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Looking Back over 27 Years of Grant-in-Aid Recidivism

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Looking back over the evolution of my research, I couldn't have cut myself off from Grants-in-Aid even if I had tried. Among the results the program has yielded has been the ability to acquire budgets for well-equipped facilities and to pioneer new fields of research. My initial contact with the Grant-in-Aid Program took place when I moved from the University of Tokyo to the High Energy Accelerator Research Organization (KEK). Over a 27-year period from 1982 through 2008, I have in both the capacities as a principal and collaborating investigator received support every year from the program. I have listed below these many Grant-in-Aid supported projects.

From FY 1982-1984: Specially Promoted Research, titled "Verification of Grand Unified Theory; Nucleon Decay Experiment, Using Water Cherenkov Detector" (Representative: Koshiba Masatoshi)

This grant helped foster the Kamiokande (Kamioka nuclear decay) facility and its experiments. The objective of Kamiokande was to verify the Grand Unified Theory by detecting and elucidating the nucleon decay phenomenon.

From FY 1985-1986: Basic Research (A), titled "Proton Decay Experiment" (Representative: Teruhiro Suda)

This was the most discouraging period in the operation of Kamiokande, as great difficulty was being experienced in detecting nucleon decay and the future of the facility seemed bleak. Then, Dr. Koshiba detected the solar neutrino, so plans were initiated to retool the Kamiokande devices.

From FY 1986-1987: Basic Research (A), titled "Observation of Solar Neutrinos" (Representative: Yoji Totsuka)

Through a process of trial and error the Kamiokande facility was reconstructed. From the beginning of 1987, solar neutrino detection experiments started in earnest. Within two months, on 23 February a solar neutrino accompanying a supernova explosion was successfully detected. Without the improvements made to the detection devices, this would have gone undiscovered.

From FY 1986-1987: Experimental Research, titled “Development of Large Aperture, High Time Resolution and Low Noise Photomultipliers”

This was the first Grant-in-Aid project in which I was the representative, or principal investigator. We developed a photoelectronic multiplier tube for use in a Super-Kamiokande.

From FY 1988-1990: Priority Area Research, titled “Study on Elementary Particle View of the Universe” (Representative: Hirotaka Sugawara)

At this time, the sense was still that particle physics researchers and space researchers were of different species. With the Grant-in-Aid, we were able to create a new scientific domain that fused them. At this time, I was deriving great enjoyment and satisfaction from my work, serving as both a collaborating researcher and overall coordinator within the project.

In FY 1990: Experimental Research (B), titled “Development of High Performance Photomultipliers for Gigantic Water Cherenkov Detector”

Using the Grant-in-Aid, we were able to complete the development of a high-performance photoelectronic multiplier tube for the Super-Kamiokande.

From FY 1991-1994: Specially Promoted Research, titled “Study of the nu_<mu>-deficit in the Atmospheric Neutrino Fluxes” (Representative: Yoji Totsuka)

Kamiokande was able to solve what had been a puzzle for some 20 years: Along with verifying the phenomenon of solar neutrino deficit, we were also able to detect atmospheric neutrino deficit. The content of the acronym Kamiokande was changed to “Kamioka neutrino detection.” The strange phenomenon of atmospheric neutrino deficit was identified as neutrino oscillation, giving us the key to discovering neutrino mass. These achievements in neutrino research at Kamiokande gave us the impetus we need to request a budget appropriation for building the Super-Kamiokande, the plan for which was approved in 1991.

In FY 1995: Priority Area Research, titled “Development of Low Background Detector for Cosmic Anti-Neutrinos”

As construction of the Super-Kamiokande was nearing completion, I moved to Tohoku University to participate in a new form of neutrino research. In 1994, we drafted a plan for building the KamLAND neutrion experiment facility, for which a Grant-in-Aid provided start-up funding.

From FY 1996-1998: Basic Research (A), titled “Study on Neutrino Physics”

From FY 1997-2003: Basic Research to Build COE + Specially Promoted Research (COE), titled “Study on Neutrino Science under Ultra-Low Radioactivity Space”

KamLAND was selected for a Grant-in-Aid for Basic Research to Build a Center of Excellence (COE). In FY 1997, construction was started on the new facility, which would take five years to complete. In January 2002, experiments began at KamLAND. In December of that year, anti-neutrino oscillation generated in Japan’s atomic power plant was detected, and the mass of anti-neutrinos discovered. With it, the phenomenon of solar neutrino deficit, which had puzzled researchers for 30 years, was finally elucidated. In 2002, Dr. Koshiba won the Nobel Prize. In his Nobel lecture, given in December, he included the KamLAND results in the paper he presented.

From FY 2004-2008: Specially Promoted Research, titled “High Precision and High Accuracy Measurements on Reactor and Geological Neutrinos, and Solar Neutrinos”

In 2005, KamLAND successfully detected geo anti-neutrinos generated from energy sources deep inside the earth. This opened the curtain on “neutrino earth science,” which added a new dimension to earth-science research. Atmospheric neutrinos were found to be nucleon decay noise and atmospheric neutrinos to be reactor anti-neutrino noise. One gets a strong sense that “today’s noises will become tomorrow’s signals.”

Up to now, I have without fail accepted every request to serve on Grant-in-Aid committees. I do so out of gratitude for the great support I have always received from the Grant-in-Aid Program. That said, I am not completely satisfied with the state of the program as it stands today. It is my hope that we can improve those aspects of the program that need improvement, while going forward in building an even better Grant-in-Aid system.