



Friday, January 4, 2019

Morning 9:00 a.m. to 12:00 noon



Welcoming Message

Shigehiro HASHIMOTO, Dr. of Med. & Dr. of Eng.

*Prof. Biomedical Engineering,
Dean, Faculty of Engineering,
Councilor, Kogakuin University,
Tokyo, 163-8677, Japan,
shashimoto@cc.kogakuin.ac.jp*

<http://www.mech.kogakuin.ac.jp/labs/bio>

KOGAKUIN UNIVERSITY

Mr. Hiromoto Watanabe, who is the first president (1886-1890) of Imperial University of Japan, made variety of societies to make communication among multidisciplinary fields. He established Kogakuin University, which is first society for education of engineering in Japan.



Engineer our Future

Since 1887



KOGAKUIN UNIVERSITY

(Institute of Technology)



Sky skleyper



Tokyo, Mt. Fuji



Spring



Autumun



Micro and Bio Systems Research Center



Micro machining,
Cell culture



Collaboration with
School of Medicine &
School of Pharmacy

*Kogakuin University,
Tokyo, 163-8677, Japan*

shashimoto@cc.kogakuin.ac.jp

<http://www.mech.kogakuin.ac.jp/labs/bio>





Chinese American
Scholars Association



Development of Multidisciplinary Field of Study in Technical University: from Biomedical Engineering to Gerontology

Shigehiro HASHIMOTO, Dr. of Med. & Dr. of Eng.

*Prof. Biomedical Engineering,
Dean, Faculty of Engineering,
Councilor, Kogakuin University,
Tokyo, 163-8677, Japan,
shashimoto@cc.kogakuin.ac.jp*

<http://www.mech.kogakuin.ac.jp/labs/bio>



Engineer our Future
2012

Background

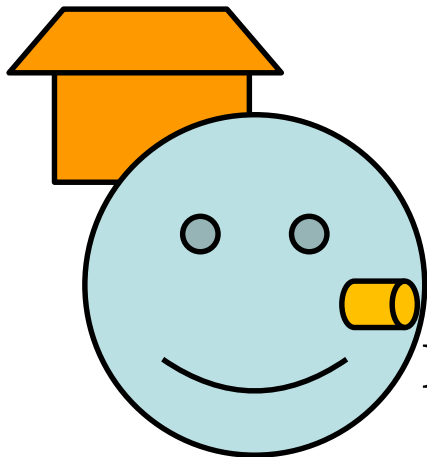
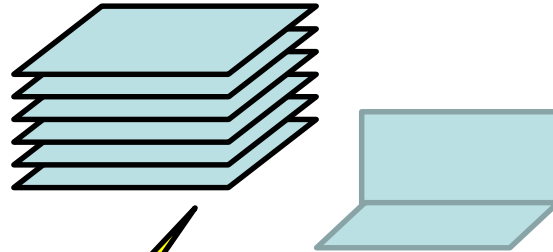
The global network society demands engineers who has studied in the multidisciplinary field.

The multidisciplinary field of study should be developed in the educational systems in the technology.

Important topic for young people (future)

