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 27 年度　年次報告書

Annual Report 2015

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はじめに

２０１６年3月３０日

２０１５年度は、このプログラムが開始されて、約５年が経過し、日本学術振興会の中間評価の年となった。また、ほとんどのシステムが整備され、修士から博士への進学の学生の評価などが行われて、大学院としての全体像が見えてきた年でもあった。

４月には、日本医学会総会関西が京都国際会館で開催され、その一部の展示に LIMS の産学連携ポスターが展示された。また、最終日は、メインホール前にポスターが展示され、多くの注目を集めた。井村裕夫会頭のご厚意でこのような活動がおこなえたことは、意義あることで、学生相互、学生と企業の対話が進むきっかけとなった。近年、医療産業が広く産業界から注目されるようになり、医学が研究のみならず、広く、社会に目をむけ、また、産業界も医学に注目して、生物学的な研究だけではなく、鉱工業界から医療産業を支える基礎研究、基礎技術が重要になってきている。

１１月には、富山市を訪問し、コンパクトシティーを提唱している森市長と懇談し、市内の案内をしてもらった。これからの高齢化社会において、市がスプロールするのではなく、必要な機能をコンパートメントに集約し、コンパートメント同士は、トラムで結合され、最小限の移動で、最大効率が上げられる市の構成を作りつつあり、これからの都市作りに参考になった。

海外からの招聘研究者としては、アメリカの精神科医で MRI 研究を行っている UCLA のマイケル・ワイナー教授に米国の ADNI 研究の内容と成果をまとめて話してもらった。MRI のスキャンが終わった次の日には、自由にそのデータが使えるという話は、米国ならではの柔軟なシステムで、世界中の研究者が数百例のアルツハイマー病、軽度認知障害、正常者などのデータを使える状況にあり、多くの学会で、その成果が発表されている。

２月に、前ライプチヒ、マックス・プランク研究所のロバート・ターナー博士による外部評価のための学生・教員との会話集会が開かれた。

中間評価が、われわれの活動を充分理解してもらえず、不十分なプログラムということになり、来年度からは、予算の削減があるので、これからのプログラムの運営には、さまざまな困難が予想される。しかし、これまでの経過をみていると、最初予想したより、良い成果があがっていると思われ、さらなる努力が必要と考えているところである。

プログラムコーディネーター

福山秀直

Preface

H. Fukuyama, M.D., Ph.D.
Program coordinator

LIMS has passed 5 years after starting the program. This year, we were evaluated by the JSPS in the middle of program, which indicated the program is progressing according to the initial plan. In my impression, the program is now progressing, and the good result will be expected in the future.

In April, 2015, General Assembly of Medicine was held in Kyoto International Conference Hall; Professor Emeritus Hiroo Imura is the Chair of the conference, and Prof. Imura gave us a chance to present our activities of students with various companies to make new medical industrial activities. This was the nice chance to introduce and notice the attending persons on the new field of medioengineering activities.

In November, we visited Toyama city, Mayer of the city Mr. Mori, and looked and experienced the concept of "compact city for aged society". Many residents were gathered to the small compartment area, which were connected each others with Tram. This was a good chance to understand the future city image.

Among the inviting investigator from abroad, Michael Weiner, Professor of UCLA and one of Principal Investigators on ADNI in USA, gage us a lecture with regard to the result of Alzheimer's disease, Mild cognitive impairment and normal control data. Just after MRI scan, data is open for all researchers, then, any researchers of the world will be able to use for his/her interests. This flexible system advances compared to Japan.

Professor Robert Turner, previous Max Plank Institute of Leipzig, visited LIMS for external evaluation. He spent half a day to discuss with the students and lectures of LIMS and gave us a useful suggestion.

JSPS evaluation was not so good in spite of our efforts. They pointed out the incomplete execution of the program that we proposed. Since next year, the budget will be expected to be low and very severe in financing condition. I think and hope that all the students and lectures will make some effort to improve our program to the final goal.

March 30th, 2016

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プログラムの概要

Outline of the Program

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

１．設立の目的

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の育成

本プログラムでは、工学系のプログラム履修者に人体解剖学、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の育成

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、プログラム履修者は、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。

２．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。

３．教育カリキュラム

（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、医学研究科医学専攻の4年制博士課程の場合は、博士課程に合格することを前提とし、4年間で実施する。また、これらの学部や京都大学の出身者である必要はなく、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

開設科目の概要は以下の通りであり、修士課程修了には、指定された必修科目１３単位を必ず修得すること（平成２５年度履修生は、１２単位）が必要である。また、博士後期課程では、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）、プレリサーチ、特別研究を修得することが必要である。

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いる。

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。

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。

（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。

博士（医科学）、博士（人間健康科学）、博士（工学）、博士（薬科学）それぞれに続いて、「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。

４．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

以下の受給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

プログラム担当者一覧（平成27年度）

	氏　名	所　属	専攻等	職　名	備　考
1	ウエモト シンジ 上本 伸二	医学研究科	医学	教授	プログラム責任者・医学研究科長
2	フクヤマ ヒデナオ 福山 秀直	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	特任教授	プログラムコーディネーター
3	ワタナベ ダイ 渡邉 大	医学研究科	医学	教授	LIMSユニット長
4	ハギワラ マサトシ 萩原 正敏	医学研究科	医学	教授	
5	サイトウ ミチノリ 斎藤 通紀	医学研究科	医学	教授	
6	マツダ ミチユキ 松田 道行	医学研究科	医学	教授	
7	ハガ ヒロノリ 羽賀 博典	医学研究科	医学	教授	
8	イワタ ソウ 岩田 想	医学研究科	医学	教授	
9	ノダ マコト 野田 亮	医学研究科	医学	教授	
10	シノハラ タカシ 篠原 隆司	医学研究科	医学	教授	（H28.3.31まで）
11	カワノ ケンジ 河野 憲二	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	特任教授	
12	オオモリ ハルノリ 大森 治紀	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	特任教授	
13	キムラ タケシ 木村 剛	医学研究科	医学	教授	
14	ミシマ ミチアキ 三嶋 理晃	医学研究科	医学	教授	（H28.3.31まで）
15	ヒラオカ マサヒロ 平岡 眞寛	医学研究科	医学	教授	（H28.3.31まで）
16	トガシ カオリ 富樫 かおり	医学研究科	医学	教授	
17	イチヤマ サトシ 一山 智	医学研究科	医学	教授	
18	サカイ ヨシハル 坂井 義治	医学研究科	医学	教授	
19	トイ マサカズ 戸井 雅和	医学研究科	医学	教授	
20	コニシ イクオ 小西 郁生	医学研究科	医学	教授	（H28.3.31まで）
21	オガワ オサム 小川 修	医学研究科	医学	教授	
22	スズキ シゲヒコ 鈴木 茂彦	医学研究科	医学	教授	
23	ヨシムラ ナガヒサ 吉村 長久	医学研究科	医学	教授	（H28.3.31まで）
24	マツダ シュウイチ 松田 秀一	医学研究科	医学	教授	
25	フジタ ジュン 藤田 潤	医学研究科	医学	教授	（H28.3.31まで）
26	タカハシ リョウスケ 高橋 良輔	医学研究科	医学	教授	
27	ミヤモト ススム 宮本 享	医学研究科	医学	教授	
28	コスギ シンジ 小杉 眞司	医学研究科	社会健康医学系	教授	
29	マエカワ タイラ 前川 平	医学部附属病院	輸血細胞治療部	教授	
30	ホソダ キミノリ 細田 公則	医学研究科	人間健康科学系	教授	（H27.12.31まで）
31	カツラ トシキ 桂 敏樹	医学研究科	人間健康科学系	教授	
32	キノシタ アヤエ 木下 彩栄	医学研究科	人間健康科学系	教授	

プログラム担当者一覧（平成27年度）

	氏　名	所　属	専攻等	職　名	備　考
33	アダチ　ソウイチ 足立　壯一	医学研究科	人間健康科学系	教授	
34	シイナ　ツヨシ 椎名　毅	医学研究科	人間健康科学系	教授	
35	スギモト　ナオゾウ 杉本　直三	医学研究科	人間健康科学系	教授	
36	クロキ　ヒロシ 黒木　裕士	医学研究科	人間健康科学系	教授	
37	イチハシ　ノリアキ 市橋　則明	医学研究科	人間健康科学系	教授	
38	フタキ　トシコ 二木　淑子	医学研究科	人間健康科学系	教授	
39	コテラ　ヒデトシ 小寺　秀俊	工学研究科	マイクロエンジニアリング	教授	
40	キムラ　シュンサク 木村　俊作	工学研究科	材料化学	教授	
41	シラカワ　マサヒロ 白川　昌宏	工学研究科	分子工学	教授	
42	アキヨシ　カズナリ 秋吉　一成	工学研究科	高分子化学	教授	
43	モリ　ヤスオ 森　泰生	工学研究科	合成・生物化学	教授	
44	ハマチ　イタル 濱地　格	工学研究科	合成・生物化学	教授	
45	ナカベ　カズヨシ 中部　主敬	工学研究科	機械理工学	教授	
46	オオシマ　マサヒロ 大嶋　正裕	工学研究科	化学工学	教授	
47	カンノ　イクオ 神野　郁夫	工学研究科	原子核工学	教授	
48	オオエ　コウイチ 大江　浩一	工学研究科	物質エネルギー化学	教授	
49	コンドウ　テルユキ 近藤　輝幸	工学研究科	物質エネルギー化学	教授	
50	サジ　ヒデオ 佐治　英郎	薬学研究科	薬学	教授	
51	ハシダ　ミツル 橋田　充	薬学研究科	薬学	教授	
52	カケヤ　ヒデアキ 掛谷　秀昭	薬学研究科	医薬創成情報科学	教授	
53	ナカヤマ　カズヒサ 中山　和久	薬学研究科	薬科学	教授	
54	カトウ　ヒロアキ 加藤　博章	薬学研究科	薬科学	教授	
55	ゴトウ　レイ 後藤　励	経済学研究科	白眉センター	特定准教授	
56	タバタ　ヤスヒコ 田畑　泰彦	再生医科学研究所		教授	
57	トグチ　ダ　ジュンヤ 戸口田　淳也	再生医科学研究所		教授	
58	アダチ　タイジ 安達　泰治	再生医科学研究所		教授	
59	ヒラキ　ユウジ 開　祐司	再生医科学研究所		教授	再生医科学研究所長
60	セ　ハラ　アツコ 瀬原　淳子	再生医科学研究所		教授	
61	ナガサワ　タカシ 長澤　丘司	再生医科学研究所		教授	（H27.12.31まで）
62	カワモト　ヒロシ 河本　宏	再生医科学研究所		教授	
63	モリ　シゲフミ 森　重文	数理解析研究所		教授	（H28.3.31まで）
64	オカモト　ヒサシ 岡本　久	数理解析研究所		教授	
65	ヤマダ　ミチオ 山田　道夫	数理解析研究所		教授	
66	テラニシ　ユタカ 寺西　豊	医学研究科	「医学領域」産学連携推進機構	特任教授	
67	イシイ　カヨコ 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	

