京都大学大学院
博士課程教育リーディングプログラム

充実した健康長寿社会を築く
総合医療開発リーダー育成プログラム

Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

平成25年度　年次報告書

Annual Report 2013

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はじめに

2014 年 3 月 31 日

充実した健康長寿社会を築く総合医療開発リーダー育成プログラム（Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society: LIMS）は、２年前から構想を練り、2012年10月に文部科学省博士課程リーディングプログラム（複合型、生命健康）に採択された。2013年度から履修生の受け入れを行い、現在、修士１回生９人が研鑽しており、次年度履修予定の学生12人が予定されている。LIMSは、理工学・薬学などを専門とする大学院生を、医学部・医学研究科で教育し、医学・医療の基礎を習得させることが主たる目的である。京都大学は、医工連携の研究では長い歴史がある。その成果は多くあるが、基礎となる、学部・大学院院での教育システムがなかった。分野を超えたリーディング大学院を、そのシステムを実現する好機と捉えた。工学・薬学だけではなく経済学などの研究科、再生医科学研究所や数理解析研究所などのご協力をえて、それなりの体裁をもった教育システムができあがってきた。

まだ、教育が始まったばかりで、これからどのような人材が輩出されるかが、もっとも重要なアウトカムであるが、それまでにも、いくつも、超えて行かなくてはいけない問題が山積している。特に、修士では、座学が多いので、以前の教養部のような授業になりがちであるが、実際、博士課程になると、多くの企業や研究所にて、インターンシップや実習を通常の博士課程よりも多く経験する計画であるが、どのようなことになるか、大きな期待と不安がある。

今後、多くの優れた人材が輩出し、医学と工学の橋渡しの人材となることを期待したい。

プログラムコーディネーター
福　山　秀　直

Preface

H.Fukuyama, M.D., Ph.D.

Coordinator of LIMS, Director of Human Brain Research Center
Professor of Kyoto University Graduate School of Medicine

"Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society" （LIMS）has been designed since 2 years ago, and won a public fund 'Program for Leading Graduate Schools' by Ministry of education, culture, sports, science and technology (MEXT) in October 2012. In academic year 2013, we recruited and selected 9 participants from master course students.
Our primary objective is in short "training engineering students in the medical circumstances". We have carefully polished the basic educational plan by the time of grant application to MEXT, but we encountered various problems and obstacles in putting it in practice. Supported by generous cooperation among program professors from graduate schools of Engineering, Pharmaceutical Science, Medicine and others, a good study course was developed and improved for master course; the first two years education.

Increasing number of students are interested in LIMS program. For the next year, we expect to receive 12 students. They will be able to study anatomy; the basic knowledge of medicine, since April, and the second grade students also will study it together. This is due to the fixed anatomy study period. I hope they will get the full knowledge as much.

In terms of research, Kyoto University has a long history of cooperation between medicine and engineering. Unfortunately, formal educational system to sustain the cooperation has not been established yet in spite of this long and productive experiences. Launching interdisciplinary graduate school program such as LIMS is a good occasion to enforce medico-engineering cooperation both from educational and research aspects. Kyoto University stands in a good position to lead such research to the fruitful future society. The analysis of big data including genetic information, and life styles, and newly developing regenerative techniques are required to integrate both fields. I hope the LIMS students have some contribution in these important fields.

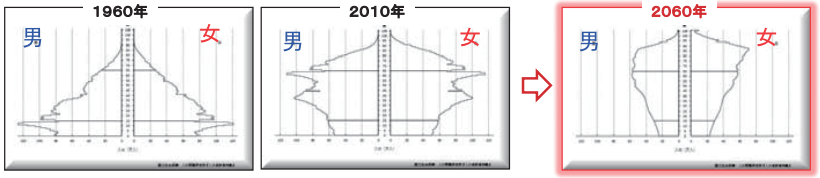
3/31/2014

1.

プログラムの概要

Outline of the Program

世界に先駆けて超高齢化社会を迎える我が国の責務



（国立社会保障・人口問題研究所「人口統計資料」2011より）

医療と福祉の統合により地域の中で個々人の生活を支える**総合医療システム**の構築と、後続諸外国にそのグローバルモデルを提示する責務

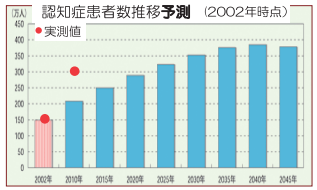
充実した医学環境の中で医工学者を教育・育成する

超高齢化社会の諸問題を俯瞰し、メディカルイノベーションを通じて、充実した健康長寿社会の構築に貢献しうる**総合医療開発リーダー**を育成し、世界に輩出する

超高齢社会の医療：課題と要請

超高齢化社会の課題

- 健康長寿とQOL向上
- 高齢者の社会参画
- 医療費の抑制



2014年462万人
中国：900万人以上

求められる総合医療システム

- 医療・福祉・在宅ケアの統合
- 個人の生活全体を考慮した支援システム
- 良い生活習慣による疾病・障害の予防

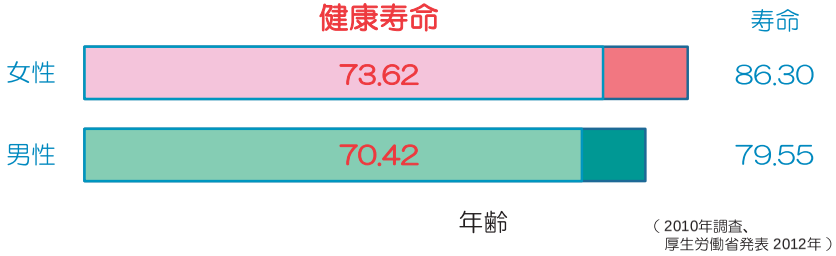
今必要とされるもの

医療現場のニーズに立脚して
総合医療システムを開発する
医工学人材と
これを統率するリーダー

健康長寿社会の日本モデル

- 時代に即した三世代互助
- 地域社会に開かれた医療支援
- 働ける限り働きつつ健康維持

充実した健康長寿社会とは？



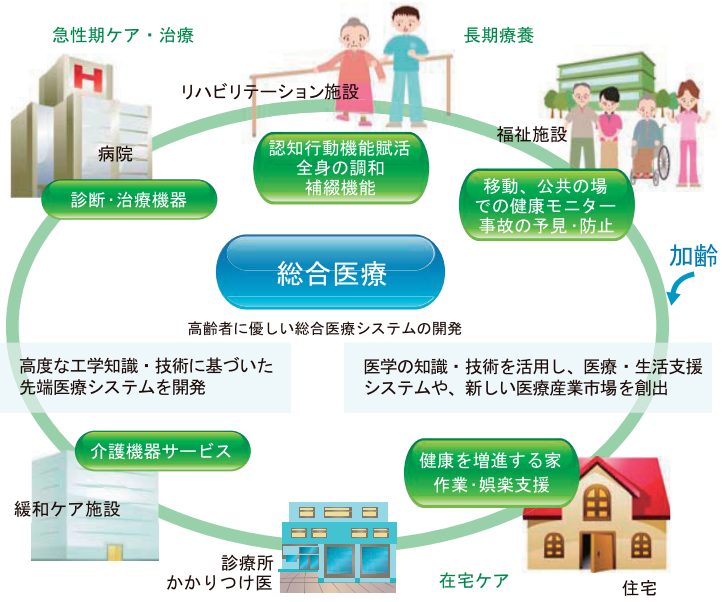
（2010年調査、
厚生労働省発表 2012年）

健康寿命：平均寿命から日常生活に制限のある期間を引いた年齢。
日本は、平均寿命が長いだけでなく、自立して日常生活を送ることの出来る「健康寿命」が世界最長。
政府の日本再興戦略（2013年）では、2020年までに国民の健康寿命を１歳以上延伸することを目標に掲げている。

LIMSプログラムは、
- 高齢者や関係者のQOLを向上しつつ
- 健康寿命を延長すること

が、いかにして可能かを解明し、健康長寿社会の構築に貢献。

総合医療と新たな医療産業



医工学の基盤に基づく新たな人材育成

医学環境のなかで健康長寿社会を担える医工学者を育成する

- 理工学、生物系学部出身者が、医学部卒業生に匹敵する基礎医学と生体知識を習得
- 医療・介護支援などの現場のニーズを理解
- 専門性の高い医工学の知識、技術の習得
- 社会における医療ルールの理解（医療政策、医療経済、医療倫理、知財・標準化など）
- 企業・国内外研究機関による実践的学修とインターンシップ

産官学連携による医療現場に立脚した医工学研究教育

講師派遣・インターンシップ受入

京都大学

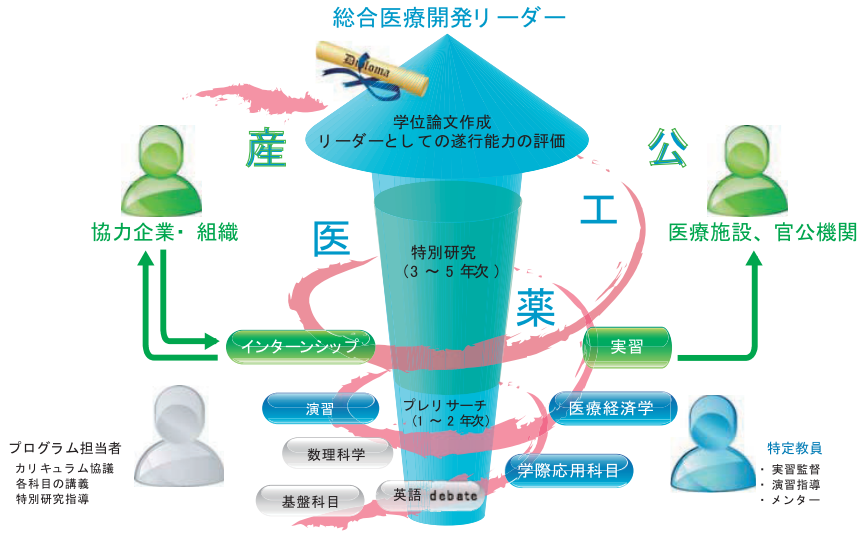
医学研究科
工学研究科
薬学研究科
数理解析研究所
経済学研究科
再生医科学研究所
先端医工学研究ユニット
統合複雑系科学国際研究ユニット

協力企業・組織

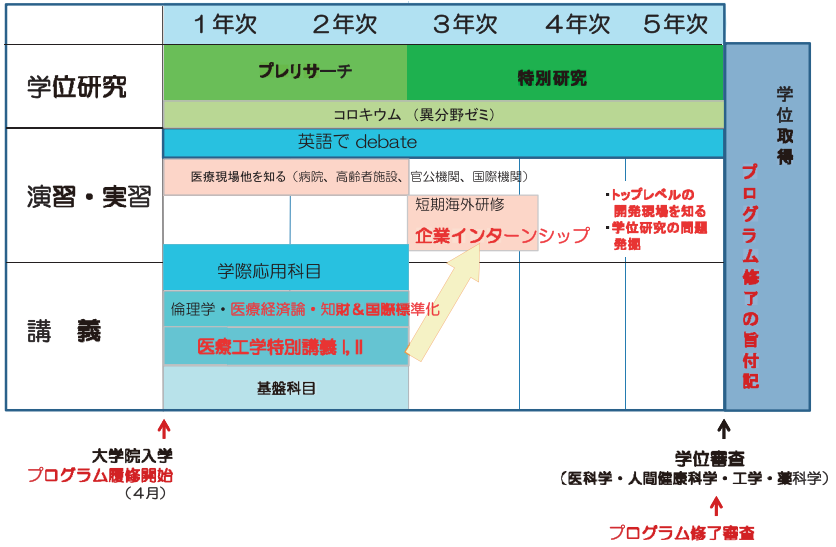
医療機器産業
自動車産業
住宅産業
等

京都市
ASTEM
神戸市産業振興財団

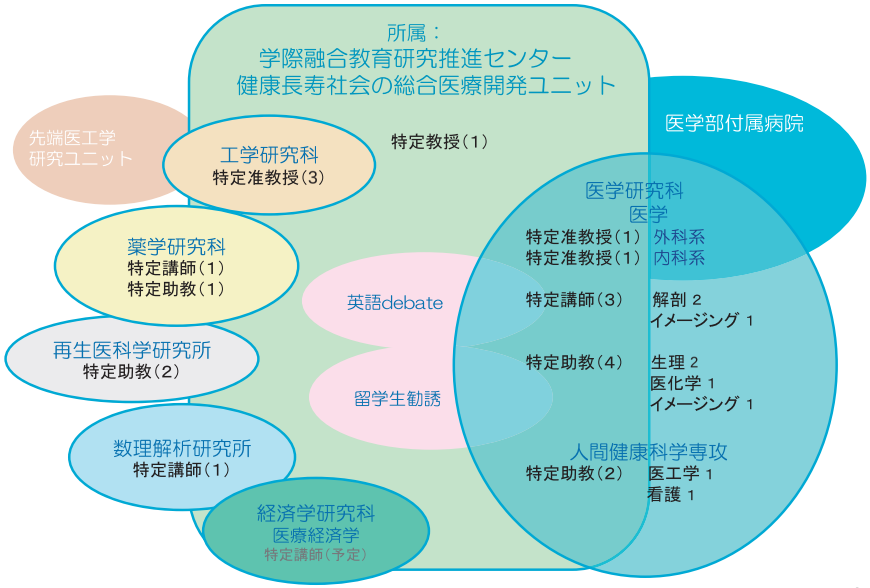
カリキュラムの概要



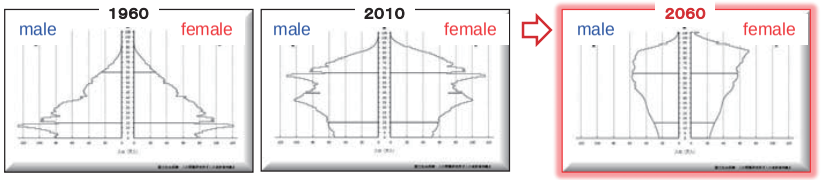
学位プログラム履修モデル



多様な分野の特定教員



Unprecedented Aging Society



（National Inst. Population & Social Security Res.「demographics 2011）

Japan is one of the first industrialized countries that face the problems of an unprecedented aging society.
Japan has to successfully achieve medical innovation to cope with it and contribute to following countries and regions of the world by showing good models.

Our approach is to train young leaders who can overlook the problems and guide the medical innovation not only in Japan but also in various societies and regions in the world.

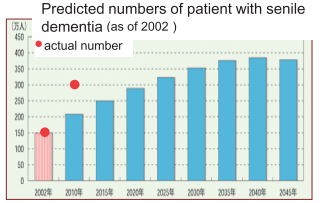
1

Problems and Needs in Aging Society

problems

- healthy longevity and high Q O L
- social inclusion of the elderly
- health care cost management

Predicted numbers of patient with senile dementia (as of 2002)



needs

- integration of medial/welfare/home-care systems
- supports respecting total aspects of individual life
- prevention of diseases and accidents with good lifestyle

expectation

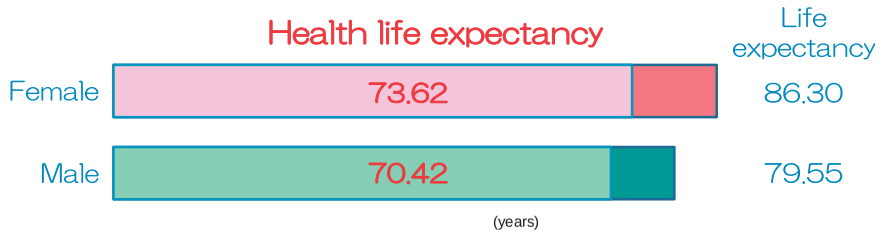
Leaders to create integrated medical system based on social needs by making good use of technology

Japanese model of healthy longevity

- mutual aid among three generations
- medical supports achieved by the community
- to maintain health by staying at work

2

Fruitful Healthy-Longevity Society



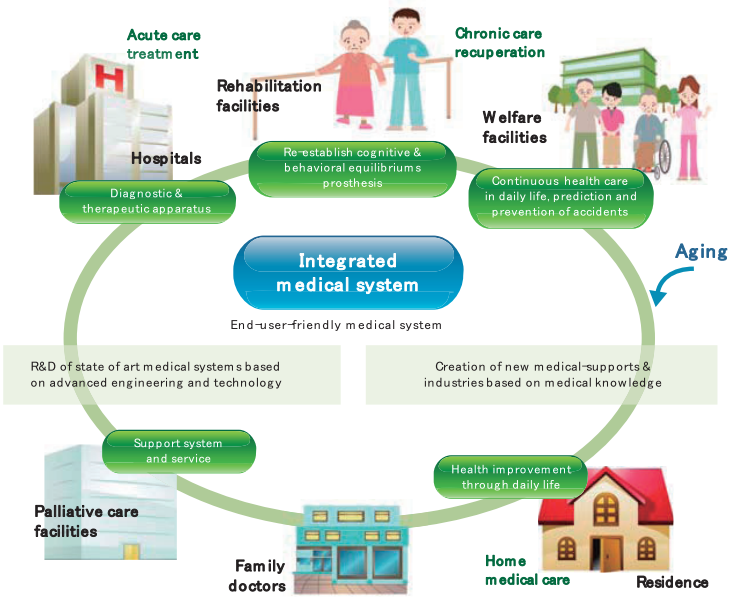
surveyed in 2010, published in 2012
by Japanese Ministry of Health, Labour and Healthcare,

The Japanese government plans to prolong health life expectancy.
At first, it aims to make the growth of health life expectancy exceeding that of life expectancy.

Kyoto University's LIMS program seeks
how to implement the growth of health life expectancy along with
the improvement of QOL for the elderly and related people.

3

Integrated Medical System and New Medical Industries



4

Research and Educational System

Training non-medical students in medical environment

- fundamental medical knowledge for **non-medical graduates**
- understanding of social needs (especially in medical and care practices)
- specialized knowledge and skills in medico-engineering areas
- health-economics, -policy, & –ethics, and intellectual properties & global standardization
- internship in companies and foreign institutes

collaboration of industry, government and academia

lecture / internship

Kyoto University

Graduate Schools of:
- Medicine
- Engineering
- Pharmaceutical Science
- Economics

Institute for Frontier Med. Sci.
Res. Inst. for Mathematical Sci.
Advanced Biomed. Eng. Res. Unit
International Res. Unit of Integrated Complex System Science

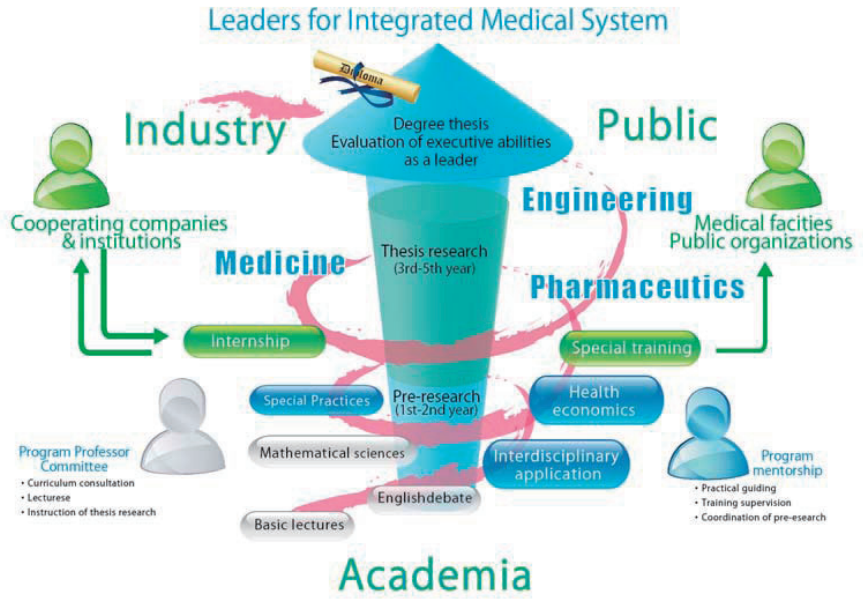
Industrial/public parties

Companies from:
- Medial apparatus industry
- Automotive industry
- Housing industry

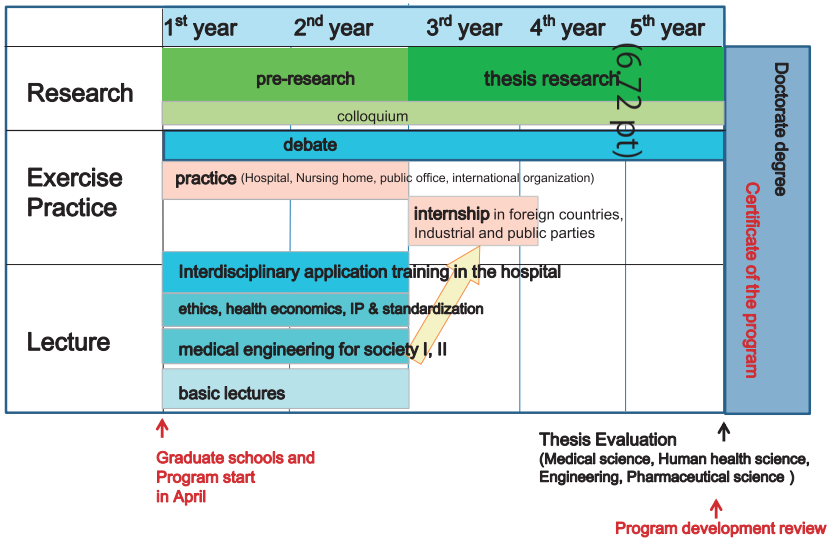
etc.

Kyoto City
ASTEM
Kobe City

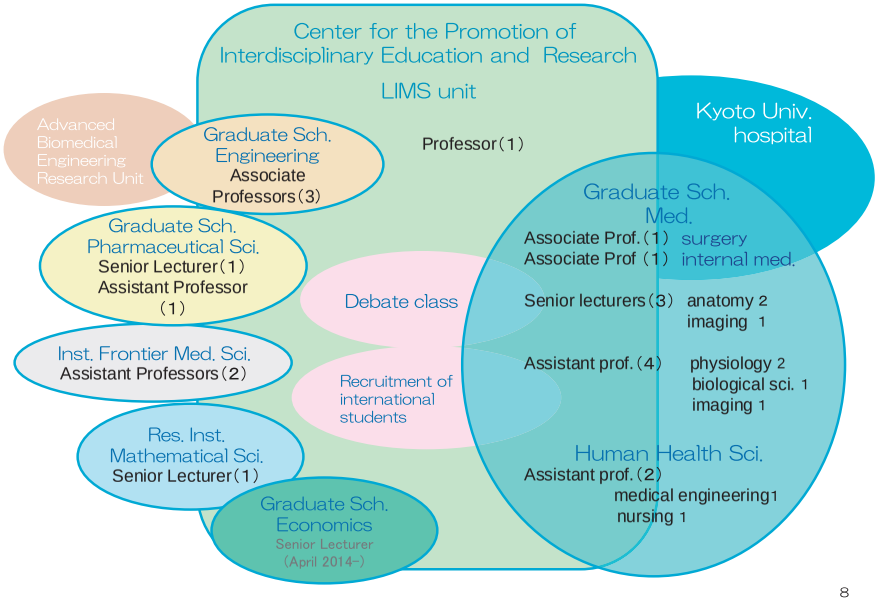
Curriculum Overview



Course Schedule



Program-Specific Staff



プログラム担当者一覧

	氏　名	所　属	専攻等	職　名	備　考
1	湊　　長博	医学研究科	医学	教授	プログラム責任者・医学研究科長
2	福山　秀直	医学研究科	医学	教授	プログラムコーディネーター・LIMSユニット長
3	渡邉　　大	医学研究科	医学	教授	
4	萩原　正敏	医学研究科	医学	教授	
5	斎藤　通紀	医学研究科	医学	教授	
6	松田　道行	医学研究科	医学	教授	
7	羽賀　博典	医学研究科	医学	教授	
8	岩田　　想	医学研究科	医学	教授	
9	野田　　亮	医学研究科	医学	教授	
10	篠原　隆司	医学研究科	医学	教授	
11	金子　武嗣	医学研究科	医学	教授	
12	河野　憲二	医学研究科	医学	教授	
13	大森　治紀	医学研究科	医学	教授	
14	木村　　剛	医学研究科	医学	教授	
15	三嶋　理晃	医学研究科	医学	教授	理事・附属病院長
16	平岡　眞寛	医学研究科	医学	教授	
17	富樫 かおり	医学研究科	医学	教授	
18	一山　　智	医学研究科	医学	教授	
19	坂井　義治	医学研究科	医学	教授	
20	戸井　雅和	医学研究科	医学	教授	
21	小西　郁生	医学研究科	医学	教授	
22	小川　　修	医学研究科	医学	教授	
23	坂田　隆造	医学研究科	医学	教授	
24	鈴木　茂彦	医学研究科	医学	教授	
25	吉村　長久	医学研究科	医学	教授	
26	伊藤　壽一	医学研究科	医学	教授	
27	松田　秀一	医学研究科	医学	教授	
28	藤田　　潤	医学研究科	医学	教授	
29	髙橋　良輔	医学研究科	医学	教授	
30	宮本　　享	医学研究科	医学	教授	
31	前川　　平	医学部附属病院	輸血細胞治療部	教授	
32	小杉　眞司	医学研究科	社会健康医学系	教授	
33	細田　公則	医学研究科	人間健康科学系	教授	
34	桂　　敏樹	医学研究科	人間健康科学系	教授	
35	木下　彩栄	医学研究科	人間健康科学系	教授	
36	足立　壯一	医学研究科	人間健康科学系	教授	
37	椎名　　毅	医学研究科	人間健康科学系	教授	

	氏　名	所　属	専攻等	職　名	備　考
38	杉本　直三	医学研究科	人間健康科学系	教授	
39	黒木　裕士	医学研究科	人間健康科学系	教授	
40	市橋　則明	医学研究科	人間健康科学系	教授	
41	二木　淑子	医学研究科	人間健康科学系	教授	
42	荒井　秀典	医学研究科	人間健康科学系	教授	
43	小寺　秀俊	工学研究科	マイクロエンジニアリング	教授	理事
44	木村　俊作	工学研究科	材料化学	教授	
45	白川　昌宏	工学研究科	分子工学	教授	
46	秋吉　一成	工学研究科	高分子化学	教授	
47	森　　泰生	工学研究科	合成・生物化学	教授	
48	濱地　　格	工学研究科	合成・生物化学	教授	
49	中部　主敬	工学研究科	機械理工学	教授	
50	大嶋　正裕	工学研究科	化学工学	教授	
51	近藤　輝幸	学際融合教育研究推進センター	先端医工学研究ユニット	教授	
52	佐治　英郎	薬学研究科	薬学	教授	薬学研究科長
53	橋田　　充	薬学研究科	薬学	教授	
54	掛谷　秀昭	薬学研究科	医薬創成情報科学	教授	
55	中山　和久	薬学研究科	薬科学	教授	
56	加藤　博章	薬学研究科	薬科学	教授	
57	後藤　　励	白眉センター		特定准教授	
58	岩田　博夫	再生医科学研究所		教授	再生医科学研究所長
59	田畑　泰彦	再生医科学研究所		教授	
60	戸口田 淳也	再生医科学研究所		教授	
61	安達　泰治	再生医科学研究所		教授	
62	開　　祐司	再生医科学研究所		教授	
63	瀬原　淳子	再生医科学研究所		教授	
64	長澤　丘司	再生医科学研究所		教授	
65	河本　　宏	再生医科学研究所		教授	
66	森　　重文	数理解析研究所		教授	数理解析研究所長
67	岡本　　久	数理解析研究所		教授	
68	山田　道夫	数理解析研究所		教授	
69	寺西　　豊	医学研究科	「医学領域」産学連携推進機構	特任教授	
70	石井 加代子	学際融合教育研究推進センター	健康長寿社会の総合医療開発ユニット	特定教授	

（平成26年3月31日時点）

Program Professors

	Name	Graduate School etc.	Devision	Position	Notes
1	Nagahiro Minato	Graduate School of Medicine	Medicine	Professor	Program Director, Dean of Graduate School of Medicine
2	Hidenao Fukuyama	Graduate School of Medicine	Medicine	Professor	Program Coordinator Director of LIMS Unit
3	Dai Watanabe	Graduate School of Medicine	Medicine	Professor	
4	Masatoshi Hagiwara	Graduate School of Medicine	Medicine	Professor	
5	Mitinori Saitou	Graduate School of Medicine	Medicine	Professor	
6	Michiyuki Matsuda	Graduate School of Medicine	Medicine	Professor	
7	Hironori Haga	Graduate School of Medicine	Medicine	Professor	
8	So Iwata	Graduate School of Medicine	Medicine	Professor	
9	Makoto Noda	Graduate School of Medicine	Medicine	Professor	
10	Takashi Shinohara	Graduate School of Medicine	Medicine	Professor	
11	Takeshi Kaneko	Graduate School of Medicine	Medicine	Professor	
12	Kenji Kawano	Graduate School of Medicine	Medicine	Professor	
13	Harunori Ohmori	Graduate School of Medicine	Medicine	Professor	
14	Takeshi Kimura	Graduate School of Medicine	Medicine	Professor	
15	Michiaki Mishima	Graduate School of Medicine	Medicine	Professor	Executive Director, Director of Kyoto University Hospital
16	Masahiro Hiraoka	Graduate School of Medicine	Medicine	Professor	
17	Kaori Togashi	Graduate School of Medicine	Medicine	Professor	
18	Satoshi Ichiyama	Graduate School of Medicine	Medicine	Professor	
19	Yoshiharu Sakai	Graduate School of Medicine	Medicine	Professor	
20	Masakazu Toi	Graduate School of Medicine	Medicine	Professor	
21	Ikuo Konishi	Graduate School of Medicine	Medicine	Professor	
22	Osamu Ogawa	Graduate School of Medicine	Medicine	Professor	
23	Ryuzo Sakata	Graduate School of Medicine	Medicine	Professor	
24	Shigehiko Suzuki	Graduate School of Medicine	Medicine	Professor	
25	Nagahisa Yoshimura	Graduate School of Medicine	Medicine	Professor	
26	Juichi Ito	Graduate School of Medicine	Medicine	Professor	
27	Shuichi Matsuda	Graduate School of Medicine	Medicine	Professor	
28	Jun Fujita	Graduate School of Medicine	Medicine	Professor	
29	Ryosuke Takahashi	Graduate School of Medicine	Medicine	Professor	
30	Susumu Miyamoto	Graduate School of Medicine	Medicine	Professor	
31	Taira Maekawa	Kyoto University Hospital	Transfusion Medicine and Cell Therapy	Professor	
32	Shinji Kosugi	Graduate School of Medicine	School of Public Health	Professor	
33	Kiminori Hosoda	Graduate School of Medicine	Human Health Sciences	Professor	
34	Toshiki Katsura	Graduate School of Medicine	Human Health Sciences	Professor	
35	Ayae Kinoshita	Graduate School of Medicine	Human Health Sciences	Professor	
36	Souichi Adachi	Graduate School of Medicine	Human Health Sciences	Professor	
37	Tsuyoshi Shiina	Graduate School of Medicine	Human Health Sciences	Professor	

	Name	Graduate School etc.	Devision	Position	Notes
38	Naozo Sugimoto	Graduate School of Medicine	Human Health Sciences	Professor	
39	Hiroshi Kuroki	Graduate School of Medicine	Human Health Sciences	Professor	
40	Noriaki Ichihashi	Graduate School of Medicine	Human Health Sciences	Professor	
41	Toshiko Futaki	Graduate School of Medicine	Human Health Sciences	Professor	
42	Hidenori Arai	Graduate School of Medicine	Human Health Sciences	Professor	
43	Hidetoshi Kotera	Graduate School of Engineering	Department of Micro Engineering	Professor	Executive Director
44	Shunsaku Kimura	Graduate School of Engineering	Department of Material Chemistry	Professor	
45	Masahiro Shirakawa	Graduate School of Engineering	Department of Molecular Engineering	Professor	
46	Kazunari Akiyoshi	Graduate School of Engineering	Department of Polymer Chemistry	Professor	
47	Yasuo Mori	Graduate School of Engineering	Department of Synthetic Chemistry and Biological Chemistry	Professor	
48	Itaru Hamachi	Graduate School of Engineering	Department of Synthetic Chemistry and Biological Chemistry	Professor	
49	Kazuyoshi Nakabe	Graduate School of Engineering	Department of Mechanical Engineering and Science	Professor	
50	Masahiro Ohshima	Graduate School of Engineering	Department of Chemical Engineering	Professor	
51	Teruyuki Kondo	Center for the Promotion of Interdisciplinary Education and Research	Advanced Biomedical Engineering Research unit	Professor	
52	Hideo Saji	Graduate School of Pharmaceutical Sciences	Biomedical Sciences	Professor	Dean of the Graduate School of Pharmaceutical Sciences
53	Mitsuru Hashida	Graduate School of Pharmaceutical Sciences	Biomedical Sciences	Professor	
54	Hideaki Kakeya	Graduate School of Pharmaceutical Sciences	Bioinformatics and Chemical Genomics	Professor	
55	Kazuhisa Nakayama	Graduate School of Pharmaceutical Sciences	Pharmaceutical Sciences	Professor	
56	Hiroaki Kato	Graduate School of Pharmaceutical Sciences	Pharmaceutical Sciences	Professor	
57	Rei Goto	The Hakubi Project		Program-Specific Associate Professor	
58	Hiroo Iwata	Institute for Frontier Medical Sciences		Professor	
59	Yasuhiko Tabata	Institute for Frontier Medical Sciences		Professor	Director of Institute for Frontier Medical Sciences
60	Junya Toguchida	Institute for Frontier Medical Sciences		Professor	
61	Taiji Adachi	Institute for Frontier Medical Sciences		Professor	
62	Yuji Hiraki	Institute for Frontier Medical Sciences		Professor	
63	Atsuko Sehara	Institute for Frontier Medical Sciences		Professor	
64	Takashi Nagasawa	Institute for Frontier Medical Sciences		Professor	
65	Hiroshi Kawamoto	Institute for Frontier Medical Sciences		Professor	
66	Shigefumi Mori	Research Institute for Mathematical Sciences		Professor	Director of Research Institute for Mathematical Sciences
67	Hisashi Okamoto	Research Institute for Mathematical Sciences		Professor	
68	Michio Yamada	Research Institute for Mathematical Sciences		Professor	
69	Yutaka Teranishi	Graduate School of Medicine	Medical Science and Business Liaison Organization	Specially Appointed Professor	
70	Kayoko Ishii	Center for the Promotion of Interdisciplinary Education and Research	Research and Educational Unit of Leaders for Integrated Medical System (LIMS)	Program-Specific Professor	

(As of March 31, 2014)

特定教員一覧

所属：学際融合教育研究推進センター　健康長寿社会の総合医療開発ユニット

	氏　名	職　名
1	石井　加代子	特定教授
2	木村　　祐	特定准教授
3	髙折　恭一	特定准教授
4	西　　美幸	特定准教授
5	松橋　眞生	特定准教授
6	山本　浩司	特定准教授
7	大江　賢治	特定講師
8	木下　武彦	特定講師
9	Christian Altmann	特定講師
10	樋口　ゆり子	特定講師
11	松田　和郎	特定講師
12	稲場　直子	特定助教
13	小林　祐輔	特定助教
14	近藤　健悟	特定助教
15	佐藤　文規	特定助教
16	Dinh Ha Duy Thuy	特定助教
17	鳥井　美江	特定助教
18	長谷川　拓	特定助教
19	平井　康治	特定助教
20	滝本　　晶	特定助教

（平成26年3月31日時点）

Program-Specific Staff

Affiliation : Research and Educational Unit of Leaders for Integrated Medical System (LIMS), Center for the Promotion of Interdisciplinary Education and Research

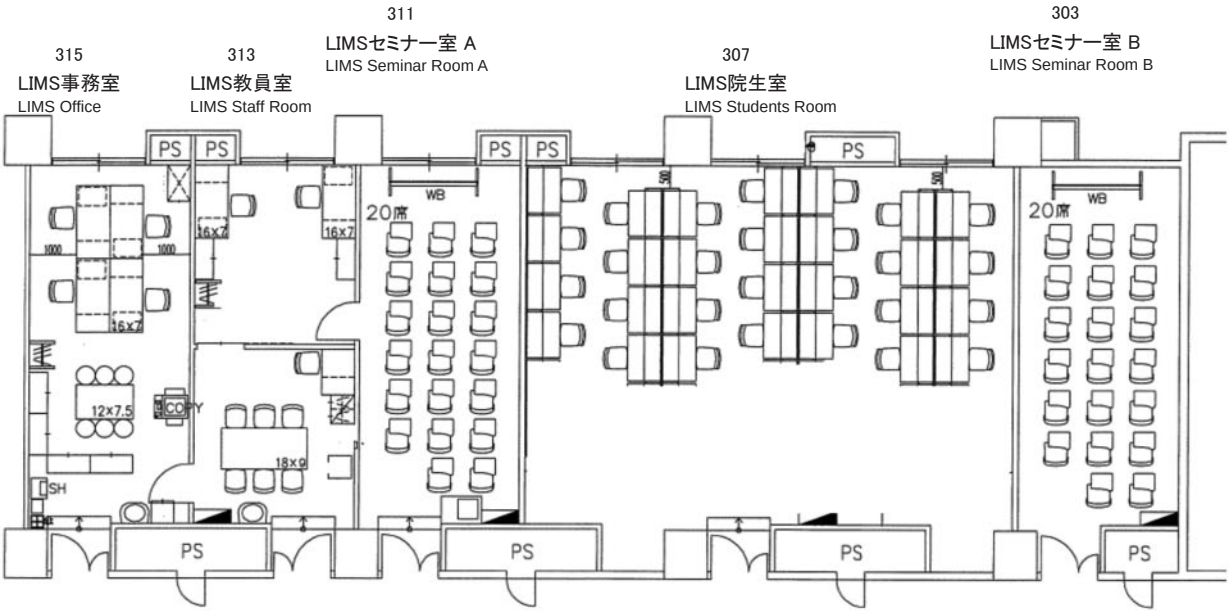
	Name	Position
1	Kayoko Ishii	Program-Specific Professor
2	Yu Kimura	Program-Specific Associate Professor
3	Kyoichi Takaori	Program-Specific Associate Professor
4	Miyuki Nishi	Program-Specific Associate Professor
5	Masao Matsuhashi	Program-Specific Associate Professor
6	Koji Yamamoto	Program-Specific Associate Professor
7	Kenji Ohe	Program-Specific Senior Lecturer
8	Takehiko Kinoshita	Program-Specific Senior Lecturer
9	Christian Altmann	Program-Specific Senior Lecturer
10	Yuriko Higuchi	Program-Specific Senior Lecturer
11	Wakoto Matsuda	Program-Specific Senior Lecturer
12	Naoko Inaba	Program-Specific Assistant Professor
13	Yusuke Kobayashi	Program-Specific Assistant Professor
14	Kengo Kondo	Program-Specific Assistant Professor
15	Fuminori Sato	Program-Specific Assistant Professor
16	Dinh Ha Duy Thuy	Program-Specific Assistant Professor
17	Mie Torii	Program-Specific Assistant Professor
18	Taku Hasegawa	Program-Specific Assistant Professor
19	Yasuharu Hirai	Program-Specific Assistant Professor
20	Aki Takimoto	Program-Specific Assistant Professor

(As of March 31, 2014)

プログラム実施場所
Location

本プログラム専用スペース
医学部構内G棟

LIMS Facilities
Building G, Faculty of Medicine Campus



1. 京都大学博士課程教育リーディングプログラム事業に係る人材養成の目的と学位授与の方針

京都大学の基本理念（2001）抜粋

- 京都大学は、研究の自由と自主を基礎に、高い倫理性を備えた研究活動により、世界的に卓越した知の創造を行う。
- 京都大学は、総合大学として、基礎研究と応用研究、文化系と理科系の研究の多様な発展と統合をはかる。
- 京都大学は、多様かつ調和のとれた教育体系のもと、対話を根幹として自学自習を促し、卓越した知の継承と創造的精神の涵養につとめる。
- 京都大学は、教養が豊かで人間性が高く責任を重んじ、地球社会の調和ある共存に寄与する、優れた研究者と高度の専門能力を持つ人材を育成する。
- 京都大学は、開かれた大学として、日本および地域の社会との連携を強めるとともに、自由と調和に基づく知を社会に伝える。
- 京都大学は、世界に開かれた大学として、国際交流を深め、地球社会の調和ある共存に貢献する。

