Division Activities of Radiation Science

Present and Future Views of Division of Radiation Science

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This report introduces the Division of Radiation Science (URL: http://annex.jsap.or. jp/radiation/), which is the second oldest among the ten divisions in the Japan Society of Applied Physics: Optics, Radiation Science, Solid State Physics and Applications, Thin Film and Surface Physics, Materials Science and Crystal Technology, Education in Applied Physics, Superconductors, Organic Molecular Electronics and Bioelectronics, Plasma Electronics, and Silicon Technology. This Division was established in 1957 to support research activities on radiation science and its applications and it has sponsored many symposiums, conferences, and lecture meetings and conducted tours and other activities on radiation science and technology. Since 1974, the quarterly bulletin "Ionizing Radiation" has been distributed to all of the 400+ members of the Division.

In 2000, the following typical meetings and functions were held under the auspices of the Division of Radiation Science. A symposium on radiation technology focusing on environment problems was organized and implemented by the Division in the spring, and another symposium on fundamental radiation physics concerning the production of light and sound for new radiation detection was held in the autumn. Also, a commemorative lecture meeting in celebration of the 7th Radiation Prize was held during the 12th summer school on radiation science, conducted at a beautiful site at the foot of Mt. Kiso-Ontake. Moreover, the Division provided the general public with a festival on radiation science in cooperation with the Hokkaido branch of the Japan Society of Applied Physics and the Division of Education in Applied Physics. A catchphrase during the festival was "Let's feel the invisible light and messages from the cosmos". Various ingenious contrivances were introduced in exhibitions, demonstrations, educational games, and other entertainments so that attendees were able to understand invisible light, i.e. radiation, in a pleasant and enjoyable manner. The two-day festival at Hokkaido University was a great success with 926 participants. The latest symposium on advanced radiation technology for state-of-the-art medical treatment was held under the auspices of the Division of Radiation Science at Osaka University on August 8-10, 2001 (with 5 invited lectures, 32 presented papers, and 114 participants).

Interesting and profitable phenomena have been elucidated at the atomic scale in various fields of scientific investigation. Radiation science, on the other hand, focuses on observations at a finer scale, namely at the scale of nuclei. One century has passed since the almost concurrent discoveries of X-rays and radioactivity by Roentgen and by Becquerel and the Curies, respectively. Radiation science has made great progress during this period. The particle accelerator was invented and now various radiation (particle) beams of high quality are available. Research on radioisotopes and their uses have resulted in the development of various apparatuses with compact radioisotope-sources for detection, examination, analysis, and other purposes. A study with a particular objective needs technological innovation, which in turn acts as a seed in a scientific field. In this way, radiation science has developed as a new and attractive scientific field and embraces various interdisciplinary technologies, which have greatly contributed to the expansion of many industries and their economic value. In Japan, for example, the annual sales of durable tires, cables, and other polymers irradiated by various types of radiation amount to about ten billion dollars. This radiation technology for promoting chemical reactions in polymers does not need heat, catalysts, or solvents, which saves both energy and resources and also reduces environmental pollution. The utilization of ion beams, which are considered an advanced type of radiation, supports annual sales in related semiconductor industries of over forty billion dollars. Moreover, the economic scale of radiation-based medical treatment is now about ten billion dollars per year, and it will grow because of expected new techniques involving more delicate treatment with higher-quality radiation. Thus, radiation science and technology has become indispensable in modern society, and the Division of Radiation Science plays an important role as a central site for research and development activities for high-quality radiation and its applications.

An image-guided radiosurgery system (CyberKnife) was developed nine years ago and has achieved good results in cancer therapy. The combination of radiation science and computer technology-a compact linear accelerator mounted on a robot-has made it possible to achieve precise stereotactic irradiation for highly efficient treatment of cancer. Another successful combination is a state-of-the-art computed tomography system supported by radiation technology. Besides these noteworthy radiation technologies, I would like to stress that radiation science and technology is becoming one of the key technologies for achieving progress in society with low environmental impact, because, in essence, radiation has hardly any effect on the environment. Now may be a good time to reflect on the essence of radiation as well as radiation technology.

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