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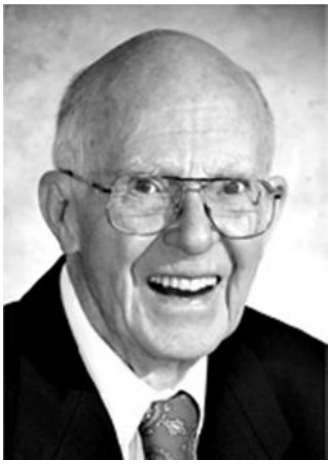
Nobel Prize in Physics 2002



Raymond Davis Jr.

Masatoshi Koshiba

Riccardo Giacconi

The Nobel Prize in Physics 2002 was divided, one half jointly to Raymond Davis Jr. and Masatoshi Koshiba *"for pioneering contributions to astrophysics, in particular for the detection of cosmic neutrinos"* and the other half to Riccardo Giacconi *"for pioneering contributions to astrophysics, which have led to the discovery of cosmic X-ray sources"*.

Information about winners:

Raymond Davis Jr
Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, USA, and
Masatoshi Koshiba
International Center for Elementary Particle Physics, University of Tokyo, Japan
Riccardo Giacconi
Associated Universities Inc., Washington DC, USA

RESEARCH INFORMATION:

Two New Windows on the Universe

The Earth lies in the path of a continuous flux of cosmic particles and other types of radiation. This year's Nobel Laureates in Physics have used these very smallest components of the universe to increase our understanding of the very largest: the Sun,

stars, galaxies and supernovae. The new knowledge has changed the way we look upon the universe.

The mysterious particle called a neutrino was predicted as early as 1930 by Wolfgang Pauli (Nobel Prize in 1945), but it would take 25 years to prove its existence (by Frederick Reines, Nobel Prize in 1995). This is because neutrinos, which are formed in the fusion processes in the Sun and other stars when hydrogen is converted into helium, hardly interact at all with matter and are therefore very difficult to detect. For example, thousands of billions of neutrinos pass through us every second without our noticing them. Raymond Davis Jr constructed a completely new detector, a gigantic tank filled with 600 tonnes of fluid, which was placed in a mine. Over a period of 30 years he succeeded in capturing a total of 2,000 neutrinos from the Sun and was thus able to prove that fusion provided the energy from the Sun. With another gigantic detector, called Kamiokande, a group of researchers led by Masatoshi Koshiba was able to confirm Davis's results. They were also able, on 23 February 1987, to detect neutrinos from a distant supernova explosion. They captured twelve of the total of 10^{16} neutrinos (10,000,000,000,000,000) that passed through the detector. The work of Davis and Koshiba has led to unexpected discoveries and a new, intensive field of research, *neutrino-astronomy.*

The Sun and all other stars emit electromagnetic radiation at different wavelengths, both visible and invisible light, e.g. X-rays. In order to investigate cosmic X-ray radiation, which is absorbed in Earth's atmosphere, it is necessary to place instruments in space. Riccardo Giacconi has constructed such instruments. He detected for the first time a source of X-rays outside our solar system and he was the first to prove that the universe contains background radiation of X-ray light. He also detected sources of X-rays that most astronomers now consider to contain black holes. Giacconi constructed the first X-ray telescopes, which have provided us with completely new – and sharp – images of the universe. His contributions laid the foundations of *X-ray astronomy.*

For more details please visit:

http://www.nobelprize.org/nobel_prizes/physics/laureates/2002/popular.html