（以下、略）

博士課程教育リーディングプログラム公募要領（2012、文部科学省）から

「博士課程教育リーディングプログラム」は、優秀な学生を俯瞰知と独創力を備え広く産学官にわたりグローバルに活躍するリーダーへと導くため、国内外の第一級の教員・学生を結集し、産・学・官の参画を得つつ、専門分野の枠を超えて博士前期課程・後期一貫した世界に通用する質の保証された学位プログラムを構築・展開する大学院教育の抜本的改革を支援し、最高学府に相応しい大学院の形成を推進する事業である。

（1） 博士課程教育リーディングプログラムに係る人材養成の目的

学内外の卓越した教員・指導者との対話や産官学の協働による教育など、博士課程前期・後期一貫の質の保証された学位プログラムのもと、多様な専門分野を俯瞰し、創造的に課題解決にあたる人材、および、コミュニケーション力と国際性を備えてグローバルに活躍する人材を養成することを目的とする。

（2） 博士課程教育リーディングプログラムに係るアドミッション・ポリシー

京都大学が実施する博士課程教育リーディングプログラムの目的に共感し、これを遂行するための基本的能力と教養、倫理性を兼ね備え、強い意欲をもって参加しようという人を求める。アドミッション・ポリシーの詳細は当該プログラムにおいて定める。

（3） 博士課程教育リーディングプログラムに係るカリキュラム・ポリシー

国内外の複数の教員・指導者との対話を通じた発展的自学自習や産官学の参画による人材養成を介して、研究企画の推進力と社会への説明力、研究チームを組織し新しい研究分野を国際的に先導する能力をもって多様な専門分野を俯瞰し、創造的に課題解決にあたるために必要な能力を育む世界に通用するカリキュラムを編成・実施する。

博士論文研究基礎力審査までの学修期間においては、質の保証された多様な専門教育によって当該プログラムに関する幅広い知識を修得させるとともに、複数の教員による研究指導を通じて専門分野を総合的に理解させるカリキュラムを編成・実施する。また、産官学の協働による実践的教育などを介して、コミュニケーション力、研究・開発の計画力と推進力、自ら課題を発見する能力などを身につけさせる。

カリキュラム・ポリシーの詳細は当該プログラムにおいて定める。

（4） 博士課程教育リーディングプログラムに係るディプロマ・ポリシー

後期課程においては、当該研究科の定める期間在学して、研究科等が実施する博士課程教育リーディングプログラムのカリキュラム・ポリシーに沿った研究指導を受け、当該プログラムを修了するとともに、所定年限内に提出した博士論文について研究科が行う審査と試験に合格し、後期課程を修了することが博士の学位授与の要件である。研究科によっては、所定の授業科目を履修して、基準となる単位数以上を修得することを要件に含む場合がある。

多様な専門分野を俯瞰し、創造的に課題解決にあたるために必要な能力とその基盤となる学識を身につけているかどうか、および、グローバルに活躍するために必要なコミュニケーション力と国際性を蓄えているかどうかが、当該プログラム修了の基準である。

前期課程において修士の学位を授与する研究科にあっては、研究科等が実施する博士課程教育リーディングプログラムのカリキュラム・ポリシーに沿って設計された授業科目を履修して、基準となる単位数以上を修得し、当該プログラムが定める博士論文研究基礎力審査に合格するとともに、所定年限内に提出した修士論文について、研究科が行う審査と試験に合格し、前期課程を修了することが修士の学位授与の要件である。

博士論文研究基礎力審査に合格するには、当該プログラムの目的に沿って設定した授業科目を履修して、基準となる単位数以上を修得するとともに、プログラムの定めるその他の要件を満たす必要がある。

博士論文作成に必要な研究基礎力である専門基礎知識、幅広く深い知識、研究計画力、語学力を基礎とするコミュニケーション力などを備えているかどうかが、博士論文研究基礎力審査合格の基準である。

研究科が行う博士論文及び修士論文の審査基準については当該研究科のディプロマ・ポリシーを参照すること。

２．充実した健康長寿社会を築く総合医療開発リーダー育成プログラム

世界的に人口の高齢化が広がる中、世界最長の健康寿命と先端的研究開発能力という条件を合わせ持つ日本では、高齢化社会の問題を俯瞰し、メディカルイノベーションを通じて充実した健康長寿社会を達成する人材を、世界に輩出することが急務となっている。そこで本プログラムでは、高齢化社会が抱える問題を俯瞰し、Ⅰ.工学技術を医療・支援システムへ適用し、Ⅱ.医学の中に蓄えられた知識を工学に活用するという２方向から、具体的な解決法を創案し、充実した健康長寿社会の構築に向け推進することの出来る「総合医療開発リーダー」を、異分野の研究者を組み合わせた産学横断的な教育プログラムにおいて組織的に育成する。

Ⅰ．真に医学・医療が分かる医工学人材

本プログラムでは、工学系のプログラム履修生に人体解剖学、生理学、病理学などの基礎医学教育と病院内実習を課し、複数分野の教員による綿密な討論・指導を行い、医学部卒業生と同等の医学・医療知識を有する医工学人材を育成する。医療・支援現場の実習や医療倫理学を通じ、利用者にとり負担の少ない「高齢者に優しい」機器・システムを開発するセンスを涵養する。医療現場のニーズや医療経済学・許認可制度の知識に基づき、機器・システムの産業化・市場の予測能力を養う。国際標準化の知識や卓越したコミュニケーション能力を備え、国際標準化機構などで活躍できる人材を育成する。

Ⅱ．医学の中に蓄えられた知識を多分野に発展させるリーダー

世界の他地域に先駆けて高齢化社会を迎える日本で、健康寿命が世界最長であるという背景を活かし、高齢者が自立して社会参加するのに適した社会システムや新産業を創出できる人材を育成する。更に、この“日本モデル”を先達として世界の健康長寿向上を牽引できる人材を育成する。

これらⅠ.及びⅡ.のリーダー人材を輩出し、新たな学際的研究開発の推進を可能とすることによって、豊かな健康長寿社会の構築に貢献することを目的とする。

本プログラムの学問分野は、「医工学」であり、プログラム履修生は、医学研究科、工学研究科、薬学研究科の何れかに属することから、工学部出身者、または生物関係学部出身者の何れかが想定される。ただし、出身学部を限定することはない。工学部出身者は、工学者としての実力を有しかつ医学部学生と同等な人体・生物学の知識を有すること、また生物関係学部の出身者では工学研究が行える工学の専門性の高い知識を取得することを目指す。プログラムは講義、演習・実習と特別研究により構成される。

３．充実した健康長寿社会を築く総合医療開発リーダー育成プログラムのアドミッション・ポリシー

医工連携ということが重要であると言われて久しい。しかし、言葉そのものの意味するところは、医学研究者と工学研究者が協力し合い、あたらしい医療機器なり、医療方法を開発するというところにあり、すでにある研究成果や問題点を協力して解決していくということであった。

歴史をたどると、脳動脈瘤手術で根治療法となるネッククリップができない場合、手が着けようのないものを動脈瘤の上から接着剤で出血しないようにするという発想を脳外科から持ち、工学と共同してビオボンドという、湿気のある組織でも接着能力のある特殊な接着剤を考案して、脳動脈瘤の手術の幅を広げることに成功している。以前は、工学研究に人体の標本などを持ち込むことは無謀に近い話しであったようであるが、現在では、当然と思われているこのような研究成果も先人の多くの努力によるもので、しかも、研究組織をまたいでの研究という点で重要なものである。

本プログラムでは、このような研究領域を超えた研究を行うだけではなく、互いに専門とする研究領域を持ち、それをもとに新しい発想をするのではなく、「医学研究環境の中で工学を学ぶ」というさらに一歩踏み込んだ発想で、工学系の大学院生の研究の場を医学研究科の中におき、医学研究そのものを行うのではなく、工学的見地から見て新しく医学へ貢献するところがないかを研究する目的意識を持ち、工学の基礎研究のトレーニングを受けつつ、医学の基礎から臨床、介護までを学び、医学・工学の垣根を越えた新しい研究領域を開拓していくことを目的としている。

特に、高齢化が顕著に進んでいる日本で、高齢者医療・介護は長い健康長寿を達成するには必須の条件の一つであるが、単に、病院で行う医療だけではなく、一般家庭にもっとも近い掛かり付け医への支援、長期療養施設のあり方など、医療設備の刷新とともに、工学的手法をもとにして高齢化した社会を支えるためのさまざまな工夫を社会に向かって積極的に発信できる人材を育成して、新しい医工連携の姿が社会に有効に機能できることを示すことを、もう一つの大きな目的としている。

このような新しい考え方をもとに、今回のプロジェクトがスタートし、医学研究科が中心となって、工学研究科や再生医科学研究所のスタッフが協力した体制を作り、上記の目的を達成すべくカリキュラムを工夫している。これまでの大学院と異なりリーディング大学院では社会との接点を重視した人材育成を目的としているので、広く英語による討論・ディベートによる自分の意思の発信能力の養成と、社会を医療の観点から俯瞰する医療経済学など、医工連携だけにとどまらない広い世界的視野に立った人材育成を目指している点で、これからの高齢社会へ資する人材の育成に役立つと信ずるものである。

４．充実した健康長寿社会を築く総合医療開発リーダー育成プログラムのカリキュラム

（１）５年一貫教育

本プログラムは５年一貫の大学院教育を行う。本プログラムの履修生の受入過程として、先ず所属研究科となる本学医学研究科（医科学専攻・人間健康科学系専攻）・工学研究科・薬学研究科の修士課程の入学試験を受験し、合格することを前提とする。ただし、これらの学部や京都大学の出身者である必要はない。留学生も積極的に受け入れる。

社会人経験者の履修も許可するが、本プログラムではかなりハードな教育プログラムを課すので、学業に専念できる環境作りを所属企業・組織との間で協議のうえ選抜する。

（2）履修科目（科目表は後掲９・１０頁）

修士課程：指定された必修科目１５単位を必ず修得すること

博士後期課程：インターンシップ（海外インターンシップと企業インターンシップの少なくともいずれか必修）、コロキウム、プレリサーチ、特別研究は、必修

（3）研究指導

各履修者に対して、指導教員及びメンターを選任し指導に当たる。

指導教員：在籍する研究科の教員のほかに本プログラム担当教授から1名を選任する。

メンター教員：異なる分野からのメンターを少なくとも２名選任する。

指導教員は、学年毎に各履修者について、研究指導記録書を作成する。

（4）本プログラムの修了要件

A．修士課程

①本プログラムが設けるカリキュラムに基づき必要な単位数を修得し、かつ、在籍する研究科が定める修士課程の修了要件を満たすこと。

②進学審査

本プログラムでは、２年次修了時に博士論文研究基礎力審査（ＱＥ）により、中間評価を行う。

１）医科学・人間健康科学・工学・薬科学等、専門分野の知識と能力、及び関連分野の基礎的素養について英語レポートを提出させる。

２）博士論文に関わる研究を行う特別研究課程（3年次～5年次）の研究計画（1・２年次の「プレリサーチ」にて作成）を提出させる。

３）研究計画について口頭試問を行う。プログラム入進学審査委員会が、メンター（プログラム特定教員）２名、所属する研究科の指導教授１名、他分野のプログラム担当教授１名、計４名を選任し実施する。

４）英語 debate 力の評価を行う。

これら①の要件を満たし、②の結果に基づき、本プログラムにおける修士課程修了の可否を、入進学審査委員会が総合的に判定する。

基礎学力の習得が不十分と判定された者については、もう1年、不足する部分の再履修を行わせる。また、特別研究の研究計画に瑕疵がある場合、成果が十分に見込めないと判断した場合等は、再提出を求める。その際、メンターが必要なサポートを行う。

B．博士後期課程

博士学位の審査については、学生からの審査請求に始まり、在籍研究科教授会からの依頼を受け、まずプログラム内学位審査委員会の審査を行う。この際、英語での debate 能力の評価を英語を母国語程度話す教員や学内研究者により厳密に行う。次いで、全学の博士課程教育リーディングプログラム運営会議が修了認定を行う。その結果を、在籍研究科教授会へ報告する。

（5）得られる学位

A．修士課程

修士課程修了者の修士号授与は、各所属研究科の判断に従う。

B．博士後期課程

所属研究科により、それぞれ次の通りとなる。

それぞれ博士（医科学)、博士（人間健康科学)、博士（工学)、博士（薬科学）に続いて、「本学充実した健康長寿社会を築く総合医療開発リーダー育成プログラムを修了したことを証する」と付記される。

（6）ディプロマポリシー

医学的知識を十分に学習し会得した、医科学・工学・薬学などの実験・研究ができる研究者で、海外の研究施設・企業・公共組織などで活躍できるよう十分な英語力・ディベート力をもち、全世界的に進行する高齢社会の現状と将来を自分で俯瞰的に考察し、多様な人や組織と協力して問題点を解決するために、さまざまな自分の知識と手法を用いることができ、高齢者が安心して生活できる環境を作り上げられる人物になり、かかる分野における日本、アジア、世界のリーダーとなること。

（7）ポートフォリオ

プログラム履修者は、履修・成績・達成度の自己点検、教員による評価を目的として、ポートフォリオを作成することが求められる。履修者は、ポートフォリオを指示された時までに適宜更新し、指導教員等の閲覧に供しなければならない。ポートフォリオは、進学審査・特待生奨励金の継続審査等の評価の一部として利用される。

5．履修カテゴリーについて

本プログラムで開設する科目は別表の通りであり、その概要は以下の通りである。

基盤科目

工学、薬学、医学・生物学

医工学領域の研究に必要となる工学、医学、薬学に関する基礎知識を習得する。工学部出身者か生物関係学部出身向けの標準履修メニューを提示。それを参考に科目を選択する。

医療倫理

医療倫理について学習する。

数理科学科目

シミュレーションを中心としたもので、本プログラムでは、医療経済学とともに高齢化社会の将来予測等に必要な重要な科目として必修とする。

医療経済学

高齢化社会における医療経済学的課題、知的財産、国際標準化の理解力を身に付けさせる。

医療工学特別講義

協力企業から派遣された講師により、医療・健康・ケアなどに関し、最先端の技術や現場の課題等について講義を受け、議論する。

学際応用科目

特別研究で行う研究領域に応じて用意された専門科目

英語 debate

国際的リーダーに不可欠な能力として英語でのコミュニケーション力を養う。

インターンシップ

企業において、研究開発などについて、実践しながら理解し、特別研究に活かす。行政機関、国際機関に短期研修を行い、許認可や国際標準化の仕組み、課題について理解を深める。

コロキウム

十分な討議時間を設け、異分野間コミュニケーション能力とプレゼンテーション能力を養うことを目的とし、セミナー形式でプログラム履修生全員が一同に会し、輪番制で各自の研究についての発表を行う。

プレリサーチ

研究室ローテーションなどを通じ、専門以外の分野に関する理解を広げる。研究者としての基礎能力を養い特別研究の研究計画を作成する。

特別研究

プレリサーチで作成した研究計画に基づいて博士の研究を遂行し、学位取得とリーディングプログラムの修了を目指す。

６．プログラム履修者への支援

プログラム履修者には、リーディング博士課程における履修及び学位研究に専念するための以下のような経済支援を行う。

◎ 特待生奨励金

以下の受験資格をすべて満たす優秀な履修者に対して特待生奨励金を支給する。支給額及び支給継続については、選抜時及び各学年末に決定され、年度ごとに見直される。また、奨励金受給者の氏名は受給開始前に学内掲示及び LIMS ホームページにて公表する。

【受給資格】

（1）プログラム履修者選抜試験に合格した本プログラムの履修者

（2）各種奨学金等の就学支援経費（本学の定める授業料等免除は除く）を受けていない者
ただし、国費留学生等で本奨励金を辞退した者は、他の奨学金を受けながら本プログラムを履修することができる。

（3）奨励金以外の収入（アルバイトの給与等）を得ていない者
ただし、研究成果の公表に伴う謝金、著作料およびTA・RAの給与（本プログラムにおいて本プログラムの実施に不可欠と判断される場合に限り、週５時間を上限とする。）等に限り、これを除外する。

（4）本学大学院の在籍期間（休学期間を除く）が５年を超えない者

（5）本プログラムにおける成績等評価において特に優秀と認められる者

（6）本プログラムが５年一貫の教育研究課程であることを了解する者

【受給資格の喪失条件】 受給者が次の各号の一に該当する場合は、その資格を失う。

（1）上記に定める受給資格を失ったとき。

（2）受給者からの辞退届が受理されたとき。

（3）奨励金について提出された書類に虚偽の記載があるとき。

（4）休学又は退学したとき、および除籍されたとき。

（5）京都大学通則の規定により懲戒処分を受けたとき。

以上

1. Kyoto University educational goals and degree policy regarding the “Program for Leading Graduate Schools”

Kyoto University Mission Statement（2001, excerpt）

- Kyoto University will generate world-class knowledge through research activities conforming to high ethical standards based upon freedom and autonomy of research.
- As a university comprising of many graduate schools, faculties, and research institutes, Kyoto University will strive for the development and integration of basic and applied research in arts and sciences.
- Within its broad and varied educational structure, Kyoto University will transmit high-quality knowledge and promote independent and interactive learning.
- Kyoto University will train researchers and related professionals with specialized knowledge to contribute responsibly to the world’s human and ecological community.
- As a university committed to a broad social engagement, Kyoto University will encourage cooperation with local and national society, and will disseminate knowledge informed by the ideals of freedom and peaceful coexistence.
- As an international institution, Kyoto University will promote foreign academic exchange and thereby strive to contribute to the well-being of the world.

（Hereinafter abbreviated）

From the application guidelines for the “Program for Leading Graduate Schools” (2012, MEXT)

The “Program for Leading Graduate Schools” aims at mentoring talented students into future leaders armed with a broad view and creative thinking, who will be active globally in industry, government and academia. In order to do so, the program mobilizes high-level mentors and students, and entices participation of industry, government and academia. It furthermore supports a radical reform of graduate education by rebuilding a high-quality interdisciplinary Doctoral degree program with a combined Master and Doctoral course and by covering a wide variety of specialties. In this way, the program will promote the development of graduate schools befitting their status as an institution of highest educational level.

(1) Educational goals and objectives of the “Program for Leading Graduate Schools”

Through interaction with distinguished teachers and professors from inside and outside the university, education based upon industry-government-academia cooperation, and a combined Master and Doctoral degree program, this program is designed to train students as leaders with the following abilities: to be proficient in a wide array of academic disciplines, to overcome problems with a creative problem-solving stance, and to communicate and interact internationally on a global scale.

(2) Admission policy of the “Program for Leading Graduate Schools”

The program welcomes appropriately qualified students who understand and value its core objectives, and are ready to embrace them with a strong motivation. A more detailed statement of the admission policy can be found in the program.

(3) Curriculum policy of the “Program for Leading Graduate Schools”

From self-evolving individual-based learning through interaction with various teachers and professors from inside and outside the university and high-level training based on

industry-government-academia cooperation, the program will organize and implement an interdisciplinary curriculum which fosters students with the following abilities: to be proficient in various fields of expertise, to overcome problems with creativity by competency in planning and executing research projects, to communicate and explain results to the public, and to internationally lead a research team to a new field.

During the two-year master's degree course until the doctoral qualifying examination, the students will be equipped with a broad range of knowledge from this program, by a high-quality, diverse professional education, and by an organized curriculum implemented for comprehensive understanding of specialized fields under the guidance of many teachers. By practical training based on industry-government-academia cooperation, the students will be taught communication skills, and learn how to independently plan and conduct research.

Further detailed statements of the curriculum policy can be found in the program.

(4) Diploma policy of the "Program for Leading Graduate Schools"

This program requires students to enroll for the number of academic years as determined by their graduate schools, to undergo research training and guidance in line with the curriculum policy of the Program for Leading Graduate Schools within their graduate schools, to submit a Doctoral thesis within the number of years allotted by their graduate schools, and pass all the designated qualifications and examinations. Depending on their graduate schools, students may also be required to complete a designated number of credits to complete the program.

In order to complete the program, students are expected to acquire the knowledge and aptitudes necessary to gain a global view on various fields of expertise and a creative problem-solving stance, as well as the experience and aptitude necessary to demonstrate strong communication skills and a career in an international setting.

The first stage (the first two years) of this program requires the students to complete the designated courses and to meet the credit requirements in line with the curriculum policy of the Program for Leading Graduate Schools within their graduate school, the submission of a Master's thesis (if it is required) and passing all the corresponding qualifications and examinations, as well as passing the Doctoral Qualification Examination (QE).

In order to pass the Doctoral QE, students are required to complete the designated courses and credit requirements in line with the program, and to meet all other necessary criteria.

In order to meet the criteria for the Doctoral QE, students are required to be equipped with basic research skills, including fundamental understanding of their specific field of expertise, extensive knowledge, the ability to plan a research project, and communication skills built upon their language skills.

For further details regarding the standards for Master and Doctoral thesis, please refer to the degree policy of each graduate school.

2. Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

In an era of global aging, there is an urgent need in Japan, with its people having the longest healthy life expectancy and with its advanced research and development technology, to foster worldwide human resources able to understand the problems of an aging society, and to lead medical innovation globally supporting a fruitful, healthy-longevity society. Thus, this program will reanalyze the problems of an aging society and systematically mentor “Leaders for Integrated Medical Development Systems” with an industry-university educational program. This program will train researchers from different fields, who can respond to the problems and advance us to the establishment of a fruitful healthy-longevity society, through a bidirectional point of view: I. applying engineering to medical support systems, II. improving engineering with knowledge from the medical sciences.

I. Medico-engineering leaders who fully understand medical practice

This program will provide basic medical education (human anatomy, physiology, pathology) and hospital practice for students with engineering backgrounds, thorough discussion and guidance by teaching-staff from different fields. Consequently, the program fosters medico-engineering leaders with medical knowledge equivalent to medical school graduates. Through hands-on experience in medical/support care and comprehension of health-care ethics, students will cultivate a sense of how to develop “elderly-friendly” devices and low burden systems for the users. Based on their understanding of the specific needs in medical practice, and the knowledge of health economics and the licensing system, students will be able to predict industry and market trends on devices and systems. Students will be trained in international standardization, develop professional communication skills and play globally active roles in settings such as the International Organization for Standardization.

II. Leaders who can extend medical knowledge to different fields

Japan is one of the first countries to face the problem of an aging society. Taking advantage of the world’s longest life expectancy, the program will train leaders who can develop new industries and social systems enabling the elderly to engage actively in community life. These leaders will help improve life expectancy globally using this “Japan model” as a precedent.

The ultimate goal of this program is to help in coordinating a fruitful healthy-longevity society by training these leaders with I. and II. , resulting in advances of international research development.

The discipline of this program is “medico-engineering”, meaning a collaboration program of the Graduate School of Medicine, Graduate School of Engineering, and Graduate School of Pharmaceutical Science, so we expect that most students will be graduates from the above-related departments, but there is no limitation on the background of their

undergraduate departments. Engineering graduates will acquire highly specialized knowledge of the human body and biology, comparable with graduates from the medical department. Biology-related graduates will acquire highly specialized knowledge in engineering, comparable with graduates from the engineering department, and will be able to conduct engineering research. The program comprises lectures, exercises, training and specific research.

3. Admission Policy of Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

The importance of medico-engineering collaboration has been discussed for a long time. However, the intended meaning of the word itself is just that medical and engineering researchers work together to develop novel devices and methods of medical treatment, to apply the results and to overcome existing problems. Looking back into history, when a neck clip could not be used as a radical therapy in cerebral aneurysms, neurosurgeons came up with the idea to seal these inoperable aneurysms with glue. Through cooperation with engineering researchers, “Biobond”, a bonding agent which can produce strong adhesion even between moist human tissues, was developed and succeeded in expanding the application of operable aneurysms. The idea of applying engineering research to the human body was considered ridiculous in the past, but it has become widely accepted nowadays due to the tremendous efforts of the pioneers in this field. In addition, this form of interdisciplinary collaboration has become important in terms of research across different research organizations. This program performs not only research extending beyond fields, but goes mutually between different fields, by bringing new ideas from each field, and by applying the concept of “learn engineering in a medical research environment”. In this way, graduate students with engineering backgrounds, not only perform medical research in a medical environment, but also seek novel ways in which engineering can contribute to medicine. With basic knowledge in medicine and medical care fostered in this program, together with already cultivated knowledge in engineering, the students will open up a new frontier in medico-engineering research. In particular, the advanced progress of unprecedented aging in Japan requires adequate medical treatment and nursing care as essential conditions to achieve healthy longevity. However, from an engineering point of view, it is necessary to show that this new medico-engineering collaboration will function effectively by training leaders who can actively disseminate their developments to the society by not only simply practicing medical care in hospitals, but also by supporting a family doctor system near each home, reconsidering long-term care facilities, and supporting an aged society with a new medical system.

Under these new concepts, the project has started with a central role of the Graduate School of Medicine in collaboration with staff from the Graduate School of Engineering and

the Institute for Frontier Medical Sciences, creating a suitable curriculum to achieve the above-mentioned aims. Unlike any of the existing graduate schools, the Leading Graduates Schools aim at training leaders and put special emphasis on interaction with the society. We believe that these students will develop abilities to express their ideas through discussion and debate in English. They will be able to look at society trends from a medical and medical economics point of view. Finally, they will develop a broad global perspective which is not only limited to medico-engineering cooperation. We believe these leaders will make a contribution to the aging society in the future.

4. Curriculum of Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

(1) Five-year continuous education

This program performs continuous graduate education over a period of 5 academic years. In order to be enrolled in this program, first, the students have to take and pass the entrance examination for Master's course of Kyoto University at one of the following Graduate Schools: Graduate School of Medicine (Medical Science Major, Human Health Science Major), Graduate School of Engineering, or Graduate School of Pharmaceutical Sciences. However, it is not required that the applicants are graduates of Kyoto University or any of the above-indicated departments. This program also welcomes students from abroad.

Students with vocational occupation can also apply for this program. However, because of the intense training course of this program, they will be selected upon discussion with their employers about their devotion to the academic activities

(2) Subjects to be attended（Table of subjects can be found on pages 7 and 8）

Master's course: must finish 13 units of the compulsory subjects (For 2013-entered students, 12 units)

Doctoral course: Internship (Overseas or Institute internship (must choose one of the two)), Colloquium, Pre-research, Thesis Research are mandatory.

(3) Research training

A teaching advisor and mentors are chosen to guide each student.

Teaching advisor: A professor of the affiliated graduate school which the students belong to or a professor of the program is chosen.

Mentors: At least two are chosen from different fields.

Teaching advisors and mentors must fill out an annual teaching record for each student.

(4) Eligibility Requirements for completion of the program

A. Master's course

① Students must complete the designated courses and meet the credit requirements in line with the curriculum policy of this program and must meet the requirements for finishing the Master's course within their graduate schools.

② Doctoral Qualification Examination

In this program, at the end of the second year, a Doctoral Qualification Examination (QE) will be conducted as a mid-term evaluation.

1. Students have to submit a report in English on fundamental knowledge and skills in Medical Science, Human Health Sciences, Engineering, Pharmacology and each specialty and related field.
2. Students have to submit a research plan (which is to be prepared during the first and second year “Pre-research” period) related to their thesis research (which will be conducted during the third to fifth year) for Doctoral dissertation.
3. Students have to present their research plan orally. Results will be evaluated by four members of the QE Committee: two mentors of the program-specific staff; one professor from their affiliated departments and one professor of the program from another field.
4. Skills in English debate will be evaluated.

Based on ① fulfillment of eligibility requirement, and ② result of QE, the Committee will make a decision on completion of Master’s degree of the program.

Any students who do not meet the above requirements must take an extra year to improve any insufficient knowledge. If the research plan is determined to be flawed or not promising, re-submission will be required. In that case, mentors will give necessary support.

B. Doctoral course

The examination for the Doctoral degree will be started upon students’ request, then it will be commissioned by the Professors’ faculty meeting of their affiliated Graduate Schools, and a board review of the degree program will be conducted. During the procedure, native English-speaking staff or university researchers will carefully evaluate the students’ English debate skills. If approvable, the all-campus steering committee of the Program for Leading Graduate Schools will certify completion. The results will be reported to the Professors’ faculty meeting of their affiliated graduate schools.

(5) Academic degrees

A. Master’s course

A Master’s degree from each affiliated graduate school will be awarded to students who have finished a Master’s course.

B. Doctoral course

Different between affiliated graduate schools as follows:

After each Doctoral statement (Medical Science, Human Health Sciences, Engineering, Pharmacology), completion of the “Training program of leaders for integrated medical system for fruitful healthy-longevity society” will be certified.

(6) Diploma policy

In order to support and build up new concepts and political directions that help people to live a fruitful life in old age, students with a non-medical background of medical science, engineering, or pharmaceutical science majors need to gain fundamental medical knowledge. In addition to these technical and research skills, the students are required to acquire English proficiency as well as the ability to debate in order to be able to play an active part in international research centers, companies and public organizations. The students are also required to be able to see present and future problems of a globally unprecedented aging society and to be able to use their skills and knowledge in cooperation with people from different backgrounds to solve these problems. The education at LIMS vigorously trains students to become strong leaders who can shape the success of the aging society not only in Japan and Asian countries, but also all over the world.

(7) Portfolio

Each student needs to make a portfolio in which self-evaluation of classes, grades, academic achievements, and evaluation by faculty will be noted. It must be updated regularly for inspection by the teaching advisors and mentors. This portfolio will be used as a part of the evaluation for promotion and the continuation of the student's allowance.

5. Categories of classes

A detailed class description of the program can be found in the appendix. Below is a summary.

Basic classes

Engineering, Pharmacology, Medicine·Biology

Acquiring basic knowledge in engineering, medicine, and pharmacology is necessary for research in the field of medico-engineering. Students can choose different standard classes, depending on their undergraduate backgrounds (engineering or biology-related).

Medical ethics

Learn about healthcare ethics.

Mathematical Sciences

Will be based mainly on simulations. Along with healthcare economics, this class is important for predicting the future of the aging society, and thus this class is mandatory for this program.

Health Economics

Learn about problems, intellectual property, and global standardization concerning healthcare economics of the aging society.

Special lectureson Medical Engineering

Receive lectures and hold discussions with lecturers from cooperative companies regarding cutting edge technology in medicine/healthcare and the current problems faced on-site.

Interdisciplinary Application

A specialized course prepared in relation to the student's thesis research.

English Debate

Gain English communication skills, which is indispensable for global leadership.

Internship

Learn about research and development through practical experience in companies and apply this experience to thesis research. Short training courses in government offices and international organizations will promote better understanding of licensing and global standardization.

Colloquium

After sufficient discussion, following a rotation schedule, each student will make a presentation of their research at a seminar with participation of all program students. This training improves communication and presentation skills in front of people from different fields.

Pre-research

Through laboratory rotation, learn about fields other than their own specialty. Develop basic skills as a researcher and prepare research plans for thesis research.

Thesis Research

Conduct Doctoral thesis research based upon the research plan prepared in the Pre-research period. The final goal is acquiring a Ph.D. degree and graduation from the program.

6. Financial Support for program students

Financial support will be given to program students to encourage them to concentrate on classes and thesis research of the Program for Leading Graduate Schools.

◎ Allowance incentives

Outstanding students who satisfy all of the eligibility requirements for recipients will be supported with a monthly allowance. The amount and continuation of allowances depends on the performance during the selection procedure, and academic achievements evaluated by teachers and mentors at the end of each academic year.

The names of recipients will be posted at the campus and on the LIMS homepage.

【Eligibility requirements for recipients】

[1] Those who are successful applicants of this program.

[2] Those who are not receiving financial support from any scholarship or stipend (except for a tuition waiver by Kyoto University). However, students who decline financial support from this program will be able to take training in this program while receiving other scholarships, such as a scholarship from the Japanese government.

[3] Those who are not receiving or expecting to receive any remuneration including wages for part-time work, with the exception of honorarium payments relating to the publication or presentation of research results, copyright fees or royalties, or a Teaching Assistant (TA) or Research Assistant (RA) allowance which is deemed essential to the program (up to 5 hours per week).

[4] Those who have been enrolled for no more than five academic years (not including any period of temporary absence) in a graduate school at Kyoto University.

[5] Those who are deemed to have achieved excellence based on their grades and scores in this program.

[6] Those who agree to continuously pursue their education and research during the 5-year period of this program.

【Loss of eligibility for financial support】

Recipients who fall in one of the following categories will lose their eligibility for financial support:

(1) Those who lose one of [1] to [6] requirements of [Eligibility requirements for recipients] above.

(2) Those who submit a letter of declination of the financial support from this program, and the letter is accepted.

(3) Those who submitted false statements in the application documents of this program.

(4) Those who stop studying, quit university or are expelled from university.

(5) Those who are subjected to disciplinary action, following the Kyoto University General Rules.

2.

教育カリキュラム

Curriculum

平成25年度　履修科目表

科目群	科　目		担当者	1学年		2学年		3学年		4学年		5学年		備　考
				前	後	前	後	前	後	前	後	前	後	
基盤科目	工学	機械工学基礎	中部･安達･山本			2								
		医用電子工学	椎名･杉本			2								
		材料化学基礎	近藤･木村		2									
		高分子医工学	岩田			2								
		連続体力学	安達		2									
		生物分子解析学	森		2									
		画像処理の基礎	杉本･椎名			2								
	薬学	薬物動態学	中山･高倉･橋田				2							
	医学・生物学	人体解剖学	萩原･金子			8								必修
		生理学	大森･河野･金子･福山		2									必修（9月～）
		医化学	渡邉		2									
		加齢医学	荒井			2								
	医療倫理	医療倫理	小杉･藤田･福山			1								
数理科学	シミュレーション概論		木下		2									
医療経済学	医療経済論		後藤				2							
	知的財産＆国際標準化		寺西			2								
医療工学特別講義	医療工学特別講義Ⅰ		石井		2									（9月～）
	医療工学特別講義Ⅱ		石井				2							
学際応用科目	**A. 学際応用科目**													
	1 画像診断学：講義													
	1−1 病理画像診断学		羽賀		1									
	1−2 放射線画像診断学		福山		1									
	1−3 MRI 画像診断学		福山											（9月～）
	2 低侵襲治療学：講義		高折		1									
	3 生体材料学・人工臓器学：講義		田畑･松田秀				1							（9月～）
	4 医療情報学：講義		黒田				1							
	5 検査機器学・研究機器学：講義		一山				1							
	6 医療･生活支援システム学：講義		椎名		1									必修（9月～）
	6−1 生体検査･画像解析法													
	6−2 在宅医療支援													
	6−3 リハビリテーション													

科目群	科　目	担当者	1学年		2学年		3学年		4学年		5学年		備　考
			前	後	前	後	前	後	前	後	前	後	
学際応用科目	**B. 実習及び病院内研修**												
	1 画像診断学：実習												
	1-1 病理画像診断学	羽賀		1									
	1-2 放射線画像診断学	福山		1									
	1-3 MRI 画像診断学	福山											(9月～)
	2 低侵襲治療学：実習	高折		1									
	3 生体材料学・人工臓器学：実習	田畑・松田秀				1							(9月～)
	4 医療情報学：実習	黒田				1							
	5 検査機器学・研究機器学：実習	一山				1							
	6 医療・生活支援システム学：実習・見学	椎名		1									必修 (9月～)
	6-1 生体検査・画像解析法												
	6-2 在宅医療支援機関												
	6-3 リハビリテーション部												
英語 debate		石井		1	1	1							必修
インターンシップ	短期海外インターンシップ	武田・福山											選択必修
	企業インターンシップ	石井・福山											
コロキウム													必修
プレリサーチ													必修
特別研究													必修

網掛けは開講学年・学期、数字は単位数
学際応用科目は、講義及び実習の両方を受講しないと単位は認められない。

Curriculum (Academic Year 2013)

	Subjects	Lecturer	1st Grade		2nd Grade		3rd Grade		4th Grade		5th Grade		Remarks
			1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	
Basic class	Mechanics and Dynamics, Fundamental	Nakabe, Adachi, Yamamoto			2								
	Medical Electronics	Shiina, Sugimoto			2								
	Basic Materials Chemistry	Kondo, Kimura		2									
	Biomaterials: Materials for preparation of medical devices and regenerative medicine	Iwata			2								
	Continuum Mechanics	Adachi		2									
	Molecular Analysis of Life	Mori		2									
	Image Processing Basics	Sugimoto, Shiina			2								
	Biopharmaceutics	Nakayama, Takakura, Hashida				2							
	Human Anatomy	Hagiwara, Kaneko			8								Compulsory
	Physiology	Ohmori, Kawano, Kaneko		2									Compulsory (Sep. ～)
	Medical Chemistry	Watanabe		2									
	Gerontology, Geriatrics, and Aging Science	Arai			2								
	Medical Ethics	Fukuyama, Kosugi, Fujita			1								
Mathematical Sciences	Introduction to Numerical Simulation	Kinoshita		2									
Health Economic	Health Economics	Goto				2							
	Intellectual Property & Global Standardization	Teranishi			2								
Special lectures	Medical Engineering for Society Ⅰ	Ishii		2									Sep. ～
	Medical Engineering for Society Ⅱ	Ishii				2							
Interdisciplinary application	◆ Interdisciplinary application (1～6)												
	1. Medical imaging: Lecture			1									
	1-1 Diagnostic Pathology	Haga		1									
	1-2 Radiology	Fukuyama		1									Sep. ～
	1-3 MRI introduction	Fukuyama											
	2. Minimally invasive therapeutics : Lecture	Takaori		1									
	3. Biomaterials and Artificial Organs : Lecture	Tabata, Matsuda				1							Sep. ～
	4. Medical informatics : Lecture	Kuroda				1							
	5. Inspection equipment studies Science research equipment : Lecture	Ichiyama				1							
	6. Medical and life support systems : Lecture	Shiina		1									Compulsory (Sep. ～)

	Subjects	Lecturer	1st Grade		2nd Grade		3rd Grade		4th Grade		5th Grade		Remarks
			1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	
Interdisciplinary application	1. Medical imaging : Practice												
	1-1 Diagnostic Pathology	Haga		1									
	1-2 Radiology	Fukuyama		1									Sep. ～
	1-3 MRI introduction	Fukuyama											
	2. Minimally invasive therapeutics : Practice	Takaori		1									
	3. Biomaterials and Artificial Organs : Practice	Tabata, Matsuda				1							Sep. ～
	4. Medical informatics: Practice	Kuroda				1							
	5. Inspection equipment studies Science research equipment : Practice	Ichiyama				1							
	6. Medical and life support systems : Practice	Shiina		1									Compulsory (Sep. ～)
	Debate	Ishii		1	1	1							Compulsory
Internship	Internship (Abroad)	Takeda, Fukuyama											Compulsory elective
	Internship (Industrial and public parties)	Ishii, Fukuyama											
	Colloquium												Compulsory
	Pre-research												Compulsory
	Thesis Research												Compulsory

Number: The number of credits

Note: Students must take both the lecture and practice for "the Interdisciplinary application".

学内ネットワークサーバーによる学習支援システムの構築

本プログラムでは、医学・工学系の多様な学術的背景を持つ履修生が新しい分野の知識を習得する。未知の分野での理解を深めるために、履修生が自身の欠けている知識を把握し、それを補うために自主的に学べる体制が必要である。その自主的な学習を助けるために、履修科目の講義資料や参考資料などを履修生が自由に閲覧できる専用サーバーを学内ネットワーク上に設置した。さらに、そのサーバー上で、各履修科目の分野で重要となる専門用語を閲覧・編集できるウェブサイトを作製した。

それぞれの分野の専門用語は厳密に定義された上で使われている。新しい分野の知識を身に付けるためには、最低限必要な専門用語を正確な定義で理解する必要がある。その手助けになるように、履修科目ごとに重要な専門用語を解説したウェブサイトを設置した（図１）。現在、各専門分野の特定教員らによって医学系７科目（生理学・生物分子解析学・医化学・薬物動態学・医療生活支援システム学・人体解剖学・低侵襲治療学）の用語をその解説と共に掲載し、履修生が講義内容を理解する手助けとなっている。

このウェブサイトでは、受動的に情報を得るだけでなく履修生自身が新しい用語を追加したり、より詳しい説明を付け加えたりすることが可能である（図２）。講義で学んだ知識を自分の言葉で表現し、それを発信することで異なる分野に親しみ持つことを期待している。履修生が編集した内容の不足な点を特定教員や他の履修生がそれを補足し、相互に理解を深め合うような体制を目指している。最終的には、プログラムを遂行する内に用語集が完成され、医学系・工学系分野の異分野横断的な学習に有用な資料が完成されることが期待される。

図１．用語集ウェブサイト（トップページ）

図２．用語集ウェブサイト（編集画面）

In this program, students with different background start learning in interdisciplinary fields of medical sciences and engineering. To successfully acquire skills and knowledge in new fields, students need to recognize their shortage of knowledge and carry out self-study. In order to assist the self-paced learning, we made a network server available, allowing them to access lecture materials anywhere from the university LAN. In addition, the server hosts a website with technical terms necessary to understand the courses in the LIMS program (Fig. 1).

