The Nobel Prize in Physics for 2002 has been shared by Feynman, Dirac, and Schwinger.
as a factor of a third or a fourth. Through dedicated experiments, he was able to show that none of the argon atoms produced were being lost during the procedure of extraction, and that the problem was to stay for many decades.

The existence of the solar neutrino problem was confirmed by the experiment Kamiokande, located in the Mozumi mine in Kamioka-cho, Gifu, in Japan (Kamiokande: Kamioka Nucleon Decay Experiment) and with which the person sharing the prize with Davis, M. Koshita is identified. The experiment was established to search for nucleon decay, predicted by grand unified theories of the fundamental interactions. The experiment proved to be versatile enough to serve as a “neutrino telescope.” The experiment uses the principle that neutrinos coming from cosmic sources when entering a large tank of water would interact with the electrons in the water and scatter elastically off the electrons. These ultra-relativistic electrons emit characteristic Čerenkov radiation which is detected by photomultiplier tubes on the periphery of the container of the water. At Kamiokande, 3000 tonnes of water were surrounded with 1000 photomultiplier tubes. Unlike the Davis experiment, the measurements here were “real time” and also had information of the direction from which the observed neutrino was coming. These experiments were able to spectacularly confirm the existence of the solar neutrino problem. Another unexpected and brilliant observation of the Kamiokande experiment was that of 11 neutrino events in the year 1987 associated with the collapse of the neutrino-sphere of the supernova 1987A. The supernova which exploded in the Large Magellanic cloud, one of the two companions of the Milky Way galaxy, was also observed optically and in other regions of the electromagnetic spectrum, and its light curve was carefully monitored. This was the first ever supernova to be explored in this remarkable manner. The standard picture of the supernova explosion requires that a significant fraction of the energy transport out of the supernova be in the form of that transported by neutrinos in a spectacular burst. The event rates calculated for Kamiokande proved to be in agreement with what was observed. Supernova neutrinos were also observed by the experiments IMB (Irvine-Michigan-Brookhaven) and the Baksan mine experiments, which confirmed that the neutrinos observed by Kamiokande were indeed supernova neutrinos.

The direct observation of the neutrino oscillations by the Sudbury Neutrino Observatory has recently solved the solar neutrino problem in favor of a particle physics scenario whereby the electron type neutrino that is produced at the core of the sun has a finite probability of oscillating into a muon or tau type neutrino. Furthermore, no modification of the standard solar model based on which the fluxes of neutrinos are calculated is necessary (see article in Resonance, Vol. 7, No. 10, pp. 79 (2002)).

The award of the Nobel prize to Davis is one that would do the prize proud. During the 30 or years of the running of his experiment, around 2000 argon atoms were collected! At age 87, he stands as an example of the rare dedication and perseverance that is required to make a truly outstanding contribution to science. A chemist by training, Davis is Professor Emeritus at the University of Pennsylvania.

The award to Koshita is no less deserving; the courage to design outstanding and brilliant experiments to search for the unusual and to prove the versatility of experiments. At the age of 76, Koshita is Professor Emeritus at the University of Tokyo.

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