

# ISIM2011

International Symposium on Integrated Microsystems

## Introduction of the “Research Center for Ubiquitous MEMS and Micro Engineering”



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Ubiquitous MEMS and Micro Engineering  
(UMEMSME), AIST

Macro BEANS & G-device Center



# Welcome to Tsukuba

Ubiquitous MEMS and Micro Engineering(UMEMSME梅娘) / AIST



Food



Me (when he was several years ago)



Golf

# TIA (Tsukuba Innovation Arena)

## 6 Core Research Domains

### Power Electronics

Integrated R&D frame from SiC wafer , device to power system

### Nanoelectronics

- Nano CMOS
- Silicon -photonics
- Carbon -electronics
- Backend device
- New material
- Advanced lithography(EUVL)

### N-MEMS

High -value -added  
MEMS and mass production  
integrated N -MEMS

### Nano -Green

R&D framework for green innovation  
driven by nanotechnology

### Carbon Nanotubes

R&D framework of CNT mass  
production and CNT composites for  
wide applications.

### Nano -Material Safety

Integrative data center and research  
frame for nano -material safety.

## Nanodevice Research Foundry

- Prototype device (45-65nm CMOS and N-MEMS, etc.) fabrication and evaluation (φ200-300mm)
- SiC power device fabrication and evaluation

## 3 Core Infra -structure

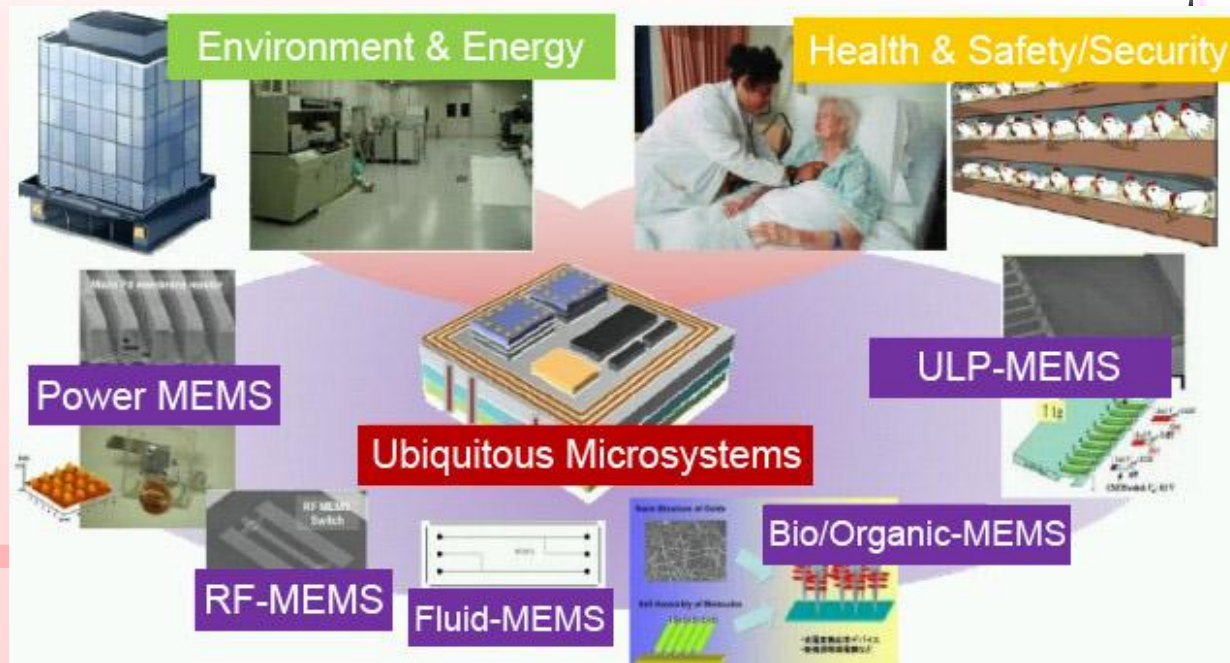
### Nanotech Open User Facilities

Open user research facilities in AIST  
and NIMS (nanocharacterization ,  
nanoprocessing etc)