Technical terms in each scientific field are explicitly defined to avoid misinterpretation. To successfully start studying in unfamiliar fields, it is necessary to know basic glossaries with exact definitions. A website has been created to list glossaries from each subject. By the program-specific staff in LIMS, technical terms from 7 medical courses are being hosted with definitions and explanations: Physiology, Molecular Analysis of Life, Medical Chemistry, Biopharmaceutics, Medical and Life Support System, Human Anatomy, and Minimally Invasive Therapeutics.

The students in this program are encouraged not only to learn from the website, but to add new glossaries or more detailed explanations by editing the contents (Fig. 2). Describing knowledge with their own words would help them to become familiarized with new fields of study. Insufficient or inappropriate descriptions would be corrected by staff or other students. Such interactions during this program would develop learning materials useful for studying the interdisciplinary area of medical sciences and engineering.

Fig. 1 Website for Glossaries (Top page)

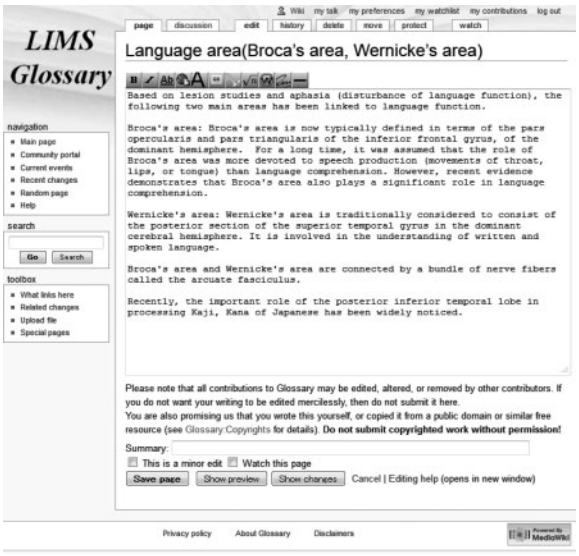


Fig. 2 Website for Glossaries (editing contents)

平成25年度　LIMS履修者・指導教授・メンター 一覧

	研究科	専攻	学年	氏名	所属分野	研究テーマ	指導教授	LIMS指導教授	メンター	メンター
1	医学	医科学	M1	佐久間（サクマ） 真紀（マキ）	生体構造医学講座 形態形成機構学	がん治療への応用を目指したDNA損傷条件下におけるトランスクリプトーム解析	萩原（ハギワラ） 正敏（マサトシ） 教授 医学研究科医学系専攻 形態形成機構学分野	森（モリ） 泰生（ヤスオ） 教授 工学研究科 合成・生物化学専攻	山本（ヤマモト） 浩司（コウジ） 特定准教授	樋口（ヒグチ） ゆり子（ユリコ） 特定講師
2	医学	人間健康科学系	M1	五明（ゴミョウ） 美香子（ミカコ）	検査技術科学コース 医療画像情報システム学	工学モデル作成に向けた生体組織の粘弾性の解明	椎名（シイナ） 毅（ツヨシ） 教授 医学研究科人間健康科学系専攻 医療画像情報システム学分野	戸井（トイ） 雅和（マサカズ） 教授 医学研究科 医学系専攻	松橋（マツハシ） 眞生（マサオ） 特定准教授	木下（キノシタ） 武彦（タケヒコ） 特定講師
3	医学	人間健康科学系	M1	石田（イシダ） 敦子（アツコ）	リハビリテーション科学コース 臨床認知神経科学	独居高齢者の在宅生活安全性のリスク評価ツールとしてのKinectの信頼性や妥当性の検討	二木（フタキ） 淑子（トシコ） 教授 医学研究科人間健康科学系専攻 生活機能適応学分野	中部（ナカベ） 主敬（カズヨシ） 教授 工学研究科 機械理工学専攻	小林（コバヤシ） 祐輔（ユウスケ） 特定助教	鳥井（トリイ） 美江（ミエ） 特定助教
4	薬学	薬科学	M1	宮之原（ミヤノハラ） 遵（ジュン）	病態機能解析学講座 生体機能解析学	電子カルテからのテキストデータマイニング	金子（カネコ） 周司（シュウジ） 教授 薬学研究科薬学専攻 生体機能解析学分野	藤田（フジタ） 潤（ジュン） 教授 医学研究科 医学系専攻	松田（マツダ） 和郎（ワコト） 特定講師	平井（ヒライ） 康治（ヤスハル） 特定助教
5	工学	高分子化学	M1	桑原（クワバラ） 令（レイ）	医用高分子講座 組織修復材料学	親水性高分子–コレステロール複合体の医用材料の可能性についての検討	岩田（イワタ） 博夫（ヒロオ） 教授 再生医科学研究所 組織修復材料学分野	木村（キムラ） 剛（タケシ） 教授 医学研究科 医学系専攻	髙折（タカオリ） 恭一（キョウイチ） 特定准教授	滝本（タキモト） 晶（アキ） 特定助教
6	工学	高分子化学	M1	松井（マツイ） 利樹（トシキ）	医用高分子講座 組織修復材料学	生分解性高分子を用いた細胞三次元構造の作製	岩田（イワタ） 博夫（ヒロオ） 教授 再生医科学研究所 組織修復材料学分野	篠原（シノハラ） 隆司（タカシ） 教授 医学研究科 医学系専攻	木村（キムラ） 祐（ユウ） 特定准教授	大江（オオエ） 賢治（ケンジ） 特定講師
7	工学	高分子化学	M1	村尾（ムラオ） 賢（ケン）	医用高分子講座 材料機能解析分野	パルスレーザーを利用した新規な光学イメージングシステムの開発	伊藤（イトウ） 紳三郎（シンザブロウ） 教授 工学研究科高分子化学専攻 高分子機能学分野	吉村（ヨシムラ） 長久（ナガヒサ） 教授 医学研究科 医学系専攻	長谷川（ハセガワ） 拓（タク） 特定助教	近藤（コンドウ） 健悟（ケンゴ） 特定助教
8	工学	合成・生物化学	M1	水藤（スイトウ） 拓人（タクト）	生物化学講座 生体認識化学分野	加齢に伴う健康障害と腸内細菌との関わりについて	梅田（ウメダ） 真郷（マサト） 教授 工学研究科合成・生物化学専攻 生体認識化学分野	渡邉（ワタナベ） 大（ダイ） 教授 医学研究科 医学系専攻	西（ニシ） 美幸（ミユキ） 特定准教授	佐藤（サトウ） 文規（フミノリ） 特定助教
9	工学	合成・生物化学	M1	山口（ヤマグチ） 一真（カズマ）	生物化学講座 分子生物化学分野	脊髄小脳失調症の分子病理学的知見	森（モリ） 泰生（ヤスオ） 教授 工学研究科合成・生物化学専攻 分子生物化学分野	髙橋（タカハシ） 良輔（リョウスケ） 教授 医学研究科 医学系専攻	Christian（クリスチャン） Altmann（アルトマン） 特定講師	稲場（イナバ） 直子（ナオコ） 特定助教

（平成26年3月31日時点）

LIMS Students, Supervisors and Mentors（Academic Year 2013）

	Graduate School	Division	Grade	Student	Department	Research Theme	Academic Supervisor	LIMS Supervisor	LIMS Mentor 1	LIMS Mentor 2
1	Medicine	Medical Science	M 1	**Maki Sakuma**	Anatomy and Developmental Biology	Identification of factors responsible for stress-induced alternative splicing	**Prof. Masatoshi Hagiwara** Anatomy and Developmental Biology, Graduate School of Medicine	**Prof. Yasuo Mori** Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering	**Koji Yamamoto** Program-Specific Associate Professor	**Yuriko Higuchi** Program-Specific Senior Lecturer
2	Medicine	Human Health Sciences	M 1	**Mikako Gomyo**	Medical Imaging System Sciences, Laboratory Science Course	Evaluation of viscoelastic property in tissue using shear wave generated by ultrasound	**Prof. Tsuyoshi Shiina** Medical Imaging System Sciences, Human Health Sciences, Graduate School of Medicine	**Prof. Masakazu Toi** Graduate School of Medicine	**Masao Matsuhashi** Program-Specific Associate Professor	**Takehiko Kinoshita** Program-Specific Senior Lecturer
3	Medicine	Human Health Sciences	M 1	**Atsuko Ishida**	Clinical Cognitive Neuroscience, Rehabilitation Sciences Course	Development of the evaluation equipment to support the life of elderly	**Prof. Toshiko Futaki** Occupational functioning and adaptation, Human Health Sciences, Graduate School of Medicine	**Prof. Kazuyoshi Nakabe** Department of Mechanical Engineering and Science, Graduate School of Engineering	**Yusuke Kobayashi** Program-Specific Assistant Professor	**Mie Torii** Program-Specific Assistant Professor
4	Pharmaceutical Sciences	Pharmaceutical Sciences	M 1	**Jun Miyanohara**	Molecular Pharmacology	Pathophysiological role of TRPV1 in cerebral ischemia	**Prof. Shuji Kaneko** Molecular Pharmacology, Graduate School of Pharmaceutical Sciences	**Prof. Jun Fujita** Graduate School of Medicine	**Wakoto Matsuda** Program-Specific Senior Lecturer	**Yasuharu Hirai** Program-Specific Assistant Professor
5	Engineering	Polymer Chemistry	M 1	**Rei Kuwabara**	Reparative Materials, Biomaterials Design	Synthesis of amphiphilic polymers carrying cholesterol and their biomedical application	**Prof. Hiroo Iwata** Reparative Materials, Institute for Frontier Medical Sciences	**Prof. Takeshi Kimura** Graduate School of Medicine	**Kyoichi Takaori** Program-Specific Associate Professor	**Aki Takimoto** Program-Specific Assistant Professor
6	Engineering	Polymer Chemistry	M 1	**Toshiki Matsui**	Reparative Materials, Biomaterials Design	Fabrication of three-dimensional cell structures using biodegradable polymers	**Prof. Hiroo Iwata** Reparative Materials, Institute for Frontier Medical Sciences	**Prof. Takashi Shinohara** Graduate School of Medicine	**Yu Kimura** Program-Specific Associate Professor	**Kenji Ohe** Program-Specific Senior Lecturer
7	Engineering	Polymer Chemistry	M 1	**Ken Murao**	Material Function and Analysis, Biomaterials Design	Development of novel imaging methods using pulsed laser sources	**Prof. Shinzaburo Ito** Polymer Structure and Function, Department of Polymer Chemisty, Graduate School of Engineering	**Prof. Nagahisa Yoshimura** Graduate School of Medicine	**Taku Hasegawa** Program-Specific Assistant Professor	**Kengo Kondo** Program-Specific Assistant Professor
8	Engineering	Synthetic Chemistry and Biological Chemistry	M 1	**Takuto Suitou**	Biorecognics Field, Biological Chemistry Course	Molecular mechanism of commensal bacteria-mediated thermoreguration in Drosophila	**Prof. Masato Umeda** Biorecognics Field, Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering	**Prof. Dai Watanabe** Graduate School of Medicine	**Miyuki Nishi** Program-Specific Associate Professor	**Fuminori Sato** Program-Specific Assistant Professor
9	Engineering	Synthetic Chemistry and Biological Chemistry	M 1	**Kazuma Yamaguchi**	Molecular Biology Filed, Biological Chemistry Course	Investigation of the molecular mechanism involved in Spinocerebellar ataxia type 6	**Prof. Yasuo Mori** Molecular Biology Filed, Department of Synthetic Chemistry and Biological Chemistry, Graduate School of Engineering	**Prof. Ryosuke Takahashi** Graduate School of Medicine	**Christian Altmann** Program-Specific Senior Lecturer	**Naoko Inaba** Program-Specific Assistant Professor

(As of March 31, 2014)

3.

履修者選抜

Student Selection

京都大学

文部科学省　博士課程教育リーディングプログラム

充実した健康長寿社会を築く
総合医療開発リーダー育成プログラム

平成 26 年度

募 集 要 項

Application Guideline

Academic Year 2014

Training Program of Leaders for Integrated Medical System
for Fruitful Healthy-Longevity Society

Program for Leading Graduate Schools, MEXT

Kyoto University

充実した健康長寿社会を築く総合医療開発リーダー育成プログラム
平成26年度　履修者募集要項

◎応募要件

本プログラムは５年一貫の大学院教育を行う。本プログラムの履修者の受入過程として、先ず所属研究科となる本学医学研究科（医科学専攻・人間健康科学系専攻）・工学研究科・薬学研究科の修士課程の入学試験を受験し、合格することを前提とする。ただし、これらの学部や京都大学の出身者である必要はない。留学生も積極的に受け入れる。

社会人経験者の履修も許可するが、本プログラムではかなりハードな教育プログラムを課すので、学業に専念できる環境作りを所属企業・組織との間で協議のうえ選抜する。

1. 募集人員

プログラム履修者　　２０　名

2. 出願資格

平成２６年４月に医学研究科、工学研究科、薬学研究科のいずれかの修士課程に入学する者で、博士後期課程進学後、博士（医科学）、博士（人間健康科学）、博士（工学）、博士（薬科学）のいずれかの学位取得が見込まれる者。

3. 出願手続

本要項に綴じ込みの封筒（海外在住者についてはこの限りではない）に下記書類を入れ、健康長寿社会の総合医療開発ユニット事務室（LIMS事務室）（あて先は、８．の出願書類提出先参照のこと）へ書留速達郵便 もしくは 持参にて提出すること。

（1）　願書（所定用紙）
（2）　研究計画書（所定用紙）
（3）　指導教員の推薦書（様式任意）
（4）　TOEFL／TOEIC／IELTSの成績（証明書）原本
　　別途提出の場合：　**11月15日（金）午後5時**　必着で提出すること。
　　［11月16日（土）数学試験開始前に会場での提出可］
　　なお、すでに京都大学大学院入学試験出願のため、受験先研究科の事務へ原本を提出している場合は、コピーでも可。（その旨申し出ること）
（5）　４．（1）付記に該当する場合は、所定書類
（6）　受験票・写真票（3.5cm × 4.5cmの写真貼付のこと。所定用紙）
（7）　宛名票（所定用紙）

(1)(2)(6)(7)については、本要項に綴じ込みの所定用紙へ記入のこと。ただし、海外在住者はホームページよりPDF様式をダウンロードして使用することができる。希望者はLIMS事務室まで e-mail にて連絡すること。

受付期間：　平成25年10月7日（月）～10月25日（金）午後5時　必着

※出願者は全員HP記載の手続きに従い、English Debate Classを11月15日までに受講しておくこと※
（ただし、海外在住者については免除する。）

4. プログラム履修者の選抜方法

英語および数学の成績について所定の基準に達したものに対して、AO選抜を実施し、AO選抜の成績・評価、指導教員の推薦書、出願書類に記載の研究計画の内容を総合して合否を判定する。海外在住者（留学生）については、(1)および(4)を参照すること。

試験日等

科　目	日　　時	場　所	合否通知
(1) 英　語	**平成25年11月15日（金）午後5時**までに成績（証明書）原本を提出 **［11月16日（土）数学試験開始前に会場での提出可］**	LIMS事務室	11月22日
(2) 数　学	**平成25年11月16日（土）午後1時～4時**　実施	京都大学 （詳細は別途通知）	
(3) AO選抜	**平成25年12月2日（月）～12月7日（土）** のうちの２日間（時間は別途通知）実施		平成26年 2月上旬 （予定）

(1) 英　語

出願者は、各自であらかじめTOEFL、TOEIC、またはIELTSを受験し、その成績（証明書）原本を、**平成25年11月15日（金）午後5時** までにLIMS事務室へ提出すること **［11月16日（土）数学試験開始前に会場での提出可］**。提出された成績は、所定の換算表を用いて換算する。

【付記】海外帰国子女の応募について

海外で長らく英語による学業に就き、英語を用いた学修・研究に関し既に高い能力を持つ学生については、新たに TOFFL／TOEIC／IELTS を受験する労を免じ、英語能力の判定を行う可能性がある。
該当する学生は、**10月25日（金）午後5時** までに下記書類をLIMS事務室へ提出すること：

- 海外の、英語を主体に教育を行う機関（主に日本の中学・高校・大学学部相当）の在籍もしくは修了（予定）証明書
- 同機関での成績証明書

これらに基づき、TOFFL／TOEIC／IELTS 受験の免除につき可否を判断する。書類の提出が難しい場合は、その旨連絡すること。
なお、英語 debate は、他の出願者と同様に、所定期間内に受講すること。

(2) 数　学

平成25年11月16日（土）に学部教養レベルの筆記試験を英語により実施する。
解答は、日本語または英語のいずれでも可。（試験会場は、別途各自へ通知する。）

(3) AO選抜

英語および数学について所定の基準に達し、選抜された出願者に対し、
平成25年12月2日(月)～12月7日(土)にAO選抜を実施する。各出願者につき２日の試験日を設け、1日に1名、合計２名の教授が評価を行う。(場所・時間等詳細は、別途各自へ通知する。)

(4) 海外在住者（留学生）の選抜について

海外在住者（留学生）で、申請時に所属している大学の学長 あるいは 学部長の推薦を得ることのできる者について、下記 A. あるいは B. の方法にて選抜試験を実施する。該当者はLIMS事務室まで e-mail にて連絡すること。選抜方法の決定、詳細については別途各自へ通知する。

A.	① 数学レポート　および　② オンラインAO選抜
B.	① 現地選抜（数学筆記試験、面接）　および　② オンラインAO選抜 （現地選抜を実施する国・地域については、事務室へ確認すること。）

5. プログラム履修者の合格発表

プログラム履修者の合格発表は、平成２６年２月上旬（予定）に行う。（合否について、各出願者へ別途通知する。）選ばれた学生は、平成２６年４月から「充実した健康長寿社会を築く総合医療開発リーダー育成プログラム」を正式に履修する。プログラムの詳細は、履修要項を参照のこと。

6. 奨励金について

以下の受給資格［1］～［6］のすべてを満たす者に対して、プログラム１・２回生（修士課程１・２回生相当）は月額１２万円、プログラム３～５回生（博士後期課程１～３回生相当）は月額１７万円を下限とし、月額２０万円を上限とする奨励金を支給する。支給額および支給継続については、選抜時および各学年末の正副指導教員・メンターによる成績等評価により決定され、年度毎に見直される。また、奨励金受給者の氏名は受給開始前に学内掲示およびLIMSホームページにて公表する。

【受給資格】

［1］プログラム履修者選抜試験に合格した本プログラムの履修者

［2］各種奨学金等の就学支援経費（本学の定める授業料等免除は除く）を受けていない者
ただし、国費留学生等で本奨励金を辞退した者は、他の奨学金を受けながら本プログラムを履修することができる。

［3］奨励金以外の収入（アルバイトの給与等）を得ていない者
ただし、研究成果の公表に伴う謝金、著作料およびTA・RAの給与（本プログラムにおいて本プログラムの実施に不可欠と判断される場合に限り、週５時間を上限とする。）等に限り、これを除外する。

［4］本学大学院の在籍期間（休学期間を除く）が５年を超えない者

［5］本プログラムにおける成績等評価において特に優秀と認められる者

［6］本プログラムが５年一貫の教育研究課程であることを了解する者

【受給資格の喪失条件】　受給者が次の各号の一に該当する場合は、その資格を失う。

（1）上記に定める受給資格を失ったとき。
（2）受給者からの辞退届が受理されたとき。
（3）奨励金について提出された書類に虚偽の記載があるとき。
（4）休学又は退学したとき、および除籍されたとき。
（5）京都大学通則の規定により懲戒処分を受けたとき。

【所得税・住民税・社会保険等について】

i　奨励金は「雑所得」として取り扱われるため、源泉徴収は行わない。
ii　奨励金は「雑所得」として課税対象となるため、受給者は家族の税法上の扶養親族から外れなければならない。
iii　受給者は自身で必ず確定申告の手続き（毎年３月15日までに）を行った上で、所得税・住民税納付に係る証拠書類をLIMS事務室へ提出しなければならない。
iv　受給者は個人で国民健康保険・国民年金保険へ加入すること。
v　国民年金保険の学生納付特例制度は適用除外となるので注意すること。（前納や口座振替による割引制度はある。）
vi　留学生の場合は、租税条約の締結の有無により取扱が変わるため、注意すること。
vii　各種手続きについては、居住する市区町村へ問い合わせること。

7. 個人情報の取り扱いについて

取得した個人情報は、プログラム履修者の選抜および履修に伴い必要となる業務のために、「京都大学における個人情報の保護に関する規程」の定めるところにより取り扱う。

8. 出願書類提出先・問い合わせ先

〒606-8501　京都市左京区吉田近衛町　医学部構内Ｇ棟３階315号室
京都大学 学際融合教育研究推進センター
健康長寿社会の総合医療開発ユニット事務室（LIMS事務室）
TEL：075-753-9334　FAX：075-751-2180
E-MAIL：info@lims.kyoto-u.ac.jp　URL：http://www.lims.kyoto-u.ac.jp/

受付時間：　午前９時～午後５時　月～金曜日（祝日を除く）

Application Guideline for Academic Year 2014

Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

◎Recruitment requirements

This program performs continuous graduate education over a period of 5 academic years. In order to be enrolled in this program, first, the students have to take and pass the entrance examination for master's course of Kyoto University at one of the following graduate schools: Graduate School of Medicine (Medical Science Major, Human Health Science Major), Graduate School of Engineering, and Graduate School of Pharmaceutical Sciences. However, it is not required that the applicants are graduates of Kyoto University or any of the indicated departments. This program also greatly welcomes students from abroad.

Students with vocational occupation can also apply for this program. However, because of the intense training course of this program, they will be selected upon discussion with their employers about their devotion to the academic activities.

1. Enrollment Capacity

20 scholarship students/ year

2. Eligibility Requirements for Applicants

By April 2014, applicants must satisfy the following two requirements:

1. Applicants must be enrolled in the master's course as 1st year students of one of the following graduate schools: Graduate School of Medicine, Graduate School of Engineering, and Graduate School of Pharmaceutical Sciences.
2. Applicants are supposed to proceed to the doctoral (PhD) course at one of the following graduate schools: Graduate School of Medicine (Medical Science Major, Human Health Science Major), Graduate School of Engineering, and Graduate School of Pharmaceutical Sciences.

3. Application Procedures

i. Application period

From Monday, October 7 until **5:00 pm on Friday, October 25, 2013.**

ii. Method for submitting application documents

Documents must be enclosed in the designated envelope attached to this guideline and sent by registered express mail or submitted in person to the Research and Educational Unit of Leaders for Integrated Medical System (LIMS) Office (Applicants living overseas can use any type of envelopes). Please refer to 8. for the submission address.

iii. Application documents (*indicates designated forms included in this guideline)

Applicants who live outside Japan can download these forms from the LIMS homepage, after sending their requests by e-mail to the LIMS Office.

(1) Application form*
(2) Research plan*
(3) A letter of recommendation from mentors
(4) TOEFL /TOEIC/ IELTS official score results or certificates

If the original of TOEFL / TOEIC / IELTS official score results or certificates have been submitted to the offices of graduate schools of Kyoto University for the entrance examination procedure, the applicants must contact and obtain approval of the LIMS Office to submit their copies.

In case that the official score results or certificates are sent separately and later than the other required documents, those must arrive by **5:00 pm on Friday, November 15.**

Personal submission of the official score results or certificates will be accepted **at the examination room before the start of the mathematics test, on Saturday, November 16.**

(5) Required documents for those who fall under the note of category 4. (1)
(6) Examination admission ticket and Photograph card (photograph must be affixed at the designated location)*
(7) Mailing label*

iv. English Debate Class

All applicants **must** attend the English Debate Class as described in the homepage by **November 15, 2013.** (Exemption for applicants living outside Japan)

4. Selection Method, Schedules

Applicants who meet the required criteria of this program for English and mathematics will proceed to the AO selection. They will be selected through a comprehensive evaluation based on the AO selection together with letters of recommendation from mentors and the contents of submitted research plans. Applicants (international students) who are living outside Japan, please refer to (1) and (4).

Examination Schedules

Subjects	Date	Place	Result Announcement
(1) English	Submit the official scores by **5:00 pm on Friday, November 15** **(Or in person on Saturday, November 16 at the examination room before the start of mathematics test)**	To LIMS Office	November 22
(2) Mathematics	**From 1:00 pm to 4:00 pm on Saturday, November 16**	Kyoto University (To be noticed individually)	
(3) AO Selection	Two days during the period from **December 2 to December 7** (Details will be noticed individually)		Beginning of February, 2014 (estimated)

(1) English

Applicants should take TOEFL, TOEIC or IELTS test by themselves and submit the official score results or certificates to the LIMS Office by **5:00 pm on Friday, November 15, 2013.** (Personal submission of TOEFL / TOEIC / IELTS official score results or certificates will be accepted **at the examination room, before the start of the mathematics test, on Saturday, November 16.**)

The submitted scores will be converted using the conversion table of this program.

【Note】 Application as a returnee from abroad

Applicants who have been using English for research or studies abroad for a long time may be evaluated for their English language proficiency without TOEFL / TOEIC / IELTS tests. Those applicants, who fall under this category, shall submit the following documents to the LIMS Office by **5:00 pm on Friday, October 25**.

- Certificate of enrollment in junior high schools, high schools and undergraduate universities (equivalent of the Japanese school system).
- Official transcripts from the schools and universities.

Based on the score statements, the applicants will be evaluated to have or not to have an exemption of TOEFL, TOEIC or IELTS test. If submission of these documents is difficult, please consult the LIMS Office.

However, these students have to take English Debate Class in a determined period, similarly to the other students.

(2) Mathematics

The written mathematics test will be held in English on **Saturday, November 16, 2013**. (Details will be noticed to applicants individually.) **The answers can be written in English or Japanese.**

Mathematics test aims at undergraduate education level.

(3) AO Selection

The applicants who fulfill the required criteria of this program for mathematics and English will undergo the AO selection during the period from **Monday, December 2 to Saturday, December 7**. Each candidate will be evaluated by two professors on separate days. (Details will be announced to applicants individually.)

(4) Oversea Applicants (international students)

Applicants who live outside Japan and apply under recommendation of the president of their universities or dean of affiliated faculties will undergo selection method A or B (see below). Those applicants, who fall under this category, shall contact the LIMS Office by e-mail. Selection method will be decided and details will be announced to applicants individually.

A.	①Mathematics report and ②Online AO selection
B.	①Local selection (written mathematics test, interview) and ②Online AO selection (Contact with the LIMS Office on details of countries or regions of local selection)

5. Announcement of Successful Applicants

Successful applicants for this program will be announced at the beginning of February, 2014 (estimated). The results will be sent to applicants individually.

From April, at the same time of enrollment in their respective graduate schools, they can be admitted to Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society as program students. For more information about the program, please refer to Course Guideline 2014.

6. Financial Support System

Admitted students who satisfy all of [1] to [6] **eligibility requirements for recipients** will be supported with a minimum amount of 120,000 yen monthly allowance at the first and second years of this program (the first and second grades of master's degree course, equivalently), and 170,000 yen monthly allowance in the third, fourth and fifth years of this program (the first, second and third grades of doctor degree course, equivalently). The maximum amount of monthly allowance is 200,000 yen.

The amount and continuation of allowances depends on the performance during the selection procedure, and academic achievements evaluated by teachers and mentors at the end of each academic year.

The names of recipients will be posted at the campus and on the LIMS homepage.

[Eligibility requirements for recipients]

[1] Those who are successful applicants of this program.

[2] Those who are receiving no financial support from any scholarship or stipend (*1) (except for a tuition waiver by Kyoto University (*2)).
However, students who declined financial support from this program, will be able to take training in this program while receiving other scholarships, such as a scholarship from the Japanese government.

[3] Those who are not receiving or expecting to receive any remuneration including wages for part-time work, with the exception of honorarium payments relating to the publication or presentation of research results, copyright fees or royalties, or a Teaching Assistant (TA) or Research Assistant (RA) allowance which is deemed essential to the program (up to 5 hours per week).

[4] Those who have been enrolled for no more than five academic years (not including any period of temporary absence) in a graduate school at Kyoto University.

[5] Those who are deemed to have achieved excellence based on their grades and scores in this program.

[6] Those who agree to continuously pursue their education and research during the 5-year period of this program.

(*1) There are several other scholarships and stipends which cannot be received concurrently with this scholarship. Recipients of this program will NOT be eligible to receive any of the following:
- The Research Fellowship for Young Scientists (DC) of the Japan Society for the Promotion of Science (JSPS)
- A scholarship or loan from the Japan Student Services Organization (JASSO)
- A scholarship from the Japanese government (The Ministry of Education, Culture, Sports, Science and Technology [MEXT]) as a government-sponsored foreign student
- A scholarship from an organization in one's home country
- A scholarship from Kyoto University, etc.

(*2) Students may receive other financial support including an entrance fee waiver or tuition waiver from other funding sources.

[Loss of eligibility for financial support]

Recipients who fall in one of the following categories will lose their eligibility for financial support:

(1) Those who lose one of [1] to [6] requirements of [Eligibility requirements for recipients] above.

(2) Those who submit a letter of declination of the financial support from this program, and the letter is accepted.

(3) Those who submitted false statements in the application documents of this program.

(4) Those who stop studying, quit school or are expelled from school.

(5) Those who are subjected to disciplinary action, following the Kyoto University General Rules.

[Income tax・Resident's tax・Social insurance obligations]

Please note that the scholarship is subject to income tax (*3) and resident's tax. Recipients are also required to enroll in the National Health Insurance Program and the National Pension Plan.

(*3) You must file a tax return by March 15 each year.

i Because allowances of this program are considered as "miscellaneous income", they fall into taxable incomes, according to tax laws.

ii After the annual tax declaration, recipients must submit documents clarifying the payment of income tax and resident's tax to the LIMS Office. Tax offices will accept tax returns until March 15.

iii Recipients will have to register to the National Health Insurance and National Pension Plan individually.

iv It is important to note that recipients will not fall into the special system of National Pension Insurance for students (Note: discount systems by prepayment or account deposit are available).

v For international students, please note that tax payments depend on the presence or absence of a tax treaty between Japan and their home countries.

vi For further details of procedures, please refer to the office of the municipality (city, town or village) in which each recipient resides.

7. Personal Information Handling

Personal information (including information relating to performance evaluations) provided in application documents, etc., shall be handled in accordance with the stipulations set forth in the “Kyoto University Personal Information Protection Regulations,” and shall be used for the objectives of (1) entrance examinations, (2) admission procedure, scholarship etc., and (3) preparation for accepting students.

8. Contact Information, Document Submission Address

Research and Educational Unit of Leaders for Integrated Medical System (LIMS) Office,
Center for the Promotion of Interdisciplinary Education and Research,
Kyoto University

Room 315, 3F, Bldg. G, Faculty of Medicine Campus
Konoe, Yoshida, Sakyo, Kyoto, 606-8501, JAPAN
TEL: (+81) 75-753-9334 FAX: (+81) 75-751-2180
E-MAIL: info@lims.kyoto-u.ac.jp
URL：http://www.lims.kyoto-u.ac.jp/

Reception time: from 9:00 am to 5:00 pm during weekdays
(Monday to Friday, except national holidays)

充実した健康長寿社会を築く総合医療開発リーダー育成プログラム

Training Program of Leaders for Integrated Medical System for
Fruitful Healthy-Longevity Society

平成26年度　願 書

Application Form for Academic Year 2014

（記入年月日 Date：2013/　　/　　）

受験番号 （記入しないこと）			
ふりがな		生年月日　Date of birth	国籍　Nationality
氏　名 Full name	㊞ Signature	年　月　日 Age （　　歳）	
所　属 Affiliation	学生番号 Student ID.No.		
	研究科 Graduate school		
	専攻 Department		
	指導予定教員の所属・氏名・役職 Academic supervisor	㊞	
現住所 Address	〒　　－		
電話番号 Phone		E-mail	

【学　歴】※高等学校～現在について記入してください。
Education (from high school education to present)

学校名等 / School name	在学期間（年月）/ Period(YYYY.MM)
	～
	～
	～
	～
	～

※該当なしの項目については、「なし」と記入してください。　（裏面につづく）/ (Please turn over.)
※If an item does not apply to you, please write "N/A" (not applicable).

【職　歴】※現在までについて記入してください。
Employment record to present

在職期間（年月日）/ Period (YYYY.MM.DD)	勤務先名・所属・職名及び資格等 / Employer, position etc.
～	
～	
～	
【賞　罰】 Awards and distinctions	

年月 / Date (YYYY.MM)	事項 / Content

【奨学金】　受給実績（予定を含む。）
Scholarships (already effective or planned)

支給機関 / Issuing institution	期間 / Period	金額（月給） / Monthly amount

※該当なしの項目については、「なし」と記入してください。
※If an item does not apply to you, please write "N/A" (not applicable).

充実した健康長寿社会を築く総合医療開発リーダー育成プログラム

Training Program of Leaders for Integrated Medical System for
Fruitful Healthy-Longevity Society

平成26年度　研究計画書

Research Plan for Academic Year 2014

氏　名 Full name	（記入年月日 Date：2013/　　/　　）

【研究計画の内容】　（800 字程度）　Research plan (approximately 300 words)
※パソコンで作成し印字したものも可　※You may use PC to print

（裏面につづく）/ (Please turn over.)

平成 26 年度　充実した健康長寿社会を築く
総合医療開発リーダー育成プログラム
Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society 2014

受　験　票
Examination Admission Ticket

※受験番号	
(ふりがな) 氏　名 Full name	
生年月日 Date of birth	年　月　日生
所属研究科・専攻 Affiliation	研究科： Graduate school 専　攻： Department

写　真
photograph
［3.5㎝×4.5㎝］
◎上半身脱帽正面向きで3か月以内に単身で撮影したもの。
◎写真の裏面に氏名を記入。
◎剥がれないよう全面糊付けのこと。
Your photograph must be:
• From the waist up, taken alone in full-face view directly facing the camera, taken within the last 3 months
• Stated your full name on the back side
• Pasted all over the back side

※受験番号欄には、何も記入しないこと。

きりはなさないこと

平成 26 年度　充実した健康長寿社会を築く
総合医療開発リーダー育成プログラム
Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society 2014

写　真　票
Photograph Card

※受験番号	
(ふりがな) 氏　名 Full name	
生年月日 Date of birth	年　月　日生
所属研究科・専攻 Affiliation	研究科： Graduate school 専　攻： Department

写　真
photograph
［3.5㎝×4.5㎝］
◎上半身脱帽正面向きで3か月以内に単身で撮影したもの。
◎写真の裏面に氏名を記入。
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平成 26 年度　充実した健康長寿社会を築く
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宛　名　票
Mailing Label

受験票・合否結果通知を受け取る住所 および 出願者本人の氏名を記入すること。
State your name and address on each mailing label.
住所変更があった場合は必ずその旨を届け出ること。
Please inform us of any changes to your address.

※受験番号	
(ふりがな) 氏　名 Full name	

1. 受験票を受け取る住所　Address for the Examination Admission Ticket

To

※

2. 英語･数学試験 合否結果通知を受け取る住所　Address for the primary examination result

To

※

3. AO選抜 合否結果通知を受け取る住所　Address for the final result

To

※

4.

