The achievements of cooperation of NanoLSI WPI KANAZAWA UNIVERSITY with researchers and institutions in the UK

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wpi
World Premier International Research Center Initiative

KANAZAWA UNIVERSITY

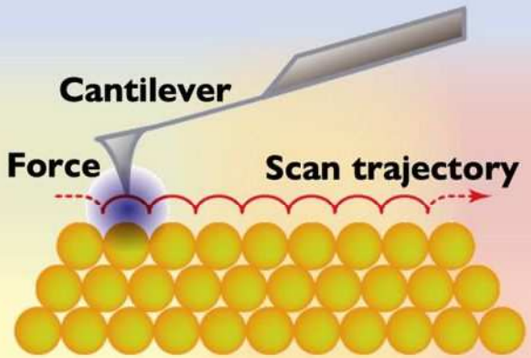
UK-Japan Higher Education Forum
8th December 2022

What is Nano Life Sciences Institute（WPI-NanoLSI）?

Inaugurated in **2017** as one of the research centres of the **WPI Program**, Japan's flagship research programme.

Life Science
Cancer Research

Research core: Bio-Scanning Probe Microscopy (Bio-SPM)



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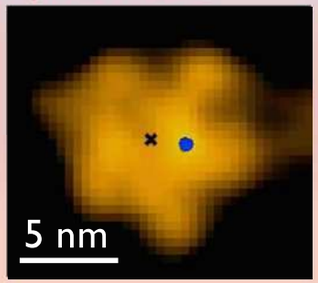
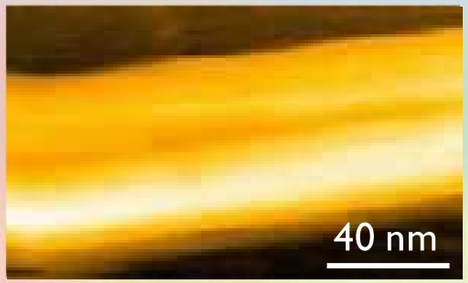


Science (2011)

Cellulase



Science (2011)

Computation
Simulation

Nanometrology
Bio-SPM

Chemistry
Supramolecule

Aim to obtain a fundamental understanding of the mechanisms of complex life phenomena such as disease, senescence, and the emergence of life.

