AINO JOURNAL, Vol. 8, 2009, pp. 1 – 2

Preface

A revolution in physics in the 19–th and the first half of the 20–th century brought drastic improvements to engineering technology, as well as the life sciences, in the second half of the last century. We have experienced in our lifetimes transformative change propagating from physics to life science.

As just one example, consider the completion of the euchromatic sequence of the human genome (*Nature* 431, 931–945 (2004)) at the beginning of this century. The number of protein-encoding genes — about 20,000–25,000 — was surprisingly small, contrary to expectation. It turns out that a large number of genes is not a necessary condition for intelligence.

Many major advances in life science have also been triggered by advances in measurement technology. The invention of the scanning tunneling microscope (STM) stimulated molecular science and promoted the development of other techniques, such as atomic force microscopy (AFM) and scanning near-field optical microscopy (SNOM). These in turn enabled progress in probing materials, including biomolecules, with nanoscale spatial resolution. Developing new techniques to observe the nanoscale world continues still, utilized in life science to produce fruitful and exciting results, such as a very recent article, "*in vivo* nano-imaging of membrane dynamics in metastatic tumor cells using quantum dots," published by a group at Tohoku University (*Journal of Biological Chemistry* 285: 2750–2757 (2010)). Like many other innovative works, this has sprung out of collaboration among medical scientists and those in other fields of science and technology. In the time domain, it is now possible to measure phenomena occurring during pico- to femto-second time scales. Progress in the spatial domain has made available manipulation techniques for single cells — even single protein molecules.

Advances in life science and supporting engineering technology benefit medicine, and hence associated fields including nursing, and may change the medical system itself in the near future. A wind of change in medical politics has also begun to blow in our country. New job titles such as nurse practitioner and physician's assistant will be newly born in the Japanese medical service system, though their naming and purposes may be different from those in the United States. This will urge in turn a restructuring of the education system for so-called co-medical staff at the university level. To cope with this situation, university faculty must increase the depth of their expertise in such areas. Thus doing, the border of their expertise will expand so as to interact with those of related fields, as happened in physics about a century ago and as one can see happening in the life sciences today.

I am sure that, by offering a chance to faculty members to publish their research results, the Aino Journal contributes to enhancing the quality of research done in the Aino Gakuin.

March 2010

Shunsuke SATO, Professor
Department of Medical Engineering
Aino University