Program Professors (Academic Year 2015)

	Name	Graduate School etc.	Devision	Position	Notes
1	Shinji Uemoto	Graduate School of Medicine	Medicine	Professor	Program Director, Dean of Graduate School of Medicine
2	Hidenao Fukuyama	Center for the Promotion of Interdisciplinary Education and Research	Research and Educational Unit of Leaders for Integrated Medical System (LIMS)	Specially Appointed Professor	Program Coordinator
3	Dai Watanabe	Graduate School of Medicine	Medicine	Professor	Director of LIMS Unit
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	Until March 2016
11	Kenji Kawano	Center for the Promotion of Interdisciplinary Education and Research	Research and Educational Unit of Leaders for Integrated Medical System (LIMS)	Specially Appointed Professor	
12	Harunori Ohmori	Center for the Promotion of Interdisciplinary Education and Research	Research and Educational Unit of Leaders for Integrated Medical System (LIMS)	Specially Appointed Professor	
13	Takeshi Kimura	Graduate School of Medicine	Medicine	Professor	
14	Michiaki Mishima	Graduate School of Medicine	Medicine	Professor	Until March 2016
15	Masahiro Hiraoka	Graduate School of Medicine	Medicine	Professor	Until March 2016
16	Kaori Togashi	Graduate School of Medicine	Medicine	Professor	
17	Satoshi Ichiyama	Graduate School of Medicine	Medicine	Professor	
18	Yoshiharu Sakai	Graduate School of Medicine	Medicine	Professor	
19	Masakazu Toi	Graduate School of Medicine	Medicine	Professor	
20	Ikuo Konishi	Graduate School of Medicine	Medicine	Professor	Until March 2016
21	Osamu Ogawa	Graduate School of Medicine	Medicine	Professor	
22	Shigehiko Suzuki	Graduate School of Medicine	Medicine	Professor	
23	Nagahisa Yoshimura	Graduate School of Medicine	Medicine	Professor	Until March 2016
24	Shuichi Matsuda	Graduate School of Medicine	Medicine	Professor	
25	Jun Fujita	Graduate School of Medicine	Medicine	Professor	Until March 2016
26	Ryosuke Takahashi	Graduate School of Medicine	Medicine	Professor	
27	Susumu Miyamoto	Graduate School of Medicine	Medicine	Professor	
28	Shinji Kosugi	Graduate School of Medicine	School of Public Health	Professor	
29	Taira Maekawa	Kyoto University Hospital	Transfusion Medicine and Cell Therapy	Professor	
30	Kiminori Hosoda	Graduate School of Medicine	Human Health Sciences	Professor	Until December 2015
31	Toshiki Katsura	Graduate School of Medicine	Human Health Sciences	Professor	
32	Ayae Kinoshita	Graduate School of Medicine	Human Health Sciences	Professor	
33	Souichi Adachi	Graduate School of Medicine	Human Health Sciences	Professor	
34	Tsuyoshi Shiina	Graduate School of Medicine	Human Health Sciences	Professor	

	Name	Graduate School etc.	Devision	Position	Notes
35	Naozo Sugimoto	Graduate School of Medicine	Human Health Sciences	Professor	
36	Hiroshi Kuroki	Graduate School of Medicine	Human Health Sciences	Professor	
37	Noriaki Ichihashi	Graduate School of Medicine	Human Health Sciences	Professor	
38	Toshiko Futaki	Graduate School of Medicine	Human Health Sciences	Professor	
39	Hidetoshi Kotera	Graduate School of Engineering	Micro Engineering	Professor	
40	Shunsaku Kimura	Graduate School of Engineering	Material Chemistry	Professor	
41	Masahiro Shirakawa	Graduate School of Engineering	Molecular Engineering	Professor	
42	Kazunari Akiyoshi	Graduate School of Engineering	Polymer Chemistry	Professor	
43	Yasuo Mori	Graduate School of Engineering	Synthetic Chemistry and Biological Chemistry	Professor	
44	Itaru Hamachi	Graduate School of Engineering	Synthetic Chemistry and Biological Chemistry	Professor	
45	Kazuyoshi Nakabe	Graduate School of Engineering	Mechanical Engineering and Science	Professor	
46	Masahiro Ohshima	Graduate School of Engineering	Chemical Engineering	Professor	
47	Ikuo Kanno	Graduate School of Engineering	Nuclear Engineering	Professor	
48	Kouichi Ohe	Graduate School of Engineering	Energy and Hydrocarbon Chemistry	Professor	
49	Teruyuki Kondo	Graduate School of Engineering	Energy and Hydrocarbon Chemistry	Professor	
50	Hideo Saji	Graduate School of Pharmaceutical Sciences	Biomedical Sciences	Professor	
51	Mitsuru Hashida	Graduate School of Pharmaceutical Sciences	Biomedical Sciences	Professor	
52	Hideaki Kakeya	Graduate School of Pharmaceutical Sciences	Bioinformatics and Chemical Genomics	Professor	
53	Kazuhisa Nakayama	Graduate School of Pharmaceutical Sciences	Pharmaceutical Sciences	Professor	
54	Hiroaki Kato	Graduate School of Pharmaceutical Sciences	Pharmaceutical Sciences	Professor	
55	Rei Goto	The Hakubi Project		Program-Specific Associate Professor	
56	Yasuhiko Tabata	Institute for Frontier Medical Sciences		Professor	
57	Junya Toguchida	Institute for Frontier Medical Sciences		Professor	
58	Taiji Adachi	Institute for Frontier Medical Sciences		Professor	
59	Yuji Hiraki	Institute for Frontier Medical Sciences		Professor	
60	Atsuko Sehara	Institute for Frontier Medical Sciences		Professor	
61	Takashi Nagasawa	Institute for Frontier Medical Sciences		Professor	Until December 2015
62	Hiroshi Kawamoto	Institute for Frontier Medical Sciences		Professor	
63	Shigefumi Mori	Research Institute for Mathematical Sciences		Professor	Until March 2016
64	Hisashi Okamoto	Research Institute for Mathematical Sciences		Professor	
65	Michio Yamada	Research Institute for Mathematical Sciences		Professor	
66	Yutaka Teranishi	Graduate School of Medicine	Medical Science and Business Liaison Organization	Specially Appointed Professor	
67	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	

特定教員一覧

（平成28年3月31日現在）

	氏　名	職　名
1	石井（イシイ）　加代子（カヨコ）	特定教授
2	木村（キムラ）　祐（ユウ）	特定准教授
3	髙折（タカオリ）　恭一（キョウイチ）	
4	西（ニシ）　美幸（ミユキ）	
5	松橋（マツハシ）　眞生（マサオ）	
6	山本（ヤマモト）　浩司（コウジ）	
7	大江（オオエ）　賢治（ケンジ）	特定講師
8	木下（キノシタ）　武彦（タケヒコ）	
9	高橋（タカハシ）　めい子（メイコ）	
10	東森（ヒガシモリ）　信就（ノブユキ）	
11	樋口（ヒグチ）　ゆり子（ユリコ）	
12	松田（マツダ）　和郎（ワコト）	
13	富塚（トミヅカ）　太郎（タロウ）	特定講師 （平成28年2月まで）
14	今井（イマイ）　宏彦（ヒロヒコ）	特定助教
15	佐藤（サトウ）　文規（フミノリ）	
16	滝本（タキモト）　晶（アキ）	
17	Dinh（ディン）　Ha（ハ）　Duy（ユィ）　Thuy（ティ）	
18	鳥井（トリイ）　美江（ミエ）	
19	平井（ヒライ）　康治（ヤスハル）	
20	矢和多（ヤワタ）　智（サトシ）	
21	市村（イチムラ）　敦彦（アツヒコ）	特定助教 （平成27年10月まで）
22	稲場（イナバ）　直子（ナオコ）	特定助教 （平成27年9月まで）
	Christian（クリスチャン）　Altmann（アルトマン）	医学研究科特定准教授

事務職員一覧

（平成28年3月31日現在）

	氏　名	職　名
1	野木（ノギ）　淑全（ヨシマサ）	特定職員
2	寺川（テラカワ）　秀世（ヒデヨ）	特定職員
3	松田（マツダ）　梢（コズエ）	教務補佐員 （平成28年1月まで）
4	崎本（サキモト）　真梨子（マリコ）	派遣職員
5	大谷（オオタニ）　真希（マキ）	派遣職員
6	松原（マツバラ）　容子（ヨウコ）	派遣職員
7	太田（オオタ）　詩織（シオリ）	派遣職員 （平成28年1月～2月まで）

