

Ultra high-speed multiplexed sensing system beyond evolution for detection of extremely small amounts of substances

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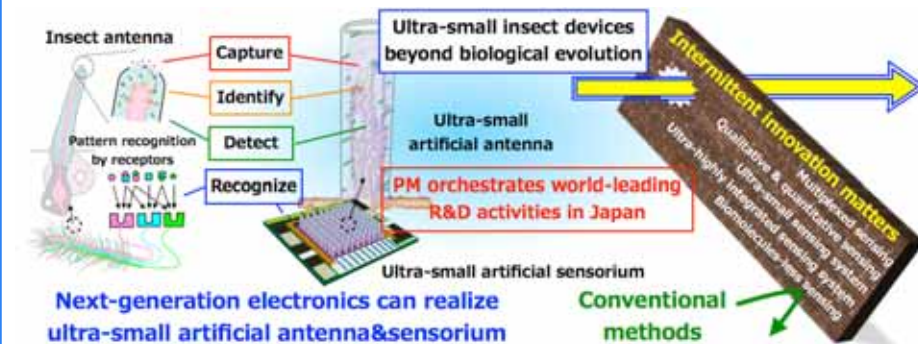
1982 Graduated from Ochanomizu University
 1982 Entered Toray Industries (Basic Research Laboratories)
 2001 Senior Researcher at Toray
 2004 IP manager at Nagoya University (on external assignment from Toray)
 2010 Specially-appointed professor at the Nagoya Univ. Office of Industry Liaison
 2014 ImPACT Program Manager

Profile

Engaged in comprehensive research and development at Toray Industries with experience of commercialization and research management. Winner of the Technology Award of the Society for Biotechnology, Japan. Engaged in management of industry, academia and government joint research in combined fields at Nagoya Univ.. Maintains a strong network of industry, academia and government specialists. Doctor of Agriculture (Kyoto Univ.).

Disruptive innovation

Achieve disruptive innovation that can achieve previously impossible ultra fast multi-item sensing systems for trace amounts. To achieve this, assemble Japan's top R&D capabilities and establishing next generation electronics more advanced than biological evolution.



The Challenges for the PM and the Impact of Success

Overview and background

Using ultrafine electronics that exceed the exceptional biological capabilities of insects, achieve a simple and effective method for protecting ourselves from the harmful and hazardous substances around us so that everybody can achieve a healthy and comfortable lifestyle. Detect risks of harm and danger quickly and easily and achieve a society in which the public feel safe and secure.

Impact on industry and society

By making a simultaneous multi-item sensing system for trace quantities of substances commercially available cheaply, it will be possible to forecast and prevent harm anywhere at any time. Achieve the world's most pleasant, safe and secure society. Create a next generation industry with a scale of \$ 1 trillion through implementation in towns and homes, and big data system related businesses.

Achieve a society in which the public feel safe and secure. Create a global market of 1 trillion USD.



Scenario for Success and Achievement Targets

✓Methods of resolution leading to achievement (approach)

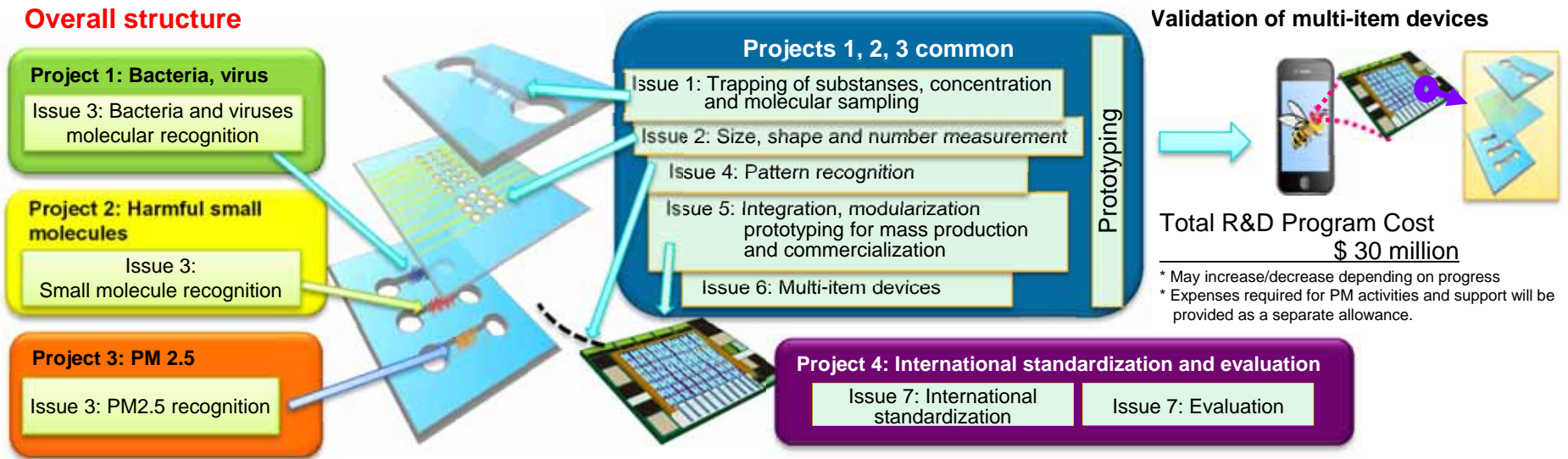
- In insects, biological evolution has achieved a wonderful capacity to detect single molecules of substances with high sensitivity and identify tens of thousands of substances using antennae of several millimeters and a perception center system. The aim of this program is to achieve the same thing with a simultaneous multi-item sensing system.
- As an approach that will secure advantage over conventional methods, work on other excellent technologies with highly selective molecular recognition technologies suitable for each target substance, compare and select several methods through competition and collaboration, with management and elimination using the stage-gate method. Confer these molecular recognition technology functions to the common device substrate and invent the optimal Insect device.