Self-Monitoring or Hospital

Personal Health Record



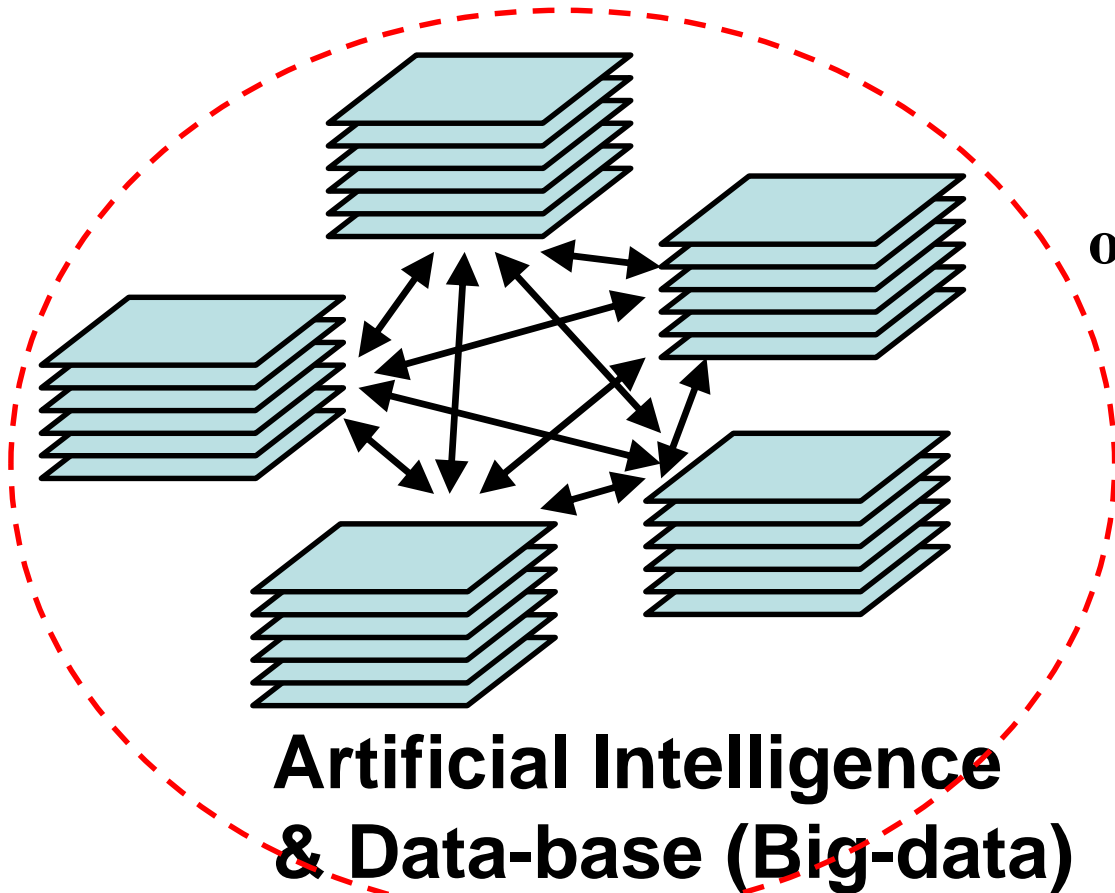
Implanted Microchip



Network? Privacy?

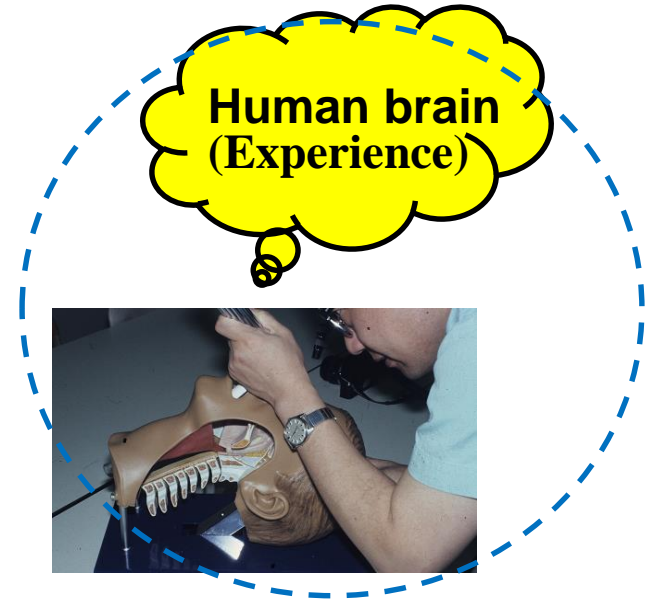
Young people must fight with multidisciplinary topics...

Do you prefer AI than Medicine for diagnostics?



Responsibility? Error?