Program-Specific Staff

(As of March 31, 2016)

	Name	Position
1	Kayoko Ishii	Program-Specific Professor
2	Yu Kimura	Program-Specific Associate Professor
3	Kyoichi Takaori	
4	Miyuki Nishi	
5	Masao Matsuhashi	
6	Koji Yamamoto	
7	Kenji Ohe	Program-Specific Senior Lecturer
8	Takehiko Kinoshita	
9	Meiko Takahashi	
10	Nobuyuki Higashimori	
11	Yuriko Higuchi	
12	Wakoto Matsuda	
13	Taro Tomizuka	Program-Specific Senior Lecturer (until February 2016)
14	Hirohiko Imai	Program-Specific Assistant Professor
15	Fuminori Sato	
16	Aki Takimoto	
17	Dinh Ha Duy Thuy	
18	Mie Torii	
19	Yasuharu Hirai	
20	Satoshi Yawata	
21	Atsuhiko Ichimura	Program-Specific Assistant Professor (until October 2015)
22	Naoko Inaba	Program-Specific Assistant Professor (until September 2015)
	Christian Altmann	Associate Professor of Graduate School of Medicine

Administrative Staff

(As of March 31, 2016)

	Name	Position
1	Yoshimasa Nogi	Program-Specific Administrative Staff
2	Hideyo Terakawa	Program-Specific Administrative Staff
3	Kozue Matsuda	Assistant Administrative Staff (until January 2016)
4	Mariko Sakimoto	Assistant Administrative Staff
5	Maki Otani	Assistant Administrative Staff
6	Yoko Matsubara	Assistant Administrative Staff
7	Shiori Ota	Assistant Administrative Staff (From January 2016 to February 2016)

平成27年度　LIMS履修生（平成25年度生）指導教授・メンター一覧

メンターについて・・・下段は専門分野
平成27年11月1日付け

	研究科	専攻	学年	氏名	研究科 指導教授	LIMS指導教授	メンター1	メンター2
1	医学	人間健康科学系	L3	五明（ゴミョウ）　美香子（ミカコ）	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 検査技術科学コース　情報理工医療学講座 医療画像情報システム学	戸井（トイ）　雅和（マサカズ）　教授 医学研究科　外科学講座 乳腺外科学	松橋（マツハシ）　眞生（マサオ）　特定准教授 （臨床神経生理学）	木下（キノシタ）　武彦（タケヒコ）　特定講師 （応用数学）
2	薬学	薬科学	L3	宮之原（ミヤノハラ）　遵（ジュン）	金子（カネコ）　周司（シュウジ）　教授 薬学研究科　薬学専攻 病態機能解析学講座　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　遺伝医学講座 分子病診療学	松田（マツダ）　和郎（ワコト）　特定講師 （神経解剖学・解剖学一般）	平井（ヒライ）　康治（ヤスハル）　特定助教 （神経生理学）
3	工学	高分子化学	L3	栗原（クワバラ）　令（レイ）	秋吉（アキヨシ）　一成（カズナリ）　教授 工学研究科　高分子化学専攻 高分子物性講座　生体機能高分子分野	木村（キムラ）　剛（タケシ）　教授 医学研究科　内科学講座 循環器内科学	髙折（タカオリ）　恭一（キョウイチ）　特定准教授 （膵臓外科学・低侵襲治療学）	滝本（タキモト）　晶（アキ）　特定助教 （発生学）
4	工学	合成・生物化学	L3	水藤（スイトウ）　拓人（タクト）	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 生物化学講座　生体認識化学分野	渡邉（ワタナベ）　大（ダイ）　教授 医学研究科　生体情報科学講座 生体情報科学	樋口（ヒグチ）　ゆり子（ユリコ）　特定講師 （生物薬剤学）	松田（マツダ）　和郎（ワコト）　特定講師 （神経解剖学・解剖学一般）
5	工学	合成・生物化学	L3	山口（ヤマグチ）　一真（カズマ）	森（モリ）　泰生（ヤスオ）　教授 工学研究科　合成・生物化学専攻 生物化学講座　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　脳病態生理学講座 臨床神経学	Christian（クリスチャン）　Altmann（アルトマン）　准教授（医学研究科） （実験心理学）	矢和多（ヤワタ）　智（サトシ）　特定助教 （神経生理学）
6	医学	リハビリテーション科学コース 臨床認知神経科学	L2	石田（イシダ）　敦子（アツコ）	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 リハビリテーション科学コース 作業療法学講座 臨床認知神経科学　生活機能適応学	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 機械材料力学講座　熱材料力学分野	大江（オオエ）　賢治（ケンジ）　特定講師 （人体解剖学・分子生物学）	鳥井（トリイ）　美江（ミエ）　特定助教 （慢性・老年看護学（免疫学））

平成27年度　LIMS履修生（平成26年度生）指導教授・メンター一覧

	研究科	専攻	学年	氏名	研究科 指導教授	LIMS指導教授	メンター1	メンター2
1	医学	医科学	L2	松原（マツバラ） 弘幸（ヒロユキ）	中畑（ナカハタ） 龍俊（タツトシ） 教授 iPS細胞研究所　臨床応用研究部門 疾患再現研究分野	安達（アダチ） 泰治（タイジ） 教授 再生医科学研究所 ナノ再生医工学研究センター バイオメカニクス研究領域	佐藤（サトウ） 文規（フミノリ） 特定助教 （発生生物学・分子生物学）	鳥井（トリイ） 美江（ミエ） 特定助教 （慢性・老年看護学（免疫学））
2	医学	医科学	L2	SAHA（サハ） Liton（リトン） Kumar（クマール）	武田（タケダ） 俊一（シュンイチ） 教授 医学研究科　遺伝医学講座 放射線遺伝学	平岡（ヒラオカ） 眞寛（マサヒロ） 教授 医学研究科　放射線医学講座 放射線腫瘍学・画像応用治療学	西（ニシ） 美幸（ミユキ） 特定准教授 (生化学・発生生物学)	矢和多（ヤワタ） 智（サトシ） 特定助教 （神経生理学）
3	医学	医科学	L2	Aila（アイラ） Johanna（ヨハンナ）	渡邉（ワタナベ） 大（ダイ） 教授 医学研究科　生体情報科学講座 生体情報科学	平家（ヘイケ） 俊男（トシオ） 教授 医学研究科　発生発達医学講座 発達小児科学	樋口（ヒグチ） ゆり子（ユリコ） 特定講師 （生物薬剤学）	Dinh（ディン） Ha（ハ） Duy（ユイ） Thuy（ティ） 特定助教 （脳機能イメージング）
4	医学	医科学	L2	MBENZA（ンベンザ） MBAMBI（バンビ） NAASSON（ナーソン）	上杉（ウエスギ） 志成（モトナリ） 教授 化学研究所　生体機能化学研究系 ケミカルバイオロジー	寺西（テラニシ） 豊（ユタカ） 教授 医学研究科 「医学領域」産学連携推進機構	富塚（トミヅカ） 太郎（タロウ） 特定講師 （家庭医療学）	佐藤（サトウ） 文規（フミノリ） 特定助教 （発生生物学・分子生物学）
5	医学系	人間健康科学	L2	松本（マツモト） 朋子（トモコ）	岡（オカ） 昌吾（ショウゴ） 教授 医学研究科　人間健康科学系専攻 医療検査展開学講座　生化学	前川（マエカワ） 平（タイラ） 教授 医学部附属病院　輸血細胞治療部	松橋（マツハシ） 眞生（マサオ） 特定准教授 （臨床神経生理学）	富塚（トミヅカ） 太郎（タロウ） 特定講師 （家庭医療学）
6	薬学	薬科学	L2	篠田（シノダ） 昂樹（コウキ）	二木（フタキ） 史朗（シロウ） 教授 化学研究所　生体機能化学研究系 生体機能設計化学	松田（マツダ） 道行（ミチユキ） 教授 医学研究科　基礎病態学講座 病態生物医学	山本（ヤマモト） 浩司（コウジ） 特定准教授 （機械工学）	滝本（タキモト） 晶（アキ） 特定助教 （発生学）
7	薬学	医薬創成情報科学	L2	堂上（ドウジョウ） 久美子（クミコ）	岡村（オカムラ） 均（ヒトシ） 教授 薬学研究科　医薬創成情報科学専攻 医薬創成情報科学講座 システムバイオロジー分野	小西（コニシ） 郁生（イクオ） 教授 医学研究科　器官外科学講座 婦人科学・産科学	大江（オオエ） 賢治（ケンジ） 特定講師 （人体解剖学・分子生物学）	木下（キノシタ） 武彦（タケヒコ） 特定講師 （応用数学）
8	工学	分子工学	L2	宇野（ウノ） 雅俊（マサトシ）	白川（シラカワ） 昌宏（マサヒロ） 教授 工学研究科　分子工学専攻 生体分子機能化学講座	岩田（イワタ） 想（ソウ） 教授 医学研究科　分子生体統御学講座 分子細胞情報学	西（ニシ） 美幸（ミユキ） 特定准教授 (生化学・発生生物学)	高橋（タカハシ） めい子（メイコ） 特定講師 （ゲノム医学）
9	工学	高分子化学	L2	末永（スエナガ） 和真（カズマサ）	中條（チュウジョウ） 善樹（ヨシキ） 教授 工学研究科　高分子化学専攻 高分子合成講座　重合化学分野	細田（ホソダ） 公則（キミノリ） 教授 医学研究科　人間健康科学系専攻 看護科学コース　臨床看護学講座 生活習慣病看護学	髙折（タカオリ） 恭一（キョウイチ） 特定准教授 （膵臓外科学・低侵襲治療学）	東森（ヒガシモリ） 信就（ノブユキ） 特定講師 （応用解析学）
10	工学	合成・生物化学	L2	遠野（エンノ） 宏季（ヒロキ）	北川（キタガワ） 進（ススム） 教授 工学研究科　合成・生物化学専攻 合成化学講座　機能化学分野	松田（マツダ） 秀一（シュウイチ） 教授 医学研究科　感覚運動系外科学講座 整形外科学	高橋（タカハシ） めい子（メイコ） 特定講師 （ゲノム医学）	鳥井（トリイ） 美江（ミエ） 特定助教 （慢性・老年看護学（免疫学））
11	工学	合成・生物化学	L2	西谷（ニシタニ） 暢彦（ノブヒコ）	松田（マツダ） 建児（ケンジ） 教授 工学研究科　合成・生物化学専攻 合成化学講座　物理有機化学分野	野田（ノダ） 亮（マコト） 教授 医学研究科　分子生体統御学講座 分子腫瘍学	木村（キムラ） 祐（ユウ） 特定准教授 （高分子化学）	平井（ヒライ） 康治（ヤスハル） 特定助教 （神経生理学）

