# Innovative collaboration system on iPS cell technologies

## Kyoto University


National Innovation System, Competition and Cooperation

June 11, 2009

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Kyoto University

# Today's presentation from Kyoto

1. Do you remember iPS cell technologies born in Kyoto University ?

2. National universities are still learning how to create business based on intellectual properties

3. What is an important matter to develop iPS cell technologies for a practical use ?

4. Why is iPS Academia Japan Inc. established ?

5. What is an innovative collaboration system?

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# Do you know Kyoto University, don't you?

- Founded in 1897
  - to be established as Kyoto imperial university.
  - the second oldest National university in Japan.

**leading academic institution**

- One of the best university in Japan.
  - Known for its pioneering spirits and academic freedom.


President; Dr.Hiroshi Matsumoto

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# Do you remember six Nobel Prize winners in Kyoto?

Dr.Hideki Yukawa
(physics, 1949)

Dr.Shinichiro Tomonaga
(physics, 1965)

Dr.Kenichi Fukui
(chemistv. 1981)

Dr.Susumu Tonegawa
(physiology-medicine, 1987)

Dr.Ryoji Noyori
(chemistry, 2001)

Dr.Toshihide Masukawa
(physics, 2008)

Who is a next winner ?

# Faculty & Organization
## (Kyoto University)

| Professor | Associate Professor | Lecture | Assistant Professor | Graduate Student | Undergraduate Student |
|---|---|---|---|---|---|
| 992 | 779 | 157 | 950 | 9,420 | 13,113 |

(Medical & Bio-science Field)

| Graduate school,Institutes, Centers, etc | Professor | Research Stuff | Graduate Students | Undergraduate Students |
|---|---|---|---|---|
| Graduate School of Medicine University hospital | 89 | 379 | 814 | 1,079 |
| Graduate School of Pharmaceuticals | 16 | 33 | 275 | 367 |
| Graduate School of Biostudies | 16 | 35 | 340 | - |
| Institute for Virus Research | 11 | 26 | - | - |
| Institute for Frontier Medical Science | 10 | 20 | - | - |
| Center for iPS cells Research & Application | 4 | 11 | - | - |

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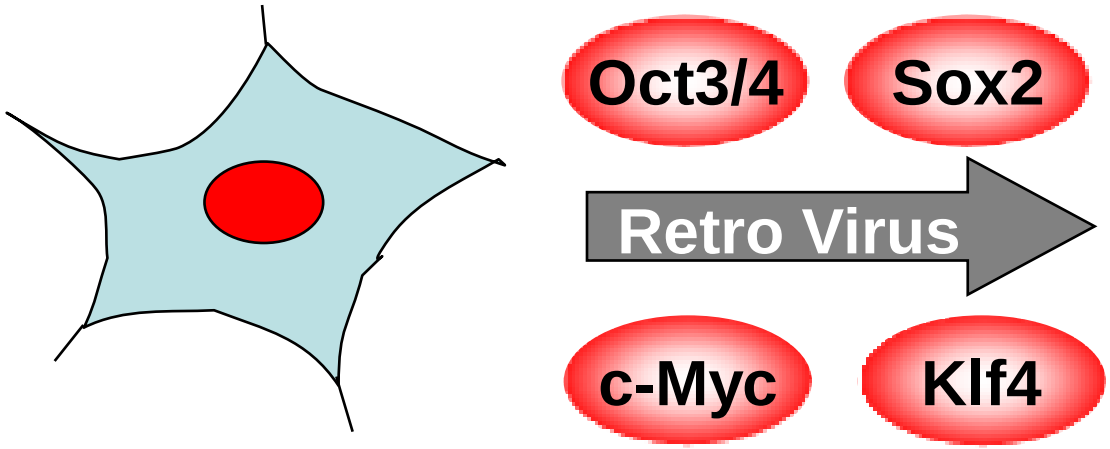
# Nobody believes the report from Kyoto in 2006.

Cell 126, 1-14,August 25,2006

## Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors

Kazutoshi Takahashi[1] and Shinya Yamanaka[1,2,*]
[1] Department of Stem Cell Biology, Institute for Frontier Medical Sciences, Kyoto University, Kyoto 606-8507, Japan
[2] CREST, Japan Science and Technology Agency, Kawaguchi 332-0012, Japan
*Contact: yamanaka@frontier.kyoto-u.ac.jp
DOI 10.1016/j.cell.2006.07.024

**4 Factors**




**Mouse fibroblast**

**Induced Pluripotent Stem cells (iPS cells)**

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# Reprogramming is confirmed!!

## Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors

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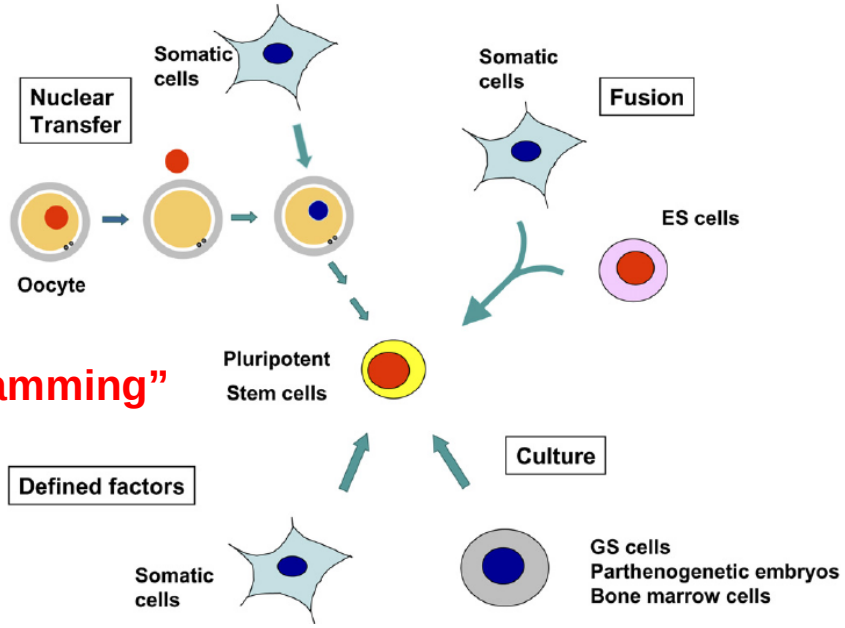
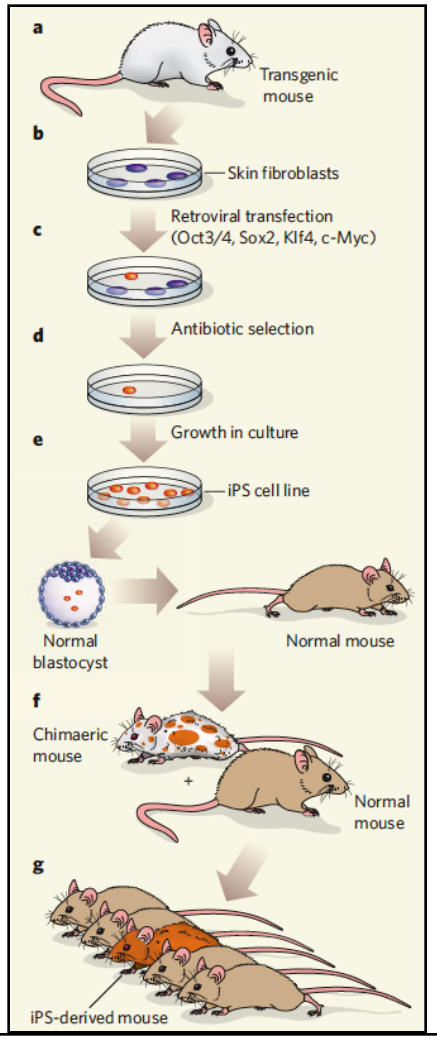
Cell Stem Cell *1*,July 2007

Prof. S Yamanaka




"Reprogramming"

Nature *Vol.448,*19 July 2007



# Finally Human iPS cells comes into being:

NEWS

EASY ACCESS
Find news on everything from stem cells to space flight.
www.nature.com/news/archive/subject/index.html

## Stem cells: a national project

Japan is scrambling to harness the promise of Shinya Yamanaka's pioneering work that reprogrammed adult human cells into an embryo-like state. With unprecedented speed, the government is pouring money into developing this home-grown field, some of which will go towards funding a new Yamanaka-headed research centre at Kyoto University.

On 20 November, Yamanaka reported using a relatively cheap and easy technique to reprogramme adult human cells into cells almost indistinguishable from embryonic stem cells. He called these 'induced pluripotent stem cells' (iPS cells) for their ability to differentiate into any of the body's cell types.

Just a week later, Japanese Prime Minister Yasuo Fukuda closed the monthly meeting of the national Council for Science and Technology Policy (CSTP) with a plea to accelerate development of the "revolutionary" method: "I want the CSTP to quickly create an environment in which this science, including clinical research, can move forward smoothly."