or



Medical doctor

More than 50 % of students: yes

Biomedical Engineering

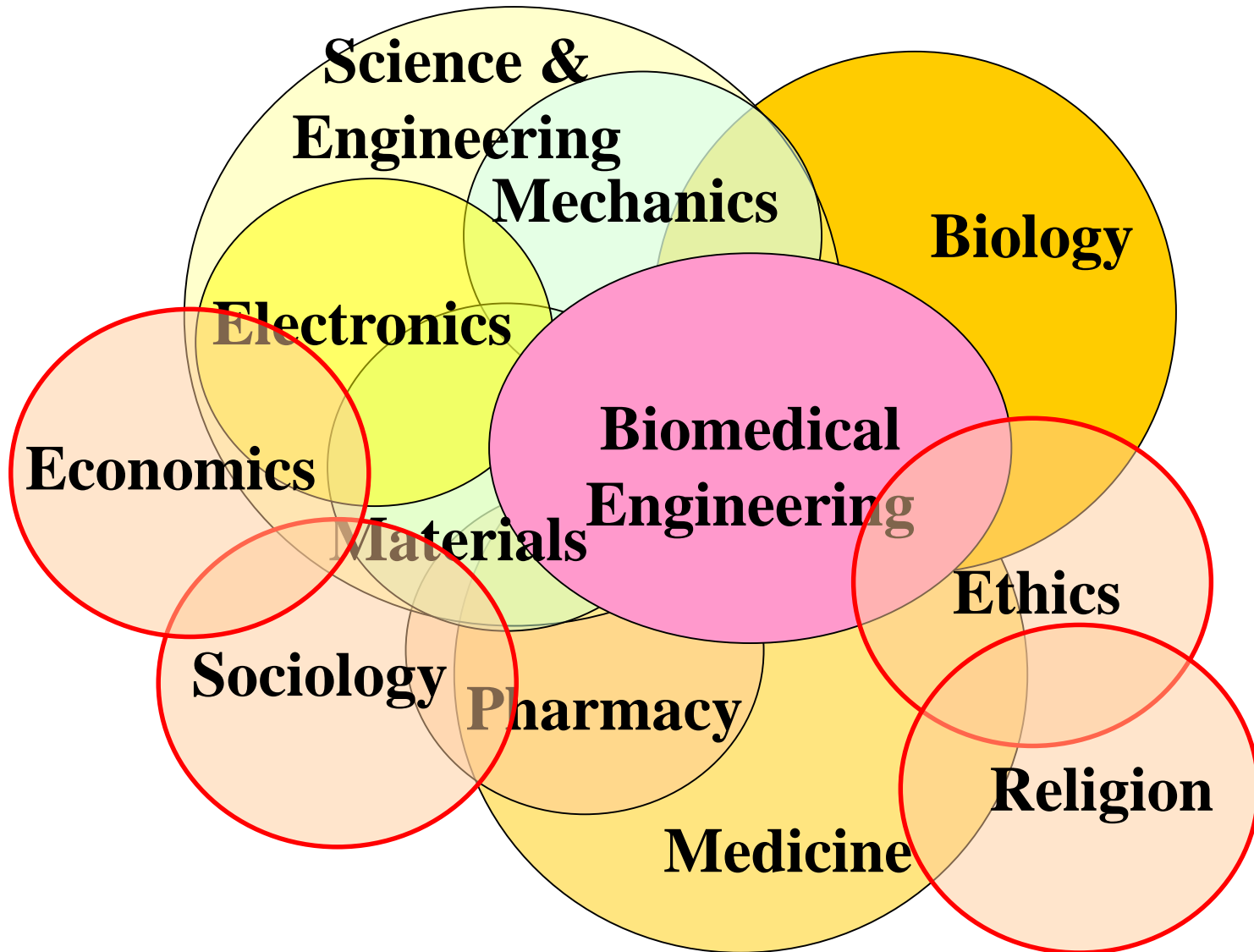
“Biomedical Engineering” is one of the multidisciplinary fields of study.

It is not only related to engineering and to medicine, but also to a variety of natural sciences, human sciences and social sciences.

It is not only a combined field between two disciplines, but also a new field to create a new discipline.

