

Research Institute for Light-induced Acceleration System (RILACS)

Purpose of RILACS

1. Play a role of the world's first core research institute for the development of "Light-induced Acceleration System (LAC-SYS)".
2. Promote basic and applied research of LAC-SYS and contribute to the realization of Super smart society (Society 5.0).
3. Work with other research institutes and companies for collaborative research and fostering young researchers.

Outline of Research Activity

By constructing the guiding principle of "Light-induced Acceleration of Biochemical Reaction" from the viewpoint of optical science and quantum science, we will clarify various phenomena in the coexisting system of biomaterials and non-biological materials, and will pave the way to the remote and non-destructive control of various kinds of vital phenomena.

Based on the principle obtained from such basic research activities, we aim to build a worldwide center for research and development of a low-cost, simple and on-demand type "Light-induced Acceleration System (LAC-SYS)" designed according to the characteristics of biomaterials such as nucleic acids, proteins, peptides and living samples such as cells and bacteria.

In particular, we will clarify the principles for extremely efficient methods for double-stranded DNA formation, concentration of living bacteria, introduction of drug into cells, and assembling energy conversion materials. With these principles, we will develop the world's top of high-throughput bioanalysis techniques with high sensitivity and detection speed, high efficiency drug delivery system (DDS), and compact and flexible energy conversion system.

Utilizing the obtained results, we will provide an innovation in a wide range of applied fields such as food inspection, clinical examination, pharmaceutical development, environmental technology, energy conversion technology, etc. through collaboration with research institutes outside the university and enterprises. These activities will contribute to the realization of the "Super smart society (Society 5.0)" of the science and technology plan of Japan.

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Target: Development of "Light-induced Acceleration System (LAC-SYS)" of Biochemical Reaction

Optical control of DNA
Patent: PCT/JP2014/064496
Genetic screening Sci. Rep. 2016

Optical control of Proteins
Patent: JP2013-096817
Allergy test JPCC 2014

Optical control of bacteria and cells
Patent: PCT/JP2015/063364
Hygiene, Medical care Opt Mater. Exp 2016

Social innovation by "Smart Biophotonics"
Low cost, compact, rapid and sensitive detection system
=>Quick detection, recording, providing data with portable device

On-demand "Light-induced Acceleration System (LAC-SYS)"
For various biological samples
Big data
Reflectorless spectrometer (CCD spectrometer)
Acceleration laser

Connection to "Biological Infrastructure" with LAC-SYS
Component: Laser source, lens, sample holder, detector

#Rapid, sensitive food inspection & environmental measurement
#Stress free diagnosis of genetic disease and cancer
#Evaluation of new medicine in a cell & drug delivery system

Quarantine & food maker
Air & water
Clinic
Large hospital
Large amount of sample
Results after 2-3 weeks

Toward "Super smart society" (Society 5.0)

Food safety & Environmental problems
Medical test and treatment

Members

Director

Takuya Iida (Associate Professor, Graduate School of Science)

Researchers

Classification	Associate Professor	Special Lecturer	Specialized Assistant Professor
Graduate School of Engineering	Shiho Tokonami		
Organization for Research Promotion		Ikuhiko Nakase	
Graduate School of Science	Goro Oohata Atsuko Kosuga		Mamoru Tamura

Guest Researchers

Organization	Position	Name
Theoretical Physics Research Group and Faculty of Applied Sciences, Ton Duc Thang University, Vietnam	Lecturer	Nguyen Duy Vy
Graduate School of Engineering Science, Osaka University	Associate Professor	Syoji Ito
School of Advanced Science and Engineering, Waseda University	Professor	Kohei Imura

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