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Status of R&D on Materials Science and Nanotechnology in KAIST

Soon Hyung Hong

Professor and Chair

**Department of Materials Science and Engineering
Korea Advanced Institute of Science and Technology**

E-mail: shhong@kaist.ac.kr

<http://composite.kaist.ac.kr>

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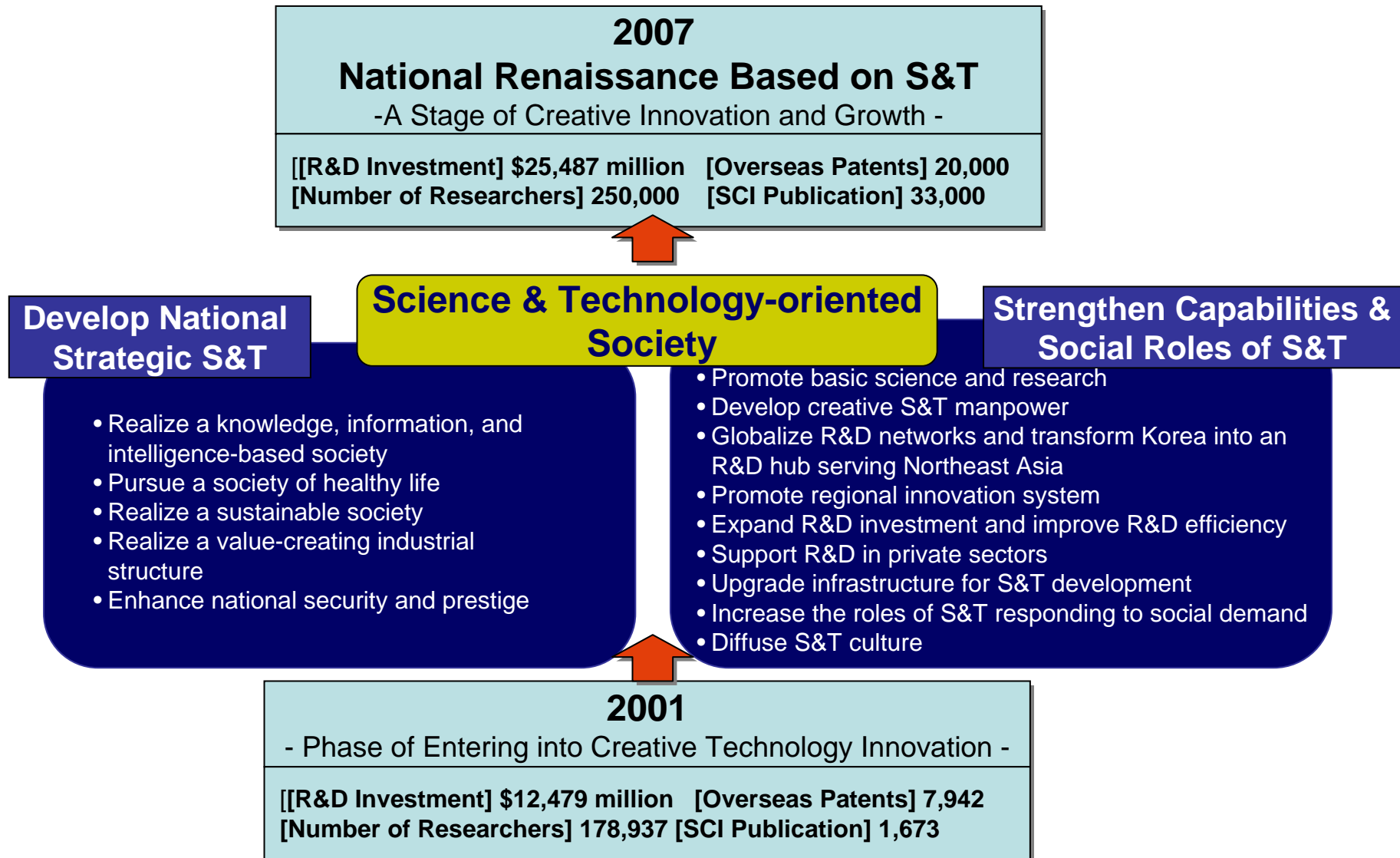
- **National Policies for R&D on Materials Science and Nanotechnology**
 - National Policies for R&D on Materials Science
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- **Status of R&D on Materials Science and Nanotechnology in KAIST**
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 - Introduction of Dept. of Materials Science and Engineering
 - Introduction of Interdisciplinary Program for Nanotechnology
 - Introduction of National NanoFab Center