By 22 December, the science ministry had laid plans to raise the funding on iPS research from ¥270 million (US$2.5 million) for 2007, to ¥2.2 billion for the 2008 fiscal year, pledging ¥10 billion over the next 5 years. The health ministry will add close to ¥100 million in the 2008 fiscal year directly to Yamanaka, in addition to ¥410 million for regenerative medicine infrastructure, such as a cell-processing centre.

In December, it was announced that Kyoto University would create a research centre dedicated to iPS, funded by the science ministry. The centre, to be headed by Yamanaka, is expected to open in 2009 and to house 10 principal investigators and 100 researchers.

Japanese researchers keen to get hold of iPS cells can apply to the BioResource Center at the Institute of Physical and Chemical Research (RIKEN) in Tsukuba, north of Tokyo, which will start distributing mouse iPS cells from previous work by Yamanaka in March. But most scientists will want to get hold of the viral vectors that Yamanaka used to introduce the four genes. A virtual consortium whose members will be able to share iPS cell information and materials without going through time-consuming material-transfer agreements is planned for the Kyoto University centre.

"If they all agree to recognize each other's technology, they might even be able to share information before publication," says Shin-ichi Nishikawa of RIKEN's Kobe-based Center for Developmental Biology, who is tipped to head the consortium. Nishikawa has already been in touch with organizers of a stem-cell consortium in China, and hopes that researchers everywhere, especially in the Asia-Pacific region, will be able to work together. "It's rare for Japan to have such an opportunity," says Nishikawa. "It should be used to encourage diplomacy."

"It's rare for Japan to have such an opportunity."

The science ministry is scurrying to pull the new projects together. ¥1 billion, to be distributed by the Japan Science and Technology Agency, will be available for major iPS research projects from 1 April, but the ministry has yet to decide on research themes. It will start taking applications by the end of March and will pick winning projects soon after.

Such sudden investment is rare for the Japanese government, which usually follows the United States' lead in defining promising scientific fields. In the past, this has led to missed opportunities — most famously leaving Japan a bit-player in the Human Genome Project, even though high-throughput sequencing was first proposed there.

David Cyranoski

T. KITAMURA/AFP/GETTY

Japan is hoping to capitalize on the work that made Shinya Yamanaka an international star.

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**Cell. 2006 August 25;*126*, 1-14**

Introduction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibroblast Cultures by Defined Factors.
K . Takahashi and S. Yamanaka

**Cell. 2007 Nov 30;*131*, 861-72**. Epub 2007 Nov 20.

Induction of pluripotent stem cells from adult human fibroblasts by defined factors.
Takahashi K, Tanabe K, Ohnuki M, Narita M, Ichisaka T, Tomoda K, Yamanaka S.

Science. 2007 Dec 21;*318*,1917-20. Epub 2007 Nov 20.

Induced pluripotent stem cell lines derived from human somatic cells.
Yu J, Vodyanik MA, Smuga-Otto K, Antosiewicz-Bourget J, Frane JL, Tian S, Nie J, Jonsdottir GA, Ruotti V, Stewart R, Slukvin II, Thomson JA.

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# Stem Cell Research Institutions & Center in Kyoto U.