特定教員

Program-Specific Staff

特定教員の配置と活動

京都大学では、博士課程教育リーディングプログラムを学際融合教育研究推進センターの制度を活用して運営している（図１）。LIMSプログラムでは、学際的な教育の促進と個々の履修生に対する多角的な観点からの指導のため、関連分野にわたって特定教員を採用した（図２）。

講義・実習・研修

特定教員（教授・准教授・講師）はプログラム科目を担当し、特定助教も実習・研修の実施を担当した。又次年度以降開講の講義・実習の準備を行った。履修生３回生以降のコロキウム・特別研究については、個々の特定教員の専門分野に応じて担当する予定である。次ページ以降に、具体的な実施状況の一部を記す：

1. 人体解剖学----------大江 賢治・松田 和郎
2. 生理学----------松橋 眞生・稲場 直子・平井 康治
3. 医療・生活支援システム学（生体検査・画像解析法、リハビリテーション）----------近藤 健悟
4. 医療・生活支援システム学（在宅医療支援）----------鳥井 美江
5. English Debate Course and Practice ---------- Christian Altmann
6. 機械工学基礎 ----------山本 浩司
7. 材料化学基礎 ----------木村 祐
8. 生物分子解析学 ----------西 美幸
9. 薬物動態学 ----------樋口 ゆり子
10. 医化学 ----------長谷川 拓
11. 再生医学 ----------佐藤 文規・滝本 晶
12. シミュレーション概論 ----------木下 武彦
13. 低侵襲治療学 ----------髙折 恭一
14. 医療工学特別講義Ⅰ、Ⅱ：　（産公学連携の章参照）

メンター

各履修生について、専門分野の指導教員のほか、LIMSプログラムの教育研究課題を学生・指導教員とともに企画し、学生の自主的な課題遂行を支援・助言するため、専門分野と関連を持ちながらも異なる分野から、副指導教員（教授）１名とメンター２名を設定した。特定教員がメンターの任に当たり、特別研究への準備段階であるプレリサーチについても、助言・指導を行う予定である。

その他

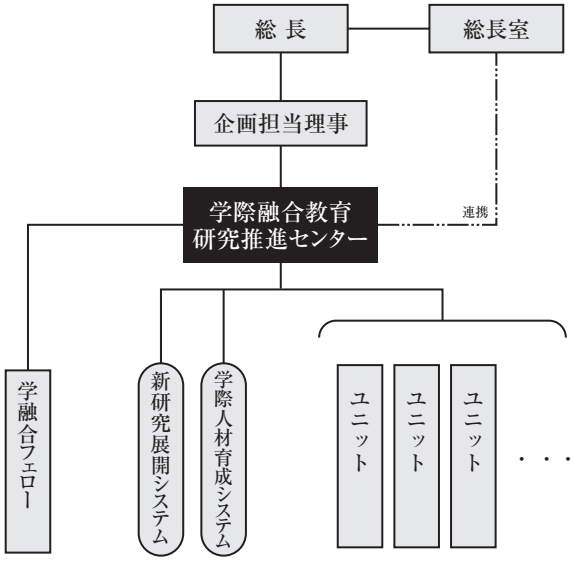
用語集作成：40ページを参照

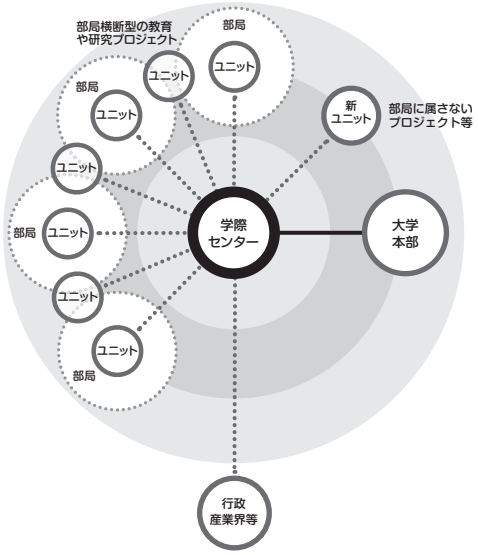
広報（ホームページ企画・運営、冊子・チラシ・ポスター）：広報の章参照

1　学際融合教育研究推進センター・ユニットによる運営

京都大学　学際融合教育研究推進センター
『健康長寿社会の総合医療開発ユニット』（LIMS）の設置

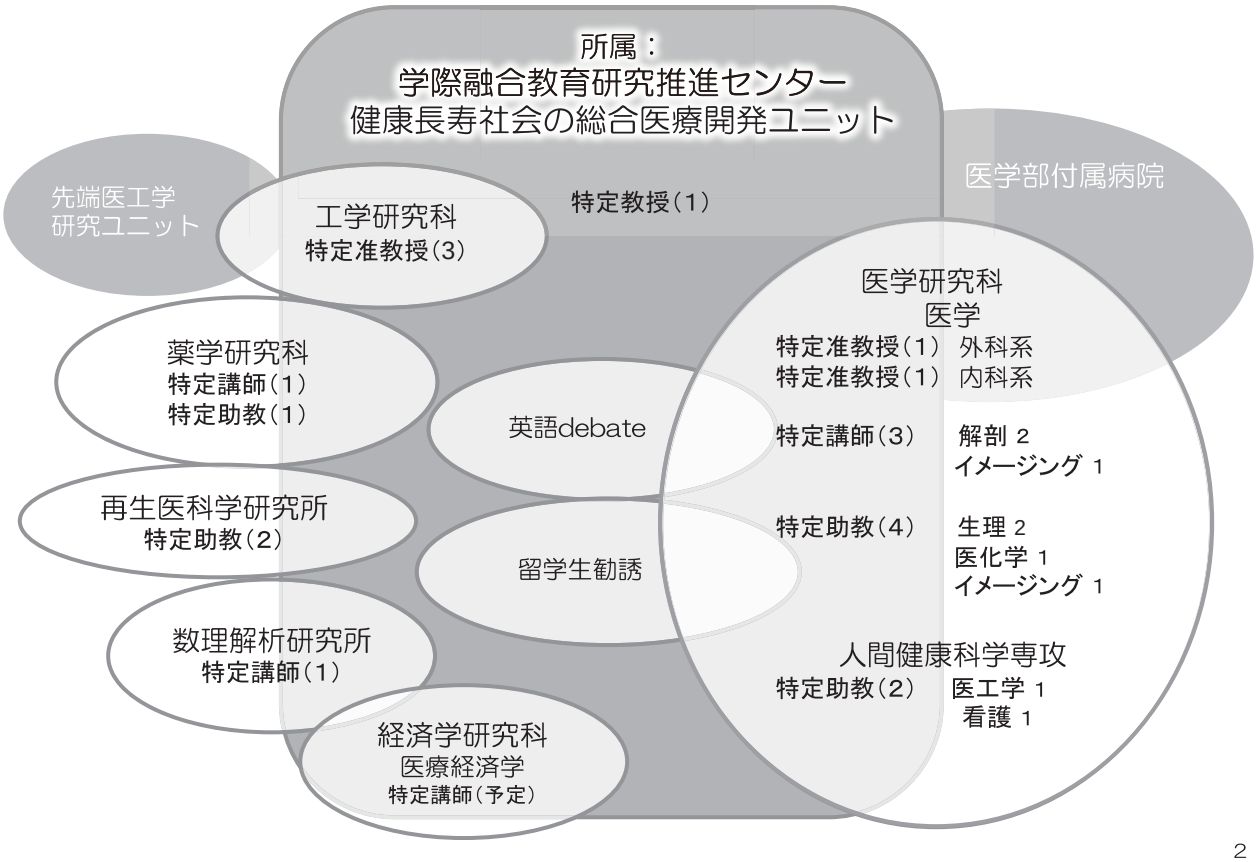
- ユニット内規の制定
- ユニットプログラム教授会、委員会（カリキュラム・人事・広報・入進学審査）による運営
- ユニット所属特定教員の採用
- ユニット事務室によるプログラム事務処理





1

2　特定教員の配置



2

実施状況

1. 人体解剖学

担当者：　萩原 正敏 教授（医学研究科・形態形成機構学）
金子 武嗣 教授（医学研究科・高次脳形態学）
山田 重人 教授（医学研究科・人間健康科学系専攻・運動機能解析学）
青山 朋樹 准教授（医学研究科・人間健康科学系専攻・運動機能開発学）
大江 賢治 特定講師（LIMS）
松田 和郎 特定講師（LIMS）

人体解剖学は、2014年前期から開始であり、対象は修士２回生である。本年度は、カリキュラムの検討を行い、超高齢社会において重要となる筋・骨格筋系講義を重視するために医学研究科・人間健康科学系専攻の青山朋樹准教授と協力して、次年度に運動学の講義を準備した。受講学生が、人体解剖学の講義と実習を通して、医工連携に不可欠な「構造」と「機能」の連関を理解してもらうことを目標としている。人体解剖学の基本は、医学部学生の使用する教科書を参考にして講義プリントを適宜配布する。実習では、医学部学生が学習する実際のご遺体に触れさせ、系統解剖を体験させる。またバーチャル画像や樹脂模型を使って、立体的に人体の構造を理解させる。

2. 生理学

担当者：　大森 治紀 教授（医学研究科・神経生物学）
河野 憲二 教授（医学研究科・認知行動脳科学）
金子 武嗣 教授（医学研究科・高次脳形態学）
福山 秀直 教授（医学研究科・脳機能イメージング）
松橋 眞生 特定准教授（LIMS）
稲場 直子 特定助教（LIMS）
平井 康治 特定助教（LIMS）

本育成プログラムの目指すところである『医療現場のニーズに立脚した総合医療システムの開発者並びにこれを統率するリーダー』に求められる基礎の知識として、また本プログラムにおけるこれからの医学・医療に関する講義・実習の理解を確かなものにするために、生理学の講義を基盤科目・必修として１学年の後期(9-12月)に行った。この講義は、特に工学系出身の学生に対し、医学部卒業生に匹敵する医学・生理学の知識を与えることを目標としている。その為、講義内容は医学部学生を対象とするものと同等のクオリティで行うことを目指した。本年度のプログラムでは特に重要と思われる以下の内容にて講義を構成した。

1. 生命に必要な生体の恒常性とそれを支える神経系について
2. 神経の働きを理解するのに必要な膜興奮性と神経活動、シナプスの構造と働きについて
3. 脳の構造と機能、及び感覚受容について
4. 生命維持に特に重要な心臓・循環及び肺・呼吸について

理解程度の確認のために、履修生には内容ごとにレポートを課し、評価した。

3月には、医学部学生に向けた生理学実習で用いる実験装置を使用しながら、生理学実験を行うための手法、並びに解析方法についても実習を通して学んだ。その際、上記講義内容に含まれなかった細目についてもカバーし、今後その知識が必要となった際に学生自ら学び、理解できる様、最低限の知識の教授と指導を行った。

3. 医療・生活支援システム学（生体検査・画像解析法、リハビリテーション）

担当者：　椎名 毅 教授（医学研究科・人間健康科学系専攻・医療画像情報システム学）
齋藤 邦明 教授（医学研究科・人間健康科学系専攻・基礎検査展開学）
杉本 直三 教授（医学研究科・人間健康科学系専攻・先進医療機器開発学）
高桑 徹也 教授（医学研究科・人間健康科学系専攻・臨床検査展開学）
黒木 裕士 教授（医学研究科・人間健康科学系専攻・運動機能解析学）
山根 寛 教授（医学研究科・人間健康科学系専攻・脳機能リハビリテーション学）
二木 淑子 教授（医学研究科・人間健康科学系専攻・臨床認知神経科学）
加藤 寿宏 准教授（医学研究科･人間健康科学系専攻･脳機能リハビリテーション学）
近藤 健悟 特定助教（LIMS）

医療の現場において検査や画像解析に関する先進医療機器、また在宅医療介護やリハビリテーションにおいて医療支援システムがどのように応用されているかを理解することを目的とし、講義および実習を行った。

【生体検査・画像解析法】

1. 講義

1.1 オミックス解析による病態解析

臨床検査の医療における役割と新しい診断薬開発の方向性を学んだ。

・個別化医療における臨床検査の役割：先制医療、コンパニオン診断

・新たな診断薬開発のためのオミックス解析による病態解析：プロテオミクス、メタボロミクス、ゲノミクス

・新たな免疫制御因子 IDO：創薬と診断薬開発

1.2 医用画像機器

生体組織の形態や機能を画像化する様々な医用画像機器についての特徴および原理の概要を学んだ。また、それらによって得られる種々の臓器の画像の例、さらに同じ部位を異なる方法で画像化し、それぞれの特徴を比較した。

・様々な臓器の形態画像：胸部 X 線、胃 X 線造影、消化管撮影、冠動脈造影、マンモグラフィ、断層撮影装置、頭部 X 線 CT、心臓３次元 X 線 CT、全身 MRI

・頭部の様々な画像（形態や機能）：X 線 CT、MRI、SPECT、PET、fMRI、脳血管造影、MRA、NIRS

・光、超音波による形態や機能の可視化：サーモグラフィ、眼底写真、眼底 OCT、内視鏡（胃）、内視鏡（大腸）、カプセル内視鏡、内視鏡（血管）、超音波内視鏡、腹部超音波

2. 学外研修

・民間臨床検査会社のファルコバイオシステムズにおいて、実際に検査を行う現場を見学した。医療機関で採取され集められた検体が、どのような過程を経て検査され、検査データとして利用されているのかを学んだ。

・医用画像機器、検査機器を開発する島津製作所を訪問し、分析装置や画像診断機器等について見学を行った。それぞれの装置の説明を受けるとともに、開発における話を伺う、実際に触れるなどし、様々な機器やその開発、応用について学んだ。また X 線画像診断装置等の画像診断機器の製造過程を見学し、医療機器がどのように製造されているかを学んだ。

【リハビリテーション】

超高齢社会をむかえた我が国において、高齢者リハビリテーションは喫緊の解決すべき課題である。リハビリテーション（理学療法、作業療法）についてその概要を学ぶと共に、リハビリテーションにおける医療・福祉・在宅ケアの統合の重要性を理解し、さらに従来の医工連携の枠組みを超えて、医療現場のニーズに立脚した総合医療システムを開発する医工学の必要性を考察することを目的に講義、実習を行った。

1. 講義

リハビリテーション（理学療法、作業療法）について、その概要を学んだ。

1.1 理学療法

・何が求められているか
・現状認識：高齢化率と障害、疾病、平均在院日数
・回復期リハビリテーション病棟
・病院で完結しないリハビリテーション：維持期リハビリテーションの重要性
・リハビリテーションの語源
・理学療法の対象と領域
・新たな機器開発の時代

1.2 作業療法

・作業療法について：語源、特性、機能、対象、手段、領域
・作業療法でもちいる作業
・歴史、日本および世界における作業療法士数、養成施設数
・作業療法の分類
・精神認知機能領域作業療法
・身体障害領域作業療法
・障害の具体例、リハビリテーションの具体例

2. 実習

京都大学医学部附属病院のリハビリテーション部において、理学療法士、作業療法士に付き、リハビリテーションの臨床で行われている理学療法、作業療法それぞれについて現場の見学を行うことにより講義で学んだリハビリテーションについての理解を深めた。

4. 医療・生活支援システム学（在宅医療支援）

担当者：荒井 秀典 教授（医学研究科・人間健康科学系専攻・近未来システム・技術創造部門）
鳥井 美江 特定助教（LIMS）

急速な高齢化に伴い、高齢者やその家族のニーズは多様化し、介護・医療・地域分野における対策が急務とされている。厚生労働省においては、自立した生活を支援し、高齢者が住

み慣れた地域での住宅生活を継続することができるように地域の包括的な支援・サービスの構築（地域包括ケア）を推進している。地域包括ケアを実現するためには、医療分野・介護分野の連携強化、介護サービスの充実、予防の推進、生活支援サービスの確保、住まいの整備などが必要とされている。

在宅医療支援分野では、高齢者への支援や療養生活を見学・体験することで地域医療・介護現場において高齢者やその家族が抱えている問題に触れ、対象者のニーズに沿った医療支援システムの構築や機器開発などの考察を目的として、講義と臨地実習を行った。講義は、高齢者概論を中心に行い、履修後に介護保健サービス対象施設である左京南地域包括支援センター、高齢者福祉施設本能、高の原ポシブルデイケアセンターの３ヶ所で臨地実習を行った。以下に内容を示す。

（１）講義

① 高齢社会と背景：　国内、諸外国の高齢化の現状や政策、今後の動向と起こりうる問題

② 高齢者の身体的・生理的特徴と変化、　社会役割・精神的特徴と変化

③ 高齢者が罹患しやすい疾患

④ 高齢者福祉政策：　介護保険制度の概要、介護保険制度創設・施行までの社会的背景、介護保険制度のサービス内容と手続き方法

（２）臨地実習

① 左京南地域包括支援センター：

ケアマネジャー、保健師（看護師）、社会福祉士が連携して地域高齢者の介護・福祉・健康・医療などさまざまな面から総合的に支援する公的相談窓口である。実習では、ケアマネジャーから施設の概要や支援内容、事例紹介を受け、高齢者の現状だけでなく、ケアマネジャーが抱える問題にも触れ、医療・介護分野の連携について学びを深めた。

② 高齢者福祉施設本能：

介護老人福祉施設（特別養護老人ホーム）、短期入所生活介護・介護予防短期入所生活介護（ショートステイ）、通所介護・介護予防通所介護（デイサービスセンター）が複合した施設である。市内の高校と同じ敷地内にあり、デイサービスセンターにおいては地域の乳幼児と母親も利用していることから高齢者と様々な年代の地域住民とのふれあいの場にもなっている。高齢者の生活を見学する中で、それぞれの施設の特性と地域連携、生活支援サービスについて学びを深めた。

③ 高の原ポシブルデイケアセンター：

理学療法士が利用者それぞれと目標を設定し、目標達成に必要な筋力トレーニングプログラムを作成、機能評価をするという生活リハビリに特化した新しいデイサービス施設である。ノルウェー、フィンランドなどの福祉先進国から最新トレーニング機器やレッドコードを導入しており、実習では実際にプログラムに参加し、リハビリテーションや予防の重要性について学びを深めた。

5. English Debate Course and Practice

Instructor:　Christian Altmann, Program-Specific Senior Lecturer (LIMS)

For students in the LIMS program, a weekly course is offered with these objectives: The course intends for LIMS students to a) improve their ability to form and express their opinions in English, in front of an audience with different scientific backgrounds and nationalities, b) improve their ability to react to questions and to defend their opinion, and c) improve their ability to refute others' arguments.

To achieve these aims, students engage in various exercises: drafting arguments and responses to counter-arguments, listening to current debate speeches or reading articles on a topic, analyzing the argumentation and discussing in the group. One main exercise is formal debate; in these debates two teams of students (3 per team) debate a topic. Students have to give 4-minute speeches presenting arguments and refutations. Both the debate topic itself and then the debate style are discussed in the plenum. Debated topics are for example the current reform of the healthcare system in the USA or the problem of publication bias affecting the publication of clinical trials.

In addition to the English debate course, LIMS students have the opportunity to engage in one-on-one English discussions with various international researchers related to the LIMS program.

English debate course schedule winter term 2013/2014:

2013/09/05 Introduction: Why debate? (example: UK-House of Commons)

2013/09/12 Formal debate: Should nuclear power be continued / discontinued in Japan?

2013/09/19 Discussion with Prof Denis Le Bihan on medical screening.

2013/10/03 Formal debate: Will the Tokyo Olympics be an economical success?

2013/10/10 The healthcare debate in the US – Affordable healthcare act

2013/10/17 Formal debate: Should health insurance be mandatory?

2013/10/31 Argumentation and Refutation Exercises (Structure of arguments)

2013/11/28 Clinical trials: problems with pharma-sponsored research.

2013/12/05 Clinical trials: problems with the current scientific publication situation.

2013/12/12 Clinical trials: discussion and preparation of arguments.

2014/01/09 Formal debate: How can we improve clinical trials? (interest groups: public, medical professionals, biomedical researchers, pharmaceutical industry)

2014/01/16 Exercise: How to prepare an efficient “elevator speech” (summary of students’ research in a short speech)

2014/01/23 Exercise: How to prepare an efficient “elevator speech” (summary of students’ research in a short speech)

2014/01/30 Preparation: Has a lay-person the right to know her genome?

2014/02/06 Formal debate: Has a lay-person the right to know her genome?

2014/02/13 Guest Professor Marc Teichmann discusses on aphasia.

2014/02/20 Emotions and social etiquette in debates.

2014/03/06 Using descriptive statistics in debates.

2014/03/13 Feedback to/from students and to/from teacher.

6. 機械工学基礎

担当者：　中部 主敬 教授（工学研究科・機械理工学専攻）
安達 泰治 教授（再生医科学研究所）
山本 浩司 特定准教授（LIMS）

機械工学基礎は2014年前期から開始する基盤科目である。対象は修士１回生であり、2013年９月入学者に限り２回生前期に選択できる。また実習は修士２回生後期の生体材料学・人工臓器学実習の一環として行う予定である。従って本年度は主に工学研究科の中部教授および再生医科学研究所の安達教授とともにカリキュラムの作成、および実習内容の確認を行った。本科目では、まず前半で実社会に関わる基本的な現象を、機械力学、材料力学、流体力学、熱力学を基本として数理的に理解できるようなカリキュラムを構成した。そして後半でそれらの力学原理が、機器やシステムの開発にどのように応用されているのかを講義や実習を通して具体的に理解できるようにする予定である。本科目を通して受講学生が機械医工学的感性を身に付け、さらに磨かれることを目標としている。

7. Basic Materials Chemistry

Instructors: Teruyuki Kondo, Professor
(Advanced Biomedical Engineering Research Unit, C-PiER)
Yu Kimura, Program-Specific Associate Professor, (LIMS)

In academic year 2013, the course started from October, and initially an exercise of organic chemistry was performed. This exercise was intended to evaluate the actual skills of students. Based on the evaluation, the review abut basic organic chemistry was lectured with detailed accounts of the exercise. The review especially emphasized explanations about presuming reaction mechanisms, processes to develop the reaction, and synthesis strategy. Then, characteristics and synthetic routes of medicines such as sulfa drug, indinavir and oseltamivir were lectured from the viewpoint of structure-property relationship and mechanism of action. Also a lot of biomolecules mainly as nucleic acid, saccharides, alkaloids, fatty acids, and terpenes were summarized to understand their bio-synthesis, functions and the structural correlation, and their metabolism. In contrast, biomaterials as a large bulk material for clinical use have many characteristic properties, such as bioavailability, biocompatibility, antithrombogeneity, or other bioactivities, the lecture summarized these properties with the explanation in molecular level. Also in the lecture, we put emphasis on understanding not only of basic requirements as biomaterial, but also of the reason why the material was chosen to use as a biomaterial. The knowledge would be helpful to design novel materials based on a demand in fruitful healthy-longevity society. Through the submitting report after the course, we are scheduling to evaluate students on the proficiency and utilizing ability of obtained knowledge.

8. Molecular Analysis of life

Instructors: Yasuo Mori (Professor, Graduate School of Engineering,
Department of Synthetic Chemistry and Biological Chemistry)
Miyuki Nishi (Program-Specific Associate Professor, LIMS)

To understand analytical methods that clarify roles of molecules in controlling biological functions,

fundamental techniques and knowledge will be acquired in this course. Specifically, we will focus on structures of genes and proteins, analyses of dynamics of proteins and 2nd messengers. The target of this course includes those students who are not familiar to living organisms as their subjects of experiments/studies. The course also provides an opportunity to prepare for the later advanced program curriculum of the leading program.

Oct./4/2013 Lecture
Orientation

Nov./29/2013 Lecture and Practice
Analysis of genes and determination of DNA sequences

Dec./6/2013 Lecture and Practice
Transport and localization of biomolecules
A. Tagging and detection of biomolecules
B. Fluorescent proteins

Dec./13/2013 Lecture and Practice
Cellular signals and metabolism
A. 2nd messengers （Ca2+、IP3 etc）
B. Temperatures, energy metabolism
and transduction, ATP production

Dec./20/2013 Lecture and Practice
Structural determination of proteins - primary to quaternary structure (including mass spectrometry)

Dec./27/2013 Presentation
10 min. presentation per person
and discussion

9. 薬物動態学

担当者：中山 和久 教授（薬学研究科・薬科学専攻）
髙倉 喜信 教授（薬学研究科・薬学専攻）
橋田 充 教授（薬学研究科・薬学専攻）
樋口 ゆり子 特定講師（LIMS）

薬物動態学の講義は修士２年の後期に提供される。講義では、薬物の生体内における動態、すなわち吸収、分布、代謝、排泄を理解するのに必要な解剖学的・生理学特徴を解説した後、各過程における薬物動態のメカニズムを講義する。さらに、薬物の体内動態制御法すなわちドラッグデリバリーシステムについての基本的な概念と実例を紹介する予定である。本年は、薬学部で提供されている講義を基に、異分野の学生にも分かりやすいような基本的な内容を追加、編集し、講義に使用する資料の準備を行った。

10. 医化学

担当者：　渡邉 大 教授（医学研究科・生体情報科学）
柳田 素子 教授（医学研究科・腎臓内科学）
長田 重一 教授（医学研究科・医化学）
湊 長博 教授（医学研究科・免疫細胞生物学）
野田 亮 教授（医学研究科・分子腫瘍学）
長谷川 拓 特定助教（LIMS）

この科目では、主に工学系のバックグラウンドを持つ本プログラム履修生を対象にし、病気の面から生化学・分子生物学に関する講義を行う。医学研究科の教授と協力し、医学部２、３回生が学ぶ範囲の内容で講義を行い、教科書的な話から実際の最先端の研究までを取り扱う。今年度は２０１４年３月から一週間程度の集中講義として実施した。
この科目の目標は、生化学・分子生物学の基礎知的な知識から、社会問題となっている病気を理解し、その医療の対する根本的な知識の習得である。具体的には大学の教養程度の細胞生物学的な知識を前提とし、代謝の異常としての糖尿病や、細胞周期の異常としての癌など、病気のメカニズムを生化学・分子生物学の面から解説する。
工学系のバックグラウンドを持つ履修生が病気のメカニズムに関する知識を身に付けることで、新規性の高い治療方法や医療機器を開発することができる人材が育成できることを期待している。学生のバックグラウンドによっては要求される細胞生物学的な知識が高いことが想定され、特定教員が個別に対応する予定である。具体的には、必要となる専門用語をまとめた用語集を作成し、ネットワーク上で公開しており、履修生が予め講義に向けて準備できる体制となっている。さらに、開講時期には、適宜講義資料を配布し、履修生の疑問に個別に対応することで補助していくことを予定している。

11. 再生医学

担当者：　開 祐司 教授（再生医科学研究所）
瀬原 淳子 教授（再生医科学研究所）
佐藤 文規 特定助教（LIMS）
滝本 晶 特定助教（LIMS）

新たに再生医学・医療を開講することになり、シラバス作成を行った。再生医科学研究所は再生医学に関連した基礎生物学、幹細胞生物学だけではなく工学さらには再生医学応用学を研究対象とした研究所である。この基礎生物学から再生医学応用学を一つの講義で学ぶことにより、基礎から応用への繋がりを理解することができる講義になる。さらには、バイオメカニクス分

野の講義も行われ、生物学から工学さらには力学までと再生医学・医療に関わる広範囲の基礎から最新研究を知ることができる。

12. シミュレーション概論

担当者：　木下 武彦 特定講師（LIMS）

本講義では主に物理学、数理生物学における現象のシミュレーション手法を学習する。シミュレーションの手順は以下の３つから成る。

1. モデル化：考察の対象となる現象を記述する微分方程式を導出する。
2. 求解：無次元化した方程式を導出し、その解を求める。
3. 可視化：解の可視化および解の性質を考察する。

微分方程式の導出には適切な次元を持つ変数を割り当て、それらの変数聞のみたす関係式を導く事が重要となる。また、次元解析を行い、導かれた微分方程式が正しい次元を持つ事を確認しなければならない。無次元化は微分方程式の次元を無次元量にする事と同時に、一般性を失うことなくパラメータを減らす変数変換である。講義ではこれらの点を強調して説明したため、聴講者の理解度は比較的高かった。

常微分方程式には求積法で解けるが分類されている。求積可能な方程式は以下のように分類される。

·積可一階線形単独常微分方程式
·階線変数分離型、同次形、完全微分型、Bernoulii 型、Riccati 型
·ic 定数係数一階連立線形常微分方程式

講義では聴講者の計算力を補うために数式処理ソフトの利用方法も解説し、上記の方程式を数式処理ソフトを利用して解く方法を述べた。また、数式処理ソフトの利用方法は常微分方程式の求解だけではなく、(偏）微分、積分、Taylor 展開、Fourier 変換、Laplace 変換も解説した。聴講者が本講義以外でこれらの計算が必要な場面に遭遇しても対応できると思われる。

微分方程式が解析的に解けない物に対しては数値計算を行う必要がある。本講義では数値計算ソフトとして Scilab を利用した。講義では Scilab の基本的な使い方から行列操作、分岐、反復、関数定義、ファイル入出力、可視化、アニメーションまで解説した。また、常微分方程式の数値解法として Euler 法、修正 Euler 法、Runge-Kutta 法、Dormand-Prince 法を解説した。講義では十分な演習時聞が取れなかったため、聴講者のプログラムの出来は良くなかった。来年度の講義では演習時聞を多く取る予定である。

講義後半では微分方程式の定性的理論と近似解の誤差解析を行った。特に、平衡点の安定性および分岐定理を紹介した。また、常微分方程式の解に対する精度保証付き数値計算法を述べた。

13. 低侵襲治療学

担当者：　木村 剛 教授（医学研究科・循環器内科学）
　　宮本 享 教授（医学研究科・脳神経外科学）

坂井 義治 教授（医学研究科・消化管外科学）
上本 伸二 教授（医学研究科・肝胆膵・移植外科学）
小川 修 教授（医学研究科・泌尿器科学）
平岡 眞寛 教授（医学研究科・放射線腫瘍学・画像応用治療学）
髙折 恭一 特定准教授（LIMS）

健康長寿社会の総合医療開発において重要なテーマである低侵襲治療学に関して、以下のとおり講義および実習を、京都大学大学院医学研究科　木村剛教授、宮本享教授、坂井義治教授、上本伸二教授、小川修教授、平岡眞寛教授の協力のもと実施した。

講義については、「肝胆膵・移植外科領域における低侵襲治療（※オリエンテーションを含む）」、「消化器疾患における低侵襲外科治療」、「脳神経外科領域における低侵襲治療」、「がん高精度放射線治療について」、「循環器領域におけるカテーテル治療」、「泌尿器科領域における低侵襲治療」を、医学部 G 棟 LIMS セミナー室および医学部附属病院において行った。

実習「肝胆膵・移植外科手術見学（腹腔鏡手術等）」では、医学部附属病院において、腹腔鏡下膵切除の手術を見学した（写真）。また、「消化管外科腹腔鏡手術見学」では、同病院において、腹腔鏡手術シミュレーターを使用した腹腔鏡手術を模擬体験し、さらに消化管外科手術を見学した。その他、低侵襲治療学の各実習では、同病院にて以下のとおりの見学を行った。

「脳神経外科手術見学（脳血管内手術および神経内視鏡手術）」：脳血管内治療を見学
「放射線治療計画の実践」：放射線治療のシミュレーションを体験実習
「循環器内科カテーテル治療見学」：虚血性心疾患に対する血管内治療を見学
「泌尿器科手術見学（ロボット支援手術）」：ロボット支援前立腺切除術を見学

Program-Specific Staff – Mission and Activities

In Kyoto University, Leading Graduate School Programs are managed under the auspice of the Center for the Promotion of Interdisciplinary education and Research (C-PIER, Figure 1). In order to implement interdisciplinary education and to instruct each student from diverse standpoints, we recruited program-specific staff from multiple fields related to LIMS Program (Figure 2).

Lecture-Exercise-Training

Among program-specific staff, a professor, associate professors and senior lecturers gives classes and associate professors take charge of exercises and trainings. They also prepared for new classes and exercises for the coming academic year. Person(s) in charge of each student's colloquiums and specific-research are arranged according to specific backgrounds of each member. Actual activities of the staff are shown as follows.

1. Human Anatomy---------- Kenji Ohe, Wakoto Matsuda
2. Physiology ---------- Masao Matsuhashi, Naoko Inaba, Yasuharu Hirai
3. Medical and life support systems (Biological test and Image analysis, Rehabilitation) ------ Kengo Kondo
4. Medical and daily life support systems (Home medical care support) ---------- Mie Torii
5. English Debate Course and Practice ---------- Christian Altmann
6. Mechanics and Dynamics, Fundamental --------- Koji Yamamoto
7. Basic Materials Chemistry---------- Yu Kimura
8. Molecular Analysis of life---------- Miyuki Nishi
9. Biopharmaceutics ---------- Yuriko Higuchi
10. Medical Chemistry ---------- Taku Hasegawa
11. Regenerative Medicine ---------- Aki Takimoto, Fuminori Sato
12. Introduction to Numerical Simulation ---------- Takehiko Kinoshita
13. Minimally invasive therapy ---------- Kyoichi Takaori
14. Medical Engineering for Society I & II :

(described in the chapter on Industrial-Academic-Government Cooperation)

Mentors

Beside a supervisor in the specific research field of each student, we arranged a sub-supervisor (professor) and two mentors (program-specific staff) from diverse fields related to but slightly different from the specific field. Four instructors collaborate and help the student to plan training & research theme(s) in LIMS Program. They support and give advices to the student so that the latter can carry out her/his project. The mentors also take charge of the pre-research to prepare for the specific research.

Other activities

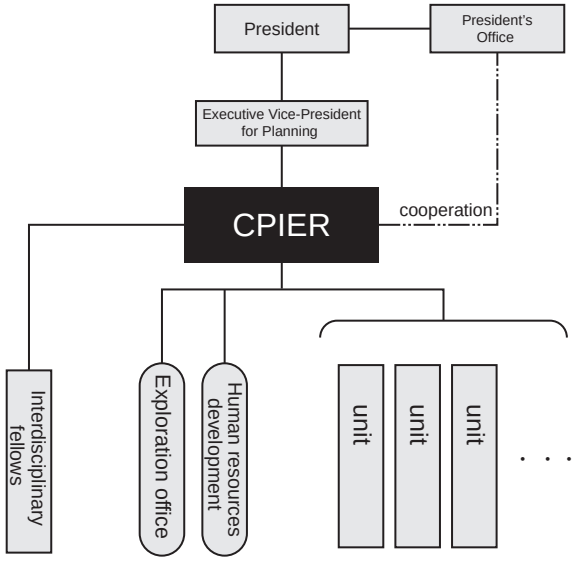
Glossary: described on page 41

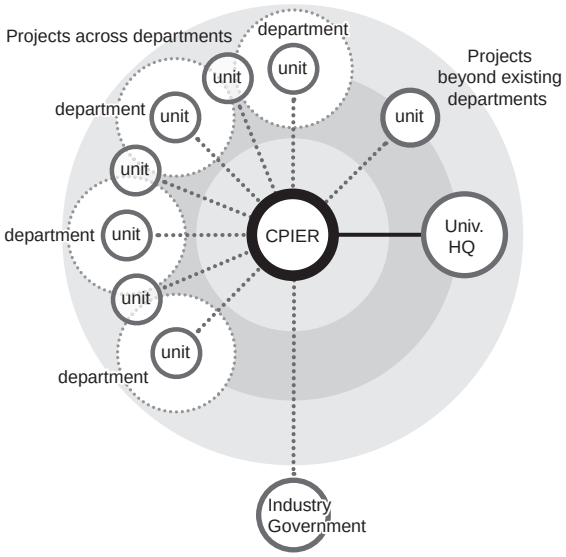
Public relation (homepage, leaflet/flyer/poster): described in the chapter on Public Relation

1 LIMS Unit

Center for Promotion of Interdisciplinary Education and Research (CPIER)
> Research and Educational Unit of Leaders for Integrated Medical System (LIMS)

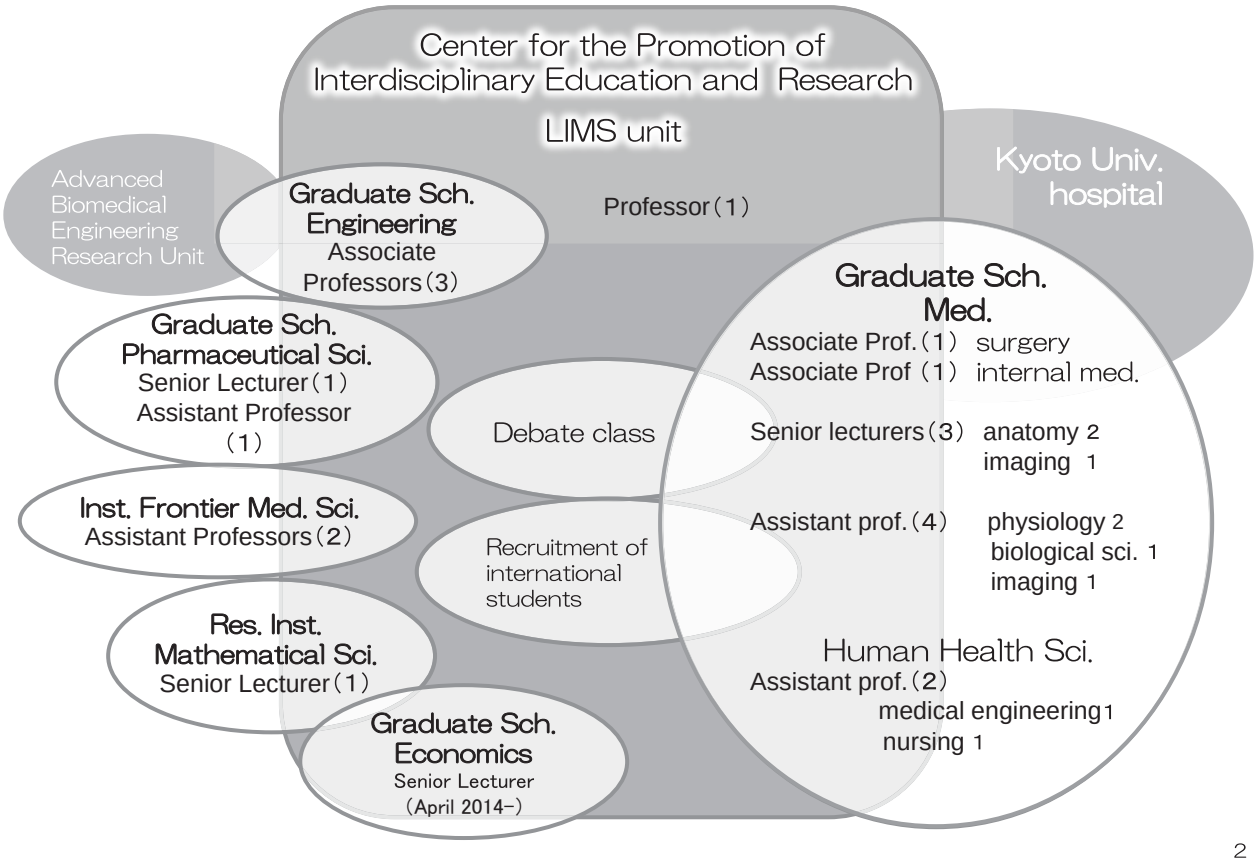
- Making the bylaws to manage the program
- Setting of the unit professorate and committees
  (curriculum, personnel, public relations, admission and promotion)
- Recruitment of program-specific staff
- Administration by the unit office





1

2 Program-Specific Staff



2

Actual Activities

1. Human Anatomy

Instructors: Masatoshi Hagiwara (Professor, Dept. Anatomy and Developmental Biology)
Takeshi Kaneko (Professor, Dept. of Morphological Brain Science)
Shigeto Yamada (Professor, Graduate School of Human Health Sciences)
Tomoki Aoyama (Associate Professor, Graduate School of Human Health Sciences)
Kenji Ohe (Program-Specific Senior Lecturer, LIMS, Dept. of Anatomy and Developmental Biology)
Wakoto Matsuda (Program-Specific Senior Lecturer, LIMS, Dept. of Morphological Brain Science)

Location: Department of Human Health Science (5th lecture room) (Class)/
Center for Anatomical, Pathological and Forensic Medical Researches (Practice)

Course year: MC2 Credits: 5 Term: 1st term

Class day & Period: Class (Wed.1st, Thurs. 4th), Practice (Wed.2nd)

Lecture Forms: Lecture, Practice

This course will start at the second grade in April, 2014. We have reconsidered the details and decided to add a lecture on Kinesiology. In this way, students will understand human anatomy which can be easily applied for coordinating “structure” and “movement”. This is essential for medico-engineering collaboration. Fundamentals of the human anatomy will be introduced systematically using textbooks, virtual pictures, plastic models and examining a cadaver to the level of medical students.

(Other activities)

- LIMS Glossary
  Assigned for “Human anatomy, Neuroanatomy” of the LIMS glossary. We are making the anatomy section an easy-accessible page with links to pictures through the LIMS server.
- Mentor
  We are interviewing students periodically on their theme, requests about the program, etc.

2. Physiology

Instructors: Harunori Ohmori (Professor, Graduate school of Medicine/Faculty of Medicine)
Kenji Kawano (Professor, Graduate school of Medicine/Faculty of Medicine)
Takeshi Kaneko (Professor, Graduate school of Medicine/Faculty of Medicine)
Hidenao Fukuyama (Professor, Graduate school of Medicine/Faculty of Medicine)
Masao Matsuhashi (Program-Specific Associate Professor, LIMS)
Naoko Inaba (Program-Specific Assistant Professor, LIMS)
Yasuharu Hirai (Program-Specific Assistant Professor, LIMS)

The lecture course Physiology was provided as the compulsory course to the first year LIMS students from September to December 2013. The course was organized to give the minimum essential knowledge to those who do not have medical background. Knowledge in human physiology is fundamental for understanding of the mechanisms how human can live, and should be the background to learn further the other field of medical sciences in the two years program of LIMS students. Accordingly, the Physiology lecture course is organized in the following topics:

1. homeostasis; its concept and examples,
2. fundamentals of neural activities; ion channels, membrane excitability, action potential, and synapse,

3. structure and function of the brain, and sensory reception and motor coordination,
4. cardiovascular system and pulmonary system.

To check and promote the students' understanding, a writing assignment was given after each topic.

In March (2014), we provided some practice of physiology for LIMS students, using the setups, which are also used in the practice for medical students. The practice is intended to teach students how to conduct experiments and analyze data of physiology. This practice includes some experiments on the topics which were not covered in the lecture course, so that, we will teach minimum knowledge on the topics during the practice and will guide the students as they learn and understand physiological phenomena by themselves.

3. Medical and life support systems (Biological test and Image analysis, Rehabilitation)

Instructors: Tsuyoshi Shiina (Professor, Graduate School of Medicine)
Kuniaki Saito (Professor, Graduate School of Medicine)
Naozo Sugimoto (Professor, Graduate School of Medicine)
Tetsuya Takakuwa (Professor, Graduate School of Medicine)
Hiroshi Kuroki (Professor, Graduate School of Medicine)
Hiroshi Yamane (Professor, Graduate School of Medicine)
Toshiko Futaki (Professor, Graduate School of Medicine)
Toshihiro Kato (Associate Professor, Graduate School of Medicine)
Kengo Kondo (Program-Specific Assistant Professor, LIMS)

This course aimed to introduce advanced medical equipment used in hospitals and in a home-care setting, and health care support and rehabilitation in hospitals and nursing-care facility through lectures and seminars. Students studied overview and understood the importance of integration of medical, welfare and home-care. Moreover they discussed the demand of medical engineering which develops integrated medical systems based on requirements in medical practice beyond conventional medicine-engineering collaboration scheme.

[Biological test and Image analysis]
1. Lecture
1.1 Sep. 3, 2013 Pathological condition analysis based on omics
・Role of clinical examination in individualized medicine: preemptive medicine and companion diagnostics
・Pathophysiological analysis by omics for new diagnostic agent development: proteomics, metabolomics, genomics
・IDO: drug development and diagnostic agent development

1.2 Sep. 6, 2013 Medical image equipment
・Morphology images of organs: chest X-ray, radiographic visualization of the stomach, X-rays of the digestive tract, coronary X-ray angiography, mammography, X-ray CT of the head, X-ray 3D CT of the heart, and full-body MRI.
・Various images of head (morphology and function): X-ray CT, MRI, SPECT, PET, fMRI, cerebral angiography, MRA, and NIRS.
・Visualization of morphology and function by light and ultrasound: thermography, fundus photograph, fundus OCT, endoscope (stomach), endoscope (large intestine), capsule endoscope, endoscope (vessel), endoscopic ultrasound, and ultrasound (abdomen).

2. Extramurally seminar

2.1 Sep. 10, 2013　Clinical laboratory test company

LIMS students visited a clinical laboratory test company, FALCO biosystems, and observed laboratory technologists testing. They studied how to test a collected specimen that taken at medical institution and provide the institution with the test data.