平成27年度　LIMS履修生（平成27年度生）指導教授・メンター一覧

	研究科	専攻	学年	氏名	研究科 指導教授	LIMS指導教授	メンター1	メンター2
1	医学	医科学	L1	Rahman Md Maminur	武田 俊一 教授 医学研究科 遺伝医学講座 放射線遺伝学	森 泰生 教授 工学研究科 合成・生物化学専攻 生物化学講座 分子生物化学分野	東森 信就 特定講師 （応用解析学）	滝本 晶 特定助教 （発生学）
2	医学	医科学	L1	SHAMIMA SULTANA	髙橋 良輔 教授 医学研究科 脳病態生理学講座 臨床神経学	掛谷 秀昭 教授 薬学研究科 医薬創成情報科学専攻 医薬創成情報科学講座 ｼｽﾃﾑｹﾐｾﾗﾋﾟｰ(制御分子学)	髙折 恭一 特定准教授 （膵臓外科学・低侵襲治療学）	Dinh Ha Duy Thuy 特定助教 （脳機能イメージング）
3	薬学	薬科学	L1	尾山 翔平	金子 周司 教授 薬学研究科 薬学専攻 病態機能解析学講座 生体機能解析学分野	小川 修 教授 医学研究科 器官外科学講座 泌尿器科学	山本 浩司 特定准教授 （機械工学）	東森 信就 特定講師 （応用解析学）
4	薬学	薬科学	L1	松本 明宏	髙倉 喜信 教授 薬学研究科 薬学専攻 病態機能解析学講座 病態情報薬学分野	坂井 義治 教授 医学研究科 外科学講座 消化管外科学	木下 武彦 特定講師 （応用数学）	高橋 めい子 特定講師 （ゲノム医学）
5	薬学	医薬創成情報科学	L1	李 雪氷	掛谷 秀昭 教授 薬学研究科 医薬創成情報科学専攻 医薬創成情報科学講座 ｼｽﾃﾑｹﾐｾﾗﾋﾟｰ(制御分子学)	鈴木 茂彦 教授 医学研究科 感覚運動系外科学講座 形成外科学	冨塚 太郎 特定講師 （家庭医療学）	佐藤 文規 特定助教 （発生生物学・分子生物学）
6	工学	マイクロエンジニアリング	L1	松村 保之	安達 泰治 教授 再生医科学研究所 ナノ再生医工学研究センター バイオメカニクス研究領域	松田 秀一 教授 医学研究科 感覚運動系外科学講座 整形外科学	西 美幸 特定准教授 (生化学・発生生物学)	松田 和郎 特定講師 （神経解剖学・解剖学一般）
7	工学	高分子化学	L1	三浦 理紗子	秋吉 一成 教授 工学研究科 高分子化学専攻 高分子物性講座 生体機能高分子分野	篠原 隆司 教授 医学研究科 遺伝医学講座 分子遺伝学	木村 祐 特定准教授 （高分子化学）	山本 浩司 特定准教授 （機械工学）
8	工学	合成・生物化学	L1	池田 燎亮	濱地 格 教授 工学研究科 合成・生物化学専攻 生物化学講座 生物有機化学分野	岡本 久 教授 数理解析研究所	松橋 眞生 特定准教授 （臨床神経生理学）	樋口 ゆり子 特定講師 （生物薬剤学）

LIMS (D1) Students, Supervisors and Mentors (AY2015)

(As of November 11,2015)

	Graduate School	Division	Grade	Student	Academic Supervisor	LIMS Supervisor	LIMS Mentor 1 Position, (research field)	LIMS Mentor 2 Position, (research field)
1	Medicine	Human Health Sciences	D 3	**Mikako Gomyo**	**Prof. Tsuyoshi Shiina** Medical Imaging System Sciences, Human Health Sciences, Graduate School of Medicine	**Prof. Masakazu Toi** Breast Surgery, Graduate School of Medicine	**Program-Specific Associate Prof. Masao Matsuhashi** (Clinical Neurophysiology)	**Program-Specific Senior Lect. Takehiko Kinoshita** (Applied Mathematics)
2	Pharmaceutical Sciences	Pharmaceutical Sciences	D 3	**Jun Miyanohara**	**Prof. Shuji Kaneko** Molecular Pharmacology, Graduate School of Pharmaceutical Sciences	**Prof. Jun Fujita** Clinical Molecular Biology, Graduate School of Medicine	**Program-Specific Senior Lect. Wakoto Matsuda** (Neuroanatomy, Anatomy)	**Program-Specific Assistant Prof. Yasuharu Hirai** (Neurophysiology)
3	Engineering	Polymer Chemistry	D 3	**Rei Kuwabara**	**Prof. Kazunari Akiyoshi** Bio-macromolecular Science, Graduate School of Engineering	**Prof. Takeshi Kimura** Cardiovascular Medicine, Graduate School of Medicine	**Program-Specific Associate Prof. Kyoichi Takaori** (Pancreatic Surgery / Minimally Invasive Therapeutics)	**Program-Specific Assistant Prof. Aki Takimoto** (Embryology)
4	Engineering	Synthetic Chemistry and Biological Chemistry	D 3	**Takuto Suito**	**Prof. Masato Umeda** Biorecognics, Graduate School of Engineering	**Prof. Dai Watanabe** Biological Sciences, Graduate School of Medicine	**Program-Specific Senior Lect. Yuriko Higuchi** (Biopharmaceutics)	**Program-Specific Senior Lect. Wakoto Matsuda** (Neuroanatomy, Anatomy)
5	Engineering	Synthetic Chemistry and Biological Chemistry	D 3	**Kazuma Yamaguchi**	**Prof. Yasuo Mori** Molecular Biology, Graduate School of Engineering	**Prof. Ryosuke Takahashi** Neurology, Graduate School of Medicine	**Associate Prof. (Graduate School of Medicine) Christian Altmann** (Experimental Psychology)	**Program-Specific Assistant Prof. Satoshi Yawata** (Neurophysiology)
6	Medicine	Human Health Sciences	D 2	**Atsuko Ishida**	**Prof. Toshiko Futaki** Clinical Cognitive Neuroscience, Human Health Sciences, Graduate School of Medicine	**Prof. Kazuyoshi Nakabe** Mechanics of Thermal Fluid and Material, Graduate School of Engineering	**Program-Specific Senior Lect. Kenji Ohe** (Human Anatomy / Molecular Biology)	**Program-Specific Assistant Prof. Mie Torii** (Gerontological Nursing (Immunology))

LIMS (M2) Students, Supervisors and Mentors (AY2015)