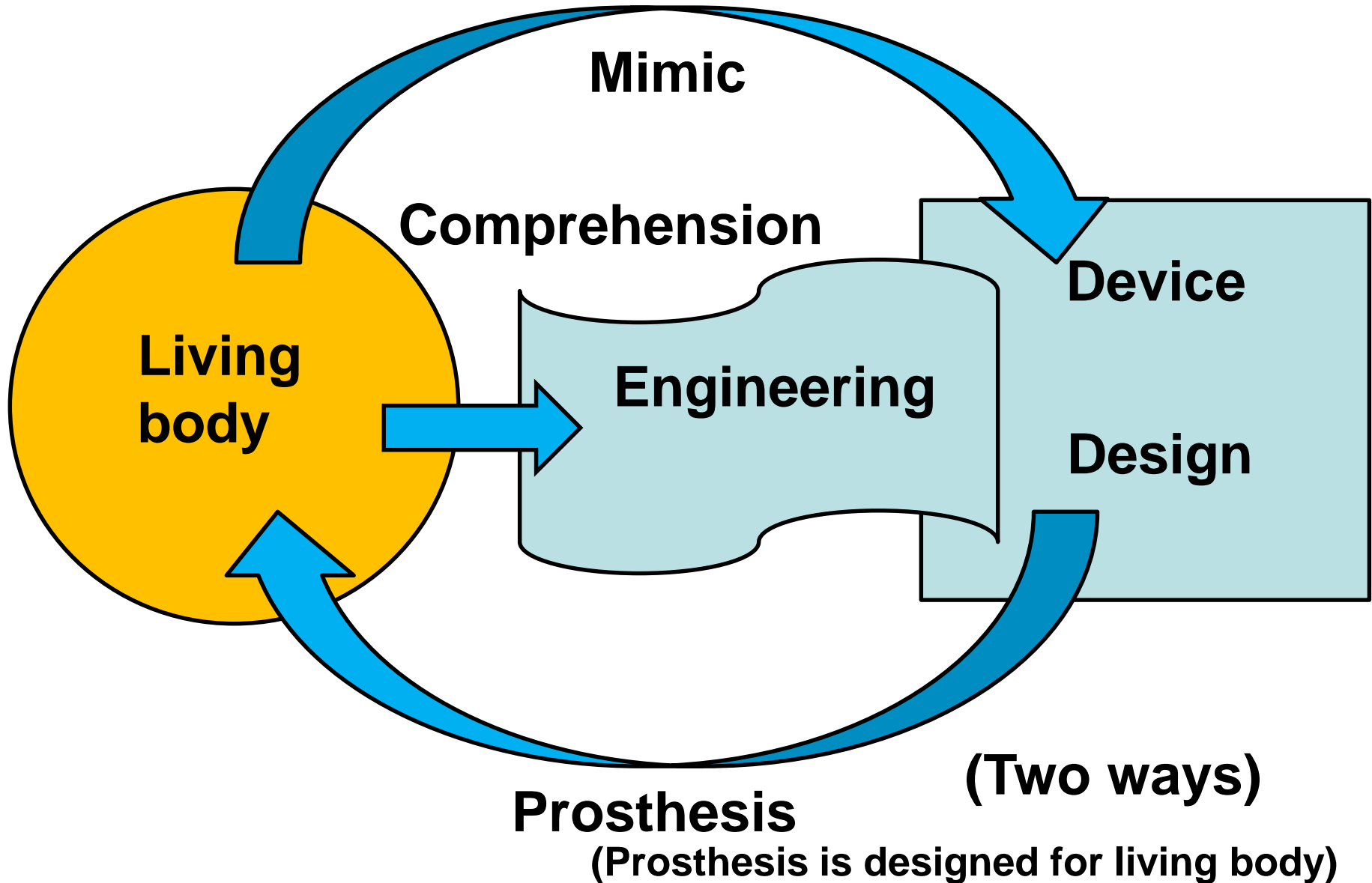
New methodology is necessary to solve the communication problem at the interface between the engineered system and the biological system.

Biomedical engineering field



What is **Biomedical Engineering**?

(Living body gives idea for new device)



Multidisciplinary field

To develop a department of the multidisciplinary field of study in a university,

you have to check several important aspects:

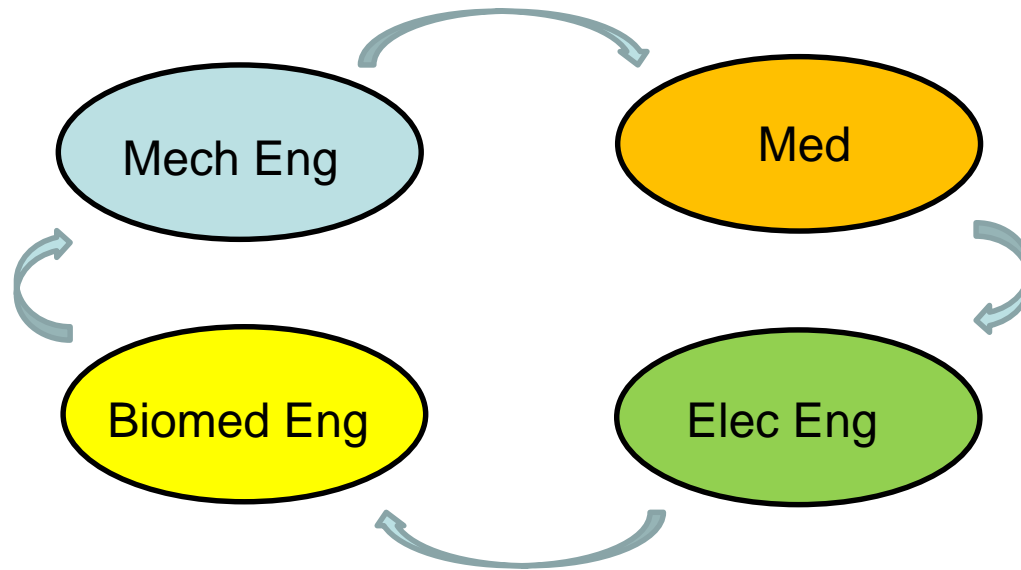
- 1) professors of multi-disciplinarian**
- 2) bridging curriculum**
- 3) common facilities**

Biomedical Engineering

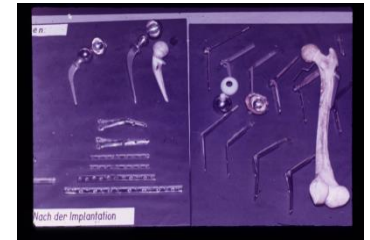
The article is based on the experiences of the author, who creates the first department of Biomedical Engineering in Japan.