National Policies for R&D on Materials Science and Nanotechnology

- National Policies for R&D on Materials Science
- National Policies for R&D on Nanotechnology

National Midterm Vision for Science and Technology



National Long-Term Visions for Science and Technology



Korea's Long-term Plan for S&T Development (1999)

provides a **roadmap toward becoming**

the world's 7th power in S&T by the year 2025

Strategies for Realizing the Vision 2025

First Step (by 2005):

Competitive levels with those of the world leading countries by mobilizing resources, expanding infrastructure, and improving relevant laws and regulations

Second Step (by 2015):

Stand out as a major R&D promoting country in the Asia-Pacific region, actively engaging in scientific studies and creating a new atmosphere conducive to the promotion of R&D.

Third Step (by 2025):

Secure a scientific and technological competitiveness in selected areas comparable to those of G-7 countries

2005

2015

2025

Strategies for Vision 2025

To identify strategic S&T areas and concentrate resources on the selected areas, namely, information technology, biotechnology, nanotechnology, environment, energy, new materials, etc.

To transform the national innovation system from the government-initiated, development-oriented system into a market-driven, diffusion-oriented system, and also from an inward-looking S&T system into a globally-networked system.

National Strategies for Nanotechnology (NT)

“Law for Promotion of Nanotechnology Development”,
Jul. 2001, Republic of Korea Government

- Target : Infra set-up within 5 years for development of nanotechnology, in order to enter into 10 advanced countries.
- Execution plans established focusing on R&D, manpower training, and facilities set-up.
- Budget (Million USD)

	1 st Phase (’01-’04)	2 nd Phase (’05-’07)	3 rd Phase (’08-’10)	Sum (Gov./Non-Gov.)
R&D	270	405	480	1,155 (731/424)
Manpower	34	25	20	79 (79/0)
Infra	100	43	37	180 (127/53)
Total	404	473	537	1,414 (937/477)

Status of R&D on Materials Science and Nanotechnology in KAIST

- Status and Mission of KAIST
- Introduction of Dept. of Materials Science and Engineering
- Introduction of Interdisciplinary Program for Nanotechnology
- Introduction of National NanoFab Center

Mission and Goal of KAIST

Mission

- To nurture highly qualified scientists and engineers possessing profound theoretical knowledge and application capability
- To perform mid-to long-term basic and applied research for domestic development and cultivation of science and technology
- To provide research platforms for other research and industrial institutions

