no spin, even positive parity, no charge, and no color charge, and can easily mold to other particles.

The Nobel Prize in Physics 2008. (2024). NobelPrize.org. https://www.nobelprize.org/prizes/physics/2008/popular-information/
Physics Nobel for matter-antimatter difference and symmetry breaking. (2024). Symmetrymagazine.org. https://www.symmetrymagazine.org/breaking/2008/10/07/physics-nobel-goes-to-symmetry-breaking-physicists?language_content_entity=und