My Affiliation

(Multidisciplinary Research)



- 1) 1975- Mechanical Engineering (Bio-tribology)
- 2) 1981- Medical University (Artificial Heart, Hemorheology)
- 3) 1994- Electronics (Bio-measurement)



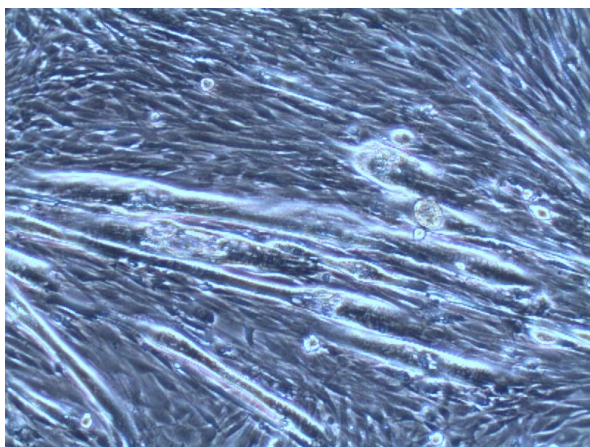
My Affiliation

(Multidisciplinary Research)

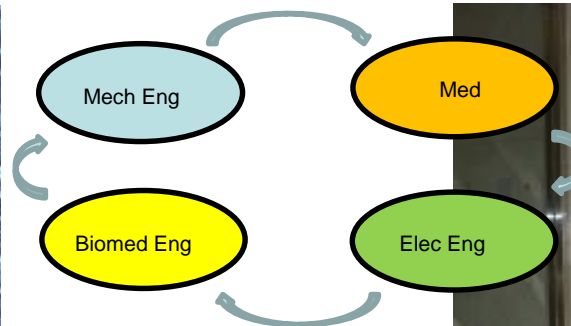


4) 2005- Create First Department of Biomedical Engineering in Japan (Bachelor, Master, PhD)
(Cell and Tissue Engineering)

5) 2011- Micro and Bio Systems Research Center, Kogakuin University (Biomechanics)

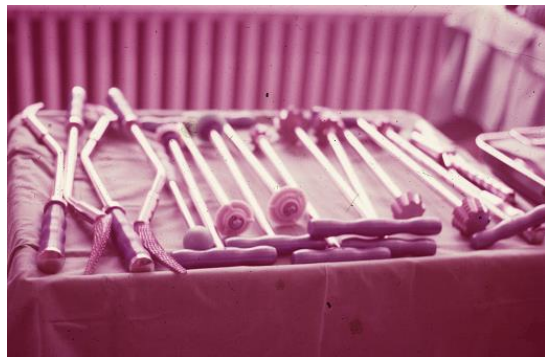


0.1 mm



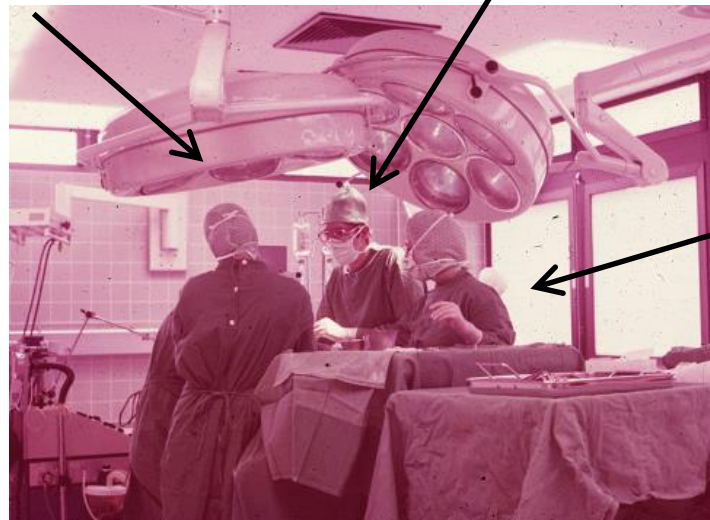
Multidisciplinary research field: Internship Abroad (1977)

Internship in institute of artificial heart in Free University Berlin, Germany.



Engineer
Mech, Elec.

Surgeon



Nurse

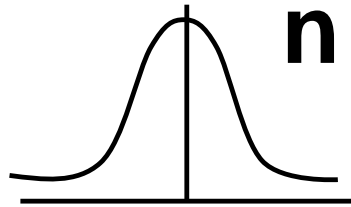
Collaboration between engineering and medicine. The cross cultural experience gave me interdisciplinary sense, too.