**Translational Research Center in Kyoto University Hospital**

Clinical Research

**Center for iPS cell Research & Application**

CiRA

Established in Jan. 2008

iPS cell Technologies

**Institute for Integrated Cell-Material Sciences**

iCeMS KYOTO UNIVERSITY

Meso-Control Stem Cells

Technologies on Integrated Stem cell and Material

**Institute for Frontier Medical Science**

Institute for Frontier Medical Sciences, Kyoto University

ES cell Technologies

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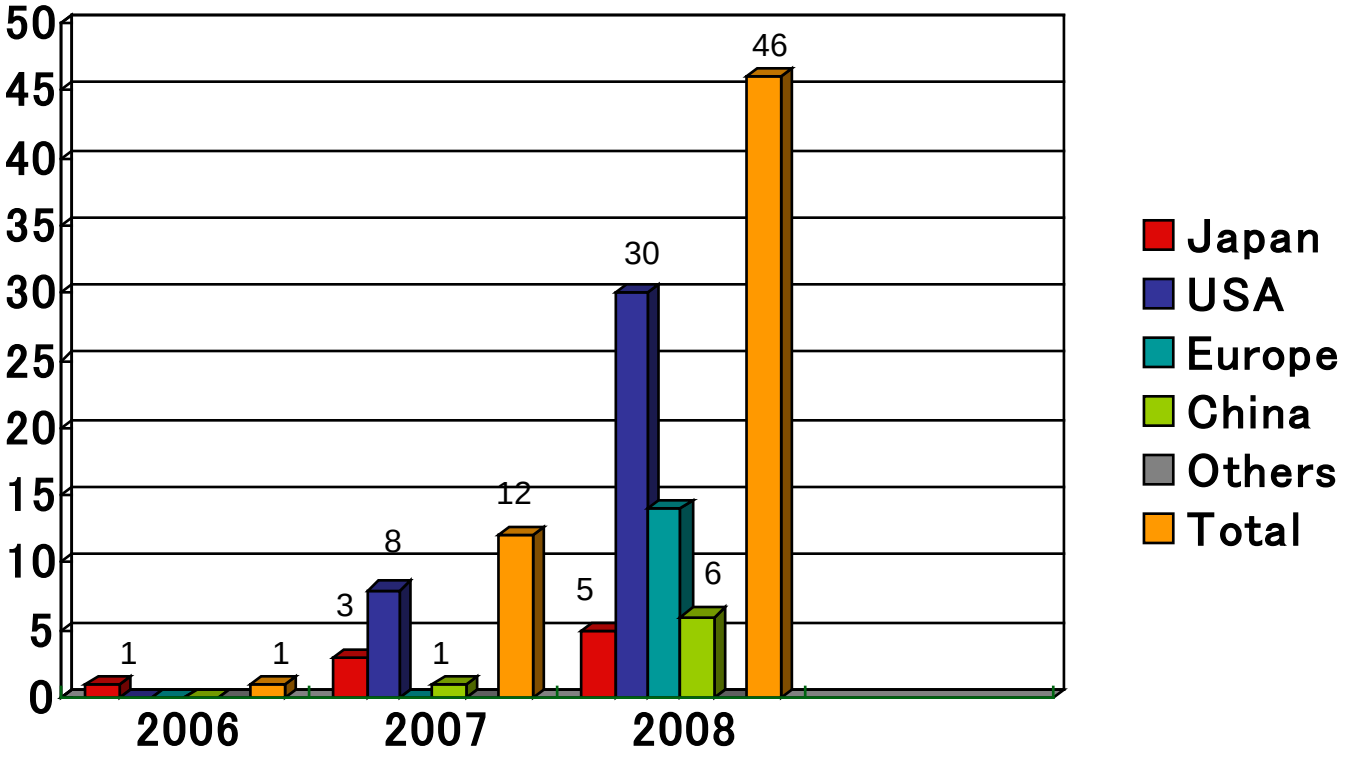
# Research Outcome on iPS Cell Research



# Research Outcome on Stem Cell Research

Since 1980 till 2006

| All papers on stem cell research | | | Papers on human ES cell research | | |
|---|---|---|---|---|---|
| Rank | Nanonality | No | Rank | Natinality | No |
| 1 | USA | 5,882 | 1 | USA | 154 |
| 2 | Japan | 1,724 | 2 | UK | 35 |
| 3 | Germany | 1,129 | 3 | Israel | 33 |
| 4 | UK | 864 | 4 | South Korea＊<br>（Withdraw） | 29* |
| 5 | France | 648 | 5 | Singapore | 19 |
| 8 | China | 463 | 6 | Sweden | 16 |
| 10 | Australia | 319 | 7 | Australia | 12 |
| 12 | Sweden | 270 | 8 | China | 11 |
| 13 | Israel | 178 | 9 | Japan<br>Germany<br>Canada | 7 |
| 22 | Singapore | 62 | | | |

Current report of the stem cell technologies, 2008; JPO

# Japanese University, Now

Since 5 years, national university was incorporated in Japan.

It is still insufficient for the achievement of the technology transfer from university to industry in Japan.

National universities are still learning how to create business based on intellectual properties.