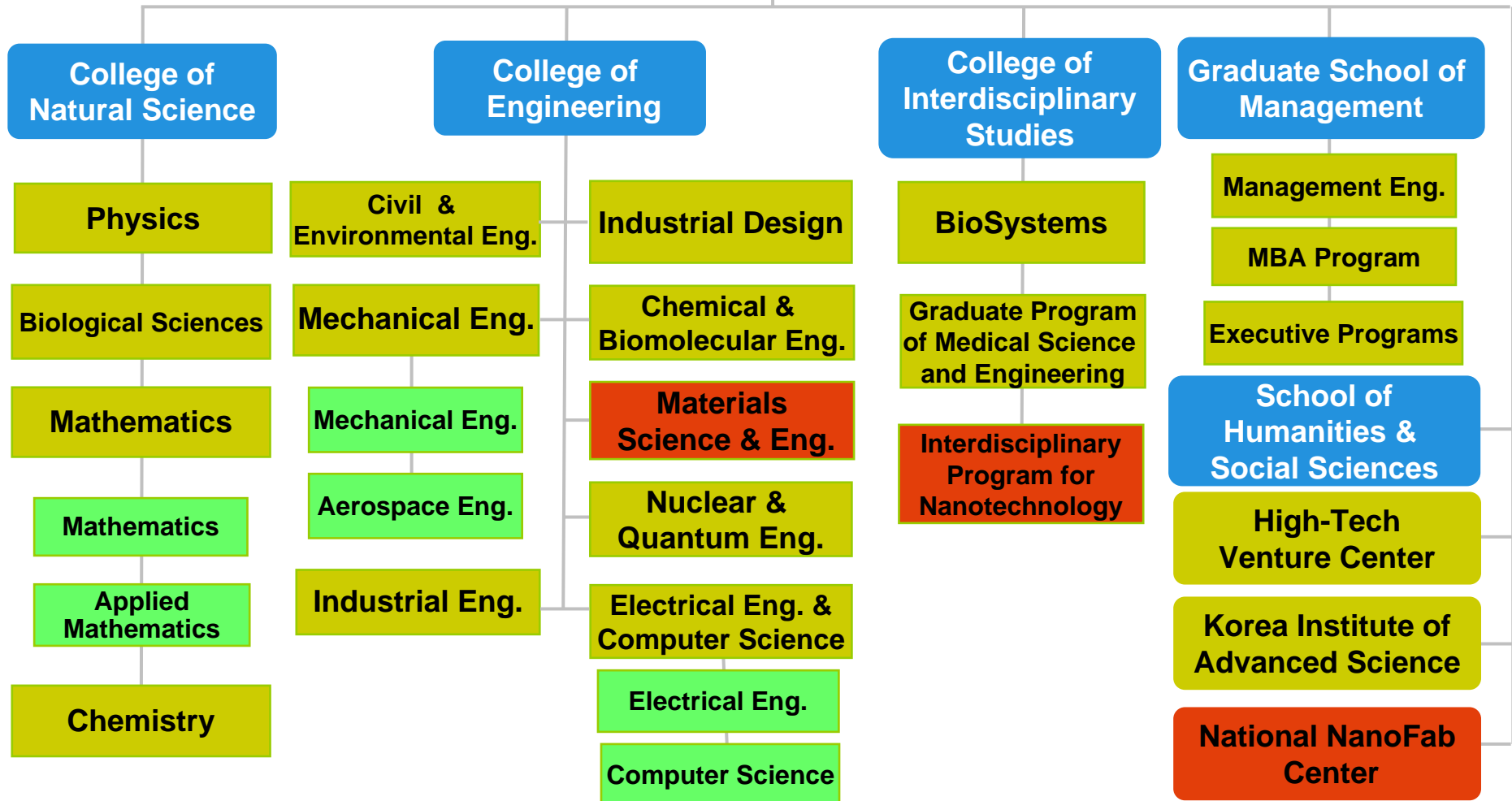
Goal

- To make KAIST a world-leading research-oriented university

Brief of KAIST

- ❑ Number of Faculty: 409
- ❑ Number of Student: 7,334
 - Undergraduate Students: 3,042
 - Master Students: 1,984
 - Ph. D. Students: 2,153
 - M.S.-Ph. D Joint: 155
- ❑ Campus Area
 - Land: 1,157,030 m²
 - Building: 314,051 m²
- ❑ Schools, Departments, and Divisions
 - 4 Schools
 - 13 Departments
 - 7 Divisions

