

Eligible Fields and Award Winners for 2021 Masao Horiba Awards

NOGUCHI Shintaro

The 2021 Masao Horiba Awards focused on optical/spectroscopic analysis and measurement technology in the life science field. Originally scheduled for 2020, the Awards were unusually postponed because of the worldwide COVID-19 pandemic that emerged in early 2020. At the time of writing this review, the worldwide critical situation is still ongoing despite the increasing prevalence of vaccination for the coronavirus on a global scale, especially in developed countries. This widespread virus has brought various changes to our societies and transformed our daily lives and business practices. In that process, people in general throughout the world, not only researchers, have become increasingly concerned about infectious diseases and how they affect our lives, as well as vaccines and pharmaceuticals. Amid such circumstances, we have continued our engagement in the Awards, supported by the sense of significance arising from the selection of life science-related research as being eligible for this year.

In addition to the development and production of novel pharmaceutical modalities (e.g., biopharmaceuticals), which have been in demand since the pre-coronavirus time, the development and production of vaccines and therapeutics for COVID-19, which have been attracting intense attention in society today, were chosen as eligible research areas for this year's Masao Horiba Awards. Directly linked to human health and lives, the latter has become a heavily invested high-profile area of study throughout the world. We hope that the 2021 Awards will serve as an opportunity that will lead to the establishment and expansion of networks for accelerating research and development (R&D) in this area. In the technology aspect, the Award eligibility focused this time on optical/spectroscopic technologies, which are not analysis technologies widely employed in life science, such as separation and mass analyses. Furthermore, considering that R&D and production could make substantive contribution to people's well-being across the globe only when these elements both proceed successfully, we counted real world applicability of research as an important aspect. The Awards' specific intentions and eligible technology areas are as follows.

<2021 Masao Horiba Awards>

Our society seeks to cure disease, and goal that unites the world and the pharmaceutical industry relies on scientific advances in medicine, to drive innovation in medicines. In new collaboration of medical field and drug discoveries, macromolecule drugs derive from nucleic acid and antibody, as well as the pharmaceutical research using calls and extracellular endoplasmic reticulum became active along with the conventional small-molecule drugs.

As research fields diversified, the needs toward analysis methods became diversified, and there is a high expectation toward optical/spectroscopic technologies along with the conventional separation method. In order to disseminate the newly developed drug efficiently to the people, establishment of sophisticated production process responding to the each modality of the drug is

also required. Measurement using optical/spectroscopic technologies is becoming also important for this requirement. In addition, the optical/spectroscopic methods have strong strengths as non-destructive or less damaging method for the live specimen. In order to take full advantage of this strength, development of the sampling and pretreatment method is also important in addition to the research on basic principle and hardware development. It is also obvious that not only the innovation of spectral and imaging but also data science approach to link these data to the actual phenomena is also important. This approach must contribute to R&D efficiency and production process improvement. The Covid-19 pandemic has spread throughout the world, greatly increasing stress in our lives. The race to create a safe and effective vaccine is important not just to prevent the disease itself, but to reduce the additional health issues and suffering that result from systemic stress. Overall, the most effective approach to solve real problems, incorporates an interdisciplinary approach from basic research all the way to implementation.

Based on the background described above, the 2021 Horiba Masao Award solicits research in the field of life science, notably state-of-art optical/spectroscopic measurement technologies which have the potential to transform drug discovery and manufacturing processes. This award asks for research especially applicable to industry and that can be dedicated to production processes.

With this in mind, we have set the following technical fields to be covered.

<Eligible fields for 2021 Masao Horiba Awards>

The award is focused on the optical/spectroscopic analysis and measurement technology which contribute to the advanced drug discovery and pharmaceuticals within the field of life science that increase the efficiency of development and production processes as well as applicable to other industries, specifically the technologies that encase the following aspects.

1: Measurement and automation technologies based on optical/spectroscopic techniques related to the production process of proteins or cells.

The result of the research will improve the efficiency of the production process, or is related to process control using a data science/data management system.

2: Analytical research for bio samples based on spectroscopic techniques in the field of drug discovery and manufacture.

The research takes into account the future industrialization or production process of cells, microorganisms, extracellular particles in the pharmaceutical field.

*We expect the applications relating to the interdisciplinary research and development on the sample preprocess utilizing microfluidic devices as well as the data analysis method applying data science.

As stated above, the eligible areas for this year's Awards included not only research for drug discovery and development (i.e., R&D) and research for higher productivity, but also research that can bridge these two research domains (e.g., research on pretreatment of specimens and on data analysis). As a result, we received many applications from researchers in various fields ranging from pharmaceutical science and biotechnology to information technology. We would like to thank those researchers for taking the time

and effort to submit their applications.

The Screening Committee had a difficult time selecting the Award winners from among the many applicants whose research was valuable, all potentially leading to treatment, diagnosis, and/or drug development; the following decision resulted from their strict evaluation: the Masao Horiba Award went to Dr. Takuya Iida at Osaka Prefectural University, Dr. Sadao Ota at The University of Tokyo, and Dr. Kazuhide Sato at Nagoya University, and the Honorable Mention to Dr. Sanghong Kim at Tokyo University of Agriculture and Technology.

Dr. Iida established a system to condense biomaterials in a microfluidic device (light-induced acceleration system; LAC-SYS) and created a platform for a rapid and highly sensitive optical bioanalysis technology. Dr. Ota, based on the concept that image reconstruction is not necessarily needed in image analysis where it is performed by a machine, established a technique called ghost cytometry, an image-reconstruction-free ultrafast cell identification and sorting method employing direct analysis by artificial intelligence. Dr. Sato developed near-infrared photoimmunotherapy (NIR-PIT), a novel cancer therapy with an extremely low burden on patients. Also, on the basis of the characteristics of the probe used in NIR-PIT, he elucidated the mechanism by which this therapy induces cancer cell death and established a method for therapeutic effect measurement. Dr. Kim, the Honorable Mention winner, developed a novel statistical analysis model utilizing near-infrared absorbance spectral data that enables real-time quality monitoring in pharmaceutical production processes.

In our current situation, where early development and market supply of safe and secure vaccines and pharmaceuticals are awaited so eagerly, highly advanced analysis and monitoring techniques suitable for various pharmaceutical modalities are indispensable. The research by the awardees is certain to contribute to fulfilling such needs for years and decades to come and to provide answers to the aforementioned concerns of people around the world. These researchers' accomplishments are well worthy of the Masao Horiba Awards. It is our hope that the Awards will aid in further advancement in their research activities and thereby realization of the timely availability of vaccines and therapeutics desired in the future.

Last but not least, we would like to extend our gratitude to those who made possible and supported our engagement in the Awards in this difficult time with the coronavirus.

* Editorial note: This content is based on HORIBA's investigation at the year of issue unless otherwise stated.



NOGUCHI Shintaro

Bio/Life Science Project
Sales Division
HORIBA, Ltd.