2.2 Sep. 18, 2013　Developing manufacturer of equipment

LIMS students visited a developing manufacturer of medical imaging equipment and testing equipment, Shimadzu Corporation, and observed analyzing devices and medical imaging devices. They learned about the devices, their developments and their applications by receiving explanations of the devices, interviewing about development, and touching them. They also learned how to fabricate medical equipment by observing the assembling processes of X-ray imaging devices.

[Rehabilitation]

1. Lecture

1.1 Oct. 1, 2013　Physical therapy

・What is required?
・Recognition of current situation: population aging rate, disorders, diseases, and average length of hospital stay
・Recovery rehabilitation unit
・Rehabilitation not completed within hospital: the importance of chronic rehabilitation
・Etymology of rehabilitation
・Targets and areas of physical therapy
・New era of developing equipment

1.2 Oct. 4, 2013　Occupational therapy

・Introduction: etymology, characteristics, functions, targets, means, and areas
・Occupation used in occupational therapy
・History, the number of occupational therapist in Japan and the world, and the number of schools
・Classification of occupational therapy
・Occupational therapy in psychiatry
・Occupational therapy in physical dysfunction
・Examples of disorders and rehabilitations

2. Oct. 7, 2013, Oct. 11, 2013 Seminar

Students improved the understanding of rehabilitation by attending physical therapy and occupational therapy at rehabilitation unit of Kyoto University Hospital with physical therapist and occupational therapist, respectively.

4. Medical and daily life support systems (Home medical care support)

Instructors: Hidenori Arai (Professor, Graduate School of Medicine and Faculty of Medicine)
Mie Torii　(Program-Specific Assistant Professor, LIMS)

Grade: MC1　Credit: 2

Lecture Forms: Lecture and field trip

In a rapidly aging society, we are under pressure to take increased measures to deal with welfare and medical care needs. The Ministry of Health, Labour and Welfare recommends community general support in which older adults can spend their last stage in their own homes and neighborhoods rather than staying long-term care facilities. To enhance this support, we need strengthening of coordination with welfare and medical care, full care services, promotion of preventive care, and elderly access features in the home. This course provides the lectures on basic characteristics of elderly patient life and also provides field trips to welfare facilities. We will focus on the present condition of older adults and aim to promote dialogue and consideration of how to advance medical support systems and equipments.

Sep. 17th, 2013 Lecture (1)

A. Background of an aging society: The trend in Japan and other countries
B. The characteristics of older adults:
Progression of physical/physiological and mental/social function
C. Diseases associated with older adults

Sep. 20th, 2013 Lecture (2)

D. Elderly welfare law and policy:
Outline, background and service content of Long-Term Care Insurance Act

Sep. 25th, 2013 Field trip (1)

A. Rehabilitation day care center

This center is a novel day care center which specializes in living rehabilitation, using purpose-built machinery introduced from countries with developed welfare service infrastructures.
This center provides older adults with physical function evaluation and muscular workout programs supervised by physiotherapists. In order to understand the importance of prevention and rehabilitation, our students acted as subjects in the program.

Sep. 27th, 2013 Field trip (2)

B. Welfare facilities

These composite facilities consist of 1) intensive-care nursing homes; 2) short-term admission for daily life long-term care facilities; 3) day-care centers. In order to understand varied care levels, types of healthcare cooperation and life support services, our students observed older adults who lived in various types of facilities.

C. Community General Support Center

This center is a public consultation center in which care is provided for frail elderly and welfare, health and medical services are provided by public health nurses and social workers. To understand cooperation with medical and welfare services, our students visited the center and attended a lecture how their support is provided.

5. English Debate Course and Practice

Instructor: Christian Altmann, Program-Specific Senior Lecturer (LIMS)

For students in the LIMS program, a weekly course is offered with these objectives: The course intends for LIMS students to a) improve their ability to form and express their opinions in English, in front of an audience

with different scientific backgrounds and nationalities, b) improve their ability to react to questions and to defend their opinion, and c) improve their ability to refute others' arguments.

To achieve these aims, students engage in various exercises: drafting arguments and responses to counter-arguments, listening to current debate speeches or reading articles on a topic, analyzing the argumentation and discussing in the group. One main exercise is formal debate; in these debates two teams of students (3 per team) debate a topic. Students have to give 4-minute speeches presenting arguments and refutations. Both the debate topic itself and then the debate style are discussed in the plenum. Debated topics are for example the current reform of the healthcare system in the USA or the problem of publication bias affecting the publication of clinical trials.

In addition to the English debate course, LIMS students have the opportunity to engage in one-on-one English discussions with various international researchers related to the LIMS program.

English debate course schedule winter term 2013/2014:

2013/09/05 Introduction: Why debate? (example: UK-House of Commons)

2013/09/12 Formal debate: Should nuclear power be continued / discontinued in Japan?

2013/09/19 Discussion with Prof Denis Le Bihan on medical screening.

2013/10/03 Formal debate: Will the Tokyo Olympics be an economical success?

2013/10/10 The healthcare debate in the US – Affordable healthcare act

2013/10/17 Formal debate: Should health insurance be mandatory?

2013/10/31 Argumentation and Refutation Exercises (Structure of arguments)

2013/11/28 Clinical trials: problems with pharma-sponsored research.

2013/12/05 Clinical trials: problems with the current scientific publication situation.

2013/12/12 Clinical trials: discussion and preparation of arguments.

2014/01/09 Formal debate: How can we improve clinical trials? (interest groups: public, medical professionals, biomedical researchers, pharmaceutical industry)

2014/01/16 Exercise: How to prepare an efficient “elevator speech” (summary of students’ research in a short speech)

2014/01/23 Exercise: How to prepare an efficient “elevator speech” (summary of students’ research in a short speech)

2014/01/30 Preparation: Has a lay-person the right to know her genome?

2014/02/06 Formal debate: Has a lay-person the right to know her genome?

2014/02/13 Guest Professor Marc Teichmann discusses on aphasia.

2014/02/20 Emotions and social etiquette in debates.

2014/03/06 Using descriptive statistics in debates.

2014/03/13 Feedback to/from students and to/from teacher.

6. Mechanics and Dynamics, Fundamental

Instructors: Kazuyoshi Nakabe (Professor, Dept. of Mechanical Engineering and Science)
Taiji Adachi (Professor, Institute for Frontier Medical Science)
Koji Yamamoto (Program-Specific Associate Professor, LIMS)

The lecture is prepared as one of the Basic Lectures in the LIMS program and starts at the first semester in 2014. First-year master's students (and second-year master's students who enrolled in LIMS at September 2013) can take the course. A practical training of this course will be held at the second semester as part of the course: Biomaterials and Artificial Organs. The syllabus and the program were organized to provide the fundamental knowledge of mechanics and dynamics to students who do not have a background of mechanical engineering. The main purpose of the lecture is to mechanically and theoretically understand dynamic phenomena of the real world using the fundamental dynamics, such as Mechanical dynamics, Material mechanics, Fluid dynamics, and Thermodynamics. In the practical training, we will also introduce how those principles of mechanics have been applied to real-world equipments and systems. Through the course, we hope that students will refine their sense of mechanical engineering necessary for the medico-engineering field.

7. Basic Materials Chemistry

Instructors: Teruyuki Kondo, Professor
(Advanced Biomedical Engineering Research Unit, C-PiER)
Yu Kimura, Program-Specific Associate Professor, (LIMS)

In academic year 2013, the course started from October, and initially an exercise of organic chemistry was performed. This exercise was intended to evaluate the actual skills of students. Based on the evaluation, the review abut basic organic chemistry was lectured with detailed accounts of the exercise. The review especially emphasized explanations about presuming reaction mechanisms, processes to develop the reaction, and synthesis strategy. Then, characteristics and synthetic routes of medicines such as sulfa drug, indinavir and oseltamivir were lectured from the viewpoint of structure-property relationship and mechanism of action. Also a lot of biomolecules mainly as nucleic acid, saccharides, alkaloids, fatty acids, and terpenes were summarized to understand their bio-synthesis, functions and the structural correlation, and their metabolism. In contrast, biomaterials as a large bulk material for clinical use have many characteristic properties, such as bioavailability, biocompatibility, antithrombogeneity, or other bioactivities, the lecture summarized these properties with the explanation in molecular level. Also in the lecture, we put emphasis on understanding not only of basic requirements as biomaterial, but also of the reason why the material was chosen to use as a biomaterial. The knowledge would be helpful to design novel materials based on a demand in fruitful healthy-longevity society. Through the submitting report after the course, we are scheduling to evaluate students on the proficiency and utilizing ability of obtained knowledge.

8. Molecular Analysis of life

Instructors: Yasuo Mori (Professor, Graduate School of Engineering,
Department of Synthetic Chemistry and Biological Chemistry)
Miyuki Nishi (Program-Specific Associate Professor, LIMS)

To understand analytical methods that clarify roles of molecules in controlling biological functions, fundamental techniques and knowledge will be acquired in this course. Specifically, we will focus on structures of genes and proteins, analyses of dynamics of proteins and 2nd messengers. The target of this course includes those students who are not familiar to living organisms as their subjects of experiments/studies. The course also provides an opportunity to prepare for the later advanced program curriculum of the leading program.

Oct./4/2013 Lecture
Orientation

Nov./29/2013 Lecture and Practice
Analysis of genes and determination of DNA sequences

Dec./6/2013 Lecture and Practice
Transport and localization of biomolecules
A. Tagging and detection of biomolecules
B. Fluorescent proteins

Dec./13/2013 Lecture and Practice Cellular signals and metabolism
A. 2nd messengers (Ca2+, IP3 etc)
B. Temperatures, energy metabolism and transduction, ATP production

Dec./20/2013 Lecture and Practice
Structural determination of proteins - primary to quaternary structure (including mass spectrometry)

Dec./27/2013 Presentation
10 min. presentation per person and discussion

9. Biopharmaceutics

Instructors: Kazuhisa Nakayama (Professor, Graduate School of Pharmaceutical Sciences)
Yoshinobu Takakura (Professor, Graduate School of Pharmaceutical Sciences)
Mitsuru Hashida (Professor, Graduate School of Pharmaceutical Sciences)
Yuriko Higuchi (Program-Specific Senior Lecturer, LIMS)

This lecture toward “Biopharmaceutics” will be provided to 2nd-graders. In this lecture, we will introduce the anatomical and physiological characteristics of tissues in the body to understand drug disposition processes, including absorption, distribution, metabolism, and excretion. Then, we will explain the mechanisms of drug disposition in each process, and provide the basic concept and its application example of drug delivery system (DDS). In this year, based on the lectures provided in the faculty of pharmaceutical sciences in Kyoto University, we have arranged the contents by adding basic information, and prepared new slides and hand out to be more familiar with students of another background.

10. Medical Chemistry

Lecturer: Dai Watanabe (Professor, Dept. of Biological Sciences)
Motoko Yanagita (Professor, Dept. of Nephrology)
Shigekazu Nagata (Professor, Dept. of Medical Chemistry)
Nagahiro Minato (Professor, Dept. of Immunology and Cell Biology)
Makoto Noda (Professor, Dept. of Molecular Oncology)
Taku Hasegawa (Program-Specific Assistant Professor, LIMS, Dept. of Biological Sciences)

This course is designed to introduce biochemistry and molecular biology for students with training in engineering. With the help of the faculty in Graduate School of Medicine, molecular mechanisms of disease are emphasized, from basic knowledge to recent researches. The lectures for this academic year were held in March, 2014.

The primary aim of this course is to comprehend common diseases based on biochemistry and molecular biology and further to realize current approaches to cure the diseases. Assuming the knowledge in undergraduate biology, the mechanisms of disease are explained from the view of biochemistry and molecular biology: diabetic caused by abnormal metabolism and cancer by a failure in cell cycle, for example.

Acquiring knowledge about molecular mechanisms of disease, this course is expected to foster engineers who can develop novel approaches for medical technologies or instruments. To help the students to study in an unfamiliar field, a website with technical terms for this course has made available; the students are encouraged to prepare for the lectures. In addition, the program-specific staff in LIMS will closely support the students to deal with individual problems for studying.

11. Regenerative Medicine

Instructors: Yuji Hiraki (Professor, Institute for Frontier Medical Sciences)
Atsuko Sehara (Professor, Institute for Frontier Medical Sciences)
Aki Takimoto (Program-Specific Assistant Professor, LIMS)
Fuminori Sato (Program-Specific Assistant Professor, LIMS)

As we’re going to open a new course of regenerative medicine, we made a syllabus.
In Institute for Frontier Medical Science, we conduct research on studies related to regenerative medicine, such as basic biology, stem cell biology and engineering, as well as applied studies on it.
By taking this course, students can comprehend the relation between basic studies and applied. Moreover, this

course includes a lecture of biomechanics, and they will learn newest researches as well as basic studies related to regenerative medicine, biology, engineering and mechanics.

12. Introduction to Numerical Simulation

Instructor: Takehiko Kinoshita (Program-Specific Senior Lecturer, LIMS)

This course introduced methods of simulation for physical and biological phenomena from mathematical viewpoint. The process of simulation is three-fold:

1. Modeling: derive a differential equation which models the phenomenon under consideration.
2. Solving: Nondimensionalize the equations and solve them.
3. Visualizing: visualize the solution and analyze its properties.

It is important for modeling to recognize the variables with appropriate dimensions and to derive a relationship between them. It is also important to verify whether the derived equations have appropriate dimensions. Nondimensionalization enables us to reduce the number of parameters without loss of generality as well as to obtain equa- tions for nondimensional quantities. I emphasized these three points in the course, and the students achieved a comprehensive understanding about them.

Differential equations are classified by solvability by quadrature. Solvable equations are further classified as follows:

- Individual linear differential equation of the first order.
- The type of separation of variables, homogeneous, exact differential equation, Bernoulii, and Riccati.
- Simultaneous linear differential equation of the first order with constant coeffi- cients.

I taught how to use formula manipulation system in order to compensate for students' ability to calculate, and the students learned how to solve equations above by using it. Besides, the students learned how to compute (partial) derivative, integration, Taylor series, Fourier transform, and Laplace transform by the formula manipulation system. It will be very helpful for the students in many ways.

Numerical simulation is necessary for analyzing differential equations which are not solvable by quadrature. Scilab was adopted as the numerical computation software in the course. I taught how to use Scilab: matrix operations, conditional expres-sions, loop, user-defined functions, file input/output, visualization, and animation. Moreover, I taught some numerical methods for solving ordinary differential equa- tions: the Euler method, the modified Euler method, the Runge-Kutta method, and the Dormand-Prince method. Since we did not have sufficient time for exercise, the students were not able to learn programming for the numerical methods sufficiently. Much exercises are due to be carried out next year.

In the last part of the course, I taught the qualitative theory of ordinary differential equations and the error analysis of numerical solutions. Especially, I introduced the stability and bifurcation theory of equilibria. Moreover, I explained the validated computational method for solutions of ordinary differential system.

13. Minimally invasive therapy

Instructors: Takeshi Kimura (Professor, Department of Cardiovascular Medicine)
Susumu Miyamoto (Professor, Department of Neurosurgery)

Yoshiharu Sakai (Professor, Department of Gastrointestinal Surgery)
Shinji Uemoto (Professor, Department of Hepato-Biliary-Pancreatic Surgery and Transplantation)
Osamu Ogawa (Professor, Department of Urology)
Masahiro Hiraoka (Professor, Department of Radiation oncology)
Kyoichi Takaori (Program-Specific Associate Professor, LIMS)

Lectures and practical seminars about minimally invasive therapies have been given under supervisions by Professors Takeshi Kimura, Susumu Miyamoto, Yoshiharu Sakai, Shinji Uemoto, Osamu Ogawa, and Masahiro Ogawa, Kyoto University Graduate School of Medicine.

Lectures included “Minimally invasive surgery in hepato-biliary-pancreatic surgery and transplantation (orientation inclusive)”, “Minimally invasive surgery for digestive diseases”, “Minimally invasive therapiesin neurosurgery”, “High precision radiation therapy for cancer”, “Intravascular catheter treatments in cardiovascular medicine”, “Minimally invasive surgery in urology” and these lectures were given at the seminar room of LIMS in the G building of MedicalFaculty or at the Kyoto University Hospital.

As shown in the Figure, the attendants of the course observed the procedure of laparoscopic pancreatic resection, which was carried out by Dr. Kyoichi Takaori, a LIMS mentor for “Minimally invasive surgery in hepato-biliary-pancreatic surgery and transplantation”, at the operation theater of the Kyoto University Hospital. Moreover, the attendants experienced laparoscopic surgery by themselves with a simulator at the Kyoto University Hospital during the course of “Minimally invasive surgery for digestive diseases” and observed procedures of gastrointestinal surgery later on. Other courses consisted of following contents.

“Minimally invasive therapies in neurosurgery”: observation of intravascular therapies for brain vascular diseases.

“High precision radiation therapy for cancer”: simulation of radiation therapy planning.

“Intravascular catheter treatments in cardiovascular medicine”: observation of intravascular therapies for ischemic heart diseases.

“Minimally invasive surgery in urology”: observation of a robotic prostatectomy.

Examples of staff activities

Activity report for community health care and observation in South Korea

Mie Torii (Program-Specific Assistant Professor, LIMS)

The prevalence of the elderly population (over 65 years) in South Korea is over 11% (2010) and is rapidly approaching that of Japan (25%).
I visited the Incheon Namdonggu Health Center and some hospitals to observe South Korean community health care and support practices, and I also visited to Seoul University to observe instructional systems.

（1） Incheon Namdonggu Health Center

The public health care services differ between district and local governments. The Incheon Namdonggu Health Center places emphasis on the welfare and ongoing evaluation of 500,000 people (older adults; 70,000) of Namdong-gu. This center consists of 1 division and 3 departments (health administration / health promotion / food hygiene).They have medical offices (comprehensive medical care / Non-smoking clinic / traditional Chinese medicine) and offer the services of primary prevention to the local inhabitants as follows.

① Atopic dermatitis and asthma health management
② Sterilization :prophylaxis services and countermeasures for viral infection
③ Dental health: Treatment fee assistance for indigent patients
④ Health club for pregnant women (nutritional education)
⑤ Immunization program
⑥ Chronic disease management
⑦ Dementia awareness program
⑧ Suicide prevention program
⑨ Lunch management program

I was able to visit all of the facilities above and learn the procedures and methods of care in Korean medical institutions. This was of great importance to my studies.

（2） Samsung Hospital

This hospital handles 3000 outpatients per day. I observed the diabetes center and breast cancer center, intestinal and stomach cancer center. I saw a demonstration of an internet interview system that the hospital uses to gain basic information of the patients' complaints while they are waiting to consult with the doctor. The patients can also use the system to check their own vital signs and basic health data. After the demonstration, I met with the hospital director to discuss the role of the hospital in providing care for local residents.

（3） Gangnam Severance Hospital

This hospital is based in the local community and offers various services for the citizens for them not to feel afraid of visiting the institution.

I observed a rheumatoid arthritis outpatient (RA) clinic. The clinic handles approximately 40 RA patients per day. I discussed with the doctors on each RA patient' status as well as clinical research topics.

（4） Department of Nursing　in Seoul University

Seoul University is one of the most famous universities in South Korea. It has an extensive research foundation and productive educational system. The university places special emphasis on medical informatics and on sending medical students abroad to learn various languages.

Seoul University researchers are well-connected with Seoul University's hospital staff. The students are educated under a special program which is designed by university staff and hospital staff

My tour of South Korean institutions enabled me to understand the different approaches between South Korea and Japan when facing various medical challenges.

Report on attendance at the Annual Meeting of the Physiological Society of Japan

Yasuharu Hirai (Program-Specific Assistant Professor, LIMS)

I attended the 91st Annual Meeting of the Physiological Society of Japan held on March 16-18, 2014 in Kagoshima, Japan. The first purpose of my participation was to hear the program for education of physiology hosted by the Physiological Society of Japan. In these years, the Physiological Society of Japan is making a strong effort on advances in physiology education, specifically through fostering highly-qualified educators. Educational Lectures and Model Lectures are given in the annual meeting, and participants fulfilled the several requirements will be certified from the Physiological Society of Japan as “physiology educator”s. In the LIMS program, we should educate the students with non-medical background to have the medical knowledge comparable to students who graduated medical schools; however, the same amount of physiology course hours could not be provided in the LIMS curriculum. Accordingly, the course is organized with minimum essential topics. This educator program was very helpful to make LIMS lectures better, and consequently more effective, especially in the topic outside of my specialty.

The other “regular” presentations in this meeting were also useful for physiology lectures. There were a lot of presentations about the work on traditional fields of physiology like a vegetative function, which have decreased in other conferences nowadays. Many physiology scientists, and also I, research a brain otherwise neurons that are regarded the last frontier in natural science. However, the lecture for students mainly consists of the story and knowledge of traditional physiology. My second purpose in this meeting was to learn the advance studies in the field of traditional physiology. My most impressive study in this meeting was the research of synaptic plasticity that using neuromuscular junction and binominal distribution analysis, because I teach the synaptic quantal release at the neuromuscular junction and use the Poisson distribution analysis (that is a specific case of binominal distribution) in the practice of physiology for students. It tells me that traditional methods and theory are still available for recent research, while it may not be surprising.

The third purpose was having the communication with other scientists. Recently, many researchers who have educational background other than physiology have joined the Physiological Society. I actually could have the opportunity to meet a person who has the professional engineering background and could make an exciting discussion. Unfortunately, I could not take LIMS students in this meeting, but I do believe that the Annual Meeting of the Physiological Society of Japan is fruitful place not only for teachers but also all LIMS students.

Activity in the 131th annual meeting of the pharmaceutical society of Japan in Kumamoto

Yuriko Higuchi (Program-Specific Senior Lecturer, LIMS)

The pharmaceutical society is the biggest academic society in Japan, which are making major contributes in the pharmaceutical sciences. Pharmaceutical sciences are based on physics, chemistry, biology and a wide range of life sciences fields. These all contribute to the health and welfare of human beings through the creation, production, supply, and prescription of medicines. In this society, there are more than 20,000 members, who are working in a company, university, hospital, pharmacy etc.

I attended the 131th annual meeting held in Kumamoto. In the 3 days of the meeting, there are 12 special lectures, 6 special symposium, 59 symposiums, and a lot of oral and poster presentation. In special lectures, speakers were experts who were invited from government office, company or other field such as medicine, engineering, not only in Japan. Each special symposiums was focused to hot topic in the various fields about the relationship between patient and the industry of pharmaceutics, the education in the university, the new grant system, carrier path for female researchers, etc. Some of special symposium co-organized with foreign or international pharmaceutical society. I gave an oral presentation of my current data about “Evaluation of adhesion between vascular endothelial cells and mesenchymal stem cells modified with peptide-PEG-DSPE”, and acted the chairperson in the session about the development of targeted delivery system.

As I mentioned above, because the pharmaceutical sciences based various fields, this annual meeting is a good chance to get the topics in the other field. I could get the latest information in the other area. Since I have a class of Bioharmaceutics in LIMS, in order to collect information for my lecture, I heard symposiums about pharmaceutics presented by pharmaceutical industry or pharmacist working in the hospital or pharmacy, such as “How to improve drug absorbance through skin”, “Responsible use of medicine”, “the new role of pharmacist in the diabetes management”, “Improved education to grow up pharmacist who can work in the relation in clinical team” etc. Moreover, I could get latest information about basic research, “New technologies to evaluate vital phenomena”, “Genome engineering technology to support drug discovery”. Those topics of education or research would be a great help to give lecture or to do basic research supporting this LIMS project.

Activity report for Japan-Korea Joint Meeting of Pancreatic Surgery

Kyoichi Takaori, MD, PhD (Program-Specific Associate Professor, LIMS)

Japan-Korea Joint Meeting of Pancreatic Surgery was held in Wakayama Marina City Royal Pines Hotel, Wakayama, Japan, on February 7th, 2014. The purpose of the meeting was to promote exchanges of information regarding pancreatic surgery among Japanese, Korean, and other international delegates.

Specialize in minimally invasive surgery and treatments in the LIMS program, I have been interested in minimally invasive surgery for pancreatic diseases. Minimally invasive surgery for the gallbladder became a gold standard in 1990's. Typically, a laparoscopic cholecystectoy, removal of gall bladder for diseased organ including gall stones, is widely performed in many local hospitals. The surgical techniques for the gallbladder are relatively simple and it is a reason why this procedure has become so popular. In contrast, pancreatic surgery is one of the most challenging fields in abdominal surgery because of complicated anatomy of the pancreas and significant postoperative morbidities such as pancreatic fistula. Minimally invasive surgery using a laparoscopic approach has been considered unsuitable for such complicated surgical procedures because there were some technical limitations in a larparoscopic approach; e.g. lack of tactile sensation, two-dimensional vision, etc. Accordingly, minimally invasive pancreatic surgery has been Pandra's Box for years. In 2004, I have performed a laparoscopic duodenum-preserving pancreatic head resection, one of the most complicated surgical techniques, for the first time in the world, and another complicated procedure, laparoscopic pancreaticoduodenectomy, for the first time in Japan. Since then, I have been involved in developments of minimally-invasive pancreatic surgery. At the same time, as the chief of pancreatic surgery in the board certification system endorsed by Japanese Society of Endoscopic Surgery, I have been engaged in educations for young surgeons learning minimally-invasive pancreatic surgery all over the country. Therefore, it was very important for me to attend this meeting and to participate in discussion about minimally invasive pancreatic surgery. There were several presentations including the lecture entitled "Outcome following DP-CAR (distal pancreatectomy with celiac artery resection) in the adjuvant setting for initially unresectable pancreatic body cancer" presented by Professor Satoshi Hirano, Hokkaido University. He presented his techniques of DP-CAR procedure and admitted that he had performed the procedure only by open approach with a big laparotomy. I pointed out that complicated procedures such as DP-CAR might be challenges for minimally invasive approaches. New concepts such as artery-first approaches may overcome such challenges. Furthermore, I referred to the significance of neoadjuvant and adjuvant therapies in order to enhance the merits of minimally invasive approaches in the setting of pancreatic cancer. Professor Ho-Seong Han, Seoul National University, agreed with my opinions and extended invitation for me to Korea-Japan Joint Meeting of Pancreatic Surgery, April 11th to 12th, 2014, and to the 9th International Postgraduate Course of Laparoscopic Surgery in Seoul, May 30th to 31st, 2014. Upon his requests, I delivered a lecture on neoadjuvant chemoradiation therapy for borderline resectable pancreatic cancer and another entitled "Artery-first distal pancreatectomy by open, laparoscopic and robotic approaches". Through the participation and discussions in these meetings, it has been acknowledged that many technical challenges must be overcome by more advanced technologies until minimally invasive pancreatic surgery shall be practiced safely. In conclusion, minimally invasive treatments including minimally invasive pancreatic surgery are key issues in the LIMS program, which is expected to promote further applications of high-technology engineering to minimally invasive surgery.

5.

大型機器

Equipment

6.

外国人研究者の招へい

Inviting researchers from abroad

7.

国内外の活動

Activities

大型機器

平成24年度　リーディングプログラム主要設備備品の設置目的

No.	名　称	設置目的
1	クリオスタット CM1950	本機器は、患者由来臨床検体から多様な免疫組織染色や特殊染色などの組織検査のための標本を作るために必須のものである。すでに動物検体用の機器は保有しているが、臨床検体の処理に当たっては肝炎など各種感染症の危険を伴うため、臨床検体専用の機器を設置する必要がある。これにより、学生に対する患者組織検体の扱い方についてのガイドラインを教育することが主要な目的である。
2	LightCycler　Nano	卓上サイズの遺伝子増幅及び定量装置であり、細胞生物学の技術・概念の教育に用いる。実習では、特定の細胞からパッチクランプ法により、電気活動の記録を実施しつつ、その細胞で転写される様々な遺伝子の特定、そして定量を即座に行う。生体内のどんな細胞の膜も電気的な性質をもっており、そのために様々なタンパク質が関わっている。学生は、細胞膜におけるタンパク質の動的な応答から細胞の性質に迫る生理学と、分子集団の中からキープレイヤーを見つけ出す生化学という方法論が、どのように融合しうるか、またどのような限界があるのかを理解する。
3	オールインワン 蛍光顕微鏡	本設備備品は、医学臨床や研究に利用される免疫組織化学的手法について、その基本原理、測定法などを、学生が実際に実習を行いながら理解するのに使用する。組織検査において可視光領域の光源ではなく蛍光を用いることの有用性を理解できる。さらに、通常の蛍光顕微鏡と異なり暗室不要、超小型、簡単な操作であること等から、 医工連携の重要性も実感できる。
4	組織切片定量解析 システム	通常病理医はガラスのスライドを顕微鏡にセットし、組織が示すさまざまな特徴を探す。例えばがんの組織試料なら、切片中の異常な細胞の数や腫瘍の進行度などを経験に基づいて判断する。しかし、本組織切片定量解析システムを用いれば、ハイスループットに多数の組織切片スライドの画像を取得し、更にその画像から腫瘍等の特徴ある領域を自動的に分別して定量的な解析を行うことが可能になる。また、これまで不可能であった個々の細胞が発現している複数の蛋白質を同時に観察して、その発現状態に応じて組織分類することや、自家蛍光に妨げられて観察不可能であった細胞を容易に検出することもできる。すなわち、現在の組織診断で用いられている手法と、理工学的方法の応用によるその大きな改善の可能性について学生は実習を行いながら体験することができる。
5	Step One Plus リアルタイム PCRシステム	本設備備品は、細菌やウイルスの同定、遺伝病や癌の診断のための遺伝子検査に必須である遺伝子増幅法を学生が実習するためのものである。さらに、その原理を応用して、遺伝子量の定量や、遺伝子変異を検出することも本機では可能となっている。そこで遺伝子診療、検査に関する教育を行うために使用する。

6	無影灯	解剖実習時の臓器の細かい観察には、無影燈による無影度・照度・焦点深度・色の再現性が重要であり、学生教育に必要である。
7	簡易型解剖テーブル 特別仕様／ FSK－P型（特）	解剖実習時の腋窩観察に肩関節の外転が必要であり、本設備備品には肩関節の外転時に上肢の置き場所となる、収納可能なサイドテーブルが備わっている。また、取り出した臓器の奥の構造物を観察するために、取り出した臓器の一時保管庫が必要であるが、本設備備品には収納可能なバケツが四つ備わっている。
8	共焦点レーザー 顕微鏡	本設備備品は高解像度のイメージと三次元情報の再構築が可能な顕微鏡で、焦点距離がばらばらになるような厚い試料であってもきれいな像を得られる特徴をもつ。医学臨床研究における各種臓器の細胞観察に必須であり、学生に本設備の使用体験は必要である。
9	筋力測定システム	人のすべての関節の筋力を等速性に評価・トレーニングできる装置であり、リハビリテーションの教育・研究に必須の機器である。この最新機器は、筋力測定だけでなく、多動トルクの測定が可能であり、ストレッチングの効果等の評価機器としても使用可能である。さらに、全身の等速性筋力トレーニングが可能な最新の機器である。
10	X-線血管造影装置	冠状動脈拡張術また脳血管内手術など、X-線血管造影下でカテーテルを用いた低侵襲治療が多く行われるようになってきた。これらの低侵襲治療の実際の実習と、これらに用いる医療用デバイスの開発を実習で試み、その有効性を検証するのに用いる。
11	高速液体クロマトグラフ 質量分析計	ドラグ・デリバリー・システム(DDS)は、癌の治療や再生医療など近年の先端的な医療で極めて重要な位置を占めている。DDSの研究を行うためには血液中の極微量の薬物の定量を行う必要がある。近年発達してきた高速液体クロマトグラフ質量分析計は極微量の薬物の定量を行うのに極めて優れた装置である。実習でこの装置に慣れ親しむこと、さらに、自分で試作したDDSの有効性を本装置を用いて検証する。

Major equipment installed in Academic Year 2012

No.	Name of equipment	Purpose of installation
1	Cryostat CM 1950	This equipment is used to make tissue sections of patients for a pathological examination. Using this device, students will learn how to manipulate the patient specimens and what to do avoid infection from the samples.
2	Light Cycler Nano	In the lab course of physiology and neurobiology, students are encouraged to learn how the cell membrane properties are linked with the transcription levels of the ion channel genes. Electrophysiological experiments provide dynamic information on the membrane excitability in real time. Simultaneously, the cytoplasmic components from the investigated cells are used for the subsequent analysis of the transcribed mRNAs using the desktop-biochemical device just by the side of the recording setup. Real-time PCR using the Light Cycler Nano quickly yields static information of the cellular states at the moment of projects recording. Students should understand the advantage and disadvantage of these experiments for the future application in their own projects of LIMS program.
3	All-in-One Fluorescence Microscope	By using this fully-integrated fluorescence microscope and practicing microscopic observations, students can understand the basic principles and techniques of immunohistochemistry routinely used in basic and clinical medicine, and advantages and disadvantages of a fluorescence microscope compared with a light microscope. Furthermore, students can realize the importance of collaboration for biomedical engineering as this equipment takes up less space without need for a darkroom, and an automated stage, six-mount lens turret, and filter turret allow users to perform imaging in a fraction of the time, while operating the system entirely from the software menu.
4	Intelligent Multispectral Slide Analysis System	This system (Vectra 2) merges automated slide-handling, multispectral imaging technology, and unique pattern-recognition-based image analysis into a powerful system for clinical studies. This system accurately measures protein expressions and morphometric characteristics in distinct tissue regions of interest or on whole slides. Sections can be labeled with either immunofluorescent (IF) or immunohistochemical (IHC) stains, or with conventional stains such as H&E. With IF or IHC, single or multiple proteins can be measured on a per-tissue, per-cell, and per-cell-compartment basis, even when those signals are spectrally similar, are in the same cell compartment or are obscured by autofluorescence. By experiencing this most advanced instrument for extracting proteomic and morphometric information from intact tissue sections, students can realize the potential of interdisciplinary collaboration on developing medico-technical methodologies and instruments for monitoring, diagnosing and treating patients.
5	The StepOnePlus™ Real-Time PCR System	Real-time polymerase chain reaction (PCR) is a laboratory technique of molecular biology, which is used to amplify and simultaneously quantify a targeted DNA molecule. This technique is now essential for laboratory identification of bacteria and viruses and diagnosis of genetic diseases and cancers. This system is perfect for both first-time and experienced users, and is able to deliver precise results for a variety of genomic research.

6	Shadowless Lamp	Shadowless lamps lighten up with reproducible: lack of shadow, strong illumination, focal depth and color which are important for observing organs in detail during anatomical practice. This shadowless lamp is necessary for teaching students.
7	Simple Dissecting Table special edition／FSK-P(custom-made)	Observation of the axillar region needs abduction of the shoulder joint; the arm will be placed on a storageable side table of this equipment to fulfill this purpose. To observe further inside after an organ is removed, space to temporarily store this organ is necessary. This equipment has four storageable buckets for this purpose.
8	Confocal Lazer Microscope	This equipment is a microscope with the characteristics of: producing high-resolution images, ability to reconstruct three dimensional information, and making beautiful images out of a thick sample with variable focal lengths. It is indispensable for observing cells of each organ for clinical research and is necessary for teaching students.
9	Strength Evaluation System	This system can be used for isokinetic strength evaluation of all human joints in the body. It is an indispensable machine in the rehabilitation field. Especially, since the most recent version of this system can also evaluate passive torque, it can be used to evaluate the effect of stretching exercise. Isokinetic muscle training of the whole body can be performed using this equipment.
10	Angiography System	This system will be used for demonstration of devices for intravascular treatment and also devices which are developed by LIMS students will be evaluated by this system.
11	Liquid Chromatograph-Mass Spectrometry	Drug delivery systems (DDS) are growing research area. LIMS students learn various DDSs. This system will be used for evaluation of released amounts of drugs in in vitro and in vivo experiments.

平成25年度　リーディングプログラム主要設備備品の設置目的

No.	名　称	設置目的
1	セルソーター	本設備備品は、授業科目の「生体分子解析学」において、学生が先端機器の一つとしてその仕組みを理解する演習に用い、また、組織を構成する異なった細胞のシグナル解析・比較の演習に供する細胞の単離にも用いる。
2	ハイスピード・デジタルイメージングカメラ 2D Flow Master PIV 解析装置	本設備備品は、マイクロ流路中を流れる細胞に係る画像撮影及び画像処理を行い、細胞の寸法、変形量、移動速度等を解析することを目的として、機械工学実習において学生が細胞特性の可視化実験を行うものである。
3	高速神経活動 イメージングシステム	本設備備品は、学生が電気生理学及びイメージングの実験実習を行うためのものである。これにより、脳機能の基盤となる神経回路の動作原理について理解を深めるとともに、脳機能とその病態を研究する先端技術の習熟を図る。
4	MRI装置 MAGNETOM Trio Tim アップグレード	工学系学生が、アーリーエクスポージャーや実習に行うことを目的として使用するものである。本設備備品は臨床用ではなく、研究目的に使用されたMRIである。京都大学医学部附属病院内に設置された機器をアップグレード（傾斜磁場の更新及び付随工事）する。
5	周産期医療臨床手技 トレーニングシステム	シミュレーション・スキルラボにおけるコンピュータ制御下で、状況設定できる等身大の全身モデル（呼吸運動、瞳孔反射、心肺音、腸音、声音の再現、学習者の処置に対して即時にフィードバックするインタラクティブなシミュレーター）を用いて実習を行う。これにより、学生はリスクの低い安全な学習ができる。
6	作業活動遂行分析 システム	人の作業の活動遂行時の生体情報の解析データを同期させて測定できるシステムであり、学生が高齢者の自律的で安全な生活を支援するためのリハビリテーションにおいて作業遂行分析を学習させるために使用する。
7	405nm レーザー アップグレードキット （BD FACS Canto Ⅱ用）	医学部人間健康学科に設置されたフローサイトメーターのレーザーアップグレードで同時に測定できる蛍光色素が最大8色となり、大幅な解像度のアップが見込める。これにより白血病などの微小残存病変の検出が世界標準レベルで可能となり、工学実習のカリキュラムにとって最先端の解析方法を学べる点で効果的である。

Major equipment installed in Academic Year 2013

No.	Name of equipment	Purpose of installation
1	Cell Sorter	This cell sorter is used in the lecture "Molecular Analysis of Life" to understand the functional bases of cutting edge equipment. Specifically, it is used to isolate different types of cells that comprise the body and to analyze and compare their signaling characteristics.
2	High-speed Digital Imaging Camera 2D Flow Master PIVAnalyzer	This system performs the cell image photographing and image processing concerning the cell which flows in a micro channel for the purpose of analyzing the size, deformation amount, movement speed, etc., and students conduct the visualization experiment of cellular characteristics using this system in the practical training in mechanical engineering.
3	Hi-speed Imaging System for Monitoring of Neuronal Signals	The imaging system is intended to instruct the graduate students about the imaging and electrophysiological analyses of neuronal activity. This should promote their understanding of the molecular and cellular basis of neural function, and improve their practical skills for advanced technology on studying brain function and dysfunction.
4	3T Whole-body MRI Scanner :MAGNETOM Trio-Tim (upgraded)	The scanner was upgraded from a 3T research scanner in terms of coils for educational purpose for students in engineering and science fields. Although this is installed in the Kyoto University Hospital area, no clinical usage is considered.
5	Advanced Full-body Interactive Simulator (Simmom & Simbaby)	SimMom is an advanced full body birthing simulator with accurate anatomy and functionality to facilitate multi-professional obstetric training of delivery management. SimBaby is the advanced infant patient simulator for team training-for routine care to critical emergencies. With realistic anatomy and clinical functionality, SimBaby is ideal for training all aspects of infant care.
6	Occupational Performance and Activity Analysis System	This system comprises of eye movement tracking equipment, force plates measuring instruments that measure the ground reaction forces generated by a parameters of biomechanics and 3D motion capture analysis equipment. They are synchronized among all. Graduate students can learn the measuring and analysis methods of human activities that are integrated with physical, cognitive and psychological function.
7	BD 405nm Laser (upgraded) (for FACS Canto Ⅱ)	The upgrade enables our flow cytometer to analyze leukemic cells with maximum of 8 colors, which is the current international standard for minimal residual disease (MRD) detection. This will facilitate the students to learn the cutting edge skills for MRD analysis.