	Graduate School	Division	Grade	Student	Academic Supervisor	LIMS Supervisor	LIMS Mentor 1 Position, (research field)	LIMS Mentor 2 Position, (research field)
1	Medicine	Medical Science	M2	**Hiroyuki Matsubara**	**Prof. Tatsutoshi Nakahata** Disease modeling with patient-specific iPSCs, Center for iPS Cell Research and Application	**Prof. Taiji Adachi** Biomechanics, Institute for Frontier Medical Sciences	**Program-Specific Assistant Prof. Fuminori Sato** (Developmental Biology / Molecular Biology)	**Program-Specific Assistant Prof. Mie Torii** (Gerontological Nursing (Immunology))
2	Medicine	Medical Science	M2	**SAHA Liton Kumar**	**Prof. Shunichi Takeda** Radiation Genetics, Graduate School of Medicine	**Prof. Masahiro Hiraoka** Radiation Oncology and Image-Applied Therapy, Graduate School of Medicine	**Program-Specific Associate Prof. Miyuki Nishi** (Biochemistry / Developmental Biology)	**Program-Specific Assistant Prof. Satoshi Yawata** (Neurophysiology)
3	Medicine	Medical Science	M2	**Aila Johanna**	**Prof. Dai Watanabe** Biological Sciences, Graduate School of Medicine	**Prof. Toshio Heike** Pediatrics, Graduate School of Medicine	**Program-Specific Senior Lect. Yuriko Higuchi** (Biopharmaceutics)	**Program-Specific Assistant Prof. Dinh Ha Duy Thuy** (Functional Neuroimaging)
4	Medicine	Medical Science	M2	**MBENZA MBAMBI NAASSON**	**Prof. Uesugi Motonari** Chemical Biology, Institute for Chemical Research	**Prof. Yutaka Teranishi** Medical Science and Business Liaison Organization, Graduate School of Medicine	**Program-Specific Senior Lect. Taro Tomizuka** (Health Economics)	**Program-Specific Assistant Prof. Fuminori Sato** (Developmental Biology / Molecular Biology)
5	Medicine	Human Health Sciences	M2	**Tomoko Matsumoto**	**Prof. Kuniaki Saito** Basic Laboratory Science, Human Health Sciences, Graduate School of Medicine	**Prof. Taira Maekawa** Transfusion Medicine & Cell Therapy, Kyoto University Hospital	**Program-Specific Associate Prof. Masao Matsuhashi** (Clinical Neurophysiology)	**Program-Specific Senior Lect. Taro Tomizuka** (Health Economics)
6	Pharmaceutical Sciences	Pharmaceutical Sciences	M2	**Kouki Shinoda**	**Prof. Shiro Futaki** Biofunctional Design-Chemistry, Institute for Chemical Research	**Prof. Michiyuki Matsuda** Pathology and Biology of Diseases, Graduate School of Medicine	**Program-Specific Associate Prof. Koji Yamamoto** (Mechanical Engineering)	**Program-Specific Assistant Prof. Aki Takimoto** (Embryology)
7	Pharmaceutical Sciences	Bioinformatics and Chemical Genomics	M2	**Kumiko Dojo**	**Prof. Hitoshi Okamura** System Biology, Graduate School of Pharmaceutical Sciences	**Prof. Ikuo Konishi** Gynecology and Obstetrics, Graduate School of Medicine	**Program-Specific Senior Lect. Kenji Ohe** (Human Anatomy / Molecular Biology)	**Program-Specific Senior Lect. Takehiko Kinoshita** (Applied Mathematics)
8	Engineering	Molecular Engineering	M2	**Masatoshi Uno**	**Prof. Masahiro Shirakawa** Biomolecular Functional Chemistry, Graduate School of Engineering	**Prof. So Iwata** Cell Biology, Graduate School of Medicine	**Program-Specific Associate Prof. Miyuki Nishi** (Biochemistry / Developmental Biology)	**Program-Specific Senior Lect. Meiko Takahashi** (Genomic Medicine)
9	Engineering	Polymer Chemistry	M2	**Kazumasa Suenaga**	**Prof. Yoshiki Chujo** Polymerization Chemistry, Graduate School of Engineering	**Prof. Kiminori Hosoda** Nursing Science for Lifestyle-Related Diseases, Human Health Sciences, Graduate School of Medicine	**Program-Specific Associate Prof. Kyoichi Takaori** (Pancreatic Surgery / Minimally Invasive Therapeutics)	**Program-Specific Senior Lect. Nobuyuki Higashimori** (Applied Analysis)
10	Engineering	Synthetic Chemistry and Biological Chemistry	M2	**Hiroki Enno**	**Prof. Susumu Kitagawa** Functional Coordination Chemistry, Graduate School of Engineering	**Prof. Shuichi Matsuda** Orthopaedic Surgery, Graduate School of Medicine	**Program-Specific Senior Lect. Meiko Takahashi** (Genomic Medicine)	**Program-Specific Assistant Prof. Mie Torii** (Gerontological Nursing (Immunology))
11	Engineering	Synthetic Chemistry and Biological Chemistry	M2	**Nobuhiko Nishitani**	**Prof. Kenji Matsuda** Physical Organic Chemistry Field, Graduate School of Engineering	**Prof. Makoto Noda** Molecular Oncology, Graduate School of Medicine	**Program-Specific Associate Prof. Yu Kimura** (Polymer Chemistry)	**Program-Specific Assistant Prof. Yasuharu Hirai** (Neurophysiology)

LIMS (M1) Students, Supervisors and Mentors (AY2015)

	Graduate School	Division	Grade	Student	Academic Supervisor	LIMS Supervisor	LIMS Mentor 1 Position, (research field)	LIMS Mentor 2 Position, (research field)
1	Medicine	Medical Science	M1	**Rahman Md Maminur**	**Prof. Shunichi Takeda** Radiation Genetics, Graduate School of Medicine	**Prof. Yasuo Mori** Molecular Biology, Graduate School of Engineering	**Program-Specific Senior Lect. Nobuyuki Higashimori** (Applied Analysis)	**Program-Specific Assistant Prof. Aki Takimoto** (Embryology)
2	Medicine	Medical Science	M1	**SHAMIMA SULTANA**	**Prof. Ryosuke Takahashi** Neurology, Graduate School of Medicine	**Prof. Hideaki Kakeya** System Chemotherapy and Molecular Sciences, Graduate School of Pharmaceutical Sciences	**Program-Specific Associate Prof. Kyoichi Takaori** (Pancreatic Surgery / Minimally Invasive Therapeutics)	**Program-Specific Assistant Prof. Dinh Ha Duy Thuy** (Functional Neuroimaging)
3	Pharmaceutical Sciences	Pharmaceutical Sciences	M1	**Shohei Oyama**	**Prof. Shuji Kaneko** Molecular Pharmacology, Graduate School of Pharmaceutical Sciences	**Prof. Osamu Ogawa** Urology, Graduate School of Medicine	**Program-Specific Associate Prof. Koji Yamamoto** (Mechanical Engineering)	**Program-Specific Senior Lect. Nobuyuki Higashimori** (Applied Analysis)
4	Pharmaceutical Sciences	Pharmaceutical Sciences	M1	**Akihiro Matsumoto**	**Prof. Yoshinobu Takakura** Biopharmaceutics and Drug Metabolosm, Graduate School of Pharmaceutical Sciences	**Prof. Yoshiharu Sakai** Gastrointestinal Surgery, Graduate School of Medicine	**Program-Specific Senior Lect. Takehiko Kinoshita** (Applied Mathematics)	**Program-Specific Senior Lect. Meiko Takahashi** (Genomic Medicine)
5	Pharmaceutical Sciences	Bioinformatics and Chemical Genomics	M1	**XueBing Li**	**Prof. Hideaki Kakeya** System Chemotherapy and Molecular Sciences, Graduate School of Pharmaceutical Sciences	**Prof. Shigehiko Suzuki** Plastic and Reconstructive Surgery, Graduate School of Medicine.	**Program-Specific Senior Lect. Taro Tomizuka** (Health Economics)	**Program-Specific Assistant Prof. Fuminori Sato** (Developmental Biology / Molecular Biology)
6	Engineering	Micro Engineering	M1	**Yasuyuki Matsumura**	**Prof. Taiji Adachi** Biomechanics, Institute for Frontier Medical Sciences	**Prof. Shuichi Matsuda** Orthopaedic Surgery, Graduate School of Medicine	**Program-Specific Associate Prof. Miyuki Nishi** (Biochemistry / Developmental Biology)	**Program-Specific Senior Lect. Wakoto Matsuda** (Neuroanatomy, Anatomy)
7	Engineering	Polymer Chemistry	M1	**Risako Miura**	**Prof. Kazunari Akiyoshi** Bio-macromolecular Science, Graduate School of Engineering	**Prof. Takashi Shinohara** Molecular Genetics, Graduate School of Medicine	**Program-Specific Associate Prof. Yu Kimura** (Polymer Chemistry)	**Program-Specific Associate Prof. Koji Yamamoto** (Mechanical Engineering)
8	Engineering	Synthetic Chemistry and Biological Chemistry	M1	**Ryousuke Ikeda**	**Prof. Itaru Hamachi** Bioorganic Chemistry, Graduate School of Engineering.	**Prof. Hisashi Okamoto** Research Institute for Mathematical Sciences	**Program-Specific Associate Prof. Masao Matsuhashi** (Clinical Neurophysiology)	**Program-Specific Senior Lect. Yuriko Higuchi** (Biopharmaceutics)

2.

教育カリキュラム及び指導体制

Curriculum and Staff

平成27年度　履修科目表（修士・博士後期課程）

科目群		科　目	担当者	修士				博士後期						備　考
				1年次		2年次		3年次		4年次		5年次		
				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									
		医薬用高分子設計学	田畑				2							
		連続体力学	安達		2									
		生物分子解析学	森・西		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・樋口				2							
	医学・生物学	人体解剖学	萩原･大江･松田	5										必修
		生理学	大森・河野		2									必修（9月～）
		医化学	渡邉		2									
		加齢医学	荒井			2								
		再生医学	開・瀬原・田畑・安達				2							
		ゲノムコホート研究	松田・高橋			2								
	医療倫理	医療倫理	小杉・藤田・福山			1								
数理科学		基礎数学	東森	2										
		シミュレーション概論	木下		2									
		応用数学	木下・東森		2									
医療経済学		医療経済論	後藤・富塚				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	講義	1 画像診断学												
		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									（9月～）
		1-3 MRI 画像診断学	福山											
		2 低侵襲治療学	木村・高折		1									
		3 生体材料学・人工臓器学	田畑・松田秀				1							9月･10月
		4 医療情報学	黒田				1							
		5 検査機器学・研究機器学	一山				1							
		6 医療・生活支援システム学	椎名	1										必修（9月）

科目群		科　目	担当者	修士				博士後期						備　考
				1年次		2年次		3年次		4年次		5年次		
				前	後	前	後	前	後	前	後	前	後	
学際応用科目	実習及び病院内研修	1 画像診断学												
		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									(9月～)
		1-3 MRI 画像診断学	福山											
		2 低侵襲治療学	木村・高折		1									
		3 生体材料学・人工臓器学	田畑・松田秀				1							9月･10月
		4 医療情報学	黒田				1							
		5 検査機器学・研究機器学	一山				1							
		6 医療・生活支援システム学	椎名	1										必修(9月)
英語 debate Ⅰ			Altmann	2										必修
英語 debate Ⅱ			Altmann			2								必修
英語 debate Ⅲ			Altmann											必修
英語 debate Ⅳ														必修
英語 debate Ⅴ														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											
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 (FY 2015)