✓Achievement targets and risks

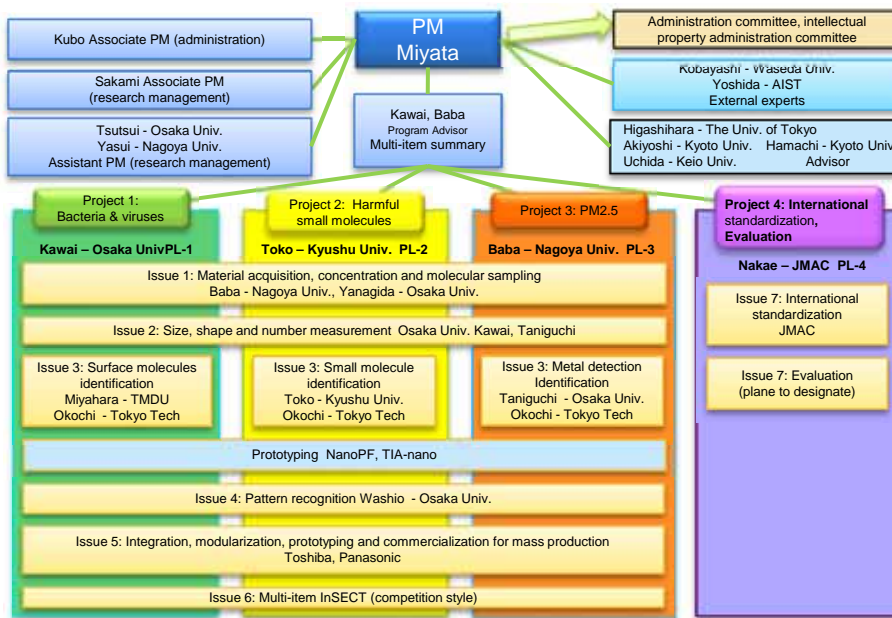
- In addition, realize socially implementable ultra compact devices (Insect devices) with an evaluation system, and commercialize systems that can sense trace quantities of harmful or dangerous substances anywhere at any time (ultimate target: Detection of a single molecule with measurement time of 5 minutes).
- By breaking through the fundamental technological barriers in advanced micromachining processes and electronics, establish a role model for the next generation electronics industry and create an industry with high international competitiveness.

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Overall R&D Program Structure Created by the PM



Implementation Structure as Assembled by the PM



✓ Keys of the Implementation Structure

Work on other excellent technologies with highly selective molecular recognition technologies suitable for each target substance, compare and select several methods through competition and collaboration, with management and elimination using the stage-gate method. Confer these molecular recognition technology functions to the common device substrate and invent the optimal InSECT device.

✓ Approach to selection of institutions

- During the building phase, hold workshops to understand the technology. Then hold several study meetings with the workshop members and select Japan's top level molecule identification technologies, highly selective materials and ultrafine electronics technologies suitable for each target material.
- After the PM has nominated several people in the workshops and study meetings, the nominees will submit proposals in a competition format.
- The technologies employed will be revised every 6 months to a year through competition to select the truly top level technologies.
- To achievement the target of Issue 6, it is important to be able to develop devices capable of measuring multiple items simultaneously. The PM will publish the specific results required and specifications and request proposals through competitive public invitation.