Organization of KAIST



Main Campus in Daejeon

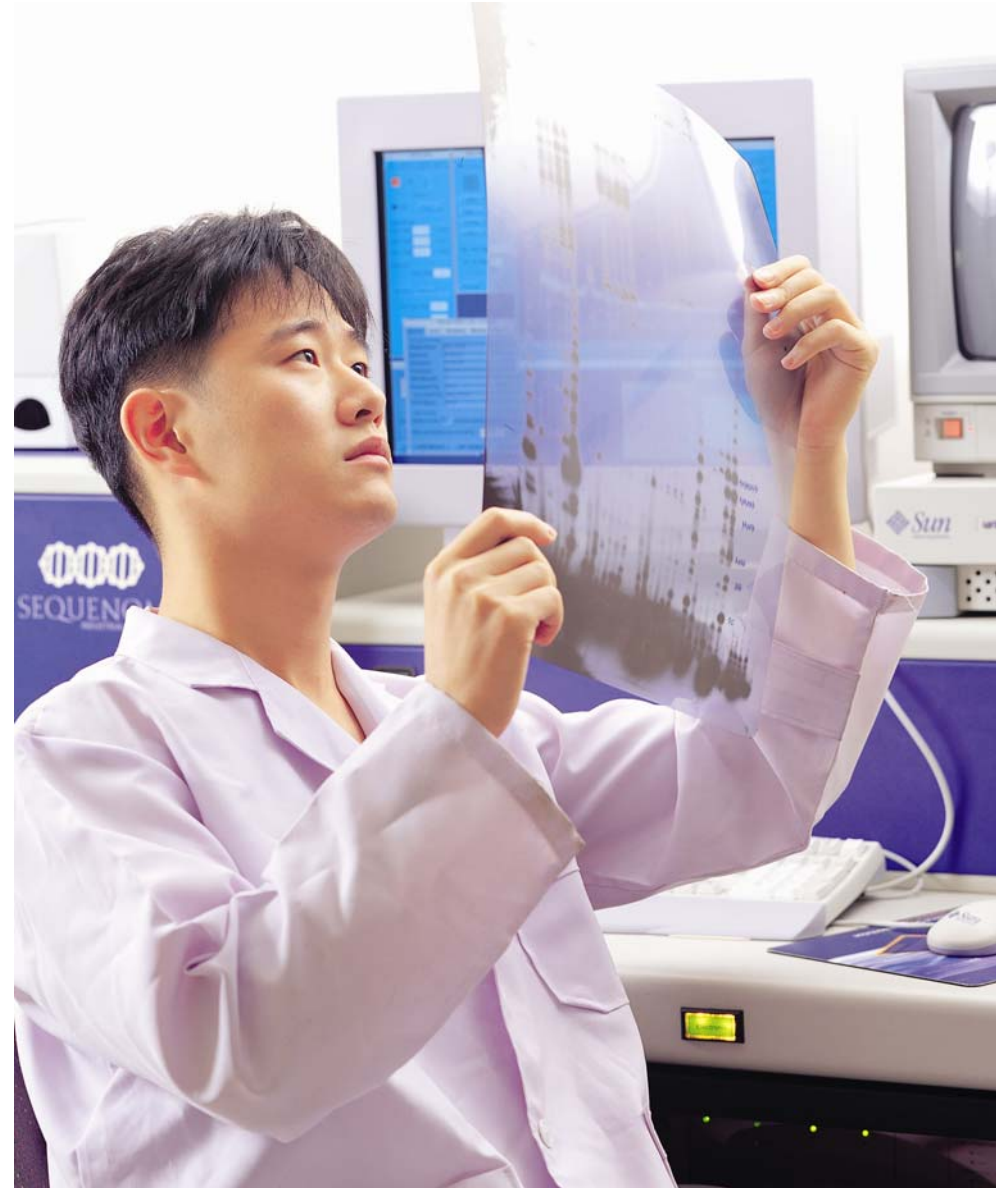


Graduate School of Management in Seoul



Distinctive Features of KAIST

- Public university supervised by Ministry of Science and Technology (rather than Ministry of Education)
- No tuition and fees, scholarship for all students
- Exemption of military service for male Ph.D. students



Distinctive Features of KAIST

→ Flexible Management of Academic Affairs

- Independent and flexible management granted by law
- B.S.-M.S. Joint program
- Early admission to Ph.D. program