No	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	
1	Mechanics and Dynamics, Fundamental	Nakabe, Adachi, Yamamoto	2										
2	Medical Electronics	Shiina, Sugimoto	2										
3	Basic Materials Chemistry	Kondo, Kimura		2									
4	Design of Biomaterials for Medical and Pharmaceutical Applications	Tabata				2							
5	Continuum Mechanics	Adachi		2									
6	Molecular Analysis of Life	Mori、Nishi		2									
7	Image Processing Basics	Sugimoto, Shiina			2								
8	Biopharmaceutics	Nakayama, Takakura, Hashida, Higuchi				2							
9	Human Anatomy	Hagiwara, Ohe, Matsuda	5										Compulsory
10	Physiology	Ohmori, Kawano		2									Compulsory (Sep.～)
11	Medical Chemistry	Watanabe		2									
12	Gerontology, Geriatrics, and Aging Science	Arai			2								
13	Regenerative Medicine	Hiraki, Sehara, Tabata, Adachi				2							
14	Genome Cohort Study	Matsuda, Takahashi			2								
15	Medical Ethics	Kosugi, Fujita,Fukuyama			1								
16	Basic Mathematics	Higashimori	2										
17	Introduction to Numerical Simulation	Kinoshita		2									
18	Applied Mathematics	Kinoshita, Higashimori		2									
19	Health Economics	Goto, Tomizuka				2							
20	Intellectual Property & Global Standardization	Teranishi			2								
21	Medical Engineering for Society Ⅰ	Ishii		2									Sep.～
22	Medical Engineering for Society Ⅱ	Ishii			2								
	◆ Interdisciplinary application（1～6）												
	1. Medical imaging: Lecture												
23	1-1 Diagnostic Pathology	Haga		1									
24	1-2 Radiology	Fukuyama		1									Sep.～
25	1-3 MRI introduction	Fukuyama											
26	2. Minimally invasive therapeutics : Lecture	Kimura,Takaori		1									
27	3. Biomaterials and Artificial Organs : Lecture	Tabata, Matsuda				1							Sep. Oct.
28	4. Medical informatics : Lecture	Kuroda				1							
29	5. Inspection equipment studies Science research equipment :Lecture	Ichiyama				1							
30	6. Medical and life support systems : Lecture	Shiina	1										Compulsory (Sep.)

No	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	
	1. Medical imaging : Practice												
23	1-1 Diagnostic Pathology	Haga		1									
24	1-2 Radiology	Fukuyama		1									Sep.～
25	1-3 MRI introduction	Fukuyama											
26	2. Minimally invasive therapeutics : Practice	Kimura,Takaori		1									
27	3. Biomaterials and Artificial Organs : Practice	Tabata, Matsuda				1							Sep. Oct.
28	4. Medical informatics: Practice	Kuroda				1							
29	5. Inspection equipment studies Science research equipment : Practice	Ichiyama				1							
30	6. Medical and life support systems : Practice	Shiina	1										Compulsory (Sep.)
31	Debate Ⅰ	Altmann	2										Compulsory
32	Debate Ⅱ	Altmann			2								Compulsory
33	Debate Ⅲ	Altmann											Compulsory
34	Debate Ⅳ												Compulsory
35	Debate Ⅴ												Compulsory
36	Internship (Abroad)	Takeda, Fukuyama											Compulsory elective
37	Internship (Industrial and public parties)	Ishii, Fukuyama											
38	Pre-research												Compulsory
39	Thesis Research												Compulsory

Number: The number of credits

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

Program –Specific Staff – Mission and Activities

In Kyoto University, Leading Graduate School Programs are managed under the auspices 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 doverse 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.

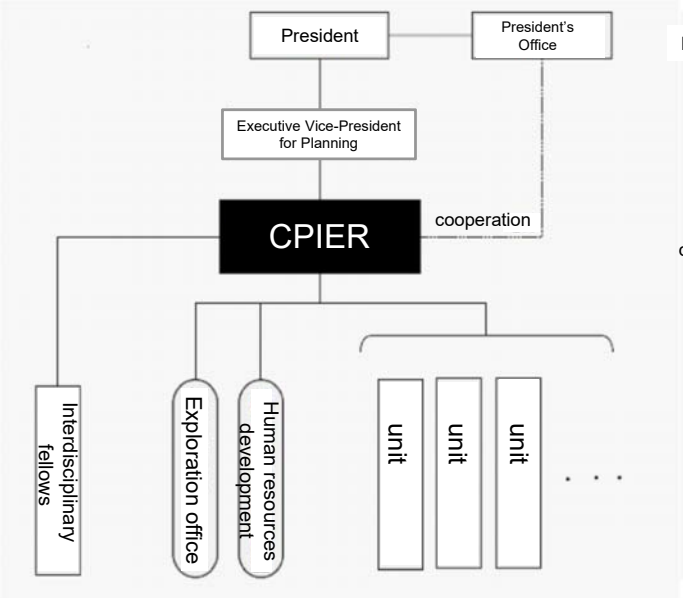
1. Human Anatomy ---------- Kenji Ohe, Wakoto Matsuda
2. Physiology ---------- Wakoto Matsuda, Naoko Inaba, Yasuharu Hirai
3. Medical and daily life support systems ---------- Mie Torii
4. Debate ---------- Christian Altmann
5. Mechanics and Dynamics, Fundamental ---------- Koji Yamamoto
6. Basic Materials Chemistry ---------- Yu Kimura
7. Molecular Analysis of life ---------- Miyuki Nishi
8. Biopharmaceutics ---------- Yuriko Higuchi
9. Medical Chemistry ---------- Satoshi Yawata
10. Regenerative Medicine ---------- --- Fuminori Sato, Aki Takimoto
11. Genome Cohort Study ---------- Meiko Takahashi
12. Basic Mathematics ---------- Nobuyuki Higashimori
13. Applied Mathematics ---------- Nobuyuki Higashimori, Takehiko Kinoshita
14. Introduction to Numerical Simulation ---------- Takehiko Kinoshita
15. Minimally Invasive Therapy ---------- Kyoichi Takaori
16. International Student Related Issues ---------- Dinh Ha Duy Thuy

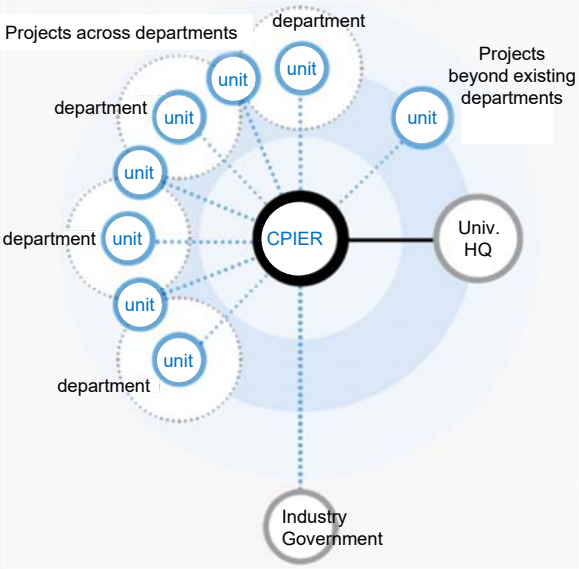
Mentors: Besides a supervisor in the specific research field of each student, we arranged a LIMS supervisor (professor) and two mentors (program-specific staff) from diverse fields to but slightly different from the specific field. Four instructors collaborate and help the student to plan training & research theke(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 for the specific research.

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





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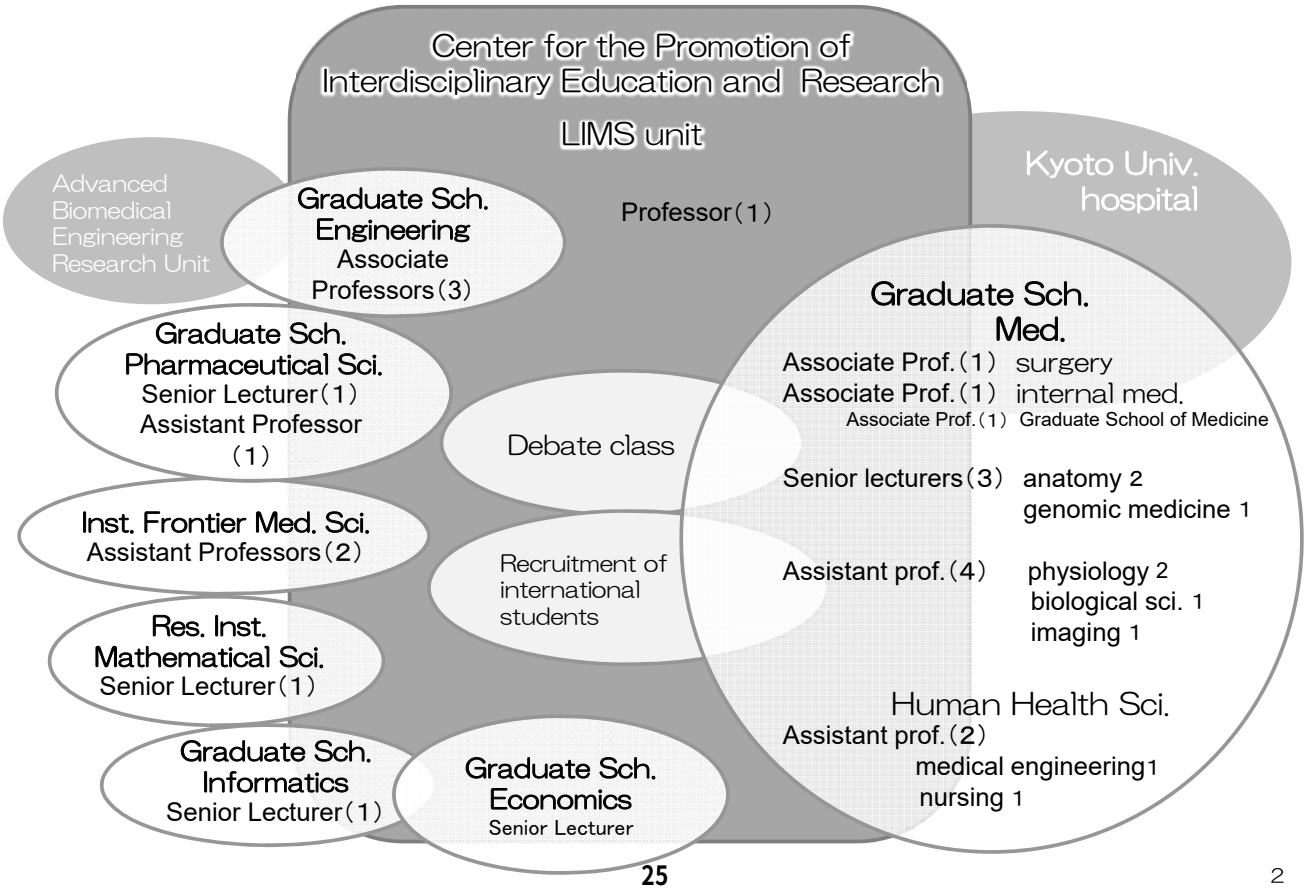
2 Program-specific Staff