平成25年度　外国人研究者の招へい実績一覧

No.	所属・職・氏名	招へい期間	招へいの概要
1	ニューロスピン研究所 超高磁場MRI研究センター 所長　教授 Denis Le Bihan	2013年9月16日 ～9月29日	高磁場MRIを用いた医療工学「磁気共鳴画像診断法」の講義を行うとともに、英語のディベートの訓練に従事した。27日には「超高磁場MRI（Ultrahigh-Field　MRI）」と題するMRI特別セミナーを行った。
2	マックスプランク研究所 神経物理学研究科長 教授 Robert Turner	2013年9月24日 ～9月28日	平成25年9月24日から28日まで高磁場MRIを用いた医療工学「磁気共鳴画像診断法」の講義のため招へいした。25日には「MRIへのハードウエア（MRI　Hardware）」と題するMRI特別セミナーを行った。
3	ユーリッヒ研究センター 神経医学研究所 研究員 Michael Poole	2013年9月22日 ～9月28日	平成25年9月22日から28日まで傾斜磁場に関する講義のため招へいした。26日には「傾斜磁場MRI（Gradient Coil）」と題するMRI特別セミナーを行った。
4	ニューロスピン研究所 超高磁場MRI研究センター 所長　教授 Denis Le Bihan	2013年11月12日 ～12月1日	高磁場MRIを用いた医療工学「磁気共鳴画像診断法」の講義を行うとともに、11月12日・15日・19日・22日・26日及び29日の6日間、履修生のディベート能力審査を担当した。
5	ニューロスピン研究所 超高磁場MRI研究センター 所長　教授 Denis Le Bihan	2014年1月25日 ～2月19日	高磁場MRIを用いた医療工学「磁気共鳴画像診断法」の講義を行うとともに、履修生の英語ディベートの教育訓練を行った。
6	ノッティンガム大学 バイオメディカルサイエンス 学科　教授 Roland John Mayer	2014年3月5日 ～3月12日	バイオメディカルサイエンスの講義を行った。3月6日及び11日の第3限に　"Brain Protein Homeostasis, Engineering, Aging and Neurodegeneration"　と題する特別セミナーを行い、医学研究における工学の重要性を説いてもらった。
7	コロンビア大学 マホニーセンター 所長　教授 Michael E. Goldberg	2014年3月15日 ～3月21日	脳と行動、神経科学、神経生物学に関する講義のため招へいした。"The brain's system in the selection of relevant information in the real world" と題する特別セミナーを3月17日に開催した。

Researchers from abroad in Academic Year 2013

No.	Name/Title/Affiliation	Duration of stay	Purpose of visit
1	Denis Le Bihan Professor and Director NeuroSpin CEA-Saclay Center France	Sep.16-29, 2013	Lecture on medical engineering with high-field MRI and training in debate in English to LIMS students Subject of instruction: Magnetic Resonance Imaging Diagnosis Holding the special seminar entitled “Ultra High Field of MRI” on September 27
2	Robert Turner Professor and Director Department of Neurophysics Max Planck Institute for Human Cognitive and Brain Science Germany	Sep. 24-28, 2013	Lecture on medical engineering with high-field MRI Subject of instruction: Magnetic Resonance Imaging Diagnosis Holding the special seminar entitled “MRI Hardware” on September 25
3	Michael Poole Researcher Institute for Neuroscience and Medicine Germany	Sep. 22-28, 2013	Lecture on medical engineering with high-field MRI Subject of instruction: Gradient Coil Holding the special seminar entitled “Gredient Coil” on September 26
4	Denis Le Bihan Professor and Director NeuroSpin CEA-Saclay Center France	Nov. 12-Dec. 1, 2013	Lecture on medical engineering with high-field MRI together with training and assessment of English debate skills of LIMS students
5	Denis Le Bihan Professor and Director NeuroSpin CEA-Saclay Center France	Jan. 25-Feb. 19, 2014	Lecture on medical engineering with high-field MRI together with training and assessment of English debate skills of LIMS students
6	Roland John Mayer Emeritus Professor University of Nottingham United Kingdom	Mar. 5-12, 2014	Lecture on biomedical science Holding the special seminar entitled “Brain Protein Homeostasis, Engineering, Aging and Neurodegeneration” on March 6 and 11
7	Michael E. Goldberg David Mahoney Professor Brain and Behavior Departments of Neurology, Psychiatry, Ophthalmology Department of Neuroscience Director Mahoney Center Columbia University U.S.A	Mar. 15-21, 2014	Lecture on brain and behavior, neuroscience and neurobiology Holding the special seminar entitled "The brain's system in the selection of relevant information in the real world" on March 17

Reports for inviting researchers from abroad

MRI Special Seminar

Hidenao Fukuyama (Professor)

Denis LeBihan is the director of Neurospin in France. Neurospin is the large laboratory of MRI, and is now building up the 11.7T MRI (the largest MRI on the world). He talked about the MRI systems, and diffusion MRI sequences, which is made by himself. The diffusion sequences are now utilized in the clinical use for detection of infarcted area of the brain within 30 min after onset, that is the good tool for treatment of stroke. There are other cellular level water molecule movements in case of brain function activation. This will be another tool for MRI activation study from blood oxygen level dependency phenomenon discovered by Dr. Seiji Ogawa.
And also English debate with the students. French persons are good at debate and the students were trained effectively. Several times of English debate with the students will prompted them how to contact with the foreign researchers and officers.

Robert Turner is the section director of Max Planck Institute of Leitch for Physics of MRI. The physical aspects of MRI were talked and the students were trained how MRI is operating. The details of MRI will be difficult for the students, but they were seriously taught by worldwide famous researchers, then they will be influenced by the medical sciences based on the various aspects of basic sciences. Robert Turner is one of the physicist of MRI and neuroscientist, which will be a good change for the students to see such kind of multi-disciplinary teacher.

Dr. **Michael Poole**, belonging to Institute of Neuroscience and Medicine, Jülich Research Institute, Germany, arrived Japan on Sep/23rd and visited Kyoto University from 24th to 27th.
He is an MR physicist and his main research field is gradient coil design and simulation. He joined the lecture course from 24th to 27th and gave a lecture on 26th about gradient coil engineering. The contents of the lecture are, brief introduction of Jülich research institute and gradient coils in MRI scanner, designing gradient coils, gradient coil construction, gradient coil performance and recent developments in gradient coils.

Poster

Training Program of Leaders for Integrated Medical System
for Fruitful Healthy-Longevity Society (LIMS)

MRI Special Seminar

24-27th September, 2013
10:30 - 12:00

Presenters

24th : Dr. Hideaki Maeda, RIKEN, JAPAN
NMRの超高磁場化 Super high field NMR

25th : Dr. Robert Turner, Max Planck Institute
for Human Cognitive and Brain Sciences, GERMANY
MRIへのハードウェア MRI Hardware

26th : Dr. Michael Poole, Institute of Neuroscience
and Medicine, Forschungszentrum Jülich, GERMANY
傾斜磁場コイル Gradient Coil

27th : Dr. Denis Le Bihan, NeuroSpin, FRANCE
超高磁場MRI Ultrahigh-Field MRI

Venues

24th & 25th : 医学部構内G棟3階演習室
Seminar Room, 3F, Bldg. G, Faculty of Medicine Campus

26th & 27th : 医学部構内G棟2階セミナー室A
Seminar Room A, 2F, Bldg. G, Faculty of Medicine Campus

京都大学 学際融合教育研究推進センター 健康長寿社会の総合医療開発ユニット事務室（LIMS事務室）
Research and Educational Unit of Leaders for Integrated Medical System (LIMS),
Center for the Promotion of Interdisciplinary Education and Research, Kyoto University
TEL：075-753-9334 E-MAIL：info@lims.kyoto-u.ac.jp HP：http://www.lims.kyoto-u.ac.jp/

Reports for inviting researchers from abroad

Lecture on biomedical science

Jun Fujita (Professor)

Prof **RJ Mayer** has a major long-standing interest in chronic neurodegenerative diseases to include Parkinson's disease and "dementia with Lewy bodies" which was discovered neuropathologically by ubiquitin immunohistochemistry by him and his colleagues. Recently, his group has succeeded in conditionally ablating a proteasomal ATPase gene (S4 = psmc1), and thus 26S proteasome, in different regions of the mouse brain. Depletion of 26S proteasome in the cortex, hippocampus, striatum and amygdala recapitulates, for the first time, neuropathological features and behavioral abnormalities of dementia with Lewy bodies, while depletion in the substantia nigra generates a new model of Parkinson's disease. He has been using these mouse models, for example, to evaluate ligands for PET scanning of human brain, and to obtain data on metabolites by NMR spectroscopy. These two studies rely on equipments designed by medical engineers that would be impossible without engineering. During his stay in Kyoto, he gave two seminars on these subjects to students in Leaders for Integrated Medical System (LIMS) for Fruitful Healthy-Longevity Society Program. During and after the lectures, students asked several questions and discussed eagerly with him. He visited and had discussions with LIMS professors, Prof Hidenao Fukuyama, Prof Ryosuke Takahashi, and Prof Jun Fujita. His background, research interests and commitment to the understanding, diagnosis and treatment of chronic neurodegenerative disease fitted very well with the objectives of the program.

Reports for inviting researchers from abroad

Lecture on brain and behavior, neuroscience and neurobiology

Kenji Kawano (Professor)

Dr. **Michael E. Goldberg** is the David Mahoney Professor of Brain and Behavior at the Departments of Neuroscience, Neurology, Psychiatry, and Ophthalmology at Columbia University College of Physicians and Surgeons, as well as the Director of the Mahoney-Keck Center for Brain and Behavior Research at Columbia University Medical Center. Dr. Goldberg is also a member of the Kavli Institute for Brain Science at Columbia University. He is also a member of National Academy of Sciences, former President of the Society for Neuroscience (SfN) and Chairman of the Society's Committee on Animals in Research. He arrived in Japan on 3/16 and joined the lecture course from 3/17 to 3/20. He gave two lectures to students and other participants on 3/17 and 3/20 and carried out discussions with them. His lectures primarily focused on the psychophysics and physiology of cognitive processes in the monkey: visual attention, spatial perception, and decision making. His visit provided good opportunities for students to learn how to debate in English and communicate with world's leading researchers.

平成24年度 LIMS海外渡航一覧

【教員】

	氏 名	所 属	職 名	出発日	日数	目的地	用 務
1	福山 秀直	医学研究科脳機能総合研究センター	プログラムコーディネーター・教授	2013/2/1	6	アメリカ	2013/2/1-4 Dr. Adam Gazzaley, M.D., Ph.D. Associate Professor of Neurology, Physiology and Psychiatry Director, Neuroscience Imaging Center University of California, San Francisco U.S.A を訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施
2	石井 加代子	健康長寿社会の総合医療開発ユニット	特定教授	2013/2/24	8	ドイツ	2013/2/25 Dr. Christopher Coenen, Prof. Dr. Michael Decker, Dr. Michael Rader, Dr. Bettina Johanna Krings, KIT (Karlsruhe Institute of Technology), ITAS (Institute for Technology Assessment and Systems Analysis), Karlsruhe, Germanyを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施 2013/2/26 Prof. Dr. Nikos K. Logothetis, Dr. Yusuke Murayama, Physiology of Cognitive Processes (AGLOGO), Max-Planck Institute for Biological Cybernetics Tuebingen, Germanyを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施 2013/2/28 Dr. Burkhard Maess Max Planck Institute for Human Cognitive and Brain Sciences, Group Leader: MEG and EEG: Signal Analysis and Modeling, Leipzig, Germany および Dipl. Psych. Corinna Bonhage, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germanyを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施
3	松橋 眞生	健康長寿社会の総合医療開発ユニット	特定准教授	2013/3/24	7	アメリカ	NIH, Bethesda, MD, USAを訪問し、以下の研究者とリーディングプログラムに係るインターンシップ先開拓の為の打合せを実施 2013/3/25 Dr. Mark Hallett, Chief, Human Motor Control Section, NINDS Leonardo G. Cohen, M.D., Chief, Human Cortical Physiology and Stroke Neurorehabilitation Section, NINDS Dr. Richard Coppola, Dir. NIMH MEG Core Facility 2013/3/26 Diane L. Damiano, PhD PT,Chief of Functional & Applied, Biomechanics Section, Clinical Center Dr. Sarah Kranick, Assistant clinical director, Chief, neurology consult service NINDS Barry B. Kaplan, Ph.D.,Senior Investigator, Molecular Neurobiology Section, Laboratory of Molecular Biology, NIMH 2013/3/27 Henry S. Eden, M.D., Ph.D., Deputy Scientific Director, NIBIB Dr. Richard A. Baird, Director, DIDT, Division of Interdisciplinary Training NIBIB 2013/3/28 Robert B. Innis, M.D., Ph.D., Chief, PET Neuroimaging Sciences Section, Molecular Imaging Branch, NIMH

Activities in Foreign Countries Academic Year 2012

[Staff]

	Name	Affiliation	Position	Date of Departure	Period (days)	Destination	Aim
1	Hidenao Fukuyama	Human Brain Research Center, Graduate School of Medicine	Professor, LIMS Program Coordinator	February 1, 2013	6	United States of America	Feb. 1-4, 2013 Meeting with Dr. Adam Gazzaley, M.D., Ph.D. Associate Professor of Neurology, Physiology and Psychiatry Director, Neuroscience Imaging Center University of California, San Francisco U.S.A about LIMS internship program
2	Kayoko Ishii	LIMS	Program-Specific Professor	February 24, 2013	8	Germany	Feb. 25, 2013 Meeting with Dr. Christopher Coenen, Prof. Dr. Michael Decker, Dr. Michael Rader, Dr. Bettina Johanna Krings, KIT (Karlsruhe Institute of Technology), ITAS (Institute for Technology Assessment and Systems Analysis), Karlsruhe, Germany about LIMS internship program Feb. 26, 2013 Meeting with Prof. Dr. Nikos K. Logothetis, Dr. Yusuke Murayama, Physiology of Cognitive Processes (AGLOGO), Max-Planck Institute for Biological Cybernetics Tuebingen, Germany about LIMS internship program Feb. 28, 2013 Meeting with Dr. Burkhard Maess Max Planck Institute for Human Cognitive and Brain Sciences, Group Leader: MEG and EEG: Signal Analysis and Modeling, Leipzig, Germany and Meeting with Dipl. Psych. Corinna Bonhage, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany about LIMS internship program
3	Masao Matsuhashi	LIMS	Program-Specific Associate Professor	March 24, 2013	7	United States of America	Visiting NIH, Bethesda, MD, USA for meetings with the following researchers about LIMS internship program Mar. 25, 2013 Dr. Mark Hallett, Chief, Human Motor Control Section, NINDS Leonardo G. Cohen, M.D., Chief, Human Cortical Physiology and Stroke Neurorehabilitation Section, NINDS Dr. Richard Coppola, Dir. NIMH MEG Core Facility Mar. 26, 2013 Diane L. Damiano, PhD PT,Chief of Functional & Applied, Biomechanics Section, Clinical Center Dr. Sarah Kranick, Assistant clinical director, Chief, neurology consult service NINDS Barry B. Kaplan, Ph.D.,Senior Investigator, Molecular Neurobiology Section, Laboratory of Molecular Biology, NIMH Mar. 27, 2013 Henry S. Eden, M.D., Ph.D., Deputy Scientific Director, NIBIB Dr. Richard A. Baird, Director, DIDT, Division of Interdisciplinary Training NIBIB Mar. 28, 2013 Robert B. Innis, M.D., Ph.D., Chief, PET Neuroimaging Sciences Section, Molecular Imaging Branch, NIMH

平成25年度 LIMS海外渡航一覧

【教員】

	氏 名	所 属	職 名	出発日	日数	目的地	用 務
1	石井 加代子、 Dinh Ha Duy Thuy	健康長寿社会の総合医療開発ユニット	特定教授、 特定助教	2013/5/19	6	ベトナム	ベトナム国家大学ホーチミン市校 自然科学大学、ノンラン大学、ベトナム国家大学ホーチミン市校 工科大学、ダナン大学工科大学、ベトナム国家大学ハノイ校 自然科学大学、ベトナム国家大学ハノイ校 工科大学にて、リーディングプログラムの企画運営に係る広報・学生勧誘活動を実施
2	武田 俊一	医学研究科 放射線遺伝学	教授	2013/9/19	10	オランダ	2013/9/20・9/24 The Netherland Cancer InstituteのProf. Rene Medema、Dr. Rob Wolthuisを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施 2013/9/25 Erasmus Medical CenterのProf. Roland Kanaarを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施 2013/9/26 The University Medical Center GroningenのProf. Roland Chiuを訪問し、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施
3	福山 秀直、 石井 加代子	医学研究科脳機能総合研究センター、 健康長寿社会の総合医療開発ユニット	プログラムコーディネーター・教授、 特定教授	2013/10/18	8	ドイツ	2013/10/20-22 M8 Alliance World Health Summit 2013に参加し、リーディングプログラムの企画運営に係る広報及び国際連携活動を実施 2013/10/23 Institut für Wissensbasierte Systeme und Wissensmanagementにて、所長のMadjid Fathi教授らとインターンシップ先開拓の為の打ち合わせを実施
4	石井 加代子、 Dinh Ha Duy Thuy	健康長寿社会の総合医療開発ユニット	特定教授、 特定助教	2013/11/21	7	ベトナム	日越国交樹立40周年記念医学歯学交流ワークショップに参加し、リーディングプログラムに係る広報活動を実施
5	武田 俊一	放射線遺伝学	教授	2014/2/6	16	スイス、イギリス、アメリカ	Friedrich Miescher Institute for Biomedical Research, University of Sussex, University of Oxford, Dana-Farber Cancer Institute, Brandeis Universityにて、リーディングプログラムに係るインターンシップ先開拓の為の打合せを実施
6	石井 加代子、 Dinh Ha Duy Thuy	健康長寿社会の総合医療開発ユニット	特定教授、 特定助教	2014/2/23	7	インドネシア	インドネシア大学、バンドン工科大学を訪問し、リーディングプログラムに係る広報活動・学生勧誘活動を実施
7	鳥井 美江	健康長寿社会の総合医療開発ユニット	特定助教	2014/3/2	4	ソウル	サムスン医療院を見学し、リーディングプログラム講義・実習に係る情報収集を実施
8	文室 知之	健康長寿社会の総合医療開発ユニット	教務補佐員	2014/3/19	7	ベルリン	30th International Congress of Clinical Neurophysiology (ICCN) of the IFCNへ参加し、リーディングプログラムに係る発表および情報収集を実施

【履修者】

	氏 名	所 属	学 年	出発日	日数	目的地	用 務
1	石田 敦子	医学研究科 人間健康科学系専攻 リハビリテーション 科学コース臨床 認知神経科学	M1	2014/2/12	6	シアトル	International Neuropsychological Society 42nd Annual Meetingに参加し、リーディングプログラムにて実施中の現段階の研究発表および情報収集を実施

Activities in Foreign Countries Academic Year 2013

[Staff]

	Name	Affiliation	Position	Date of Departure	Period (days)	Destination	Aim
1	Kayoko Ishii/ Dinh Ha Duy Thuy	LIMS	Program-Specific Professor/ Program-Specific Assistant Professor	May 19, 2013	6	Vietnam	Visiting Vietnam National University, Ho Chi Minh City University of Science/ Nong Lam University/ Vietnam National University, Ho Chi Minh City University of Technology/ Danang University of Technology/ Vietnam National University, Hanoi University of Science/ Vietnam National University, Hanoi University of Engineering and Technology, for LIMS program public relation activity
2	Shunichi Takeda	Department of Radiation Genetics, Graduate School of Medicine	Professor	September 19, 2013	10	Netherlands	Sep. 20 and 24, 2013 Meeting with Prof. Rene Medema and Dr. Rob Wolthuis, The Netherland Cancer Institute, about LIMS internship program Sep. 25, 2013 Meeting with Prof. Roland Kanaar, Erasmus Medical Center, about LIMS internship program Sep. 26, 2013 Meeting with Prof. Roland Chiu, The University Medical Center Groningen, about LIMS internship program
3	Hidenao Fukuyama/ Kayoko Ishii	Human Brain Research Center, Graduate School of Medicine/ LIMS	Professor, LIMS Program Coordinator/ Program-Specific Professor	October 18, 2013	8	Germany	Oct. 20-22, 2013 Participate in M8 Alliance World Health Summit 2013, for LIMS program public relation activity and international cooperation. Oct 23, 2013 Meeting with Professor Madjid Fathi, Director of Institut für Wissensbasierte Systeme und Wissensmanagement, about LIMS internship program
4	Kayoko Ishii/ Dinh Ha Duy Thuy	LIMS	Program-Specific Professor/ Program-Specific Assistant Professor	November 21, 2013	7	Vietnam	Participate in The Workshop for Medical and Dental Cooperation with Japan and Vietnam for the 40th Anniversary of the Establishment of Diplomatic Relations between Vietnam and Japan, for LIMS program public relation activity
5	Shunichi Takeda	Department of Radiation Genetics, Graduate School of Medicine	Professor	February 6, 2014	16	Swizarland, Untited Kingdom, United States of America	Visiting Friedrich Miescher Institute for Biomedical Research, University of Sussex, University of Oxford, Dana-Farber Cancer Institute, and Brandeis University, for meetings about LIMS internship program
6	Kayoko Ishii/ Dinh Ha Duy Thuy	LIMS	Program-Specific Professor/ Program-Specific Assistant Professor	February 23, 2014	7	Indonesia	Visiting University of Indonesia, and Institut Teknologi Bandung, for LIMS program public relation activity
7	Mie Torii	LIMS	Program-Specific Assistant Professor	March 2, 2014	4	Seoul	Visiting Samsung Medical Center, to collect information for lecture and practice of LIMS program
8	Tomoyuki Fumuro	LIMS	Assistant Teaching Staff	March 19, 2014	7	Berlin	Participate in 30th International Congress of Clinical Neurophysiology (ICCN) of the IFCN, to make a research presentation and to collect information for LIMS program

[Students]

	Name	Affiliation	Grade	Date of Departure	Period (days)	Destination	Aim
1	Atsuko Ishida	Clinical Cognitive Neuroscience, Rehabilitation Sciences Course, Human Health Sciences, Graduate School of Medicine	M1	February 12, 2014	6	Seattle	Participate in International Neuropsychological Society 42nd Annual Meeting, to make a research presentation and to collect information for LIMS program

平成25年度 LIMS履修者の学外活動（国内）

	氏 名	所 属	職名／学年	出発日	日数	目的地	用 務
1	杉本 直三 （引率）	医学研究科・人間健康科学系専攻 情報理工学医療講座	教授	2013/9/10	1	京都市	島津製作所（本社・三条工場）にて、リーディングプログラム学際応用科目「医療・生活支援システム学」に係る学外研修を実施
	近藤 健悟 （引率）	健康長寿社会の総合医療開発ユニット	特定助教				
	佐久間 真紀、石田 敦子、 宮之原 遵、葉原 令、 松井 利樹、村尾 賢、 水藤 拓人、山口 一真 （以上8名）	（LIMS履修者）	M1				
2	近藤 健悟 （引率）	健康長寿社会の総合医療開発ユニット	特定助教	2013/9/18	1	久世郡 久御山町	ファルコバイオシステムズ総合研究所にて、リーディングプログラム学際応用科目「医療・生活支援システム学」に係る学外研修を実施
	佐久間 真紀、石田 敦子、 宮之原 遵、葉原 令、 松井 利樹、村尾 賢、 水藤 拓人、山口 一真 （以上8名）	（LIMS履修者）	M1				
3	鳥井 美江 （引率）	健康長寿社会の総合医療開発ユニット	特定助教	2013/9/25	1	奈良市	高の原ポシブルデイケアセンターにて、リーディングプログラム学際応用科目「医療・生活支援システム学」に係る学外研修を実施
	佐久間 真紀、石田 敦子、 宮之原 遵、松井 利樹、 村尾 賢、水藤 拓人、 山口 一真 （以上7名）	（LIMS履修者）	M1				
4	石井 加代子 （引率）	健康長寿社会の総合医療開発ユニット	特定教授	2013/9/27	1	京都市	社会福祉法人京都福祉サービス協会本能 および京都市左京南地域包括支援センターにて、リーディングプログラム学際応用科目「医療・生活支援システム学」に係る学外研修を実施
	鳥井 美江 （引率）	健康長寿社会の総合医療開発ユニット	特定助教				
	佐久間 真紀、石田 敦子、 宮之原 遵、松井 利樹、 村尾 賢、水藤 拓人、 山口 一真 （以上7名）	（LIMS履修者）	M1				
5	石田 敦子	（LIMS履修者）	M1	2013/11/28	3	松江市	第37回高次脳機能学会に参加し、リーディングプログラムに関連する高齢者の認知機能について情報収集を実施
6	石田 敦子	（LIMS履修者）	M1	2013/12/7	1	京都市	日本情動学会第3回大会に参加し、情動と脳機能との関連についての文献が増えているため、転倒リスクに関わる新たな因子として「情動」を取り入れられるか検討するための情報収集を実施

Activities of LIMS Students Academic Year 2013

	Name	Affiliation	Position／Grade	Date of Departure	Period (days)	Destination	Aim
1	Naozo Sugimoto (Supervisor)	Human Health Sciences, Graduate School of Medicine	Professor	September 10, 2013	1	Kyoto, Kyoto Prefecture	Visiting Shimadzu Corporation (Head Office and Sanjo factory) for LIMS Medical and Life Support Systems class
	Kengo Kondo (Supervisor)	LIMS	Program-Specific Assistant Professor				
	Maki Sakuma/ Atsuko Ishida/ Jun Miyanohara/ Rei Kuwabara/ Toshiki Matsui/ Ken Murao/ Takuto Suitou/ Kazuma Yamaguchi	(LIMS Student)	M1				
2	Kengo Kondo (Supervisor)	LIMS	Program-Specific Assistant Professor	September 18, 2013	1	Kumiyama-cho, Kuze-gun, Kyoto Prefecture	Visiting FALCO SD HOLDINGS Co., Ltd. for LIMS Medical and Life Support Systems class
	Maki Sakuma/ Atsuko Ishida/ Jun Miyanohara/ Rei Kuwabara/ Toshiki Matsui/ Ken Murao/ Takuto Suitou/ Kazuma Yamaguchi	(LIMS Student)	M1				
3	Mie Torii (Supervisor)	LIMS	Program-Specific Assistant Professor	September 25, 2013	1	Nara, Nara Prefecture	Visiting "Takanohara Possible Day Care Center" for LIMS Medical and Life Support Systems class
	Maki Sakuma/ Atsuko Ishida/ Jun Miyanohara/ Toshiki Matsui/ Ken Murao/ Takuto Suitou/ Kazuma Yamaguchi	(LIMS Student)	M1				
4	Kayoko Ishii (Supervisor)	LIMS	Program-Specific Professor	September 27, 2013	1	Kyoto, Kyoto Prefecture	Visiting "Hon-nou, Kyoto Welfare Service Association" and "Kyoto Sakyo-Minami Area Comprehensive Support Center" for LIMS Medical and Life Support Systems class
	Mie Torii (Supervisor)	LIMS	Program-Specific Assistant Professor				
	Maki Sakuma/ Atsuko Ishida/ Jun Miyanohara/ Toshiki Matsui/ Ken Murao/ Takuto Suitou/ Kazuma Yamaguchi	(LIMS Student)	M1				
5	Atsuko Ishida	(LIMS Student)	M1	November 28, 2013	3	Matsue, Shimane Prefecture	Participate in The 37th Annual Meeting of Japan Society for Higher Brain Dysfunction to collect information for LIMS program
6	Atsuko Ishida	(LIMS Student)	M1	December 7, 2013	1	Kyoto, Kyoto Prefecture	Participate in 3rd Meeting of The Japan Emotionology Society to collect information for LIMS program

8.

学生の活動報告

Student Activity Report

Personalized medicine and genomicsin our longevity society
Maki Sakuma

Introduction

Japan provides one of the best healthcare systems in the world and resulted in being the country of highest life expectancy, but the healthcare system is becoming unsustainable by the very fact of the fruit it produced, too many old people, not entirely healthy. It is now in pressing need to reform the healthcare system, and research that tells us ways to prevent and treat diseases that most old people get is much awaited such as cancer and dementia.

Research

Personalized medicine based on individual genome and transcriptome sequencing gives great promise to advancing fruitful healthy-longevity society as it enables more efficient preventive screening programs and prediction of drug responses. However, the techniques to interpret the sequencing data are not as developed as the sequencing technique itself. My research goal is to develop a technique that can identify the combination of drugs and specific DNA mutations that interact more effectively and will treat “splicing diseases.” Splicing diseases are caused by abnormal splicing, which is a post-transcriptional process, and cancer transcriptomes are known to exhibit abnormal splicing. Currently I am sequencing normal cells to identify the sequence characteristics that respond well to the drug.

Training

***The 2nd Kyoto Course and Symposium on Bioinformatics for NGS with Applications in Human Genetics*. 2014.3.11-14**

This course covered most tools used in handling next generation sequence data, and special attention was paid to cancer genomics and statistics because of its importance in medicine and the technical issues associated with handling data from the cancer genome. An example was presented that stratifying the population depending on their susceptibility to specific cancers promises better preventive screening programs. With the knowledge from LIMS courses on MRI inspection for early detection of cancer, I gained useful insight as to how to combine sequencing and MRI technologies in establishing an integrated medical system to tackle with the problems of our super aged society. This course also provided opportunities to socialize with researchers in this field and I established valuable contact with a researcher in Chicago University who might help me with my transcriptome data analysis.

Other Contacts and Conclusion

Aside of cancer, an important field of study is the process of aging itself in order to establish fruitful healthy-longevity. Through a former Japanese colleague I established contact with an aging researcher from the Salk Institute and was advised the current trends and good labs as a possible location for internship in the third year. Through the training and opportunities available from LIMS I was able to successfully communicate with both national and foreign researchers and learned and updated on my knowledge and techniques in my own and fields that are different from mine, deepening my expertise and also broadening my perspectives in medical science.

Research Activity in LIMS

Department of Human Health Sciences,
Graduate School of Medicine
Mikako GOMYO

1) Aim in LIMS and difference with my laboratory

Deciding what to research in LIMS, I considered why I tried to apply to LIMS in the first year in master's course.

At present Prof. Shiina's laboratory I belong to provides me with the opportunity that how to diagnose diseases much earlier by using ultrasound device; I attempt to detect where and how much elasticity and viscosity are by using shear wave propagation inside body. Some kinds of diseases, such as a breast cancer and liver fibrosis, can be found in an earlier stage with ease and no invasion when this research will achieve.

For the reason I am concentrating on ultrasound and looking ahead to a clinical experiment in my laboratory, I thought of my research in LIMS as the subject which should be involved in engineered approaches, considering LIMS aims to work medicine and engineering together. The first subject of research is 'Identify what viscoelasticity is inside human body for composing engineering modeling'. It set as a long-term goal, and then the second one should be a middle-term aim and involved in my laboratory, 'Apply the viscoelastic property to diagnoses such as pathology'. Eventually, my final target is to apply the diagnostic method I invent to clinical tests by means of integrating these two subjects.

In determining what I would research in LIMS, I really appreciate mentors belonging to LIMS to talk it over with me intimately.

2) Research progress

As the present goal of the first subject in this term, I attempted to comprehend what kinds of viscoelastic engineering modeling had been developed so far and how they were applied.

I examined literatures and got to know that three types of models, Maxwell, Kelvin-Voigt, and Zener, had already known and particularly Kelvin-Voigt was common method used to experiment under assumption of applying for a human body from theses about human tissues. Therefore, I tried to apply the Voigt formula to experiment data I fetched by the ultrasound device in my laboratory.

The second subject is to invent the diagnostic method, thus in this semester I searched whether the viscoelastic property had been available in clinic practice at present.

At first, I learned from textbooks of pathology the cytodiagnosis was adopted as a definite diagnosis of cancer, and latest books of medical ultrasound showed that the

ultrasound device which can use the elastic property had already invented and employed on clinical tests. It is developed on the basis of the palpation that cancer and tumor are supposed to be stiffer than other tissues. Secondly, I found the famous thesis [1] saying viscosity as well as elasticity could be worth examining because its property would be different between some tissues (Fig.1). To be more precise, in the tissue which is thought to have both elasticity and viscosity (liver), the velocity of shear wave generated by ultrasound depends on frequency of shear wave, though in the tissue with elasticity and no viscosity (muscle) it does not depend (Fig.2). These features can be valid for examining the viscoelastic property in near future work.

In addition to self-education, LIMS provides many opportunity to study for us; taking my situation for example, the pathological lecture held in Kyoto University Hospital is taught us by clinicians and researchers who know clinical practices, and in the less-invasive therapy class we are allowed to enter operating rooms for surgery of various departments, both of which and other lectures are valuable and unsubstituted opportunities for all of us.

As for my research progress in my laboratory, related to the second subject in LIMS, I have attained some results in mimic biological tissues by the method I invented using ultrasound device, thus I obtained several opportunities to make statements on the symposium at the ultrasound medical research center in Doshisha University (February 2014) and the annual conference of the Japan Society of Ultrasonics in Medicine (May 2014).

3) Discussion and future work

In the first subject about engineering modeling, the remaining problem is to focus on just one model of three because of its usefulness from previous studies, then as a next phase other methods should be applied to my research as well. If its strong and weak points are discovered respectively, these characteristic terms can be helpful in making engineering modeling by myself. On the other hand, all of these models have the underlying problem human body is simplified to be an isotropic and linear medium. This assumption cannot be true because human tissue is known to heterogeneous, anisotropic, and non-linear nature. Although I have started to apply my research data to the existing model, I will endeavor to solve these problem at the same time in the course of research.

The second subject for clinical tests needs to consider that at present there are supposed to be no clinical test using viscoelastic property without ultrasound devices. I have imagined the viscoelastic property of lesional tissues gotten by biopsy might be detected on some kinds of methods. Therefore, I should contemplate how to apply and validate an inventive method for human body in near future.

In parallel with working out these problems, I would like to catch up with latest studies from the symposium and annual conference I will attend, and also to seek and participate in such kinds of publishing opportunities.

4) Conclusion

I really appreciate all persons involved in the LIMS course to sharing many diverse opportunities for several kinds of study. One professor and two mentors always lend their ear sincerely and offer me impressive advice for my research, and doctors and business persons as lecturers gave us chances to observe operations and informative talks. I am sure my English skill is gradually improving thanks to our English teacher who provides us with various kinds of talking such as debating, self-introduction, and short presentation. Of course many fellows in LIMS inspire each other, though all of us have different backgrounds and research themes, which makes me grateful to participating in LIMS. I will work much harder than this year with many thanks to lots of people involved in this program.

5) References

[1] T.Deffieux, G.Montaldo, M.Tanter, and M.Fink: Shear Wave Spectroscopy for In Vivo Quantification of Human Soft Tissues Visco-Elasticity, IEEE Trans. Medical Imaging, Vol. 28, NO. 3, pp. 313-322, 2009

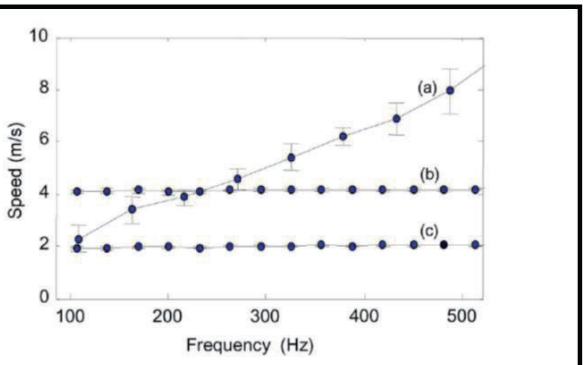


Fig. 1 Phase velocity in different *in vitro* phantoms, the (a) viscous silicon phantom is characterized by (b) a strong dispersion whereas the (c) agar and (c) gelatin gels are nearly nondispersive (nonviscous).

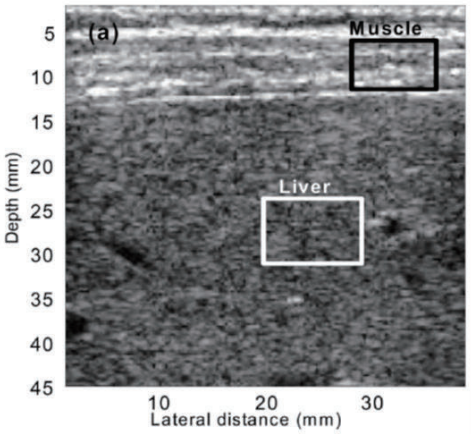


Fig. 2. (a) B-mode image showing the intercostal muscle (top) and the liver (bottom) of an healthy volunteer, regions of interest used for SWS correspond to a 5 ×10 mm and a 8 × 10 mm boxes respectively for muscle and liver regions. (b) *In vivo* Dispersion curves in muscle and in liver reflect their viscoelastic properties and allow their characterization.

平成 25 年度　活動報告

人間健康科学系専攻　石田　敦子

研究名：高齢者のよりよい生活を支援する生活能力評価機器の開発

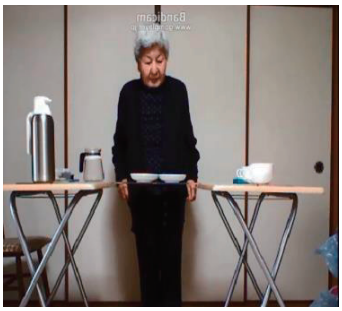
１．計測すべき動作の抽出

高齢者にとって意味のある作業，ニーズの高い作業という視点から，複数文献より 58 動作を選択した．この動作のうち，現在 Microsoft Kinect (以下，Kinect)を利用して測定可能な洗濯物干し動作，モップ掛け動作，書字動作，食器洗い動作，食事動作，紅茶淹れ動作の 6 動作を抽出した．

２．実際に実施・測定した動作

学内，地域生活者，有料介護老人施設において被験者を募った．

被験者は，１．より抽出された動作について，決まった手順を遂行した．遂行中の様子を Kinect カメラで撮影し，収得した身体座標データからそれぞれの動作特性を反映すると思われる動作指標を定めた．現在 Kinect 動作指標として定めているのは，紅茶淹れ動作における右肘Ｘ座標のパワースペクトル値(Elbow Right X spectrum data: ERS)と洗濯物干し動作における左肘Ｙ座標のパワースペクトル値(Kinect Index: KI)である．



紅茶淹れ動作実験風景
(※被験者ご本人の了承を得て写真を掲載しております。)

動作遂行後には，高齢者の生活能力に関わるとされる検査を実施した．検査は身体機能の評価指標である Timed Up and Go test (歩行能力評価，以下 TUG)，開眼片足立ち検査(バランス評価)，握力検査(筋力評価)，認知機能の評価指標である Mini Mental State Examination (認知症スクリーニング，以下 MMSE)，Frontal Assessment Battery (前頭葉機能評価，以下 FAB)，Trail Making Test (遂行機能評価，以下 TMT)，生活状態の評価指標である Barthel Index (日常生活動作能力指標，以下 BI)，老研式活動能力指標(日常生活関連活動指標，以下老研式)，転倒リスク評価(転倒のリスクスクリーニング)の 9 項目を実施した．

また，被験者 1 人につき作業療法士の資格を有する医療スタッフ 3 人による動画データの動作観察点の平均も算出した．

３．動作指標とその他の検査との関連性

洗濯物干し動作については，KI 値は TUG，MMSE との間に有意な相関を認めた．また紅茶淹れ動作については，ERS 値は開眼片足立ち検査，MMSE，FAB，TMT-A，老研式との間に有意な相関を認めた． KI 値，ERS 値それぞれが複数の検査と有意な相関を示したことで，Kinect で収得した値は生活能力に関する身体機能や認知機能などの複数の因子と関連性を持つ可能性が考えられる．

紅茶淹れKinect値と身体・認知機能との相関

	相関係数(ρ)
開眼片足立ち検査	−0.71 **
TUG	0.48
握力検査	−0.23
MMSE	−0.71 **
FAB	−0.71 **
TMT−A	0.59 *
BI	−0.41
老研式	−0.85 **
転倒リスク評価	0.38

Spearmanの相関分析 *p<0.05, **p<0.01

また，KI 値も ERS 値も動作観察点と有意な相関を認めているが，Kinect の感度については今後さらに検討予定である．

また，これら単独の動作指標と他の検査項目との関連性については，下記に示す学会で報告を行う予定である．

４．今後の方向性

来年度は現在解析を行っていない動作の指標値の検討や Kinect 本体の信頼性・妥当性の検討といった基礎的研究も踏まえて， 生活機能スクリーニング検査としての Kinect の実用性を高めていく予定である．また，データ数を増やすことで重回帰分析も実施し，検査得点との関連性を検討していく予定である．

＊今年度・来年度の学会発表予定

ヒューマンインターフェース学会第 108 回研究会

第 58 回システム制御情報学会

Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society (LIMS) has started since last September, 2013, to cope with global-scale problems of an unprecedented aging society. It's my great pleasure to have become a member of the training program.