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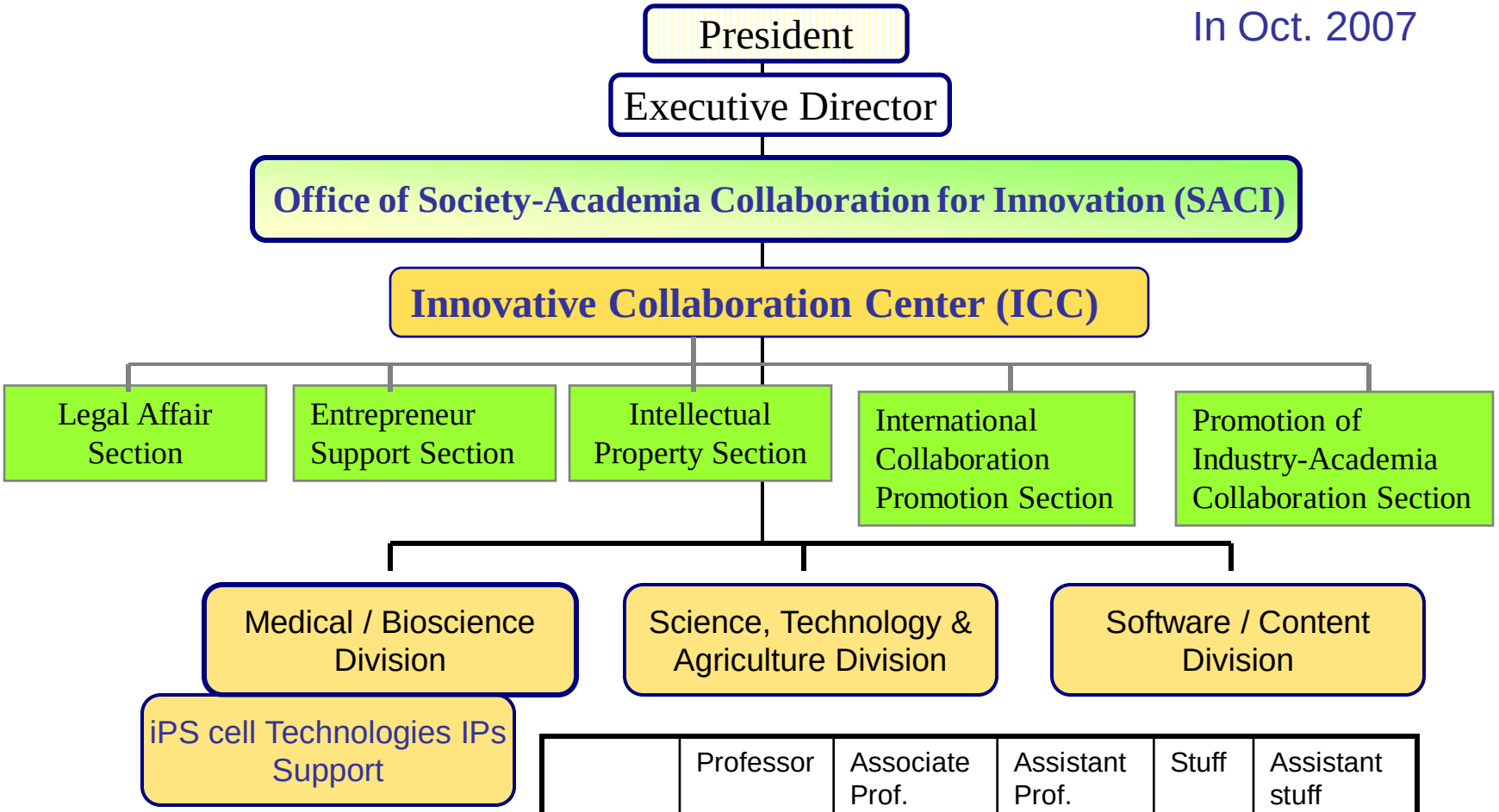
# Japanese pro-patent policy

1995, **Basic Law for Science & Technology policy**
Purpose: encourage development of science and technology aiming to become "Science and Technology-Oriented Nation"
1996, **Basic Plan for Science and Technology**
1998, **Law for Promoting Technology Transfer from Universities**
Purpose: support establishment and development of TLOs(similar OTT).
1999, **Law for Special Measures for Industrial Revitalization**
This law is recognized as Japanese Bayh-Dole Act.
This law made it possible that intellectual property ("IP") rights to results of research commissioned by the government belong to the party who undertakes the research, such as a university.
2000, **Law to Strengthen Industrial Technology**
This law contains support measures to acquire the rights to research results which stem from universities by taking measures to reduce patent application fees paid by researchers of universities and other institutions.
2001, **The 2nd term Basic Plan for Science and Technology**
2002, **The Basic Law on** Intellectual **Property**
2003, Establishment of National University the office of Intellectual Properties management
2004, **Incorporation of national universities**
National universities are required to promote utilization of research results as its duty.
2006, **The 3rd term Basic Plan for Science and Technology**

