Completion of the BEANS Project Interim Evaluation

A subcommittee meeting for interim evaluations of the NEDO-sponsored BEANS Project was held at Otemachi Sunsky Room (Room E) from 10:30 to 17:30 on September 10, and members of the evaluation committee assessed the activities and R&D achievements produced over the first two and a half years of the project. Since NEDO will announce the results of the interim evaluation at a later date, this article will serve to describe the proceedings of the meeting and the significance of the BEANS Project summarized for purposes of the interim evaluation.

1. Overview of the Interim Evaluation Subcommittee Meeting

A total of 39 people attended the subcommittee meeting for interim evaluations. These attendees comprised 7 subcommittee members including the chair of the subcommittee, Professor Kazuo Sato of Nagoya University; 8 personnel from METI and NEDO in charge of promoting the project; 10 members of the BEANS Project in charge of implementing the project, including President Atsushi Yusa; 12 members of the subcommittee meeting secretariat; and 2 participants from the general public.

The morning session, which was open to the public, was used to give an outline of the project and to answer any questions. Hideaki Watanabe, the principal investigator from NEDO, and President Yusa, the BEANS Project Leader, gave a 50-minute presentation based on the project's records, and subsequently fielded questions from subcommittee members. The questions were primarily concerned with the outline and R&D management of the project and led to a particularly lively Q&A session between the BEANS Project members and the subcommittee members regarding the appropriateness of the project's priorities and goals, as well as the best method of expanding on the project's achievements. Consequently, the morning session ran well past the scheduled ending time of 12 o'clock.

In the afternoon session, which was closed to the public, each of the center directors in the BEANS Project gave detailed reports on research findings covering all eight themes of the project. The subcommittee members showed great interest in the latest hot topics of BEANS research. Perhaps for this reason, the afternoon session had a different mood from the morning session, evolving into a meaningful discussion with various specialists giving a wide range of views on the academic significance of the research findings and their value as industrial technologies.

The final segment of the meeting, which was once again open to the public, featured questions and comments throughout. Notably, all of the subcommittee members expressed a high regard for the project's achievements and creative activities. There was also a request to further clarify the objectives and direction of the project in order to disseminate and expand on the project's achievements and to study scenarios in which the achievements of the project could contribute to the growth of MEMS technology in Japan and help strengthen the nation's international competitiveness in industry. Following this discussion, the meeting was adjourned.

2. Significance of the BEANS Project

In preparation for the interim evaluation, we summarized the significance of the project's achievements thus far from the following perspectives: 1) academic significance, 2) market expansion/creation brought about by the achievements, 3) generation of achievements that are the world's first or highest level, 4) potential for pioneering new technological fields, and 5) versatility of the achievements. Each of these aspects of the project's significance is described briefly below.

1) Academic significance

As indicated by the name of the project, the academic significance of BEANS lies in the integration of dissimilar fields to create devices with novel functions. The following three points may be considered the substance of this heterogeneous integration.

i) Integrating different scales from nanometers to meters
ii) Integrating different processes employing bottom-up and top-down approaches
iii) Integrating different materials from biomaterials to semiconductors

2) Market expansion/creation brought about by the achievements

Process innovation created through the BEANS Project enables the manufacture of unprecedented innovative devices that will provide us with novel methods for dealing with national issues twenty years from now in such fields as energy and the environment, medical care and welfare, and safety and security. Such innovations are hoped to enrich people, lifestyles, and the Earth and to enable us to expand into a wide range of markets and to create new markets. At the meeting, we provided several examples to illustrate how the achievements of the BEANS Project can enrich people, lifestyles, and the Earth.

3) Generation of achievements that are the world's first or highest level

In the BEANS Project, we researched and developed new technologies that are only now possible through heterogeneous integration. Our presentation at the subcommittee meeting noted that, to date, the BEANS Project has produced a number of achievements that are considered the world's first or highest level, including nine such achievements from R&D item 1 on bio/organic materials integration processes, twelve from R&D item 2 on 3D nanostructure fabrication processes, and eight from R&D item 3 on large-area continuous micro/nanostructure fabrication processes.

4) Potential for pioneering new technological fields

Achievements of the BEANS Project that are expected to pioneer new technological fields were divided into the following three categories.

i) Achievements through heterogeneous integration (9)
ii) Achievements through technologies based on new concepts (9)
iii) Achievements through technological advancements (5)

5) Versatility of the achievements

An objective of the BEANS Project is to build a process platform for inventing next-generation devices through development in R&D items 1–3, and research has been carried out while envisioning target devices in each of the R&D items. However, the processes used in development were selected for their versatility. For the subcommittee meeting, devices other than the target devices that were thought to have application potential were summarized in a table.