In this program, the graduate students are required not only to acquire English proficiency in order to play an active role in the international community, but also to learn medical knowledge comparable with that of students who graduated from medical schools, regardless of their backgrounds. Here, I would like to introduce some of courses which was very useful to develop oral communication skills in English and to study fundamental medical knowledge.

・Debate-

The aim of the course is to improve communicating one's own ideas convincingly. In this course, English articles were provided and discuss the matter and then presented in parliamentary debate style. We could learn how to debate and improve our ability to form and express opinions in English

・Medical and Life Support Systems-

Through the lectures and the seminars, we could develop an understanding of problems on present equipment and systems used in clinical practice. In addition, we could visit institutes at the seminar of 6 days practice, including medical equipment company, district support center, day-care center, and rehabilitation section of university hospital.

・Medical Engineering for Society-

In this class, we were able to learn research and development strategy and its practical and potential problems in mainly engineering fields that are closely or indirectly connected to the integrated medical system. We could have a good opportunity to talk with lecturers in a variety of professional fields and develop problem solving strategy through the lecture.

・Minimally Invasive Therapeutics-

In this course, we took lectures of minimally invasive therapy by laparoscopic surgery, robotic surgery, endoscopic surgery, and so on. Not only that, we were able to enter into the operating room and had a valuable experience at the site.

Thanks to teaching staff, office workers, and my colleagues, I had a fruitful time throughout the semester. I am looking forward to your ongoing support, thank you.

Presentation at ipita

Kuwabara Rei

I joined international pancreas & islet transplant association (ipita). The IPITA is an international conference about clinical and experimental results about the transplantation of islets of Langerhans (islets) or insulin producing tissue for the treatment and cure of diabetes mellitus.

I presented the title of “Xenotransplantation of Encapsulated Co-Aggregates of Sertoli Cells and Islet Cells” at the conference. Summary of this presentation is below.

Islet transplantation has been considered as a promising treatment method of patients with diabetes mellitus. However, it remains an experimental procedure, and shortage of human donor is one of major problem to overcome. For improvement of a xenograft survival, we examined co-transplantation of islets with Sertoli cells which are known to have immunosuppressive ability. We prepared co-aggregates of islet cells and Sertoli cells from Wistar rat by the hanging drop method and encapsulated them with agarose gel. In the agarose-encapsulated co-aggregates, islet cells surrounded the sertoli core aggregate (Figure 1). The Sertoli part secreted activin and islet cells could release insulin in response to change of glucose levels. This indicated the encapsulated co-aggregates well maintained the functions of both islet cells and Sertoli cells. Agarose-encapsulated co-aggregates from Wistar rat were transplanted into each diabetic BALB/c mouse by intraperitoneal injection, and their blood glucose levels were monitored. Blood glucose levels remained normal after transplantation in the recipients, by contrast, immediately returned to the high levels in recipient mice with agarose-encapsulated islets.

I would like to contribute to develop treatment of diabetes mellitus by researching this more.

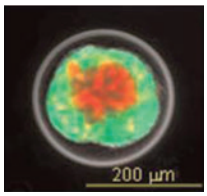


Figure 1. Agarose-encapsulated co-aggregates of and islet cells (green) and Sertoli cells (red).

Annual Report

Faculty of Engneering
Graduate School of Engneering
Department of polymer Chemistry
MC1 Toshiki Matsui

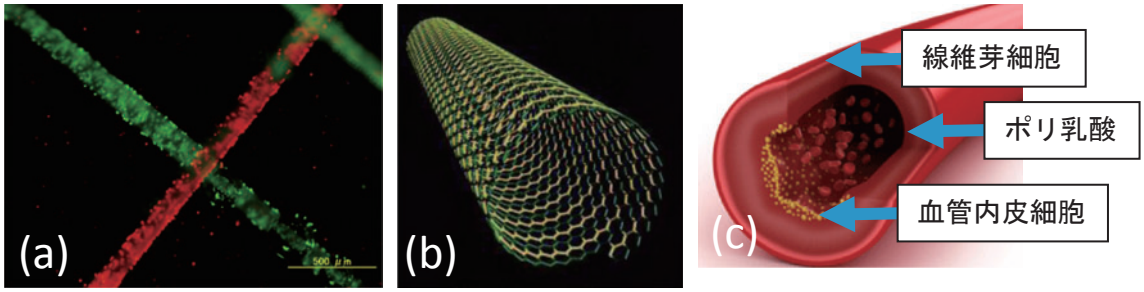
■平成25年度LIMSプログラムに関して

プログラムの都合上平成25年の四月からの開講では無く、九月からの開講となったため1年分のカリキュラムを半年に縮める事となり非常にハードなカリキュラムだった。しかし履修生のバックグラウンドが異なるなか講師の先生方がわかりやすい講義を行っていただけたため、ハードではあったが実りある半年となった。また座学だけでは無く介護や医療の現場に見学に行く実習が有り、知識を記号として暗記するだけでは無く、生きた体験として学ぶ事ができた。今後は自身の研究に本年度得た知識や体験を生かしていく予定である。

左からポシブル高の原、京大病院、特別養護施設本能　写真は各HPから引用

■平成25年度研究テーマに関して

研究テーマである「生分解性高分子を用いた細胞による三次元構造の作製」の進捗状況について述べる。概要として、iPS細胞などの多能性幹細胞を用いた再生医療研究は現在国策として強力に進められている。特に細胞を体内に移植する細胞治療は糖尿病を含む様々な疾患に対して根本的な治療法となると考えられておりその研究が進められている。しかしながら細胞は単体ではその機能を発揮する事ができない事が知られており、機能を発揮する為には細胞が生体内で存在する環境を再現する必要があることが知られている。従って細胞を生体組織を模倣し三次元上に配列、成形しその後培養する技術の確立が望まれており、このようにして成形された細胞三次元構造は機能を持った移植用生体組織として用いる事ができる。本研究ではこのような細胞による三次元構造の作製の為の技術として、生分解性の高分子であるポリ乳酸を用いて、その表面に単鎖DNAを固定化し、あらかじめ細胞表面に修飾しておいた相補的な単鎖DNAと反応させる事でDNAハイブリダイゼーションを起こし、細胞をポリ乳酸基板表面に接着させる事を目標として研究を行った。本研究では他の細胞接着法である、静電相互作用や共有結合法と比べ細胞に与える影響が少ないばかりか、反応を単鎖DNAによる分子認識能でコントロールできる為、複数のペアを用意することで狙った場所に狙った細胞だけを接着する事が可能になる。本実験では2組の単鎖DNAを用いてポリ乳酸基板に対して細胞の接着を行い、それぞれを狙った場所に接着する事ができ、また接着後培養可能であることが示された。今後は三次元プリンターを活用することで3次元構造に対しての細胞の接着及び、それにより作製される三次元細胞構造のバイオマテリアルとしての性能を試験していく予定である。



2種類の細胞を繊維ごとに選択的に接着させた図(a)、3Dプリンターを用いたポリ乳酸三次元構造のイメージ図(b)、ポリ乳酸三次元構造体に細胞を播種することで作製する人工血管のイメージ図

Department of Polymer Chemistry Ken Murao

LIMS ANNUAL REPORT 2013

This Annual Report covers the period from September 1, 2013, to march 31, 2014.

Purpose：My research theme has been developing novel imaging methods using pulsed laser sources and it is necessary for me to know the imaging modalities used in clinical practice. Thus I have been extending my knowledge of such modalities as ultrasound, MRI, PET and X-ray CT by taking lectures as follows.

① Diagnostic Pathology
② Radiology
③ MRI introduction

Methods：Taking lectures, Asking the developers

Results：

・ultrasonic diagnostic equipment

超音波画像診断装置は、時と場所を選ばず使用することができる。
プローブをかえることで心臓や腹内臓器等の様々な臓器の断面を撮像することができる。
ある程度強い超音波が生体組織を伝播すると、生体組織に損傷を引き起こすことがわかってきているが、超音波での撮像はこのエネルギーの数百分の 1 で可能なため、生殖細胞に影響を与えることはないと考えられている。
超音波は骨や空気を通過しないため、骨の裏側は撮像することができない。また手技依存があり、これを解消するには感覚的なものをどう定量化するかが課題となっている。

・X-ray CT

時間分解能、空間分解能が高いため、カテーテル治療でも用いられている。また検査音が静かであるので、緊急時の対応がしやすく子どもでも容易に用いることができる。また体内に金属がある方にも使用することができる。しかし、X 線被爆があることや、骨や空気によるアーチフェクトを受けやすく、軟部組織のコントラストが MRI に比べて劣る。
また治療の際の X 線の被爆線量が決められていないことは問題だと思われる。

・MRI

X 線と比較すると、被爆がない点は大きな利点である。また組織のコントラストが高く任意の方向の断面像を得ることができる。しかし MRI は強磁場を用いているので、漏洩磁界をさけるための特定のスペースが必要である。また強磁性の金属があると吸い込まれる危険があり、MRI 室内の金属は全て非磁性体でなければならない。また検査音が大きく、空間

分解能が低い上、動きに弱いため、子どもに対してはやや扱いが難しい。また金属インプラントを埋め込んだ患者、ペースメーカー使用者には用いることができない。

	Merit	Demerit
Ultrasound	safety anytime, anywhere available in various organs	unable to penetrate bone or air procedure dependence
X-ray CT	high time, spacial resolution	radiation exposure cause artifatcs by bone and air lower contrast in soft tissue than MRI
MRI	safety high contrast in tissues	low time, spacial resolution unavailable for pacemaker users need large space noisy

self-evaluation：

講義・実習を通して超音波、X 線 CT、MRI に関して以上のような基本的な知識を得ることができた。個人的には以下の点が気になった。

X 線は被曝すること、被曝線量が決まっていないことが問題となっている。X 線は治療法としてはこれからも存続していくと思われるが、福島第一原発事故や、昨今の MRI の目覚しい発展を考えると、イメージングモダリティとしての X 線は今後衰退していくと思われる。

また日本製の診断装置があまり普及していない点も気になった。日本のみならず海外でも普及するよう体格、文化の違い等を考慮すること、また使いやすい解析ソフトを同時に開発することが重要な課題であると思われる。海外企業にシェアを取られないようにするためにも新しいイメージングモダリティの開発と解析ソフトの両方を同時に開発し、パッケージ化をすることが重要だと思われる。

講義、実習、関連するモダリティの文献調査、また必要であれば自ら企業等の訪問を行うことで以上の不十分な点を補う。

The First Year of LIMS Program

Graduate school of Engineering,
Takuto Suito

In this year, as a first grade of LIMS program, I learned many things through the program and I'm sure this year became a year of progress to think my future carrier.

At first, I learned the present situation of an aging society. In Japan, “super” aging society has come and there are many problems. As the average lifespan increase, the population of aging people and the number of people who has age-related disease increases. In addition, the progress of medicine has made more diseases curable; however more people become bedridden or required an assistant because of aftereffects of the disease. In order to solve the problem, it is very important to extend not simple life expectancy but extend “healthy” life expectancy.

We visited nursing home and care facility for aged people as the LIMS curriculum. Many aged people and also their families mentally and financially go through a lot. I feel that extending healthy life expectancy is not only medical problem but also social problem to be solved.

Medical classes were also interesting for me. I have had engineering curriculums from undergraduate student. So, I have never learned medicine. For example, in the physiology class, I learned nerve systems or circulatory systems which need to know in order to understand human systems. In the medical chemistry class, we take a same class with medical student and I learned mechanisms of several important diseases. The most impressive class was visiting the University Hospital and watch operations or rehabilitations. When I see them at the first hand, I feel that it is our mission to develop the treatment method as soon as possible

The class of Medical Engineering for Society was also interesting. In this class, lecture was invited from company and talked about what is required to develop new products. I learned that quickness of action and cooperation among industry, government and university are important to develop the products quickly and compete with foreign companies. I’m sure that life science industry will be a key

industry of Japan. I want to acquire knowledge and practical skills in order to lead Japanese life science research.

Next, as my research theme, I'm now studying about thermoregulatory systems and their relation of commensal bacteria using fruit fly, *Drosophila melanogaster*. For all organisms, it is essential to control their body temperature in order to maintain their homeostasis. Our group found that thermoregulation of fly changes by the existence of commensal bacteria. Now, I attempt to search what kinds of microbes are related to the change.

Host-microbes relationship which affect to the human health is now attracting a great deal of attention. Recently, NIH committed $140 million to the Human Microbiome Project (HMP) and other worldwide consortiums were also established to search the microbiome. There are trillions of microbes in human's gut; this is called "microbiome". The emergence of next-generation DNA sequencer made us analyze the DNA of microbiome easily and other biological methods enable us to survey how bacteria affect to the host.

My research goal is to elucidate the molecular mechanism of host-microbes relationship which affects to the host's physiological system. In future, I also want to search several microbes which related to the human health, for example, longevity or human health.

Finally, I had great experience through LIMS program. I could learn many things through communicating with other program students, teachers and lectures in different fields of study, and I felt I could make tie with them.

I and LIMS program have only just begun. I want to learn more and make an effort toward the future.

Progress Report

Kazuma YAMAGUCHI
Graduate school of Engineering, Kyoto University
2014.03.24

Object

Neurodegenerative disorders are one of the most serious worldwide problems in our aging, aged or highly aged societies because the onsets of these disorders are mostly late and these are progressive. Specific neurons die and patients lose some abilities, for example, hippocampus degrades in Alzheimer's disease and patients lost their ability to memorize or locus niger (substantia nigra) of midbrain degrades in Parkinson's disease and then dopamine secretion from neurons decrease. In these neurodegenerative disorders, there is Spinocerebellar Degeneration (SCD), a generic name of diseases expressing the ataxia as a main symptom. Now, the effective ways to cure these disorders are not established because of the complex molecular mechanisms of onsets. In 1976, Ministry of Health, Labor and Welfare in Japan authorized SCD as "specified rare and intractable disease". There are over 30,000 SCD patients in Japan, and 10,000 are hereditary. Comparing to Europe or America, the proportion of autosomal dominant SCD patients is high.

Autosomal dominant SCD is called Spinocerebellar Ataxia (SCA), and same as other neurodegenerative disorders, SCAs are progressive and the genetic anticipation (increase the severity and decrease in the age of onset with successive generations of pedigree) was observed in some of them. Cerebellar, brain stem and spinal cord slowly degrade in SCA patients. By the genomic analysis, SCAs are classified and named from type 1 (SCA1) and in 2013 the new type of SCA was reported (SCA37).

But the numbering of SCAs is not complete: It is said that SCA 9 and 24 is vacant, and some of their causative genes are overlapped on genome and the more detailed researches are needed. Not only the incomplete naming, the molecular mechanisms of onset of SCAs are not also revealed. Because there is no way to cure and these are late onset and progressive disease in highly aged society, we have many problems with SCAs. But there are some reports suggesting that the rehabilitation is effective to delay the progress of ataxia.

To clear the information and confirm the effects of the rehabilitation, I set two themes in training program of Leaders for Integrated Medical System (LIMS program).

Themes of research in LIMS program

1) Molecular pathological study of spinocerebellar ataxia.
2) Nursing care and rehabilitation for patients with spinocerebellar ataxia.

Results of study

At first, I study about foundation of SCAs in Japan.

The sum of patients with SCDs is about 30,000. A third of total SCDs patients (10,000 people) are hereditary. In hereditary patients, firstly SCA3 is the most (one fourth), SCA6 (one fourth), SCA31, DRPLA (Dentatorubral pallidoluysian Atrophy), SCA1, SCA2 and other SCAs (7, 8, 17, 36). But the cause of residual hereditary SCDs (one third) remains unknown.

Second, with Dr. Yamashita's cooperation, I could get an appointment to see two patients, one suffers SCA6 another suffers SCA36. Then I studied from SCA6 and SCA36.

SCA6

In 1997, one causative gene of the cerebellar ataxia was detected and that ataxia was named SCA6, and this ataxia expresses pure cerebellar ataxia with the progressive degradation of cerebellar. The causative gene is CACNA1A that found in 1991 and codes alpha 1A subunit of the voltage-dependent calcium channel. The expansion of poly-CAG repeat region was detected in SCA6 patients and this CAG repeat, which exits in exon 47, is translated to poly-glutamine chain, therefore SCA6 classified to poly-Q disease. Normal number of CAG repeats is 19 or less, but SCA6 patients have more than 20 and more CAG repeats. Generally to say, the aggregation of poly-Q chain is cause of poly-Q diseases. But the detail of the molecular mechanism of SCA6 onset remains unknown and there is no effective cure. There are many reports about the relationships between the length of poly-Q and the age of onset but the number of the experimental subjects are not so much in these reports. Then I summarized the results of five reports and made a figure (Fig. 1). As it is said generally, the inversely correlation was obtained. (N = 156)

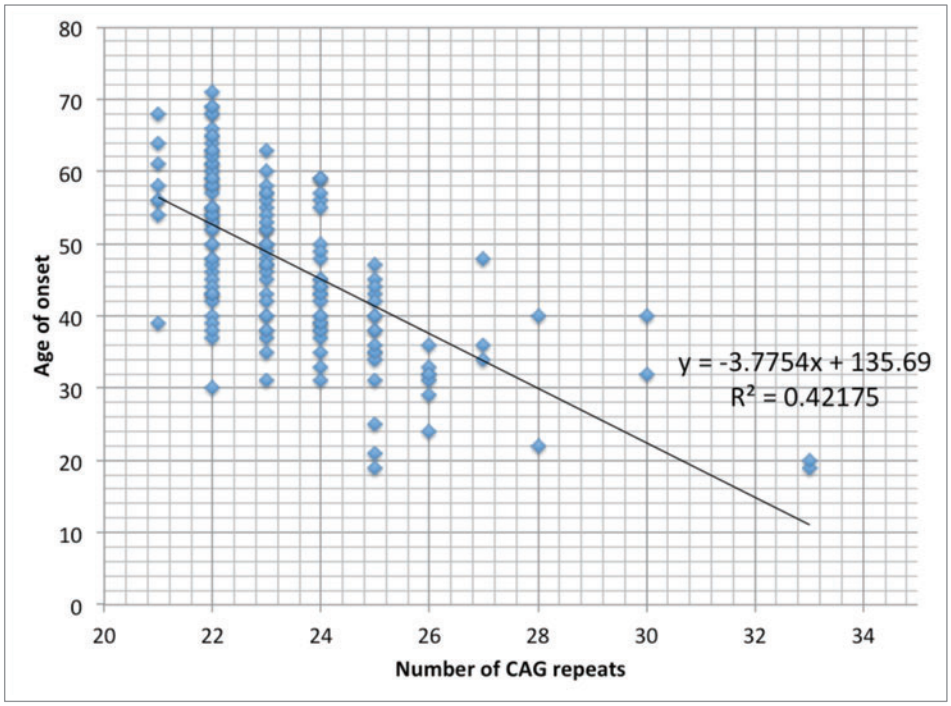


Figure 1. The relationships between the number of CAG repeats and the age of onset. (N = 156)

SCA36

In 2011, the causative gene of new SCA was detected and that is SCA36. SCA36 is spinocerebellar ataxia with the motor neuron degradation especially atrophy of tongue and tongue neuronal fiber and amyotrophy of limbs. The causative gene is NOP56, which codes Nucleolar Protein 56 (NP56), and the 6 bases, GGCCTG, repeat in intron 1 expands in SCA36 patients. Normally the number of repeat is under 14, SCA36 patients have much longer repeat region, from 1700 to 2300. This NP56 is important for the assembly of 60S ribosome, but there is no report that suggests detailed molecular mechanism.

The story heard from the SCA patients

SCA6

1. Information of the patient

Age : 51 years old

Gender : female

Onset : about 10 years ago

2. About onset

Suffering sporadic deafness, she went to hospital. In second hospital the doctor took the MRI image covering the cerebellar by chance, and he noticed little degradation started. When she heard she was the cerebellar ataxia, she realized that she suffered the same disease with her father. Her father has 5 brothers and sisters, his younger sister and he suffered SCA6 in the brothers and sisters.

3. About symptom

She feels the very slow progress of the disease: it is like that I could do this motion more smooth a few years ago. In daily life, when talking, the words sometimes don't come out, maybe because the muscle of throat doesn't work. She totters when she stands on one leg, for example when wearing the shoes or when she just finishes swinging the golf club. She feels bad when her spit chokes her. Although now choking occurs with low frequency, because she has taken care of her suffered father and she is female, she hates choking especially at meal.

4. About family

Father and his younger sister (aunt) suffer SCA6. The progress of aunt might be earlier and the symptom might be heavier than those of father.

5. About exercise

She goes to golf sometimes, swims once in a week and runs or brisk walking about 30 minutes everyday using room-runner.

6. About medicine (drug)

Although she knows the drug for SCDs (Ceredist) exists, because generally to say the effect of Ceredist is vague, and because the progress of disease is very slow, she doesn't think to take the Ceredist.

7. About the basic research

Because her disease's progress is very slow and she doesn't think so seriously, she doesn't study about SCA6 and doesn't know any of SCA6 or other diseases. But she thinks the basic research is great.

8. Consideration and impression talking with SCA6 patient

In spite of being 10 years, there is no unnatural motion or movement. Although she said the words don't come out, the conversation with Dr. or me was very smooth. And Nose Finger Nose test was done, but there is no strange point. I couldn't distinguish her from healthy people. But she said that her father's symptom was dramatically worse when he had entered hospital a week and come back home. Furthermore, her aunt used a stick and her symptom was worse than father. In addition, there are the reports that suggest the usefulness of

rehabilitation. From these testimonies, there is the possibility that the progress of this disease can be delayed by the exercise. Conversely, disuse of the cerebellar function may cause the rapid progress.

SCA36

1. Information of the patient

Age : 61 years old

Gender : male

Onset : about 25 years ago

2. About onset

When he was 35 years old, sometimes he couldn't sing song well. One day he went to fishing and walk on tetrapod, he felt scary. When he was 42 years old, walking the way back, he couldn't walk straight. After that, his colleague said him that his way to drink a coffee is strange. Furthermore, he couldn't talk at all in his job, then he decides to go to hospital.

3. About symptom

He cannot walk by himself and he uses the electric wheelchair. He always trembles. This is one of the characteristics of the cerebellar ataxia. When he was directed to walk by his legs, he opened the legs widely and used a desk to support his body. Dysarthria, deafness and atrophy of tongue were observed and he cannot move his eyes successively. Nose Finger Nose test was dangerous for him.

When he is sitting on the chair which doesn't have a back or on the floor, he sometimes falls on his back unconsciously. Recently he bought a "Kotatsu", but he felt more difficult to walk and to use the spoon than before he uses the Kotatsu. And he stopped using it. And he goes to the care facility three days in every month, but when he comes back from short stay, he felt much more difficult to walk than before.

4. About family

In the relatives of his mother, there are some people who show ataxia. He has one daughter and one son, and he worried whether they suffer SCA36 or not.

5. About exercise

Everyday, he soaks in bath by himself. The rehabilitation is twice in a week and once 2 hour (physical therapy (PT) only).

6. About medicine (drug)

Although he takes the Ceredist, but he has not realized the effect of that drug, therefore he doesn't trust that drug.

7. About the basic research

Maybe he studied hard about SCDs using Internet. But he doesn't have the any technical knowledge, and then he couldn't understand the information completely. He is very smart and earnest, and he faced with the disease. He said that, for his children or grandchildren, he could give his body for the experiments for elucidating the mechanism of this disease or developing the cure.

8. Consideration and impression talking with SCA6 patient

Regardless of his serious symptom, he faced with his disease and he try hard to move by himself as possible. This is one of the most difficult problems of hereditary diseases: he worried about his son because the wife of his son doesn't want to produce their children for fear that their children have possibility to be suffered by this disease. Now there is no cure, then we can only pray to the children don't inherit the mutated allele. But I felt the feeling of patients and know directly that there are many people who expect the cure, therefore I think I have to do my best. As same as the SCA6 patient, he said that after he came back from hospital or short-stay, he felt more difficult to move than before.

Consideration and hypothesis

There are many reports which suggest the effect of rehabilitation. And two patients, her father and aunt showed the possibility that rehabilitation is effective to the SCAs. Most of SCAs show slow progress and the death of neurons may be also slow. If the neurons in SCAs are between life and death and the proportion of death is little higher than life, and if the activated neurons don't die, we can help the dying neurons by rehabilitation or the drugs which activate neurons.

Future plan

1. Studying about other SCAs
2. Confirmation of the effect of rehabilitation

Cooperation

1. Yasuo Mori, Graduate school of Engineering, Kyoto University.
2. Ryosuke Takahashi, Graduate School of Medicine, Kyoto University
3. Hirofumi Yamashita, Graduate School of Medicine, Kyoto University
4. Naoko Inaba, Graduate School of Medicine, Kyoto University
5. Christian Altmann, Center for the Promotion of Interdisciplinary Education and Research, Kyoto University

Reference

1. Autosomal dominant cerebellar ataxia (SCA6) associated with small polyglutamine expansions in the alpha 1A-voltage-dependent calcium channel. Olga Zhuchenko et al. *Nature genetics* (1997)
2. Primary structure and functional expression from complementary DNA of a brain calcium channel. Yasuo Mori et al. *Nature* (1991).
3. Zenjiro Matsuyama et al. *Human Molecular Genetics* (1997).
4. Olaf Riess et al. *Human Molecular Genetics* (1997).
5. K Ishikawa et al. *Am. J. Hum. Genet.* (1997).
6. I Yabe et al. *Journal of Neurological Science* (1998).
7. Y Nagai et al. *Journal of Neurological Science* (1998).
8. Expansion of intronic GGCCTG hexanucleotide repeat in NOP56 causes SCA36, a type of spinocerebellar ataxia accompanied by motor neuron involvement. H Kobayashi et al. *The American Journal of Human Genetics* (2011)
9. Classification of ataxia (from National Ataxia Foundation)
10. http://www.nanbyou.or.jp/entry/284 Japan Intractable Diseases Information Center

The Congress Report

—The 37th Annual Meeting of Japan Society for High Brain Dysfunction—

Atsuko Ishida, M1, Human Health Science Course

Theme: The apathy caused by organic brain disease
Date: November 29-30, 2013
Place: Shimane, Japan

<Summary>

The program of the congress consisted of the Special Lecture, the President Lecture, seven educational lectures, a symposium, two workshops, oral presentations, and poster presentations. The jobs of attendances were various. I met the doctors, rehabilitation staffs, nurses, clinical psychologists, care workers, and the government officer.

<Impressions>

I joined this congress because the elderly who are suffered from dementia or mild cognitive impairment live in local community, and they and their caregivers need the way to live there more comfortably. There were many themes about dementia in presentations. One session was about the mechanism of dementia and BPSD, while another session was about the rehabilitation for prevention of dementia. They were meaningful for me.

Particularly I was interested in the use of IT devises for training to improve patients' cognitive function. One of these IT devises sessions was that the iPad applications were very useful to diagnose people who were wondered suffering cognitive disorder or not. For example, there is general game application that is needed to select more safe place among 25 squares while rocks accesses from several directs. This game's score reflects player's judge ability. In addition, the application for promotion of children's language ability is very useful for language training of semantic dementia patients. These are almost the free applications, and everyone can use when they need.

Because I want to develop the screening devise which can predict the fall risk of dwelling elderly, IT sessions were good references for my research, I think. And I learned the devise which is easy to use and everyone can use is needed.

The Congress Report

—The 3rd Japan Emotional Society—

Atsuko Ishida, M1, Human Health Science Course

Theme: Search for Emotion
Date: December 7, 2013
Place: Inamori Foundation Memorial Hall, Kyoto, Japan

<Summary>
The program of the congress consisted of a symposium and two oral presentation sessions. I presented my research on emotional brain. The symposium contained various kind of emotional topics. For example, monkey's emotional behavior, the emotional growth of little children, emotion's expression used the robots, and emotional education.

<Impressions>
My research was to compare the score of second emotions which used previous study in Brazil, and to measure participants' cerebral blood flow on functional near-infrared spectroscopy (fNIRS). I couldn't gain the clearly result because participants were too few. After I finished my presentation, I got some advices and thought that this research should continue until the something new were found.

In the symposium, there were many kind of lectures like above. I was interested in relation between depression and attachment. There is two styles in attachment, stable or not. The depression is also classified four types, melancholy, dysthymia, bipolar disorder, and borderline person disorder (BPD). The melancholy and bipolar disorder are attachment type, and the rest are non attachment type. If people's attachment type are not stable, they tend to restrain the emotion or to exacerbate negative emotion. Recently, the attachment in family is decreasing. This may be going to cause the increasing of mental disorder of non-attachment type depression like dysthymia or BPD. We don't have to try medication but should do our best to repair the way of attachment in patients' family and their surroundings.

I agreed the lecture a lot, and thought that I should adopt this type of mental state in my research.

The Congress Report

—International Neuropsychological Society 42nd Annual Meeting—

Atsuko Ishida, M1, Human Health Science Course

Theme: Translating Evidence into Practice
Date: February 12-15, 2014
Place: Seattle Washington, USA

<Summary>
The program of the congress consisted of Symposiums, Workshops, Paper sessions and Poster sessions.

<Findings>
There were many kinds of research about Neuropsychology. Participating in this congress widens my point of view. I was interested in various themes. I had thought that Neuropsychology is a discipline of adult cerebrovascular accident (CVA) patients. However, presentation of CVA patients were a part of this congress, and in addition to this, I found other subjects, for example, traumatic brain injury in children, executive function of preschool children, cancer, Attention Deficit Hyperactivity Disorder, HIV/AIDS, autism, depression, schizophrenia, and so on. In particular I didn't know the cognitive disorder of cancer and HIV.

<Poster presentation>
I presented my research in poster session on 15, February. In doctor's course, I want to develop the useful devise which can measure elderly's safety of dwelling life. In this congress, I presented conventional stage of research. I tried to clarify the relationships between finger acceleration in writing tasks and results of several cognitive measures. Elderly participants conducted writing tasks attaching "HapLog" which can measure finger acceleration. Then, they responded on Mini-Mental State Examination, Frontal Assessment Battery and Trail Making Test. For analysis, we used Spearman's correlation coefficient. In the result, finger acceleration had good correlation with some cognitive tasks.

Health professionals and researchers who watched our poster asked me some questions. I heard that one professor researched "writing tasks" which we had used in the experiment, and he was interested in task potential. Because "HapLog" was unfamiliar with comers, I had to explain this devises. Analysis of my research was dependent on computer calculator, so I found the difficulty of explaining analysis method.

There were some similar themes which address to develop cognitive measurement devise in congress. So, it was useful for me to attend this congress. However, I'm trying to develop multiple devise to assess not only cognitive function but also physical, mental function. It needs to attend congress of other region to know how to measure physical or mental function used devises.

9.

広　報

Public Relation

10.

産官(公)学連携

Industry-Public-Academia Cooperation

充実した健康長寿社会を築く総合医療開発リーダー育成プログラム

第一回シンポジウム

京都大学「充実した健康長寿社会を築く総合医療開発リーダー育成プログラム」では、実施開始に際し、京都大学医学部構内で公開シンポジウムを開催した。学生はじめ、学内外より96名が参加した。

公開シンポジウム概要

2013 年 2 月 12 日（火）（FY2012）

開催場所	京都大学医学部構内 芝蘭会館（稲盛ホール）
参 加 費	無 料
申し込み	申し込み不要
事前登録	シンポジウムのホームページから事前登録
問い合わせ先	健康長寿社会の総合医療開発ユニット事務室 info@lims.kyoto-u.ac.jp

プログラム

13:00 – 13:15
松本紘・京都大学総長
開会挨拶「プログラムの全学的取り組みについて」

13:15 – 13:30
湊長博・医学研究科長・プログラム責任者
「プログラム・シンポジウム趣旨説明」

13:30 – 14:00
福山秀直・医学研究科教授・プログラムコーディネーター
「プログラム概要説明」

14:00 – 14:15
京藤倫久様 日本学術振興会 監事
「京大プログラムに期待すること」

14:15 – 14:45
田井一郎様 （株）東芝 常任顧問
「未来日本を担う皆様へ」

14:45 – 15:00 休 憩

15:00 – 15:30
志賀利一様 オムロンヘルスケア（株）技術専門職
「健康・医療機器開発の現状と今後の研究開発への期待」

15:30 – 16:00
山脇昇様 京セラメディカル（株）研究技術調査部・部長（フェロー）
「医療機器の開発に携わる人材について ～人工関節屋の私見～」

16:00 – 16:30
野村剛様 パナソニック（株） 常務役員 モノづくり本部長
「パナソニックの医療・介護ロボットの取り組み」

16:30 – 16:45
白須正様 京都市 産業観光局長
「閉会にあたって」

16:45 – 17:00
小寺秀俊・理事
閉会挨拶

京都大学
充実した健康長寿社会を築く
総合医療開発リーダー育成プログラム

Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

［学生募集予定人数］20名／年
［現在の学生数］平成25年度から募集予定
［修了者見込み数］20名／年
［プログラム担当者数］69名
京都大学69名
［参画研究科・専攻等］3研究科・10専攻
〈医学研究科〉医科学、人間健康科学系
〈工学研究科〉機械理工学、マイクロエンジニアリング、材料化学、分子工学、高分子化学、合成・生物化学、化学工学
〈薬学研究科〉医薬創成情報科学
［プログラムコーディネーター］
福山　秀直（大学院医学研究科
脳機能計測学　教授）

真に医学・医療が分かる医工学人材の育成

本プログラムでは、工学系学生に医学部卒業生に匹敵する医学・医療知識を教育し、「真に医学・医療が分かる」医工学人材を育成します。また、医療支援現場の実習や医療倫理学を通じて、利用者にとって負担の少ない「高齢者に優しい」機器・システムを開発するセンスを養います。さらに、単なる医工学知識のみならず医療経済学・許認可制度にも通暁し、機器・システムの産業化・市場の予測をできる能力を身に着けるほか、国際標準化の感性や、英語による卓越したコミュニケーション能力を備え、国際機関などでも活躍できる人材を育成します。

超高齢化社会の日本モデル
――医学に蓄えられた知識を多分野に発展させるリーダー

日本は世界に先駆けて超高齢化社会を迎え、医療と福祉の統合により地域の中で個々人の生活を支える総合医療システムの構築と、後続諸外国にそのグローバルモデルを提示する責務があります。この日本で、健康寿命が世界最長であるという背景を活かし、高齢者が自立して社会参加するのに適した社会システムや新産業を創出できる人材を育成します。そしてこの“日本モデル”を先達として超高齢化社会の諸問題を俯瞰し、メディカルイノベーションを通じて、充実した健康長寿社会の構築に貢献しうる総合医療開発リーダーを育成します。

総合医療と新たな医療産業

高齢者が出来るだけ自立して社会参加できる、住環境・移動通信・医療介護などにわたる社会システムを構築する際には医工学の背景に基づいて関連アイデアや情報を創案・流通・推進する能力が求められます。本プログラムにて育成された人材は高齢者の価値観・生活様式や加齢医学、医療倫理、広範な社会情勢を理解する能力、産業界や公的・国際機関での情報統合・立案に関する実践的研究を通じた俯瞰力と遂行能力を備え、これからの超高齢化社会における新たな医療産業を牽引するリーダーとしての活躍が期待されます。

プログラムの特色

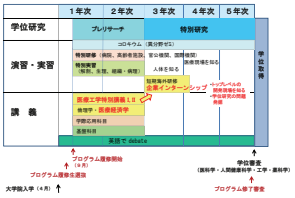
・人体解剖、生理、組織・病理の特別実習を行うなど理工学系出身者が医学部卒業生に匹敵する基礎医学と生体知識を習得します。

医学部構内にある本プログラム専用スペース

総合医療と新たな医療産業

・病院・高齢者施設、官公機関、国際機関などでの特別研修を行い医療・介護支援などの現場のニーズを理解する一方で医療政策、医療経済、医療倫理、知財管理など社会における医療ルールを理解します。
・企業・国内外研究機関による実践的学修とインターンシップにより、卒業後の即戦力として産官学界で活躍できるリーダーを育てます。
・もちろん、これまで京都大学が培った専門性の高い医工学の知識、技術を習得していただきます。

学位プログラム履修モデル



総合医療開発リーダー
――その人物像とキャリアパス

このプログラムで養成される総合医療開発リーダーの人物像は以下のとおりです。
・先進医療分野の革新的人物として医学・医療の広範な知識、高度な工学技術を駆使して高齢者に優しい医療支援機器システムの立案ができる。
・高齢者特有のニーズを理解し、自立した生活や社会参加の向上方法を創案できる。
・高齢化社会の医療経済問題を深く理解し、プロアクティブに対応できる。
・世界標準を目指す医療産業を創出できる。

産業界においては新しいサービスやビジネスモデルを創出し、高齢者の生活全般を支援するシステムの整備を牽引します。大学・研究所では医・理工学界に埋もれている斬新な知恵を、日常生活に活用する土壌を開拓し、また、起業支援のためのインキュベーションセンターでの活躍も期待されます。政府機関に入って活力をもって生活できる社会に向けた施策を立案し、産学における研究開発の成果を迅速に社会実装する体制の整備に尽力するすがたや、国際機関で先端的な医療・介護支援システムの普及促進や質の高い日本モデルをもって健康長寿社会の拡充に貢献するキャリアも、視野に入ります。

CLOSE UP

医学部卒業生に匹敵する医学・医療知識を持つ医工学系人材の育成

人体解剖学講義・実習

■学習目標
人体の構造を系統的に学ぶことで、医療機器開発など応用研究の基礎となる、人体の機能と構造の連関を考察します。
■授業概要
医療機器開発など携わる技術者は、人体の機能と構造の連関を知ることが必要です。本演習では人体解剖学について基本的な事柄から講義します。さらに、座学のみならず実際に医学部生が実習をする傍らで遺体に接し、座学で学んだ解剖・生理の知識と照らし合わせながら系統解剖を体験（見学）します。またバーチャル画像や樹脂模型を使って、立体的に人体の構造を学習します。実習における安全性の確保、実習手順についての細かな指導のために知識・経験の豊富な教員がインタラクティブに指導します。
■内容
解剖学序論・解剖学用語概説、運動器・神経系、頭頸部・画像診断、心臓の外科的解剖学、呼吸器系、食道・胃、肝臓・胆道、小腸・大腸、骨盤と骨盤内臓器、脳・感覚器

VOICE

金子　武嗣
医学研究科（高次脳形態学）
教授

研究領域の紹介

高次脳形態学では中枢神経系の神経回路のデザインを明らかにして、脳の作動原理を究明することを目的にしています。具体的には組織学（免疫組織学・in situ hybridization histochemistry）・電子顕微鏡・電気生理学・遺伝子工学等の技術を用いて、げっ歯類の大脳皮質を中心として視床・基底核・小脳を含めた神経回路を研究対象としています。工学的なニューラルネットのシミュレーション研究も対象になっています。

大嶋　正裕
工学研究科化学工学専攻
（材料プロセス工学）
教授

学生へのメッセージ

日本のロボット工学は世界最先端なのに、なぜ医療用ロボットには外国製のダビンチしかないのか？人工臓器はどうしてもっと小型化できないのか？現在の日本の工学はもっと医療の世界に貢献できるはずです。このプログラムは、工学の学生がより深く医療の現場を学べ、ニーズを知ることができるようになっています。工学と医学が融合した分野に飛び込み、将来いろいろな新しい医工学フィールドを作る人材が数多く生まれることを楽しみにしています。

荒井　秀典
医学研究科人間健康科学系専攻
（近未来システム・技術創造部門）
教授

研究紹介

加齢医学の講義を担当します。今後ますます少子高齢化が進み、やがて国民の4人に1人が75歳以上の高齢者となるわが国において、安心して生活ができる社会を構築するには、老年医学・老年学の研究が重要です。なかでも脳卒中、心筋梗塞などとともに認知症や虚弱の予防が重要課題であり、地域において多職種連携による包括的な予防のための研究を実施するとともに、医工連携により、高齢者の健康増進・安全管理につながる機器開発を行っています。

ホームページについて

意欲ある学生確保を目的としてプログラムの内容を周知すべく、平成25年2月3日にホームページ(http://www.lims.kyoto-u.ac.jp/)を開設した（図1）。

ホームページでは、プログラムの特徴について紹介するとともに、プログラムコーディネータからのことばや「社会からの期待」として、出口となる機器メーカーや官僚 OB、海外の研究者からのメッセージを掲載して学生へプログラムの魅力をアピールしている（図2）。また、外部でのプログラム紹介等、実施予定事項を随時告知している。

また、カリキュラム紹介、履修生募集ページでは、ポンチ絵を用いたプログラム概要の説明、履修モデル、選抜スケジュールを示すことにより、プログラム履修を目指す学生（外国からの受験生を含む）に対してその意欲を高めることができるように、わかりやすく具体的な履修内容、インターンシップなどの個人で挑戦が可能な内容、あるいは奨励金制度について紹介している（図3）。

今年度の履修生募集では追加募集が必要であった状況を鑑みて、今後、現履修生の意見も踏まえながら、より学生への周知を図るべく大学ホームページへの告知依頼や履修に関わる Q&A ページの作成、また出口としての人物像が明確になるような紹介ページ作成を行う予定である。

図１．LIMSプログラムトップページ

図２．「社会からの期待」ページ

図３．「カリキュラムの概要」ページ

The homepage for introduction of our program (http://www.lims.kyoto-u.ac.jp/?lang=en) has been launched from February 3rd, 2013 under the object tomotivate more students for the admission application (Figure 1).