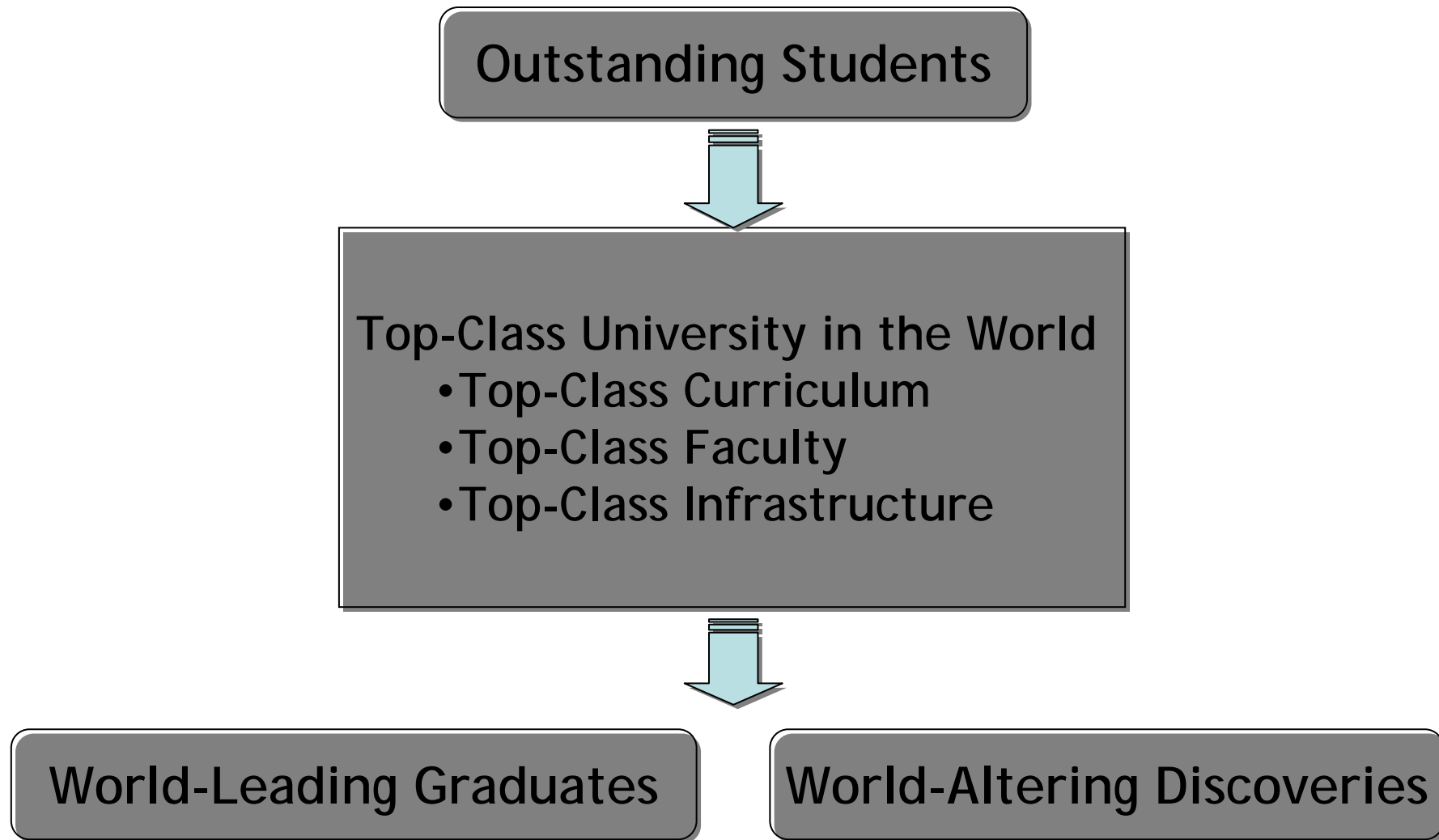
→ Research-oriented/ Quality-oriented Education

- Maximization of educational effects via mutual interaction between classroom and laboratory
- Cultivation of creativity by emphasizing discussion, experimentation, tutoring, etc
- Compulsory publication of Ph.D. dissertation in internationally renowned academic journals