# IP Management organization

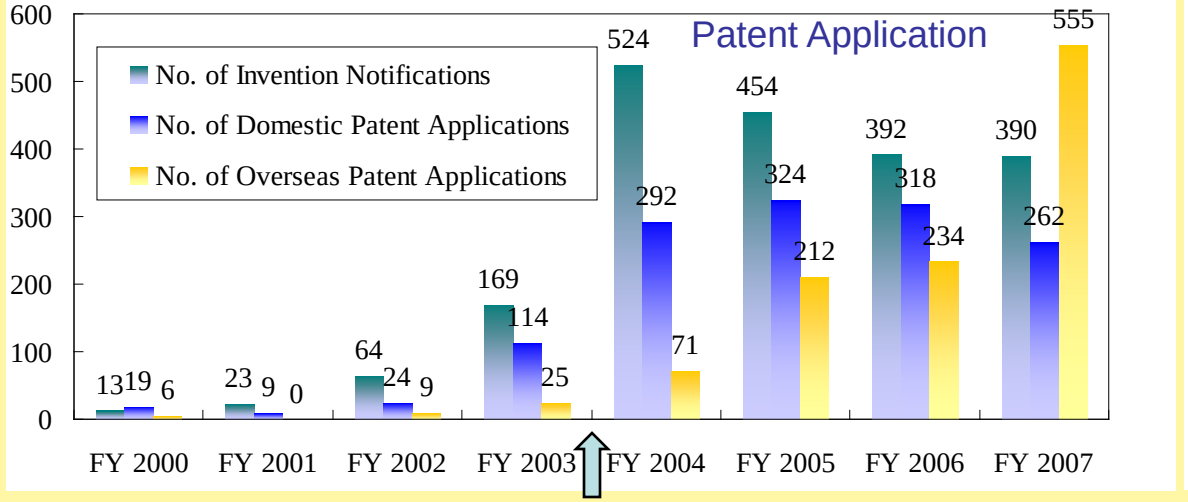
In Oct. 2007

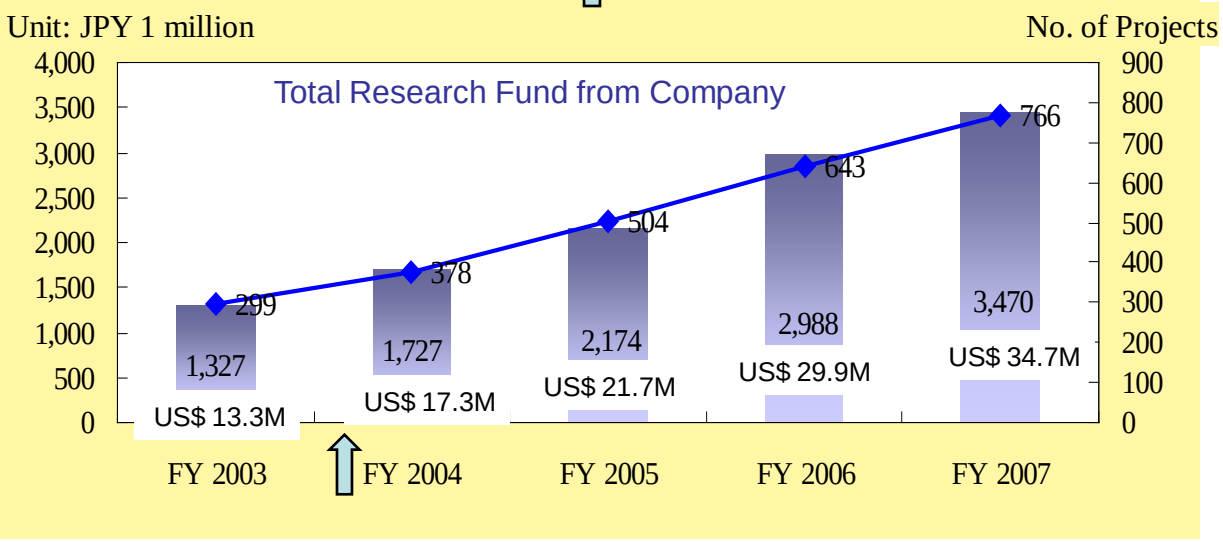


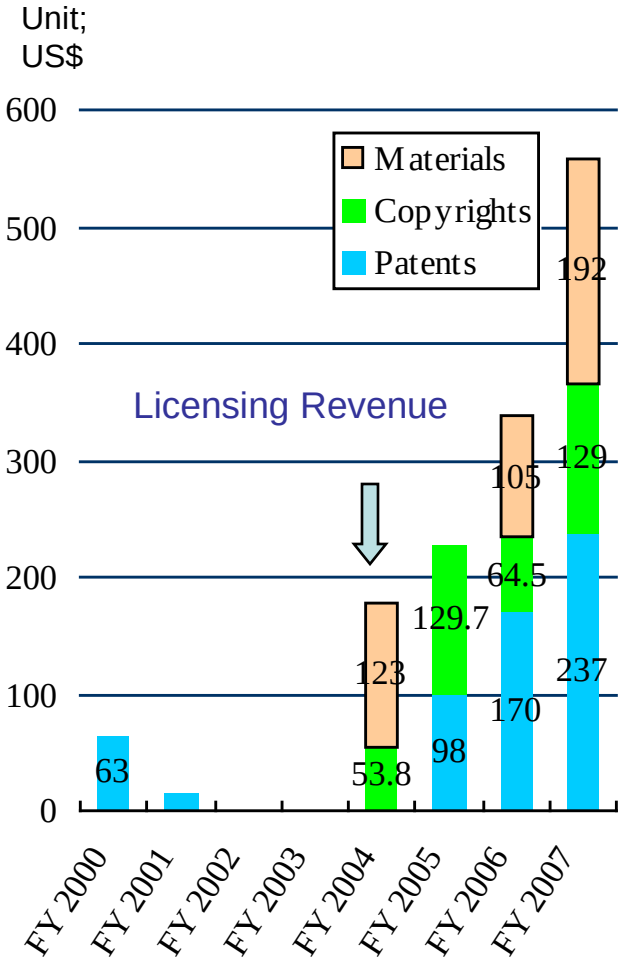

| | Professor | Associate Prof. | Assistant Prof. | Stuff | Assistant stuff |
|---|---|---|---|---|---|
| Number | 8 | 1 | 1 | 11 | 13 |

# Achievement of IP management

National universities are still learning.



# What is the important matter

## to bring iPS Cell Technologies into practical use ?

The research on iPS cells is rapidly developing and new discoveries are made day by day.

In order to develop iPS cell technologies for a practical use, it is necessary to combine iPS cell induction technology with the differentiation technology from ES/iPS cells.

To avoid the time-consuming caused by unreasonable competitions, it is necessary to establish an intensified innovative collaboration system.

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# Why is iPS Academia Japan Inc. established ?

Research institutions must be able to mutually use their respective rights under the satisfactory conditions.

Kyoto University, who owns prior art, should serve the role of a hub based on a non-exclusive license and has established this company as the hub in an innovative collaboration system.

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# Parties that established the initiative

**Kyoto University**
**The office of SACI**
**Innovative Collaboration Center**

Since 2004,the IP management organization has been established, but it's activity is still insufficient. The university has not so enough money and dose not secure the executive person to promote iPS cell technologies in a practical use.

**iPS Holdings**
**LLIC**

National university incorporation is limited to the investment of the company.
Five partners who are dispatched from Kyoto university established this LLIC.This LLIC accepts the investment without voting right from SMBC groups.
Then this LLIC established the new corporation.

SMBC group
Sumitomo Mitsui Banking Corp. (SMBC)