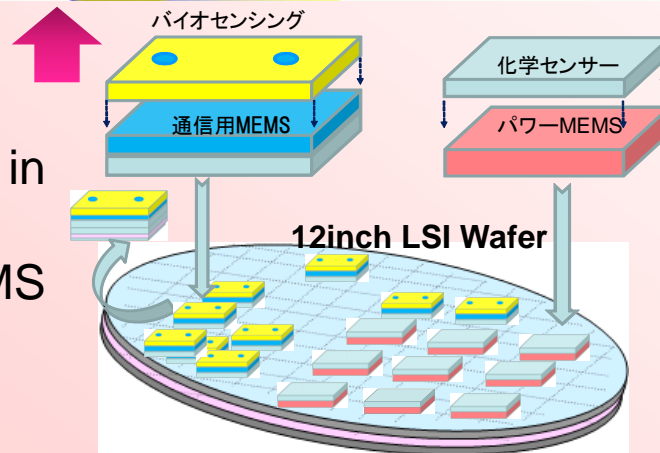
### Networking School of Nanotechnology

Graduate school function through  
cooperation of University of Tsukuba  
and partnering universities .

# UMEMSME Research Strategy



- ✓ Highly Integrated MEMS in Wafer-scale
- ✓ Large Area (Macro) MEMS





# Facility Feature Detail

**2G Existing  
4 inch Line**

**New Investment:**

**3D (351 m<sup>2</sup>) 8inch MEMS and 12 inch Integration**  
**3F(60 m<sup>2</sup>) Bonding and Testing, 2A(84 m<sup>2</sup>) Evaluation**  
**3B (154 m<sup>2</sup>) Green Testing**



- Green and Safety Management
- Important is Not Facilities but Manpower
- Invite SMEs of Polishing, Electroplating, etc.

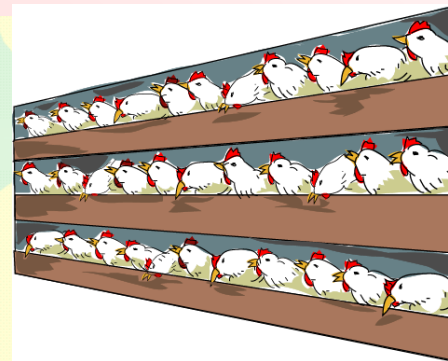
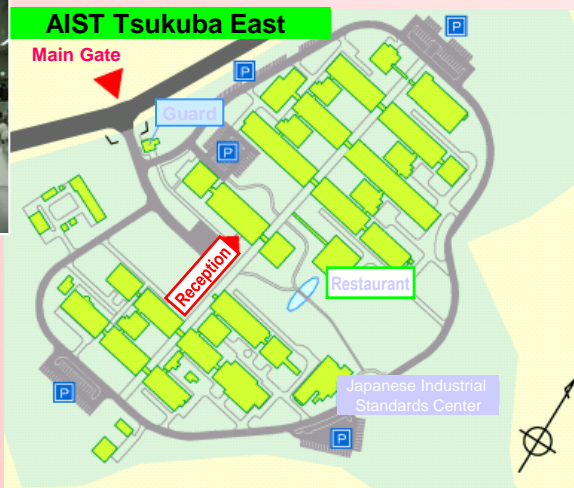
# UMEMSME looks for Low Carbon and Safe Society

*R&D and Prototype Environment for Emerging Industries*

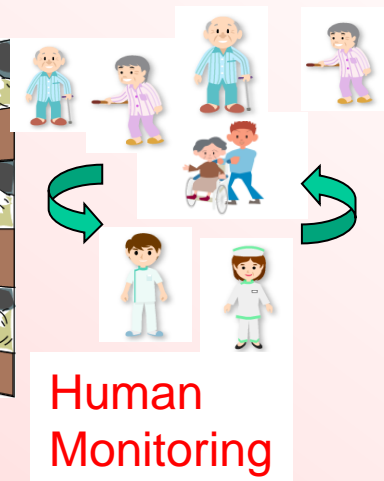
TIA N(Nano and Network)-MEMS is featured as;