Each discipline has philosophy:

Doctor thesis twice

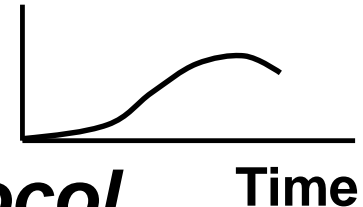
(Protocol should not be changed or should be modified?)

a) Medicine: repeat, **statistics**



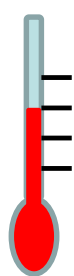
Individual difference

Time dependent



Never change protocol

b) Engineering: **standardize**



Temperature



Homogenization

Sophisticated methodology,

Pure material

(reviews for two doctors)

Multi-disciplinarian

Text book on multidisciplinary field

- 1) Introduction to **Biomechanical Engineering**
- 2) Introduction to **Biomedical Measurement Engineering**
- 3) Introduction to **Biosystems Engineering**



Bridge between engineering and medicine.

<http://www.mech.kogakuin.ac.jp/labs/bio/contents/index.html>

Bridge between courses

Guide for students?
Multi-disciplinarian?

Prof. A & B

Bio-measurement

Prof. B & C

Introduction to
medicine

Medical Information

Bio-systems

Prof. F & B

Prof. C & D

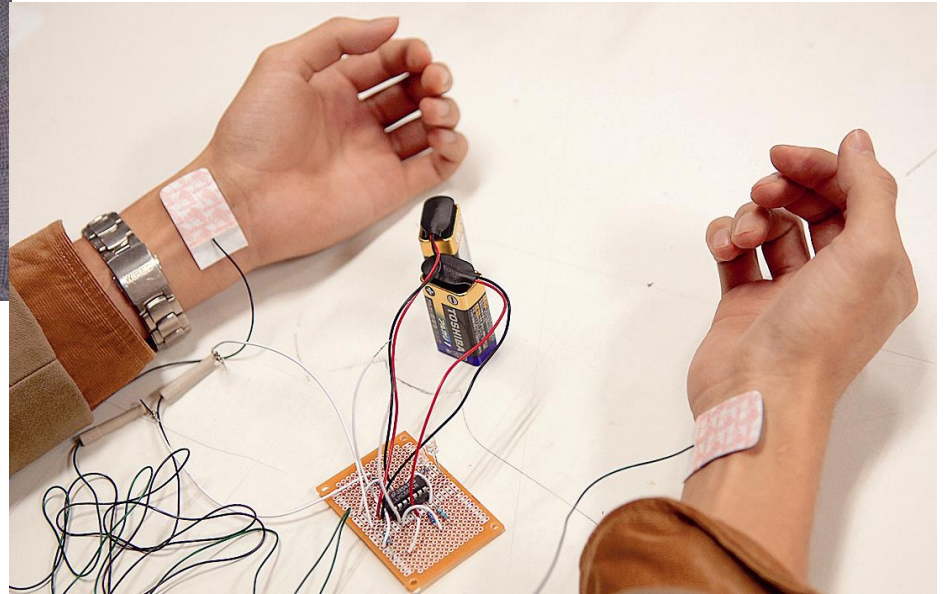


Time course

Core curriculum: experiments (project)



**Electro cardiogram
measurement**



Electric circuit

Learning environment: Training room next to Lab



**Staff
room**

Laboratory

**Training room
(undergraduate)**

Teamwork

The activity by a team, which consists of members from a variety of backgrounds, is effective to learn multidisciplinary topics.

Cross cultural

A cross cultural training is also effective to break through the barrier between disciplines.

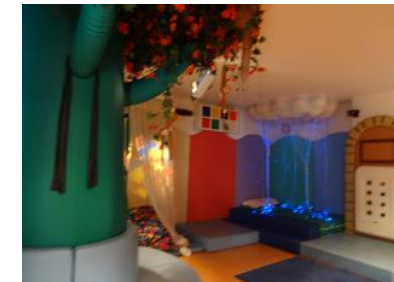
Workshop: Nursing home (Chula in Aug 2016)



Memorandum of Understanding



BME



Gerontology

“Gerontology” is picked up in the aging society in the world. Gerontology is also multidisciplinary field of study.

Japan is one of the country, in which the generation balance will change in few years.

The multidisciplinary technology will support the ageing society.