Daiwa Securities Group Inc.
Daiwa SMBC Capital Co. Ltd

SMBC is the main bank of Kyoto university.
SMBC group is willing to support the development of excellent results on iPS cell research in Kyoto University.
They give the money like as the Corporate Social Responsibility to Kyoto U.

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# Parties that related to the initiative

**Kyoto University**
The office of SACI
**Innovative Collaboration Center**

Center for iPS cells Research & Application ( CiRA )
Director & Prof.Yamanaka,S.

Established in Jan.2008

Invention / Patent

Invention / Patent

5 Partners

**iPS Holdings**
LLIC

Established in May 2, 2008

Investment

Without voting right

Sumitomo Mitsui Banking Corp.
Daiwa Securities Group Inc.
Daiwa SMBC Capital Co. Ltd

Exclusive License

Investment

**iPS Academia Japan Inc.** (iPS/AJ Inc. )

Established in May 25, 2008

Non-exclusive License

**Many Companies**

Blue:Kyoto University

SACI: Society-academia collaboration for innovation

LLIC:Limited Liability intermediate Corporation

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# The mission of the initiative

Kyoto University will make its intellectual properties in iPS cell technologies available to worldwide academic researchers free of royalties.

Kyoto University will welcome world leading universities and research institutions to join this initiative by offering royalty free cross licensing.

Professor Yamanaka will be the center of iPS cell research program.
iPS Academia Japan will serve as a hub for iPS cell technologies network worldwide(an innovative collaboration system).

Kyoto U. give the authority and the right of license of IPs on iPS cell technologies to iPS Academia Japan Inc. The company's mission is followings;
1. Support the acquisition of the paten rights in the worldwide.
2. Consolidation of the related patents on ES/iPS cells technologies.
3. Technology transfer of these technologies to the bio and/or pharma-company in order to promote State-of-the-art therapies.