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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 Lecturer, LIMS)
Wakoto Matsuda (Program-specific Lecturer, LIMS)

The human anatomy course is a basic subject for the second grade students of LIMS. We have considered important to teach the musculoskeletal system and kinesiology in detail, which will become essential knowledge in coping with the unprecedented aging society. The students will apply what they have learned in human anatomy to structure-movement coordination, which will help their themes in medico-engineering collaboration. This year, we have distributed handouts and asked the students to hand in reports about the fundamentals of human anatomy. During anatomical practice, the students have learned the three-dimensional arrangement of the human body by observing and touching the cadaver, studying virtual pictures and plastic models. For further learning, we have only mentioned but will show next year how to use a confocal microscope, a basic instrument used for research as well as studying histology, which is necessary to understand anatomy. An important feature of this program is to have the LIMS students experience human anatomy in a similar way as medical students do.

2. Physiology

Instructors: Harunori Ohmori (Specially Appointed Professor)
Kenji Kawano (Specially Appointed Professor)
Wakoto Matsuda (Program-Specific Senior Lecturer, 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. The course is 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 LIMS program. 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.

At the end of lecture course, some practices of physiology were given. Students have learned how to record the neural activity from the animal brain *in vivo*, and have had a firsthand experience of human visuomotor learning through prism adaptation. The practice is intended to teach students how to conduct experiments and analyze data of physiology.

3. Medical and Daily Life Support Systems

Instructors: Hidenori Arai (Director of Center for Gerontology and Social Science,
National Center for Geriatrics and Gerontology)
Mie Torii (Program-specific Assistant Professor, LIMS)

In Japan, one in four people are over 65, and we are under pressure to take increased measures to deal with welfare, nursing and medical care needs. The Ministry of Health, Labor and Welfare recommends regional comprehensive support in which older adults can spend the terminal stage of their lives in their own homes and neighborhoods rather than staying in 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 welfare law and policy, 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 how to advance medical support systems and equipment

September. 15th, 2015 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

October. 2nd, 2015 Lecture (2)

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

September. 25th, 2014 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 assessment 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.

September. 29th, 2015 Field trip (2)

A. Welfare facilities

These composite facilities consist of 1) intensive-care nursing homes; 2) short-term admission for daily lifelong term-care facilities; 3) day-care centers. Local families can use facilities within the day-care centers, designed to foster intergenerational social communication with elderly patients and local families. In order to understand varied care levels, types of healthcare cooperation, life support services and regional exchange, our students observed older adults who lived in various types of facilities.

4. Debate

Instructor: Christian F. Altmann, Associate Professor (Graduate School of Medicine)

The English Debate course and practice was held in 2015 as a weekly course with the aim to a) improve the students' 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 respond to questions and to defend their opinion, and c) improve their ability to refute others' arguments.

First year students were trained in basic argumentation skills, and the presentation of scientific / societal topics and ideas. Discussions were amongst others on funding of basic versus applied science, internet pharmacies, entertainment in nursing homes, and employees' working hours. Students also presented project ideas such as drug-delivery systems or the application of a social business approach to provide sanitized water in developing countries.

The second year students practiced project discussion and debate activities in teams. In parts of the course, teams of two students proposed an idea which was discussed in a simulated meeting, which – depending on the topic – simulated a science grant committee, a company board, or a political TV discussion. Exemplary topics were the development of cancer-smelling chips to be installed in a toilet, creation of specialized community care homes for the elderly, the repopulation of depopulated rural villages and discussion of food supplements and sugar substitutes.

Third year students (doctoral level) engaged in discussions with researchers with various scientific

backgrounds (engineering, medicine, biochemistry, etc.) and nationalities (French, Korean, British, US American, German, Japanese, etc.). Topics were amongst others the benefits and drawbacks of genetically modified organisms, nutrition for healthy aging, city planning for the elderly, and susceptibility to radiation after a nuclear disaster (Ukraine).

Thus, the English debate course and practice provided students with a wide range of activities and discussion opportunities in English to widen their viewpoint and hone their communication skills.

5. 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 course is designed to introduce mechanical engineering, mainly four fundamental dynamics such as Mechanical dynamics, Dynamics for material and structure, Fluid dynamics and Thermodynamics, to students who do not have a background of mechanical engineering. The primary aim is to acquire and refine knowledge of mechanical engineering necessary for developing novel devices or measuring systems in the medico-engineering field. In this year, ninety-minute class was given every Monday during the first semester for L1 student (Two students attended this class). In the first half of this course, those dynamics were explained with the concept of continuum physics, which can help students understand the relation between equations of motion or governing equations and real phenomena. In the lecture, we focused on the physical implications of equations describing each dynamics and theoretically expounded common physical phenomena, such as movement, deformation of objects with mass and shape, and flow of gas or liquid. In the second half, we introduced how those principles of mechanics have been applied to real-world equipments and systems, and also explained about the latest mechanical engineering technologies used in the field of medical or welfare engineering. Practical training of this course for second-year master's students was held as part of the class: Biomaterials and Artificial Organs.

[Course Content and Schedule in the 2015 academic year]

<Fundamental Mathematics>

1 Dynamics and mathematics

<Fundamental Dynamics>

2-3 Mechanical dynamics (Mass and rigid-body dynamics)

4-5 Continuum dynamics (Mechanics for deformed body)

6-7 Dynamics for material and structure (Material mechanics)

8-9 Fluid dynamics

10-11 Thermodynamics and heat transfer

<Fundamental Mechanical System Engineering>

12 Control system engineering

13 Robot system engineering

14 Micro-nano system engineering

15 Design system engineering

6. Basic Materials Chemistry

Instructors: Teruyuki Kondo (Professor, Advanced Biomedical Engineering Research Unit, C-PiER)

Yu Kimura (Program-Specific Associate Professor, LIMS)

In academic year 2015, an exercise of organic chemistry was performed initially as usual. This exercise was intended to evaluate the actual skills of students. Based on the evaluation, the review about 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, especially including retrosynthetic analysis. Then, characteristics and synthetic routes of medicines such as sulfa drug and indinavir were lectured from the viewpoint of pharmacophore, structure-property relationship, mechanism of action and their biodistribution. In contrast, biomaterials as a large bulk material for clinical use have many functional moieties and characteristic properties, such as bioavailability, biocompatibility, antithrombogeneity, or other bioactivities, the lecture summarized these properties with the explanation in molecular level. In the lecture, we put emphasis on understanding not only of basic requirements as biomaterial, but also of the reason why the chemical composition 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 and the follow-up, we evaluated students on the proficiency and utilizing ability of obtained knowledge. Also a practice in imaging chemical probes on mouse have been executed since academic year 2014. Together with students, pigment molecules as a probe were injected *via* tail vein of mice, and the distribution in body was observed with 3-D photoacoustic CT scanner and fluorescence camera-TV monitor. Moreover, dissection of organs and the photoacousitic and fluorescent imaging was performed together with students. These experiences would be helpful to prepare further anatomy and physiology courses.

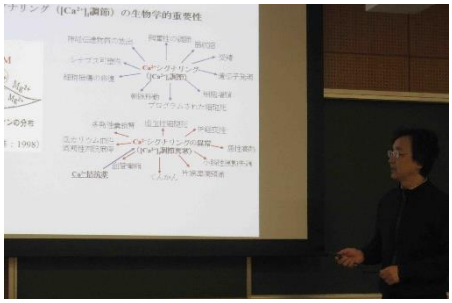
7. Molecular Analysis of life

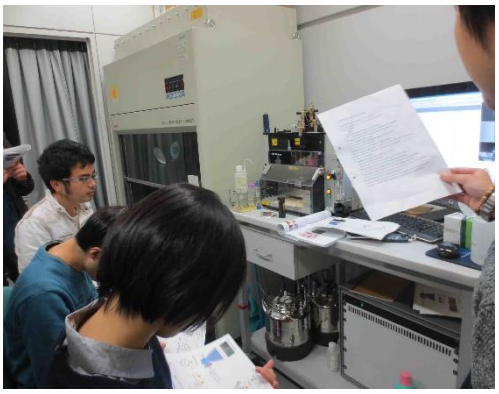
Instructors: Yasuo Mori (Professor, Graduate School of Engineering)

Masayuki Mori (Associate Professor, Graduate School of Engineering,)

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.





1. Orientation
2. Analysis of genes and determination of DNA sequences
3. Analysis of Proteins
4. Second messenger and thermosensor
5. Cell sorting (BD FACSJazz Cell Sorter)
6. Presentation and Discussion

8. 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” was provided to 2nd-graders. In this lecture, we introduced the anatomical and physiological characteristics of tissues in the body to understand drug disposition processes, including absorption, distribution, metabolism, and excretion. Then, we explained the mechanisms of drug disposition in each process, and provide the basic concept and its application example of drug delivery system (DDS). Short presentation in English by students helped further understanding of lectures.