→ Well-rounded Education

- Various liberal arts courses
- Diversity of extracurricular programs

Education Policies of KAIST

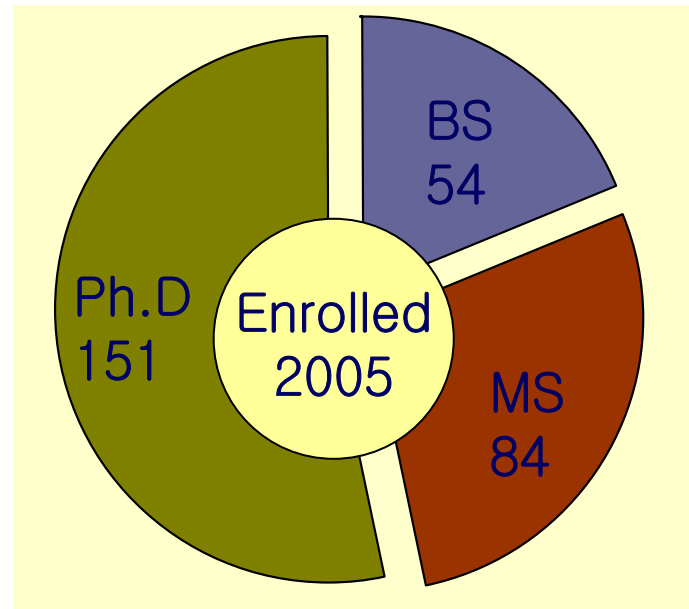


International Cooperation of KAIST

- **Agreements with 71 international universities and research institutes in 29 countries for exchange of personnel & information, joint research, joint workshop/conference, and etc.**
- **Student Exchange Programs:**
34 overseas partner universities
- **International joint research activities:**
23 research projects with 12 countries
- **Dual degree programs for M.S. and Ph.D.:**
Ecole Polytechnique and INSA

Dept. of Materials Science and Engineering at KAIST

- ❑ **Faculties : 29 professors**
- ❑ **Research staffs : 3 research professors**
11 post-doctoral fellows
- ❑ **Administration staffs : 4**
- ❑ **Technical staffs : 4**
- ❑ **Students:**



* foreign students: 7
foreign post-doc fellows: 4
foreign visiting scientists: 1

Research Achievements of DMSE (2004)

Number of professors	29
Research funds	₩ 5,876 million (US\$ 5.8 million)
Avg. funds/professor	₩ 226 million (\$ 0.223 million)
Papers published in international journal	176
Avg. No. of papers/professor	6.77

Organization of DMSE

Faculty Laboratories

- 25 Laboratories

National Research Centers

- Electronic Components Materials Design Education Center
- Center for Electronic Packaging Materials

National Research Laboratories

- Materials Interface Lab.
- Semiconductor Materials Lab.
- Electron Microscopy Lab.
- Photoferroelectric Materials Lab.

Laboratories in DMSE

Professor	Laboratory	Homepage
Ahn, Byung Tae	Electronic Materials Laboratory	http://mse.kaist.ac.kr/~pemplab
Bae, Byeong-Soo	Optical and Coating Materials Laboratory	http://www.sol-gel.net/lomc
Choi, Si Kyung	Photoferroelectric Materials Laboratory	http://pfml.kaist.ac.kr
Choo, Woong Kil	Intelligent Materials and Phase Transformation Laboratory	http://mse.kaist.ac.kr/~choo
Hong, Soon Hyung	Composite Materials Laboratory	http://composite.kaist.ac.kr
Jeon, Duk Young	Display Laboratory	http://display.kaist.ac.kr
Kang, Jeung Ku	Nano Materials Simulation & Fabrication Laboratory	http://nanosf.kaist.ac.rk
Kang, Sang Won	Semiconductor Materials Laboratory	http://ald.kaist.ac.kr
Kang, Suk-Joong L.	Ceramic Processing Laboratory	http://mse.kaist.ac.kr/~sjkang
Kim, Do Kyung	Nano Ceramics Research Laboratory	http://mse.kaist.ac.kr/~ncrl
Kim, Ho-Gi	Electronic Ceramics Research Laboratory	http://sorak.kaist.ac.kr/~hgkim
Kim, Sang Ouk	Soft Nanomaterials Laboratory	http://mse.kaist.ac.kr/~sokim
Kwon, Hyuk Sang	Corrosion and Energy Storage Materials Laboratory	http://corrosion.kaist.ac.kr