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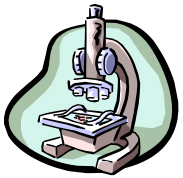
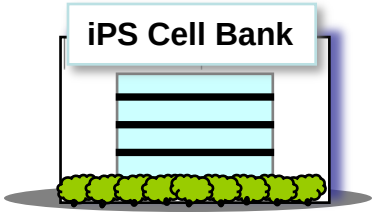
# Image of Cell Therapy

**Pharmaceuticals**
**Immuno-suppressor**

Suppliers of technologies

**Bio-engineering**
**Bio-reactor**






**② Preparation of iPS cell**

Bench side

**① Supply of somatic cells**

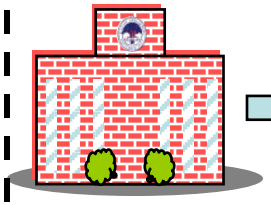
Human cells for Remedy

**⑤ Transport**

Cell Processing Center

**③ Incubation of cells (GMP)**

**④ Preservation**



Hospital

Doctor

Patient

**⑥ Transplantation**

Bed side

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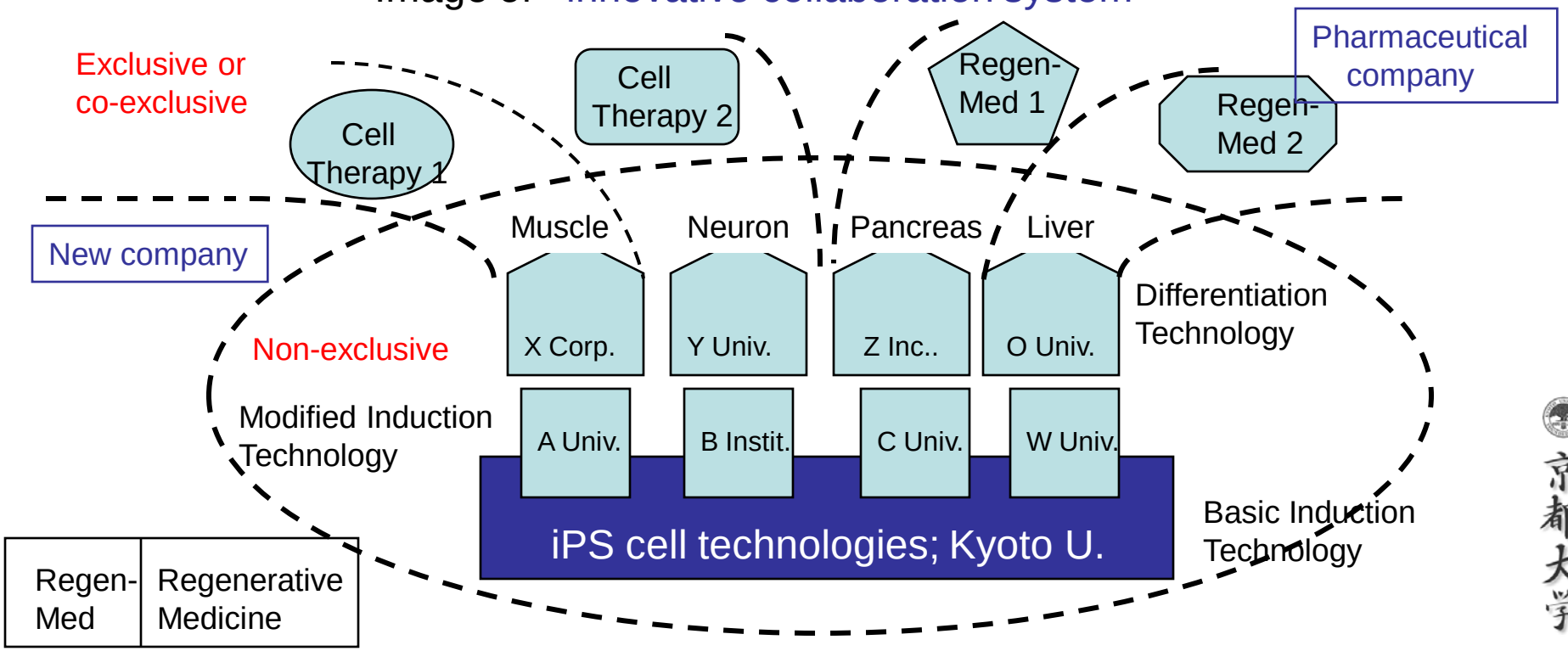
# Image of innovative collaboration system

In order to develop iPS cell technologies for a practical use, it is necessaryto combine iPS cell induction technology with the differentiation technology from ES/iPS cells.

Image of innovative collaboration system




# Thank you for your attention !