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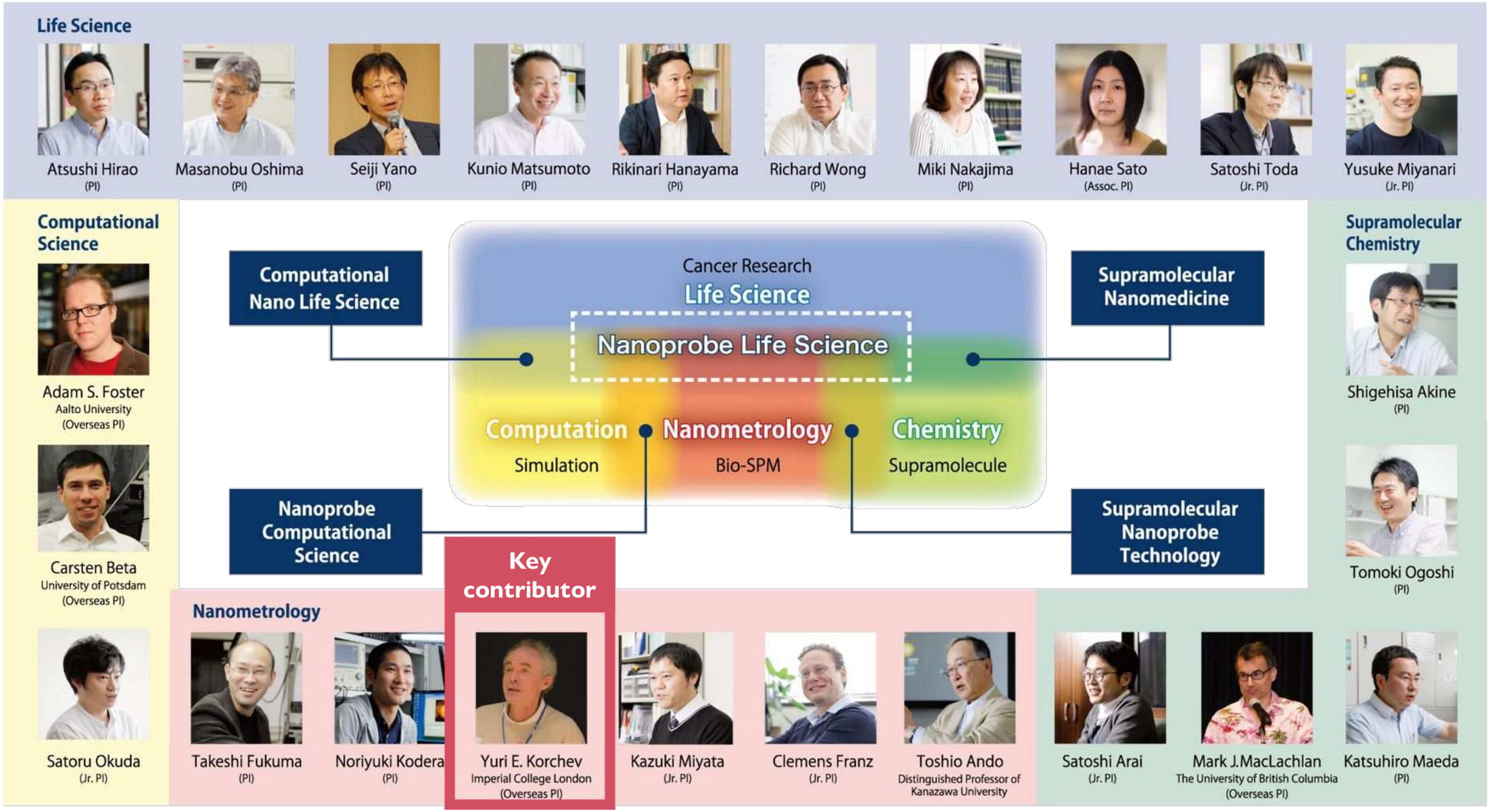
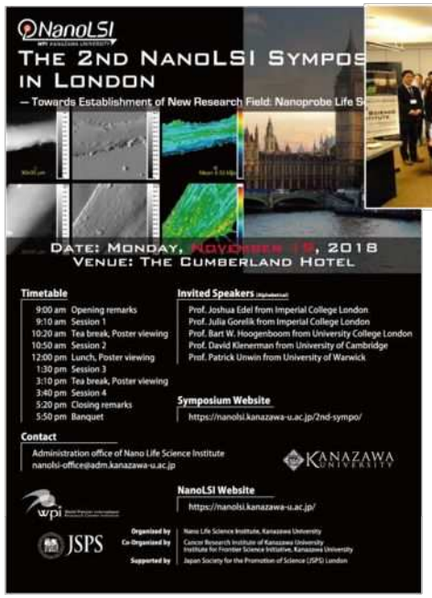


Collaboration with ICL, with the Overseas PI as a Key Contributor

Key contributor

Yuri E. Korchev
Imperial College London
(Overseas PI)