Laboratories in DMSE

Professor	Laboratory	Homepage
Lee, Hyuck Mo	Computational Materials Science Laboratory	http://triangle.kaist.ac.kr
Lee, Jeong-Young	Transmission Electron Microscopy Laboratory	http://hrtem.kaist.ac.kr
Lee, Taek Dong	Thin Film and Magnetic Materials Laboratory	http://mse.kaist.ac.kr/~tfmm
Lee, Won-Jong	Plasma and Thin Film Laboratory	http://mse.kaist.ac.kr/~tfilm
Nam, Soo Woo	Mechanical Metallurgy Laboratory	http://creep.kaist.ac.kr
No, Kwangsoo	Electronic and Optical Materials Laboratory	http://mse.kaist.ac.kr/~eomlab
Paik, Kyung-Wook	Nano Packaging and Interconnect Laboratory	http://npil.kaist.ac.kr
Park, Chong Wook	Solid State Device Laboratory	http://mse.kaist.ac.kr/~copark
Park, Joong Keun	Nano and Functional Materials Laboratory	http://nanolab.kaist.ac.kr
Pyun, Su-II	Corrosion and Electrochemistry Laboratory	http://web.kaist.ac.kr/~sipyun
Wee, Dang-Moon	Advanced High-temperature Materials Laboratory	http://mse.kaist.ac.kr/~ahml
Yu, Jin	Electronic Packaging Laboratory	http://epl.kaist.ac.kr

Interdisciplinary Program for Nanotechnology

Mission

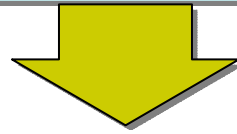
- Initiated to construct Education/Research infra to cultivate human resources of ability and interdisciplinary
- Education focused on interdisciplinary and globalization

Program

- 17 professors from 9 departments
- 31 graduates students from 9 departments

National NanoFab Center

**“Law for Promotion of Nanotechnology Development”,
Jul. 2001, Republic of Korea Government**



- Was strongly required to develop NT for universities, research institutes and industry
- National NanoFab Center project was launched at July 2002 to provide completely supporting all researchers in NT

National NanoFab Center as Infrastructure for Nanotechnology R&D

- Period: 2002 ~ 2011
- Fund: 290 Million USD

Mission of National NanoFab Centers

- To establish fabrication facilities with cleanroom capable of meeting the needs of nanotechnology development

- To provide one-stop service from idea generation to manufacturing of engineering sample

- To train nanotechnologists with hands on experience

- To contribute to the commercialization & advancement of nanotechnology

Programs for National NanoFab Center

Basic Service

- ◆ R&D supporting service with equipment/process (Nanodevice, MEMS, Fundamental Physics, Biochip, etc.)
- ◆ Evaluation/validation of materials/equipments
- ◆ Test wafer service
- ◆ Cleanroom lease

