

## Science and Technology for a Sustainable Future

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My research field is theoretical high energy physics, which is probably the remotest field from daily life. So it is difficult to say something about a sustainable future from a viewpoint specific to my field. Here, I would like to emphasize the importance of basic research from a more generic viewpoint, although this has been repeatedly discussed through this forum.

I am currently working at the Japan Society for Promotion of Science, JSPS, as an executive director. One of the most important missions of JSPS is to support the research activities of universities through the allocation of Grants-in-Aid for Scientific Research, or *Kakenhi* in Japanese. These grants are so-called bottom-up type research funds, and they are the most popular kind of funding among researchers in Japanese universities. Researchers supported by these grants are predominantly working in the basic sciences. Defining “basic science” is rather difficult, but it may be characterized as curiosity-driven research.

In contrast to curiosity-driven research, there is application-driven research. Certainly, industry is strongly motivated to apply science. Beside that, solving problems faced by human beings is an important task of scientific research. Such problems may include climate change, epidemics, and resource shortages and so on. Related research has predetermined objectives, so it is different in character from curiosity-driven research.

I am not saying that application-oriented research is not important. What’s important is that both basic and applied science are advanced in a well-balanced manner.

My concern, however, is that these days funding is too slanted toward the application side with research outcomes being overly emphasized.

I think it is risky to devote too much resource to narrow research regions. Science oriented too much to outcomes would

seem fragile. No new buds will germinate from the end of a branch that has grown to full maturity. Diversity in basic science is important to bringing about true innovation. It is often the case that major advances spring out of basic research in totally unexpected ways. We cannot foresee what kind of application will appear from basic research. More importantly, sometimes basic science has capability of changing the fundamental way of thinking. We should not evaluate basic research with the same standard as applied research.

Last year, I attended the Nobel Prize award ceremony. In his opening address of the ceremony, the chairman of the board of the Nobel Foundation, Dr. Marcus Storch, said “Unfortunately, the trend today is that an ever-smaller share of our total resources is being allocated to basic research,” and “Basic research is the single most important component that enables us to meet the challenges that humanity faces.”

If we look to science and technology to provide a sustainable future, we should consider it from a long-term perspective, at least, say, on a hundred year scale.

Let me remind you that it was about a hundred years ago, at the beginning of 20<sup>th</sup> century, when theories of relativity and quantum mechanics appeared. They are the foundation of modern science and technology. They have changed science and technology profoundly. People have been receiving the benefits of research advances in these fields from that time up to the present. Scientific progress is very rapid, but there are forms of science that continue to exert influence over more than a century.

In pursuing our research, we need to think about what we can hand down to the world 100 years from now.