Overview of Kibo experiment candidates for around 2012

1. Experiment Title
Epigenetics in spaceflown *C. elegans*

2. Principal Investigator
Atsushi Higashitani, Professor
Graduate School of Life Sciences, Tohoku University

3. Outline of Experiment

In addition to genetic mutation, gene silencing mechanisms via modifications of histone and DNA, and small RNA pathways, including RNA interference (RNAi) pathway and the microRNA (miRNA) pathway have been found as epigenetic functions of several plants and animals including human. The nematode *Caenorhabditis elegans* has been at the forefront of small RNA research. *C. elegans* is a free-living, non-parasitic soil nematode. It can be easily manipulated, observed and cultivated in the laboratory owing to its small size (an adult worm is approximately 1 mm in length), transparency and feeding on bacteria. A wealth of studies over the past few decades has resulted in *C. elegans* becoming a well-known model organism. For example, the complete cell-lineage, neuronal networks, muscle anatomy and genome sequence, make this an excellent in vivo model in which to conduct biological research both on Earth and in space. During the Dutch Soyuz mission DELTA to the ISS in April 2004, an international collaboration of laboratories carried out the "FIRST International *C. elegans* Experiment in space (ICE FIRST)". One of the main goals of this experiment was to validate the biological response of *C. elegans* to 10 day spaceflight. Consistent with past experiments, animals displayed a normal rate of development in flight and returned in good apparent health. With the exception of a slight movement defect upon return to Earth, which appears to be due to altered muscle development in flight, no significant abnormalities were detected. These results appear similar to what is observed for humans and suggest that *C. elegans* can be used to study responses to spaceflight and may be developed as a biological sensor. In this project, we therefore would like to investigate not only mutation by cosmic radiations but also epigenesis during long-term space flight beyond several generations. We expect that the results will offer a novel concept of the evolution to adapt to space environment.