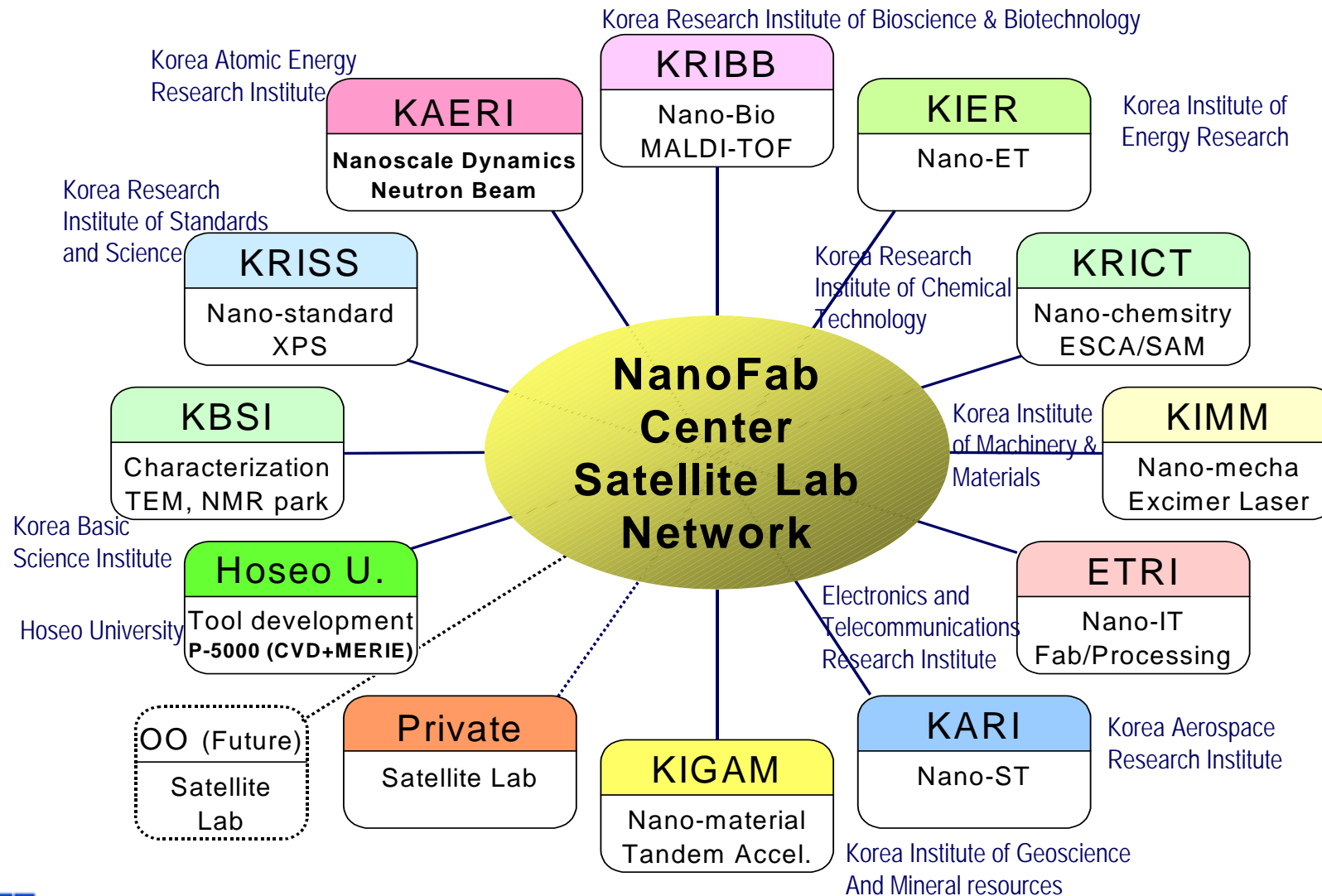
User-activating Service

- ◆ Standard CMOS process
 - (1) Baseline process
 - (2) Nano level process
- ◆ Specific process module : Future non-volatile device, RF ID, etc
- ◆ MPW program (Multi-Project-Wafer)

R&D Collaboration Program

- ◆ Providing equipments, established technology, experienced manpowers
- ◆ Target to develop new device, process, materials, equipment
- ◆ Focusing area : Si-base CMOS, NEMS/MEMS, biochip, and integration

Satellite Lab Network in National NanoFab Center



Overview of Facility at National NanoFab Center

Building Capacity : 18,009 m²

- Cleanroom : 5,067 m² (2 Floors)
- CUB* : 4,588 m² (4 Floors)
- Office : 8,354 m² (4 Floors)

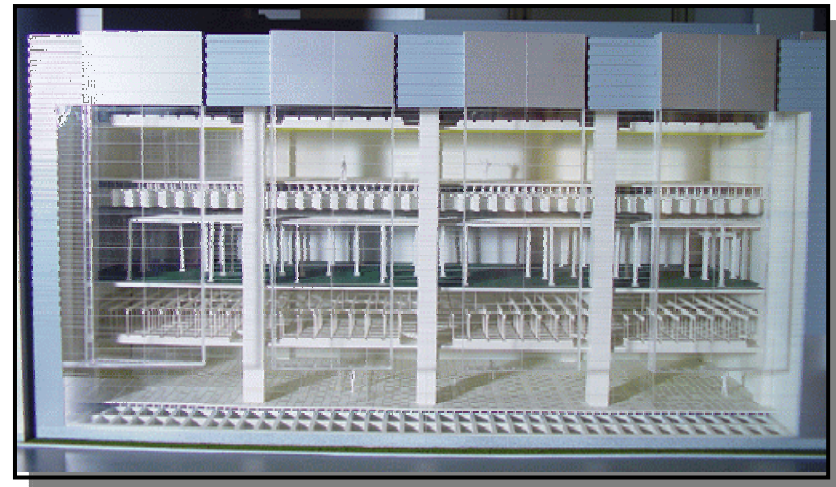
* CUB : Central Utility Building



[Birds-Eye-View]

Clean-room Cleanness

- Class 1 : 598 m²
- Class 100 : 2,506 m²
- Class 10,000 : 1,193 m²
- Others : 770 m²



[Cleanroom Inside]

Thank you