- Easy Access for Aliens [Support Industries Throu Services](#)
- Low Cost and Flexible [MEMS Integration Line for Flexible Water Size](#)
- Create Market Through Test Field of Wireless Networked MEMS [ogy and Safety Management Clean Room and Data Center](#)

Safety and Health Monitoring for Aged, Juvenile and Feathered



Bird flu detection

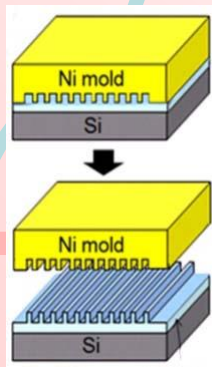


# Strategy of Hetero Integration

Border line of Business success

Cost down strategy by large wafer level production and new low cost process

Introduction of Flexible and high reliability process

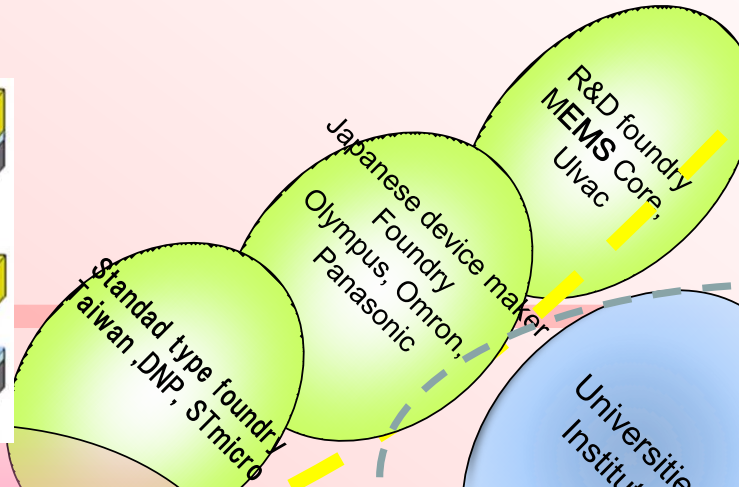


**Integrated Mass Production**

(RF, Power, IR imager, etc)

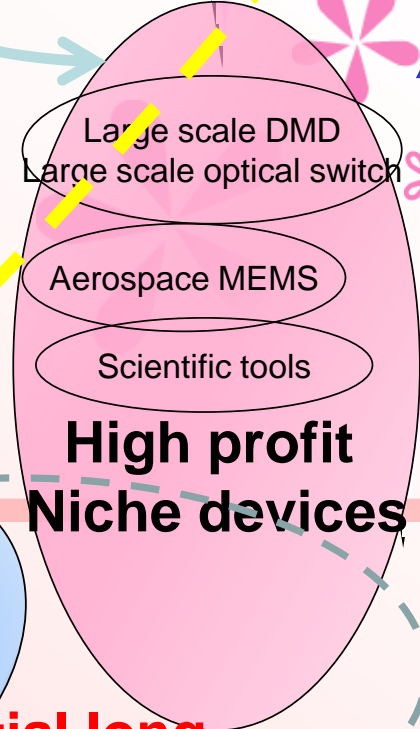
Automobile, Robot, Healthcare,

High volume production



Universities Institutes

**Potential long tailed needs**



**High profit Niche devices**

Product price per unit

Small Batch production

# CRs with Energy & Safety Management

- Carbon Foot Print Calculation of the Fabricated Device by Networked Sensing
  - Visualization of Energy and Mass Consumption
- Pricing Action by Carbon Foot Print
- Security Monitoring of Staff