Population pyramid

(Japan has big problem)

years

100

Male

Female

2040? (inverse triangle)

50

1920

2015

1920 (triangle)

0

1000

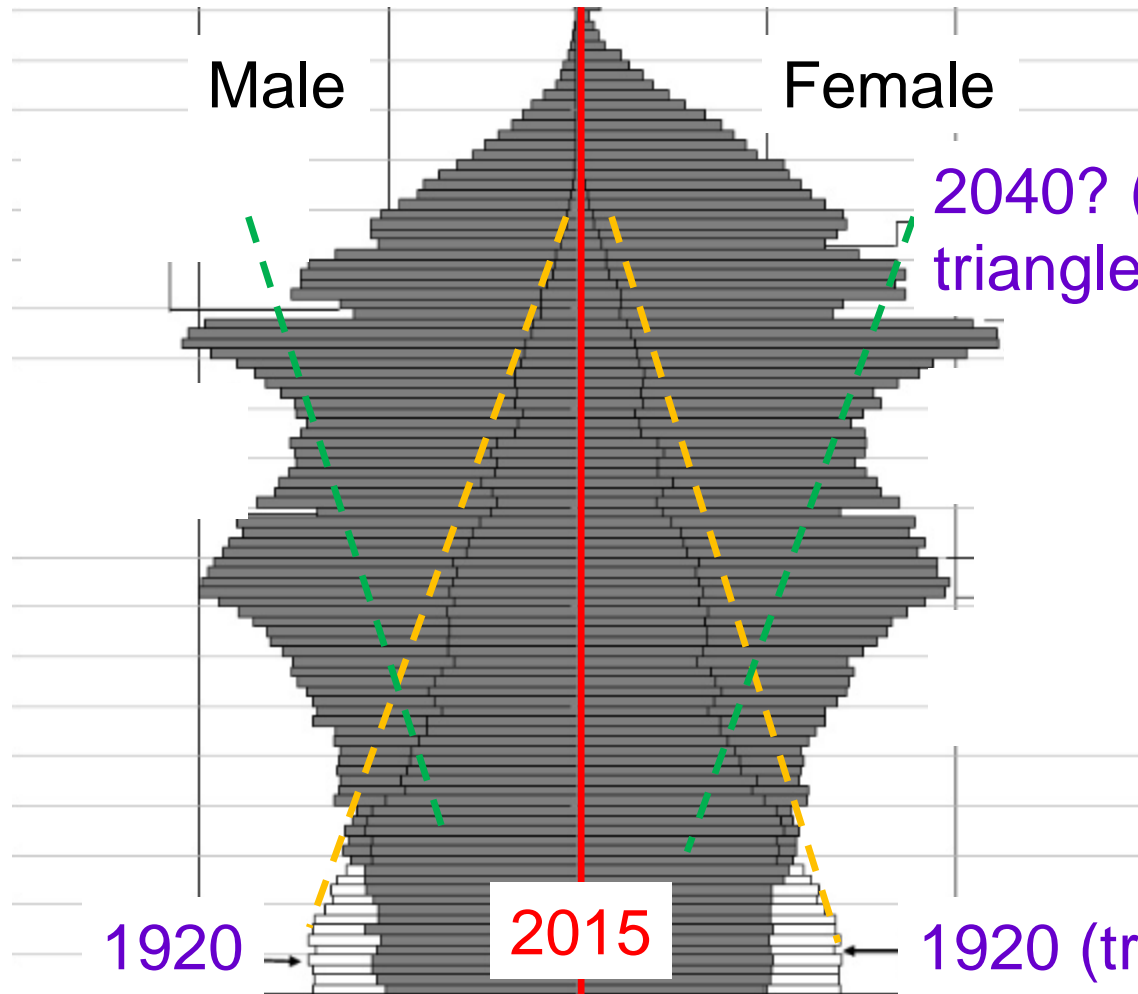
500

0

500

1000

thousand



Gerontology

The multidisciplinary technology will support the ageing society.