Figure 1. Top page of the program

Through the whole pages, bilingual contents in Japanese and English are sequentially corresponded because the application procedure is introduced also for the superior students abroad.

The homepage contents are including an introduction of program outline and messages which are from the program coordinator, researchers in equipment manufacturer, former bureaucrats, and researchers in abroad as “Expectation from the society”. These contents would make our program much attractive for the applicants. Also a future plan of the public presentation about our program has been posted at any time.

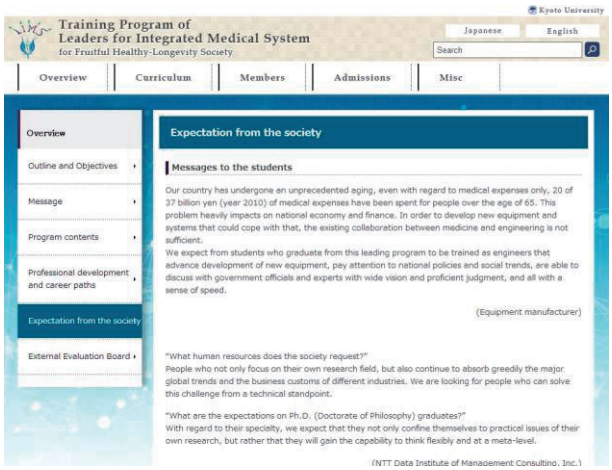


Figure 2. “Expectation from the society” page

In “Curriculum” and “Admission” pages, curriculum overview, course structure, and application schedule are described by using schematic illustrations. We hope that these contents would encourage motivation of applicants from both inside and outside Japan. In addition, the pages include introduction about the concrete contents of all courses, personally-challengeable program like internship, and financial support system (Figure 3).

Figure 3. “Curriculum overview” page

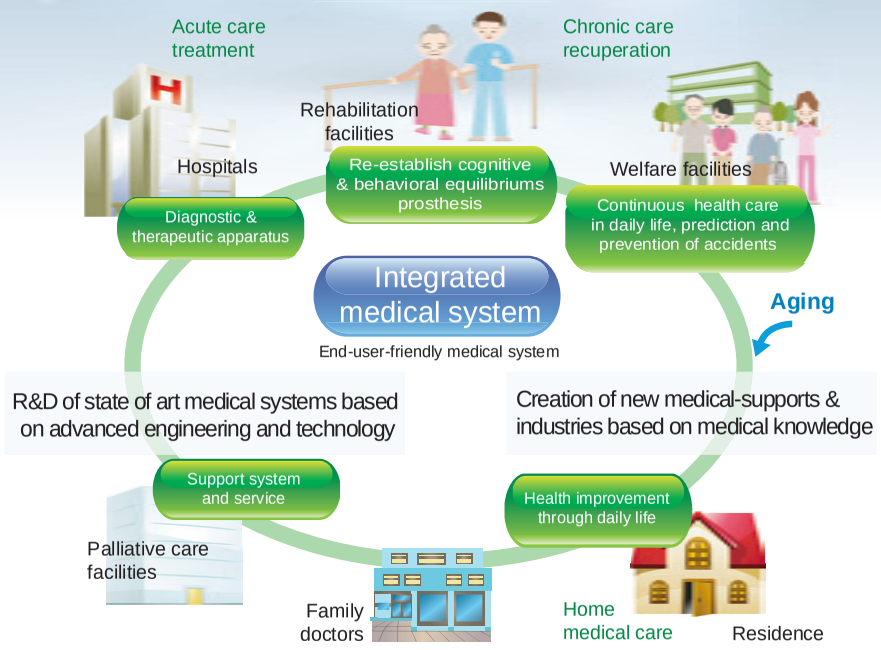
From the consequent result of past application in 2013, in which extra application period had been scheduled, further improvement of the homepage will be designed in accord with the suggestions from already admitted students, to inform our program much wide-spreading. For example, recruitment in main page of Kyoto University, new FAQ page, and introduction page about the expected personality after graduation of the program would be prepared.

Program for Leading Graduate Schools
Ministry of Education, Culture, Sports,
Science and Techonology-JAPAN

Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

Kyoto University

to challenge the unprecedented aging society in the world through medical innovation



Message from the program coordinator

"Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society" : this new project is dedicated to collaborative studies in medico-engineering. Previous attempts of cooperation between specialists from the medical and the engineering fields have often faced major problems compromising success.

Therefore, we have decided to train a new generation of graduate students with an engineering background in the medical sciences and provide them with an insight into the clinical environment and patient long-term care. This will enable our students to understand what kind of research and engineering will be helpful for medical practice within hospitals and by general physicians. The focus of our program is to respond to the challenges of an aging society and to develop new technologies and concepts that support fruitful longevity for all of us.

Furthermore, world-wide propagation of an innovation requires excellent communication skills, so that our students can spread their ideas with strong words and confidence. Our program seeks to hone these skills with training courses in English language debate. Moreover, in our program students will receive training in economics with a focus on medical problems given by specialists in this field. Thus, our students will have the capability to spot innovative opportunities and to develop new research fields in medico-engineering.

We are very keen to accept students with challenging minds to our program and we hope that they will support the aging society of many countries all over the world with new technologies and concepts.

Hidenao Fukuyama, M.D., Ph.D.

Expectation from the society

Our country has undergone an unprecedented aging, even with regard to medical expenses only, 20 of 37 billion yen (year 2010) of medical expenses have been spent for people over the age of 65. This problem heavily impacts on national economy and finance. In order to develop new equipment and systems that could cope with that, the existing collaboration between medicine and engineering is not sufficient.

We expect from students who graduate from this leading program to be trained as engineers that advance development of new equipment, pay attention to national policies and social trends, are able to discuss with government officials and experts with wide vision and proficient judgment, and all with a sense of speed. (Equipment manufacturer)

"What human resources does the society request?"

- People who not only focus on their own research field, but also continue to absorb greedily the major global trends and the business customs of different industries. We are looking for people who can solve this challenge from a technical standpoint.

"What are the expectations on Ph.D. (Doctorate of Philosophy) graduates?"

- With regard to their specialty, we expect that they not only confine themselves to practical issues of their own research, but rather that they will gain the capability to think flexibly and at a meta-level. (NTT Data Institute of Management Consulting, Inc.)

Professional development and career paths

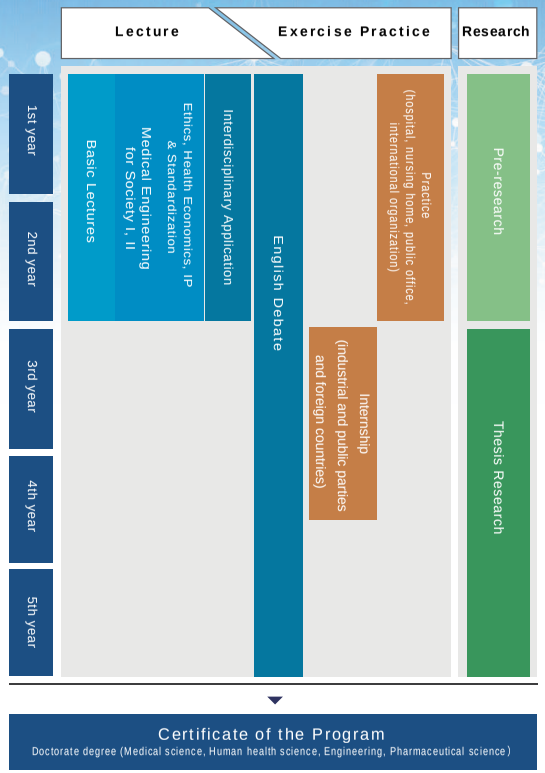
This program's objective is to train leaders in the field of integrated medical systems. Below are some examples of personalities we would like to foster in our program:

- Innovative leaders in the advanced healthcare field, with extensive knowledge of medicine and medical care, advanced engineering technology, and the ability to design medical support equipment systems with the aging society in mind.
- Leaders who understand the specific needs of an aging society, capable of inventing new methods for improving independent living and social participation of the aging people.
- Leaders who deeply understand the health economics problem of an unprecedented aging society and who are able to cope proactively.
- Leaders who are able to create new forms of medical industry with global impact.

This program expects to create and develop high-quality students, and new professions and disciplines that do not yet exist.

- For the industry, to create new services and business models; to coordinate the preparation of support systems based on the consideration of the general life of the aging society.
- In universities and research institutes, to develop and advance the field of normal daily life practices, based on innovations in medicine, science and engineering.
- Venture business
- In government and government organizations, to develop measures that allow the members of our society to lead vivid and fruitful lives; to make efforts to quickly implement the results of research and development from industry-university cooperation to our society.
- In international organizations, to facilitate and disseminate state-of-the-art medical and nursing care support systems and to contribute the Japanese high quality model of a fruitful healthy-longevity society to other countries and regions in the world.

Course structure and Curriculum



▶Through lectures on practical training in human anatomy, physiology, and histopathology, students with non-medical backgrounds such as science, technology or pharmaceutical sciences can gain basic knowledge of medical science and medical care comparable with graduates from the department of medicine.

▶Through special training in hospital, nursing homes, and public and/or international organizations, the students will understand the needs at the practical scenes of medical and health care.

▶The students can benefit from the highly specialized knowledge and skills in medico-engineering accumulated in Kyoto University. Furthermore, they are encouraged to develop executive potential for comprehensive research and development based on the societal needs.

▶The students will gain an understanding of norm in health care, in fields such as health economics, medical ethics, intellectual property and global standardization.

▶Through practical training and internships in domestic and foreign industries, research institutes or universities, students will be endowed with suitable natures for leaders that may, after graduation, facilitate early demonstration and swift maturation of their abilities in professional world of industry, government and academia.

Course list

1 Mechanical Engineering	Mechanics and dynamics, Fundamental; Medical electronics; Basic materials chemistry; Biomaterials; Continuum mechanics; Molecular analysis of life; Image processing basics
2 Pharmaceutical Sciences	Biopharmaceutics
3 Medicine・Biology	Human anatomy; Physiology; Medical chemistry; Gerontology, geriatrics, and aging Science; Stem cell biology
4 Medical Ethics	Medical ethics
5 Mathematical Sciences	Introduction to numerical simulation
6 Health Economics	Health economics; Intellectual property & global standardization
7 Medical Engineerings	Medical engineering for society I, II
8 Interdisciplinary Application	Medical imaging (diagnostic pathology, radiology); Minimally invasive therapeutics; Biomaterials and artificial organs; Medical informatics; Inspection equipment studies Science research equipment; Medical and life support systems
9 English Debate	
10 Internship (industrial and public parties and foreign countries)	
11 Colloquium 12 Pre-research 13 Thesis Research	

2014 Application Schedule

Admission guideline

▶Recruitment requirements

This program performs continuous graduate education over a period of 5 academic years. In order to be enrolled in this program, first, the applicants have to take and pass the entrance exam for master's course of Kyoto University at one of the following graduate schools: Graduate School of Medicine (Medical Science Major, Human Health Science Major), Graduate School of Engineering, and Graduate School of Pharmaceutical Sciences. However, it is not required that the applicants must be graduated from Kyoto University or any of the indicated departments. This program also greatly welcomes students from abroad. People, who are working, can also apply for this program.

▶Enrollment capacity

20 scholarship students/ year.

▶Application procedures

Application period：From October 7 until 5:00 pm October 25, 2013.

Subjects	Date	Place	Result Announcement
(1) English	Submit the official scores of TOEFL, TOEIC or IELTS test by **5:00 pm , November 15, 2013** (Or in person, November 16 at the examination room before the start of mathematics test)	To LIMS Office	November 22
(2) Mathematics	**From 1:00 pm to 4:00 pm, November 16, 2013**	Kyoto University (To be noticed individually)	
(3) AO Selection	Two days during the period from **December 2 to December 7, 2013** (Details will be noticed individually)		Beginning of February, 2014 (estimated)

For more detail, refer to our homepage and Application Guideline 2014

Academic degree

▶**Type**

Students, who meet the eligibility requirements, will be awarded a Ph.D. degree (Medical Science, Human Health Science, Engineering and Pharmaceutical Science Majors). Completion of the "Training program of leaders for integrated medical system for fruitful healthy-longevity society" will be certified.

▶**Award procedure**

Students of LIMS program will defend their Ph.D. thesis individually at their own affiliations (Medical Science, Human Health Science, Engineering and Pharmaceutical Science Majors).

▶**Master's degree**

Master's degree will be awarded after the first two years of the LIMS graduate course, according to the criteria of each affiliation.

Leading program completion review

The program completion will at first be examined by the committee of the Leading program and then approved by the committee of the university.

Implementation sites

▶Desks/Meeting rooms — LIMS Space (Faculty of Medicine Campus)

▶Lecture/Practical training — Graduate Schools, Kyoto University Hospital, Related Medical Facilities, etc.

▶Thesis Research — Laboratories in Kyoto University, Collaborating Companies and Public Institutes

Contact Information

Research and Educational Unit of Leaders for Integrated Medical System (LIMS) Office
Center for the Promotion of Interdiciplinary Education and Research
Kyoto University

E-mail: info@lims.kyoto-u.ac.jp
URL: http://www.lims.kyoto-u.ac.jp/

International student Enrollment - Report 2013

Towards a globalized society, international student recruitment is one of important missions of LIMS program.

In order to recruit international students effectively, we have been trying to build an official connection between LIMS and local universities of each country.
This academic year 2013 we could build a connection with universities in Vietnam and Indonesia.

In May, I and Professor Kayoko Ishii visited 6 universities in Vietnam (3 at Ho Chi Minh City, 1 at Da Nang City and 2 at Hanoi City) to introduce our LIMS program and engage Vietnamese students to join in this program. In November, seizing a chance of attending the "Workshop of medical-dental academic communication – 40th anniversary of diplomatic relationship between Vietnam and Japan" held in Hanoi, I and Professor Ishii again visited another 2 universities (1 at Hanoi, 1 at Ho Chi Minh City) for the same purpose.
The feedback from staffs of universities in Vietnam is that LIMS program (medico-engineering education field) is very an interesting and useful aspect. They will encourage and would like to send their students to our LIMS program. However, there are some difficulties (I will list later) which are needed to be considered and improved on LIMS side (Kyoto University side).
We visited universities in Indonesia in February, 2014.

The visiting of local universities in Vietnam also guided 1 student from Da nang University to come to Kyoto to pursue his wish to join in LIMS program. Unfortunately, this student could not pass the entrance examination for Master course, as the first step of qualification of LIMS.

In comparison with the academic year 2012, the selection procedure of the academic year 2013 has been improved at following points: 1) Program starts since April so that international students can get financial support at the same time of admission to Master course; 2) The second step of qualification has been conducted completely online. However there still are obstacles which should be changed and need us to make efforts to overcome:

- At the first step of qualification, students have to travel to Kyoto for entrance

examination by their own budgets. This is really a very big obstacle for Vietnamese students, where living cost is around 20.000 yen/month/ 1 student.

- Entrance examination at Graduate School of Engineering and Graduate School of Pharmaceutical Science are only conducted in Japanese so that it requires high level of Japanese proficiency for the students. This Japanese language requirement will become a heavy barrier for recruiting international students for LIMS program.

Suggested solutions: perform a complete qualification selection at local universities.

<u>Below is a summary on recruitment strategy, which we are conducting:</u>

1) Approach to build connection with local universities

2) Visit local universities to introduce LIMS program

3) Response to inquiry from international students: help students to find a suitable supervisor with their backgrounds.

4) Entrance examination: assist students on the following matters
   -Application procedure
   -Preparation for an entrance examination of Master course
   -Get a Visa to come to Kyoto for an entrance examination

5) Selection procedure of LIMS
   - Guide application procedure
   - Perform online selection procedure, which already settled up
   - Math test: submit a report online
   - Interview: through Skype

6) Successful applicants: assist students on the following matters
   -Admission procedure
   -Get a student Visa
   -Life set-up in Kyoto

Dr.Thuy and Prof.Ishii: Universities in Vietnam, May 2013

① May 20, 2013
Associate Prof. Vu Hai Quan, Vice President
Prof. Nguyen Van Hieu, Head, Office of International Relations
Dr. Nguyen Du Sanh, Dean of Biology Faculty
University of Science, VNU-HCMC
Ho Chi Minh City

② Dr. Vu Ngoc Thuy, Head of International Cooperation Office
Dr. Nguyen Phu Hoa, Vice Head of International Cooperation Office
Nong Lam University
Ho Chi Minh City

③ May 21, 2013
Prof. Vu Dinh Thanh, Rector
Dr. Nguyen Danh Thao, Head of External Relations Office
Associate Prof. Dang Tran Khanh, Vice Dean, R&D and External Relations
Ho Chi Minh City University of Technology
Ho Chi Minh City

④ May 22, 2013
1) Meeting with staffs:
Associate Prof. Le Kim Hung, Rector
Associate Prof. Nguyen Dinh Lam, Director of International Collaboration Office
Associate Prof. Nguyen Van Tuan, Dean of Department of Electronic and Telecommunication Engineering
Dr. Dang Duc Long, Faculty of Chemistry
University of Da nang
Da nang
2) Discussion Seminar with students: around 10 students joined

⑤ May 23, 2013
1) Meeting with staffs:
Associate Prof. Nguyen Van Noi, Vice Rector
Associate Prof. Nguyen Tien Giang, Head of International Relations Office
Dr. Le Minh Ha, Vice Dean of Faculty of Mathematics, Mechanics and Informatics
VUN, Ha noi University of Science
Ha noi
2) Discussion Seminar with students: around 30 students joined

⑥ May 24, 2013
Associate Prof. Mai Thanh Tung, Vice Director of International Cooperation Office
Dr. Nguyen Pham Hong Lien
VUN, Ha noi University of Science and Technology
Ha noi

Dr.Thuy and Prof.Ishii: Universities in Vietnam, November 2013

⑦ November 22, 2013 (Dr.Thuy)
Dr. Nguyen Pham Hong Lien
VUN, Ha noi University of Science and Technology
Set up and performed a test of an online interview via VCS (Video Conference System) and Skype between a university in Vietnam and Kyoto University.

⑧ November 25, 2013
Prof. Ta Thanh Van, Vice President
Dr. Ha Phan Hai An, Head of International Relations Office
Hanoi Medical University
Ha noi

⑨ November 25, 2013
Associate Prof. Tran Diep Tuan, Vice President
Associate Prof. Nguyen Duy Phong, Epidemiology and Tropical Medicine
Associate Prof Pham Le An, Head of Family Doctor Department
University of Medicine and Pharmacy-Ho Chi Minh City
Ho Chi Minh City

Dr.Thuy and Prof.Ishii: Receive a visit of Indonesian Staff, December 2013

⑩ December 4, 2013
Associate Prof. Ika Dewi Ana, Director of Partnership and Alumni
University Gadjah Mada
Yogyakarta, Indonesia

Dr.Thuy and Prof.Ishii: Universities in Indonesia, February 2014

⑪ February 24, 2013
Prof. Pratiwi Pujilestari Sudarmoto, Vice Dean, Faculty of Medicine (in Jakarta)
Dr. Junaidi M.A, Head of International Relations Office
University of Indonesia,
Depok

⑫ February 25, 2013
Prof. Tati R.Mengko, Prof. Ir. Richard Karel W. Mengko, and Dr. Agung W.Setiawan, School of Electrical Engineering and Informatics
Dr. Edwan Kardena, Director of Partnership and International Relations
Bandung Institute of Technology,
Bandung

Public Relation and Communication

Kyoto University Tokyo Forum

(Tokyo, October 4, 2013)

The 8th Kyoto University Tokyo Forum titled “Exploration of Kyoto School -Tradition of Field Studies” was held at the Hotel New Otani.

We presented the LIMS project by putting emphasis on its aspects fitting the context of the forum:

- how we can make a good use of knowledge on human evolution and the origin of family
- how we are designing our “proactive fieldwork” to construct healthy longevity society in cooperation with local community and industry

: a panel for the presentation was shown below:

World Health Summit

(Berlin Germany, October 20-22, 2013)

1. M8 Alliance Meeting：

Kyoto University, Graduate School of Medicine is a member of the M8 Alliance of Academic Health Centres, Universities and National Academies, that aims at improving global health, working with political and economic decision makers to develop science-based solutions to health challenges worldwide. It is a foundation to the World Health Summit. Professor Fukuyama participated in the M8 Alliance Meeting (Oct. 19).

2. World Health Summit 2013.

We have organized the session “Trans-disciplinary collaboration for healthy aging” at the World Health Summit 2013 and presented Japanese proactive approaches (Oct. 21). LIMS Program Coordinator Dr. Fukuyama chaired the session. Dr. Goto, a lecturer of Health Economics in the LIMS program, presented a paper titled “proactive measures for healthy longevity society in Japan” and Dr. Ishii served as a modulator of total presentations.

Workshop of medical-dental academic communication — 40th anniversary of diplomatic relationship between Vietnam and Japan —

(Hanoi Vietnam, November 23-24, 2013)

As part of the 40th anniversary of diplomatic relationship between Japan and Vietnam, the workshop was held at the Hanoi Opera House to promote Japan-Vietnam cooperation and medical-dental communication for education. Representatives from 11 selected Japanese Universities introduced their academic programs, research and clinical activities.

We presented recent approaches of Kyoto University by focusing on the LIMS program for fruitful healthy-longevity society (Nov. 24).

FM Kyoto – Kyoto University Academic Talk

(Kansai area, March 19, 2014)

In collaboration with a broadcasting program “α – station” of FM Kyoto, Kyoto University makes active and strategic efforts of public communication. Teaching staff of the university present and explain their research projects and some impressive topics to general public. In this context, Dr. Ishii talked about LIMS program on March 19.

LIMS

充実した健康長寿社会を築く 総合医療開発リーダー育成プログラム

社会・家族の起源に学び、　プロアクティブ なフィールド研究を創出する

超高齢社会の医療

超高齢社会の課題
- 健康長寿とQOL向上
- 高齢者の社会参画
- 医療費の抑制

↓

求められる総合医療システム
- 医療・福祉・在宅ケアの統合
- 個人の生活全体を考慮した支援システム
- 良い生活習慣による疾病・障害の予防

↓

今必要とされるもの
- 社会や医療現場のニーズに立脚して総合医療システムを開発する医工学人材とこれを統率するリーダー

↓

健康長寿社会の日本モデル
- 時代に即した三世代互助
- 地域社会に開かれた医療支援
- 働ける限り働きつつ健康維持

総合医療と新たな医療産業

医学環境の中で医工学者育成

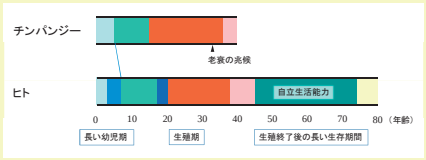
日本の責務:
- 医療と福祉の統合により地域の中で個々人の生活を支える総合医療システムの構築
- 後続諸外国にそのグローバルモデルを提示

充実した医学環境の中で医工学者を教育・育成

超高齢社会の諸問題を俯瞰し、メディカルイノベーションを通じて、充実した健康長寿社会の構築に貢献しうる総合医療開発リーダーを育成し、世界に輩出する

LIMSプログラム:
理工学・薬学・生物系学部出身者が、医学環境の中、産官学の学際的教育陣のもとに研鑽
- 基礎医学と生体知識を習得
- 医療・介護支援など、現場のニーズを理解
- 社会における医療ルールの理解（医療政策、医療経済、医療倫理、知財・国際標準化、など）
- 企業（医療機器、自動車、住宅産業、など）・公的機関での実践的学修とインターンシップ

進化の隣人に学ぶ
おばあさん仮説：ヒトでは、“高齢者から家族・社会へ”の子育て支援により、子供の成熟が遅いにも関わらず、母親が続けて出産することが可能となった。
冗談関係：祖父母・孫の様に離れた世代間でからかったり、あからさまに禁忌を語ったりする関係が、親子の様な近接世代間に生じる緊張を緩和し、社会に柔軟性を生む。



超高齢社会のモデル:
- 社会参画、社会貢献しつつ健康維持することを可能にする、生活スタイルと価値観の創造。
- 必ずしも血縁によらない、異世代間の交流、‘遊び’、互助関係を可能とする、社会システムの創出。

プロアクティブなフィールド研究へ！

地域社会・産業界と協力した実証研究

総合医療のサイクルをどう有効に回すか？
- 病院と在宅をつなぐ 中間施設”を標的にした、機器・システム開発。
  新たな概念の「医療機器許認可」の整備。
- 中間施設を巡り、新しいサービス産業（企業）を創設・育成。雇用創出・専門家育成。
- 新産業の創設は、行政・経済団体が推進。
  京都大学・企業・医療機関等が協力し、行政等を動かす為の根拠（事実・数値・予測）を提供。

社会というフィールドで技術を育てる
- 社会需要の側から発した、技術の創出・探索・統合
- 社会実証研究・社会実装の中での技術の成熟
- 社会実証研究を通じた評価基準・規制のあり方・倫理の整備

⇨ 許認可・社会実装・普及の迅速化

京都大学　LIMSプログラム
健康・医療データの二次活用に向けビジョン設定
どのような変革を標的とし、何を解析するか
施策の費用対効果研究
調査参加者への説得基盤・動機付け策定
高齢者・こころの健康の疫学調査
認知症発症予測と介入方法の開発
ビックデータの収集・解析方法の開発

滋賀・長浜市
長浜予防コホート事業
健常時から生体情報を蓄積
→ 解析・活用
電子カルテの共有化
各人に最も適した
- 健康を維持する医療
- 発症・重症化の阻止

京都市
伝統と進取の気性を併せ持つ都市の
包括的運営モデル創出
先端の医療特区を活用した医療ツーリズム
「歩くまち」の健康・QOL向上の評価・実証
高齢者の暮らし易い京町家モデル創出
子育て・教育～高齢者・在宅医療支援まで
一貫した運営モデルの創出

京都府
けいはんな学研都市＆周辺
人口構成の揃った新興地域
健常人・家庭の継続的調査
- エネルギー有効活用
- 健康維持・増進

日本の‘健康・医療戦略’のさきがけ

内閣官房は、平成25年6月14日に、「健康・医療戦略」を発表したが、京都大学LIMSプログラムと極めて近い構想となっている。
- 基本理念
  1. 健康長寿社会の実現
  2. 医療関連産業の活性化
  3. 超高齢化社会を乗り越えるモデルを世界に広げる
- 医学部・大学院を通じて、企業等と連携し、新たな医療機器等の研究開発でイノベーションを起こす人材の育成拠点を構築
- 医療ニーズの発掘から医療機器の企画・開発、薬事・知財戦略、ビジネスプランの策定までを一貫してマネジメントできるコーディネーター人材を育成

京都大学は、いち早く国家的課題を全学の課題として提示しており、率先して実施することが望まれる。

グローバルモデルに向けた議論の先導

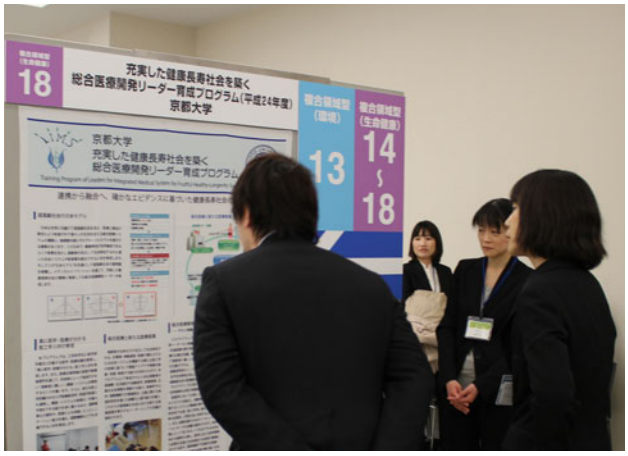
京都大学は、学術的な連盟World Health Summit (M8) Allianceの一員として、政治・経済界の意思決定者と協力し、科学に基づいて世界の健康向上に貢献することに努めてきた。
- 第5回World Health Summit（2013 年10月20－22日、ベルリン）では、**「健康長寿社会 に向けた学際的協同」** 会議を主催し、**日本のプロアクティブな取り組み**を紹介する。
  〔座長：LIMSプログラムコーディネータ・福山秀直・医学研究科教授〕
- **第7回 World Health Summit　地域大会（ 2015年）の京都大学での開催**を提案する。

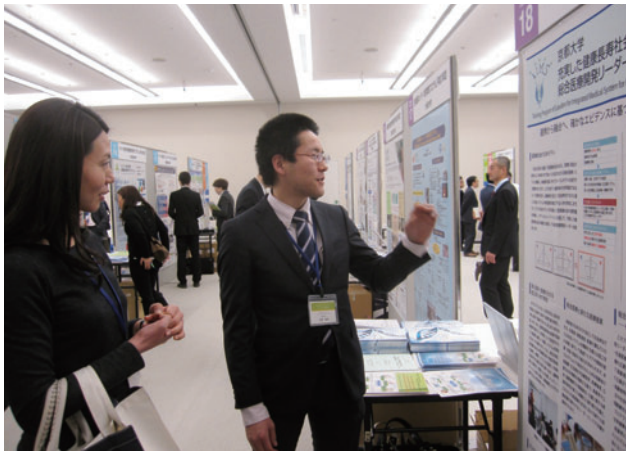
M8 Alliance Members

Leading Forum 2013 in Osaka

Place: Knowledge Capital Congrès Convention Center
Date: January 10th and 11th, 2014

1. Poster presentation





2. Leading Staff Workshop: Globalization of educational program
Presenter: Dinh Ha Duy Thuy

3. Business Meeting (Jan.11):

Fukuyama Program Corninator and Ishii participated in discussion of the Business Meeting of Programm Members.

Mr. Nogi (program-specific administrative staff) participated in the meeting of secretariats.

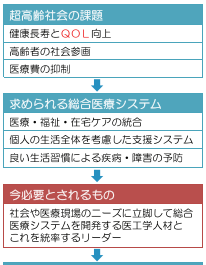
京都大学
充実した健康長寿社会を築く総合医療開発リーダー育成プログラム

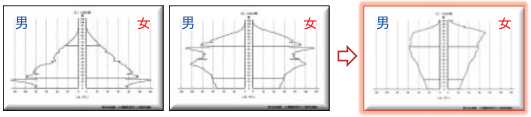
Training Program of Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society

連携から融合へ、確かなエビデンスに基づいた健康長寿社会の実現に向けて

超高齢社会の日本モデル

日本は世界に先駆けて超高齢社会を迎え、医療と福祉の統合により地域の中で個々人の生活を支える総合医療システムの構築と、後続諸外国にそのグローバルモデルを提示する責務があります。この日本で、健康寿命が世界最長であるという背景を活かし、高齢者が自立して社会参加するのに適した社会システムや新産業を創出できる人材を育成します。そしてこの"日本モデル"を先達として超高齢社会の諸問題を俯瞰し、メディカルイノベーションを通じて、充実した健康長寿社会の構築に貢献しうる総合医療開発リーダーを育成します。





（国立社会保障・人口問題研究所「人口統計資料」2011より）

総合医療と新たな医療産業

真に医学・医療が分かる医工学人材の育成

本プログラムでは、工学系学生に医学部卒業生に匹敵する医学・医療知識を教育し、「真に医学・医療が分かる」医工学人材を育成します。また、医療支援現場の実習や医療倫理学を通じて、利用者にとって負担の少ない「高齢者に優しい」機器・システムを開発するセンスを養います。さらに、単なる医工学知識のみならず医療経済学・許認可制度にも通暁し、機器・システムの産業化・市場の予測をできる能力を身に着けるほか、国際標準化の感性や、英語による卓越したコミュニケーション能力を備え、国際機関などでも活躍できる人材を育成します。

英語ディベート講義

総合医療と新たな医療産業

高齢者が出来るだけ自立して社会参加できる、住環境・移動通信・医療介護などにわたる社会システムを構築する際には医工学の背景に基づいて関連アイデアや情報を創案・流通・推進する能力が求められます。本プログラムにて育成された人材は高齢者の価値観・生活様式や加齢医学、医療倫理、広範な社会情勢を理解する能力、産業界や公的・国際機関での情報統合・立案に関する実践的研究を通じた俯瞰力と遂行能力を備え、これからの超高齢化社会における新たな医療産業を牽引するリーダーとしての活躍が期待されます。

医療・生活支援実習

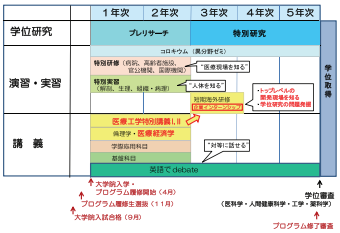
総合医療開発リーダー ――その人物像とキャリアパス

このプログラムで養成される総合医療開発リーダーの人物像は以下のとおりです。

- 先進医療分野の革新的人物として医学・医療の広範な知識、高度な工学技術を駆使して高齢者に優しい医療支援機器システムの立案ができる。
- 高齢者特有のニーズを理解し、自立した生活や社会参加の向上方法を創案できる。
- 超高齢社会の医療経済問題を深く理解し、プロアクティブに対応できる。
- 世界標準を目指す医療産業を創出できる。

産業界においては新しいサービスやビジネスモデルを創出し、高齢者の生活全般を支援するシステムの整備を牽引します。大学・研究所では医・理工学界に埋もれている斬新な知恵を、日常生活に活用する土壌を開拓し、また、起業支援のためのインキュベーションセンターでの活躍も期待されます。政府機関に入って活力をもって生活できる社会に向けた施策を立案し、産学における研究開発の成果を迅速に社会実装する体制の整備に尽力する姿や、国際機関で先端的な医療・介護支援システムの普及促進や質の高い日本モデルをもって健康長寿社会の拡充に貢献するキャリアも、視野に入ります。

学位プログラム履修モデル



プログラムの特色

・人体解剖、生理、組織・病理の特別実習を行うなど理工学系出身者が医学部卒業生に匹敵する基礎医学と生体知識を習得します。

低侵襲治療学実習

最先端機器を使った全員参加型の実習風景

VOICE

佐久間　真紀
医学研究科医科学専攻
修士課程１年

人類未曾有の超高齢社会に対応した新たな研究者像をめざす

私は、医工分野のトップ企業の講師による講義や英語ディベートに大変興味を持って参加しています。大学研究者とは異なる企業研究者のものの考え方を学びつつ、研究成果が還元されるまでの道筋を理解し、超高齢社会に資する研究は何かを考え、総合的なアプローチによる新たな方法を探っています。国を導けるような、他国の研究者と対等に議論できる、新しい研究者のあり方を開拓したいと考えています。

山口　一真
工学研究科合成・生物化学専攻
修士課程１年

本プログラムの活用と研究

私は医学寄りの研究をしていますが、今までは工学研究科の授業しか履修していなかったため、医学に触れる機会が自己学習以外ありませんでした。このプログラムは、医・薬・工の研究科が協力してできており、非常に広い範囲の知識を得ることができます。 また学生１人に対して、所属研究室の指導教官に加え、異なる研究科の３人の先生により研究生活をサポートして頂けるので、このチャンスを活かして研究を発展させていきたいと思います。

産公学連携

１）意見交換会

開催日：　2012 年 3 月 29 日（木）　京都大病医学部附属院・会議室

参加者：　企業：　　16 社 24 名

　　公的機関：　京都市産業観光局 3 名、京都市高度技術研究所 1 名

　　京都大学：　医学研究科、工学研究科、再生医科学研究所

　　メディカルイノベーションセンター／9 名

２）博士課程教育リーディングプログラムへの申請

協力組織：企業：　　13 社

　　公的機関：　京都市、神戸市産業振興財団

３）ＬＩＭＳプログラム実施

協力組織：企業：　　16 社

　　公的機関：　京都市、神戸市産業振興財団

講義への講師派遣：

１．医療工学特別講義Ⅰ：　7 企業 7 名（14 コマ）＋学内講師

1. 総論・標準化活動
2. 生体計測・イメージング機器の研究開発
3. 知的財産戦略と国際標準化
4. 整形外科分野における新規製品の研究開発について
5. 医療機器関連材料の研究開発
6. 在宅医療・健康産業の研究開発
7. 治療機器の基礎研究開発
8. 光技術の研究開発と医用応用

2. 医療工学特別講義Ⅱ（来年度開講予定）：企業

3. 知的財産＆国際標準化（来年度開講予定）：　公的機関

Industry-Public-Academia Cooperation

1) Opinion-Exchanging Meeting

Date: 29 March, 2012 (Academic Year 2011)

Place: Kyoto University Hospital Conference Room

Participants:

Industry: 20 participants from 16 companies

Public: 3 participants from Industry and Tourism Bureau, City of Kyoto, 1 participant from Advanced Scientific Technology & Management Research Institute of KYOTO

Kyoto University: 9 participants from Graduate schools of Medicine, Graduate School of Engineering, Institute for Frontier Medical Science, & Medical Innovation Center

2) Application to Program for Leading Graduate Schools

Cooperators: 13 companies

City of Kyoto, Kobe City industrial Promotion foundation

3) Implementation of LIMS Program

Cooperators: 16 companies

City of Kyoto, Kobe City industrial Promotion foundation

Education:

1. Medical Engineering for Society I:

7 lecturers from 7 companies (14periods) + Kyoto Univ. Staff

Theme of class:

1. Introduction to the Standardization
2. R&D for Biometric Imaging Analysis
3. Strategies for Intellectual Property and Global Standardization
4. R&D and Evaluation of Prosthetic Apparatus
5. R&D in Biomaterials and Bio-devices
6. R&D Based Home Medical Care
7. Basic R&D toward Therapeutic Apparatus
8. R&D for State of Art Biomedical Optics Techniques

2. Medical Engineering for Society II (academic year 2014):

lecturers form companies

3. Intellectual Property & Global Standardization (academic year 2014)

lecturers from an independent administrative agency and public organizations

編集後記にかえて

ロゴについて

「充実した健康長寿社会を築く総合医療開発リーダー育成プログラム」の略称“LIMS”（Leaders for Integrated Medical System)を、京都大学のスクールカラー濃青で示しました。「シーズから成果（結実）への迅速な連関」が、プログラムの主要課題のひとつであり、これを、弾けて種が四方に飛び散る鳳仙花の実で表しました。鳳仙花の軸は、種をはじき飛ばす生物学的な微小機械ともいえます。これをスパイラスで表現したのは、「シーズとニーズ（社会需要）とのスパイラル的な統合による研究開発の発展」という目標の意味をこめています。

特定教授
石井加代子

Postscript

About our logo

The characters “LIMS” in a dark blue, which is the Kyoto University’s school color, stands for “Leaders for Integrated Medical System” and is the abbreviated name for “Training Program of Leaders for Integrated Medical System.”

The logo as a whole represents balsam whose seed capsule explodes to fling seeds far from the parent plant. This rapid movement and ‘biological micro-machines’ underlying it symbolize main concepts of LIMS program such as:

- swift translation of (research) seeds to fruition (production of results)
- promotion of research & development through spiral integration of “seeds and (social) needs”

Program-Specific Professor
ISHII Kayoko, Ph.D.

学際融合教育研究推進センター
健康長寿社会の総合医療開発ユニット
京都市左京区吉田近衛町

Center for the Promotion of Interdisciplinary Education and Research
Research and Educational Unit of Leaders for Integrated Medical System (LIMS)
Konoe, Yoshida, Sakyo, Kyoto

http://www.lims.kyoto-u.ac.jp/