2018



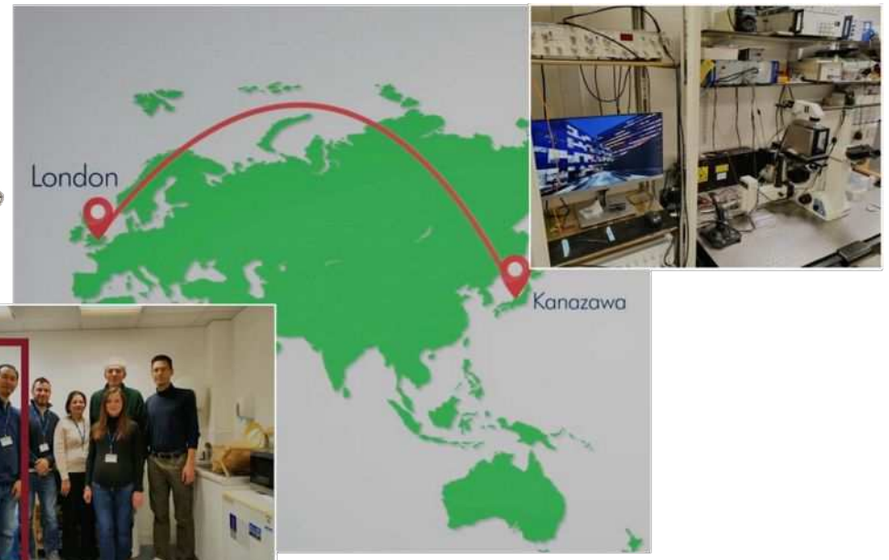
NanoLSI Symposium in London

- **5 invited speakers from the UK**
- **53 participants from worldwide**

2019

LT Int'l Joint research agreement

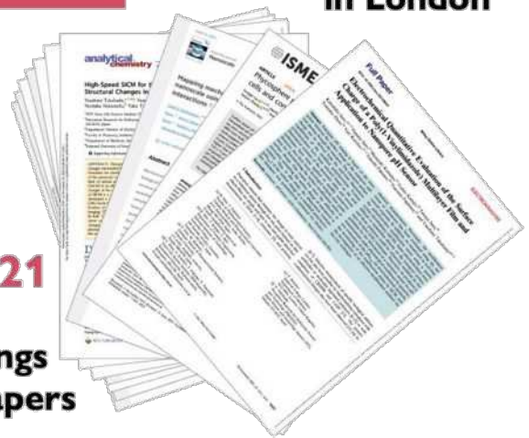
2019



ICL Satellite Centre of NanoLSI

International brain circulation

~ 2021



Research findings fruition in 9 papers

Brain circulation through our unique outreach programmes

Open Facility Programs at NanoLSI

Opportunities to use world-class Biological Scanning Probe Microscopy Facility

Introduction

Researchers at Nano Life Science Institute (NanoLSI), Kanazawa University have engaged in the pioneering development of original Biological Scanning Probe Microscopy (Bio-SPM) technologies, such as high-resolution AFM (FM-AFM/3D-AFM), high-speed AFM, and scanning ion conductance microscope (SICM), and applied them to the life sciences. We are pleased to offer you opportunities to use our facilities for imaging your own biological samples or materials for biological research, and realize their potentials. Through the programs, we would like to foster research collaborations and networks.

Bio-SPM Technologies Available

High-resolution AFM
(FM-AFM & 3D-AFM)

FM-AFM (Frequency-modulation Atomic Force Microscope) can visualize subnanometer-scale surface structures in solution. Combined with 3D scanning technique, it can also visualize 3D distribution of hydration and flexible surface structures at solid-liquid interfaces. The imaging rate is typically 1 min/frame. The spatial resolution is 0.3 nm in the lateral direction and 0.01 nm in the vertical direction.

High-speed AFM
(HS-AFM)

HS-AFM (High-speed Atomic Force Microscope) can visualize moving objects in solution. Its temporal resolution is typically 100 ms/frame, while the spatial resolution is 2-3 nm in the lateral direction and 0.15 nm in the vertical direction. When it is applied to protein molecules in action, the acquired HS-AFM images can provide a significant insight into how the molecules function.

Scanning Ion Conductance Microscopy
(SICM)

SICM has a unique measurement principle and provides unprecedented opportunity that enables submicroscale functional imaging of single live cells by a combination of nanoscale local stimulation and noncontact topography imaging. The imaging rate of SICM is 30-300 s/frame. Spatial resolution of the instrument is 10 nm in the lateral direction and 5 nm in the vertical direction.

AFM for Cell Measurement
(HS-AFM & nanoendoscopy-AFM)

Based on high-speed AFM or 3D-AFM, NanoLSI is developing new AFM technologies. For example, high-speed AFM successfully visualized the surface structure of bacteria at a molecular scale, while a nanoendoscopy-AFM technique developed on the basis of 3D-AFM has succeeded in 3D observation of cell nucleus and actin fibers inside living cells, surface stiffness measurement of cell nucleus, and so on.

- **For young researchers**
- **Hands-on style school**
- **1 week in August every year**

2018-2022

- **181 applications from 34 countries**
- **73 participants from 15 countries**
- ➢ **3 participants from the UK**

- **For any researchers**
- **Up to several months**
- **3 calls per year**

2018-2022

- **116 applications from 17 countries**
- **110 projects from 15 countries adopted**
- ➢ **1 project from the UK implemented**

Prof Bart Hoogenboom
University College London
(Biophysicist)

For PIs
More than 1 month
e.g., sabbatical leave
Anytime in a year

Prof Anthony Watts
University of Oxford
(Biophysicist)

Panoramic view of the Kakuma Campus, Kanazawa University

Thank you for your kind attention.

KANAZAWA UNIVERSITY

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