# Wireless Sensor Applications for Animal Health

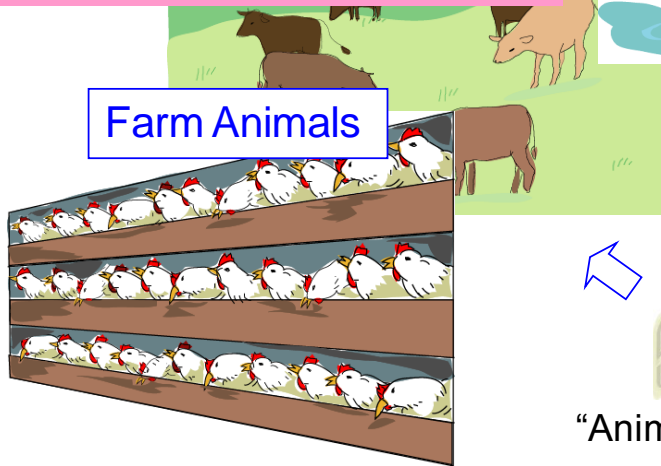


## Animal Health & Welfare

### Food Safety

A Measure for Zoonotic Diseases  
(Avian Influenza)

### Farm Animals



### (Semi-)Wild Animals



"Animal Watch Sensors"

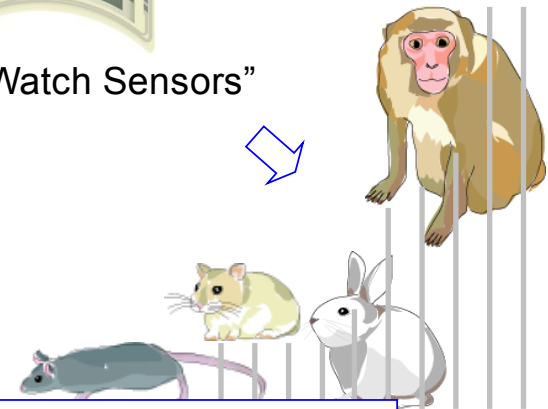
### Pets

Mental Hygiene



### Laboratory Animals

Medical



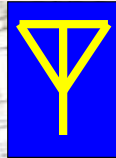
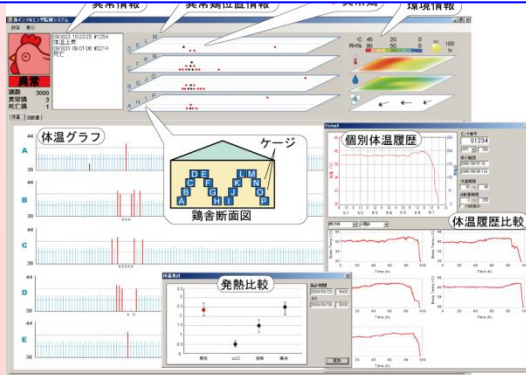
Safe and Secure Society

# Health Monitoring System for Chickens



AWS-CREST

## Health Monitoring and Management System in Poultry Farms



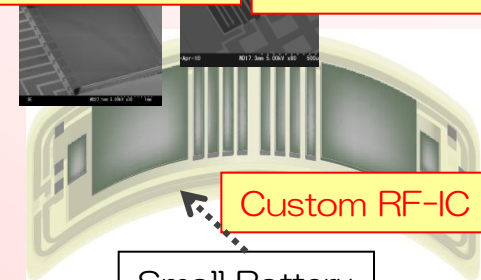
### <Miniaturized Flexible Node>

Wing-Band  $6 \times 30 \times 0.1 \text{ mm}^3$ , 1 g  
maintenance-free (2 years)  
315MHz, 10 m  
Average  $< 5 \mu\text{W}$   
(Target  $1 \mu\text{W}$ )

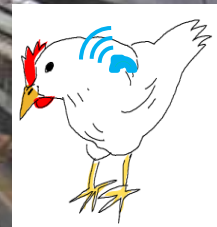


Piezoelectric  
Activity Sensor

Digital Temp.  
Sensor



Small Battery



# MEMS for Our Better Life

G-MEMS  
for Global  
Monitoring of  
Environment and  
Management of  
Society