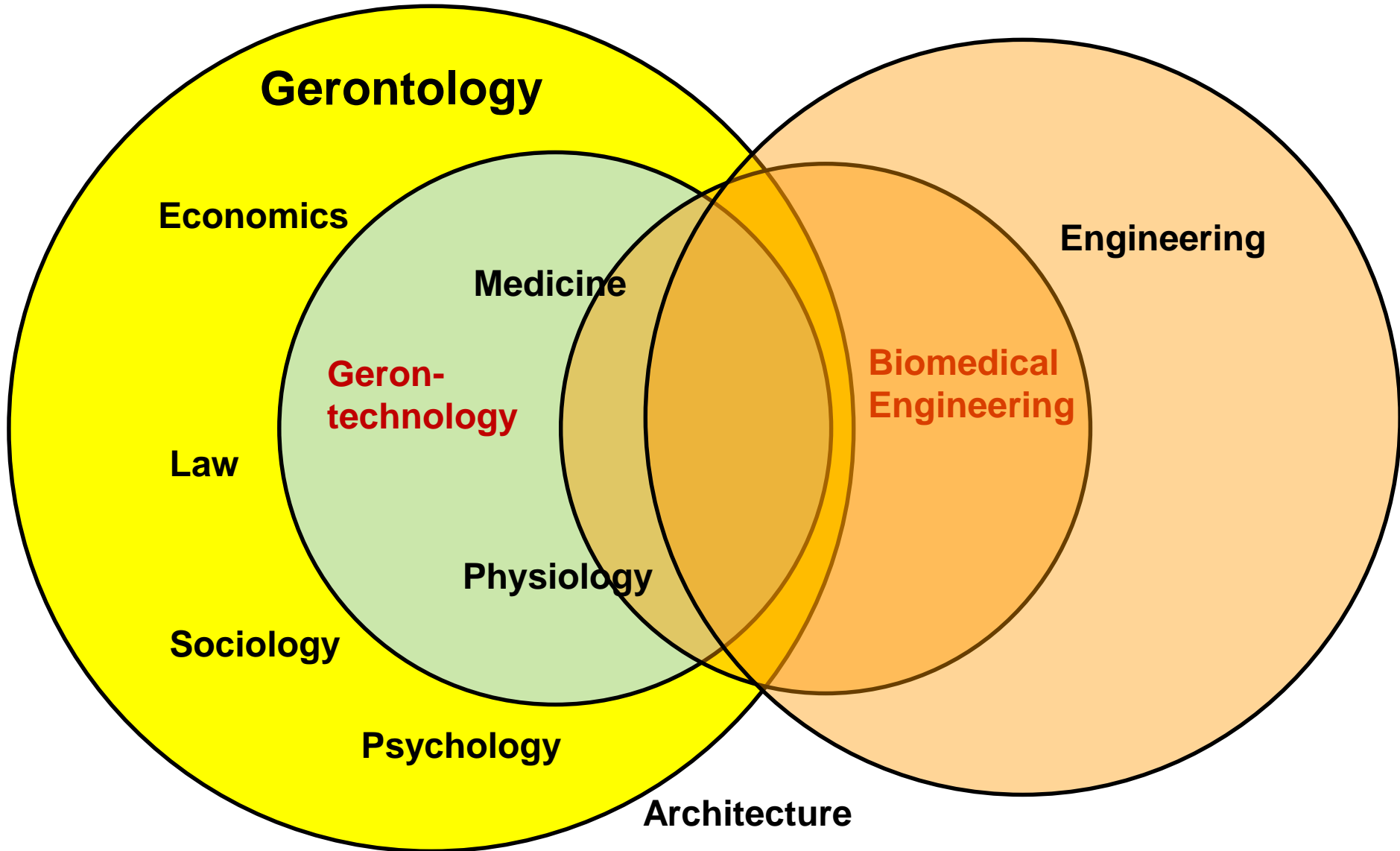
Medicine, science and engineering, law,
economics, sociology, psychology,
ethics, pedagogy, philosophy, art

from **Biomedical Engineering** to
Gerontology

To reorganize the social system
and infrastructure according to
the super aged society.



Gerontechnology



comprehensive solution of elderly people

various problems associated with aging

REFERENCES

- 1) R.A. Linsenmeier, **IEEE Engineering in Medicine and Biology Magazine**, Vol. 23(4), 2003, pp. 32-38.
- 2) S. Hashimoto, et al., **Proc. 11th World Multiconference on Systemics Cybernetics and Informatics**, Vol. 4, 2007, pp. 39-44.
- 3) S. Hashimoto, et al., **Journal of Communication and Computer**, Vol. 8 (12), 2011, pp. 1117-1122.
- 4) S. Hashimoto, **Journal of Systemics Cybernetics and Informatics**, Vol. 11, No. 9, 2013, pp. 17-22.
- 5) S. Hashimoto, **Journal of Systemics Cybernetics and Informatics**, Vol. 12, No. 5, 2014, pp. 43-48.
- 6) S. Hashimoto, **Journal of Systemics Cybernetics and Informatics**, Vol. 13, No. 6, 2015, pp. 1-7.
- 7) S. Hashimoto, **Journal of Systemics Cybernetics and Informatics**, Vol. 14, No. 5, 2016, pp. 22-27.
- 8) S. Hashimoto, **Journal of Systemics Cybernetics and Informatics**, Vol. 15, No. 6, 2017, pp. 106-112.
- 9) S. Hashimoto, “Cross Cultural Seminar Inspires Multidisciplinary Learning: from Biomedical Engineering to Gerontechnology”, **Journal of Systemics Cybernetics and Informatics**, Vol. 16, No. 6, 2018, in press.