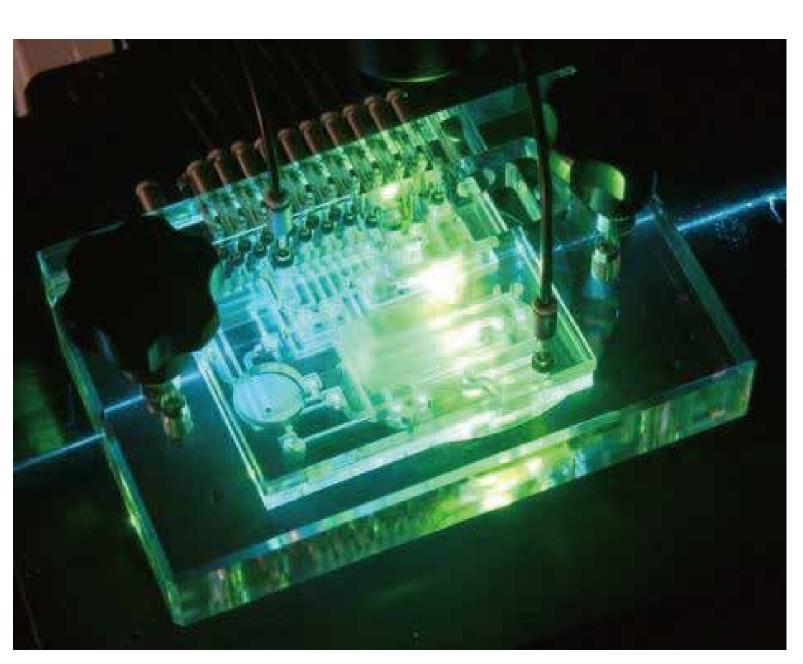
Bioelectronics and Biotechnology

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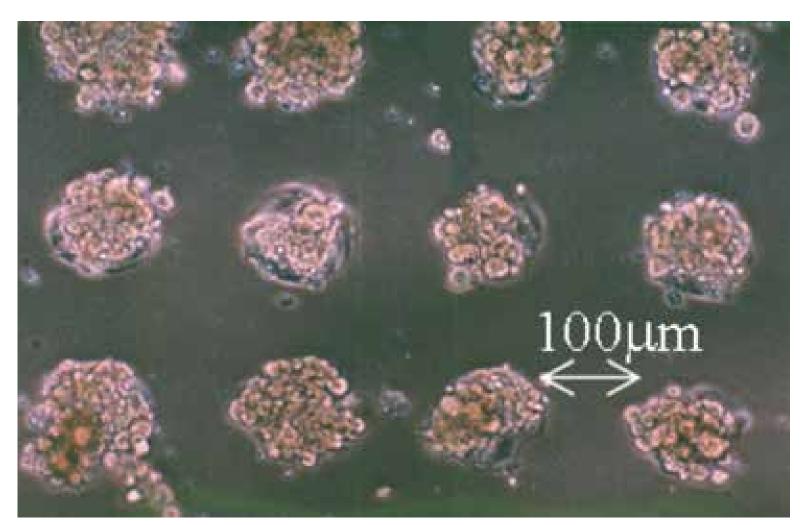
In the field of bioelectronics and biotechnology, extensive studies as well as its development related to artificial organs, biocompatible materials, energy conversion systems, and drug delivery systems, utilizing the inherent, unique, and original functionalities of biomolecules and organisms, have been performed. The desire of human being for a long and healthy life has motivated the development of robots for nursing and advanced medical systems. We predict that studies in this field will contribute to a sustainable society, a long and healthy life, personalized medicine, and so forth.

Fundamental Research and Development

- 1) New materials: biomimetic and biocompatible materials, functional biomolecules
- 2) Precise interfacial control: surface modification, molecular interaction explication
- 3) Analysis: localized nano-structural and functional observation, kinetic interpretation
- 4) Fabrication: ubiquitous system, chip device
- 5) Novel devices: bio-computer, nerve circuit, smart sensor
- 6) Medicine: regenerative medicine, drug delivery system, nursing robot
- 7) Energy: photosynthesis, biomass, bio-fuel cell



MicroRNA diagnostic device (Prof. T. Ichiki, Univ. Tokyo)



Cell Chip Device (Prof. H. Otsuka, Tokyo Univ. Sci.)

Fusion between bioand other technologies

New Devices

Progress toward novel systems

Integrated Photonic sensor Photonic communication Surface modification New functional material Biomimetic material Diagnosis chip

> Micro biomachine Cell chip device **Artificial organ**

> > Drug delivery system Regenerative medicine

Environmental recovery Waste treatment

Harmful fungus check CO₂ fixation

Human imitation robot

Nursing robot

Bio-computer

Bio-fuel cell

High functional sensing technology Single molecule detection combining multiple methods Super high-sensitivity

Smart healthcare Order-made diagnosis Physical enhancement Cognitive enhancement Implantable biomarker detection system **Human-machine interface** Real time cancer diagnosis Particular fusion with iPS cell technology

Final Goal

Food self-support New energy supply Taylor-made medicine Long and healthy life Sustainable society

2010 2025 2030 2035 2020 2015 2040 2045

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