- Drug absorption after local injection, and factors affecting it
- Anatomical and physiological characteristics of the skin and transdermal absorption of drugs
- Anatomical and physiological characteristics of the gastrointestinal tract and gastrointestinal absorption of drugs
- Rectal, pulmonary and nasal absorption of drugs
- Factors affecting drug distribution in each tissue

- Structure and functions of blood-brain barrier, blood-cerebrospinal fluid barrier and placental barrier, and drug distribution into brain and fetus thorough the barriers
- Anatomical and physiological characteristics of the kidney and renal excretion mechanisms of drugs
- Biliary excretion and enterohepatic circulation of drugs
- Drug metabolism and drug-metabolizing enzymes
- Drug/drug interactions
- Basic of clinical pharmacokinetics
- Drug delivery systems for major protein drugs and nucleic acid drugs and those for cell therapy

9. Medical Chemistry

Instructor: Dai Watanabe (Professor, Dept. of Biological Sciences)
Shohab Youssefian (Professor, Dept. of Molecular Biosciences)
Satoshi Yawata (Program-Specific Assistant Professor, LIMS)

The aim of this course is that LIMS students, especially those with the background in engineering, acquire knowledge in the common diseases in the modern society. With the help of the faculty in Graduate School of Medicine, the biochemical and molecular biological mechanisms for diseases, as well as the current treatment for diseases, are explained and discussed. In this course, the students are expected to acquire the knowledge that the second- or third-grade medical students learn; the lectures cover from the basics in biochemistry, molecular biology and genetics to the mechanism of diseases, especially focused on the disease having social significance, such as cancer. In this academic year, the lectures were held from October to January, aimed at M1 and M2 students.

The LIMS students with the engineering background are expected to utilize the knowledge obtained in this course during the future development of new treatments for diseases or medical instruments. Furthermore, even for the students with the biology background, this course provides the great opportunity to study biochemistry and molecular biology from the perspective of the diseases commonly occurring in the society.

10. Regenerative Medicine

Instructors: Yuji Hiraki (Professor, Institute for Frontier Medical Sciences)
Atsuko Sehara (Professor, Institute for Frontier Medical Sciences)
Yasuhiko Tabata (Professor, Institute for Frontier Medical Sciences)
Taiji Adachi (Professor, Institute for Frontier Medical Sciences)
Hirofumi Suemori (Associate Professor, Institute for Frontier Medical Sciences)
Masaya Yamamoto (Associate Professor, Institute for Frontier Medical Sciences)

Fuminori Sato (Program-Specific Assistant Professor, LIMS)
Aki Takimoto (Program-Specific Assistant Professor, LIMS)

The rapid advances in stem cell biology including iPS cell research and its clinical applications make it more important to comprehensively understand regenerative medicine in the various field of medicine. Institute for Frontier Medical Sciences focuses on the basic and application studies on regenerative medicine including stem cell biology, developmental biology, and tissue engineering. This course was arranged for the second year LIMS students to provide lectures on the following latest topics:

- History and recent advance of pluripotent stem cell research.
- Use of human PSCs for cell transplantation therapy
- Cellular Differentiation and Stem Cells (I), (II)
- Hard tissue development and regeneration (I) ECM, (II) Growth & differentiation, (III) Connections of building blocks
- Definition of biomaterials and their applications to medical devises and drug delivery system (DDS)
- Regenerative medicine from the viewpoint of biomaterials – Regenerative research and regenerative therapy –
- The importance of material sciences in hard tissue regenerative medicine.
- In vitro fabrication of tissue-like constructs and their applications
- Nanotechnologies for regenerative medicine
- Modeling and simulation of bone regeneration/remodeling and their application to scaffold design
- Modeling and simulation of multicellular dynamics in tissue morphogenesis

Through the lectures concerning stem cells, cellular differentiation, organogenesis, and biomaterials, we made a special effort to encourage students to find a systematic connection between basic and clinical studies on regenerative medicine. This course also provides a lecture on biomechanics to help students understand the mechanical aspects of developmental phenomenon and locomotive organs, which are latest research topics in developmental biology and regenerative medicine.

11. Genome Cohort Study

Instructor: Meiko Takahashi (Program-Specific Senior Lecturer, LIMS)

"Genome Cohort Studies" provides an intensive overview of genomic epidemiology for students intending to engage in, collaborate in, or interpret the results of genomic and epidemiologic research. This course was started in April 2014 and is available for all second year Master's degree students. Through lectures and group discussions, students will be able to understand the essential roles genomic analyses will play in 21st Century medicine - the era of "preventive medicine".

The course covers the following topics:

(1) Research fields and novel techniques developed that have emerged in the years since completion of the Human Genome Project.
(2) Understanding the importance of medicine and genomic research.
(3) What is a "cohort"? Comprehend the differences between cohorts and case-control analyses, and appreciate the strengths and weaknesses of the various types of analyses.
(4) Acquiring basic knowledge of the latest technologies used in genomic medicine.
(5) Introduction to the different techniques used in bioinformatics and proteomics, as well as how to handle web-based public databases.

12. Basic Mathematics

Instructor: Nobuyuki Higashimori (Program-Specific Senior Lecturer, LIMS)

This course provides basic materials of calculus and linear algebra at first-year undergraduate level, as a review for students who have once learned these materials and as an introduction for those who have not. Main topics are as follows:

- Differential and integral calculus in one and several variables,
- Ordinary differential equations,
- Extremum problems,
- Basic concepts in abstract linear space theory,
- Operations on matrices and solution of simultaneous linear equations,
- Inner product and eigenvalue problems.

The knowledge and concepts given in this course will be needed in situations such as when LIMS students learn more advanced courses including numerical simulation and basic physics, and when they formulate and analyze mathematical models in order to predict the future of the aging society.

13. Applied Mathematics

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

This course introduced an analysis for application and several concepts of statistics.

The former half was an introduction to topics in Fourier analysis and statistics. Fourier analysis is explained as an example of understanding basic ideas of medical imaging such as X-ray CT. Statistics was provided as a mathematical methods of inference from data obtained by random sampling. The goal was to learn elementary concepts about those topics.

The latter half of this course changed the schedule and described machine learning because the audiences were interested in it. We explained three problems, clustering, classification, and regression that are possible to solve it in machine learning. Especially, support vector machine (SVM) was introduced as the method to solve a classification problem. Moreover, to improve the accuracy of SVM, we introduced preprocessing data scaling, cross validation, and parameter tuning for SVM using the Gaussian radial basis function kernel.

We explained Python programming to actually calculate SVM classifier. Since Python has the modules not only numerical computation but also machine learning, Python was adopted in this course. Therefore, the students were able to learn well for the SVM classifier program.

14. Introduction to Numerical Simulation

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

This course introduced methods of numerical simulations for various natural or social phenomena. 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 equations for nondimensional quantities. I emphasized these three points in the course, and the students achieved a comprehensive understanding about them.

I taught how to use formula manipulation system in order to solve ordinary differential equations (ODE). Numerical simulation is necessary for analyzing ODEs which are not solvable by quadrature. I taught some numerical methods, the Euler method, the Runge-Kutta method, and the Dormand-Prince method, to solve ODEs.

Python was adopted as the formula manipulation system and the numerical computation software in this course. I taught how to use Python, matrix operations, conditional expressions, loop, user-defined functions,

visualization, and animation. Since we used the Python module to analytically or numerically solve ODEs, the source cords of students are well-made.

In the last part of the course, I taught the qualitative theory of ordinary differential equations. Especially, I introduced the stability and bifurcation theory of equilibria. Moreover, I explained the bifurcation phenomena of equilibria for the SIR model and the FitzHugh-Nagumo equation.

15. Minimally Invasive Therapy

Instructors: Shinji Uemoto

(Professor, Department of Hepato-Biliary-Pancreatic Surgery and Transplantation)

Takeshi Kimura (Professor, Department of Cardiovascular Medicine)

Yoshiharu Sakai (Professor, Department of Gastrointestinal Surgery)

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 gastrointestinal diseases", "Minimally invasive therapies in the field of neurosurgery", "High precision radiation therapy for cancer", "Catheter-based treatments of cardiovascular disease", "Minimally invasive and function sparing surgery in urology" and these lectures were given at the seminar room of LIMS in the G building of Medical Faculty or at the Kyoto University Hospital.

The attendants experienced laparoscopic surgery by themselves with a simulator at the Kyoto University Hospital during the course of "Site-visit to operation theater of gastrointestinal laparoscopic surgery" and observed procedures of gastrointestinal surgery at the operation theater of the Kyoto University Hospital later on. Besides, the attendants of the course observed conventional open surgery associated with significant invasiveness during the "Site-visit to operation theater of hepato-biliary-pancreatic surgery and transplantation" and had a individual discussion about the comparison between the conventional surgery and minimally invasive surgery subsequently. Moreover, other courses consisted of following contents.

"Site-visit to operation theater of neurosurgery (neuro-intervention and endoscopic surgery)": "Introductory lecture on radiation treatment planning"; "Site-visit to catheter-based treatment of cardiovascular disease"; "Site-visit to operation theater of urological surgery (robot-assisted surgery)".

16. International Student Related Issues

Instructor: Dinh Ha Duy Thuy (Program-Specific Assistant Professor, LIMS)

1) International student Recruitment

In March 2016, I visited 2 universities in Vietnam to introduce our LISM Program to staffs and students over there. Besides that I have been continuing to keep email exchanges with other universities in Vietnam, Indonesia which I visited during the last 2 years for disseminating information on the annual recruitment or events of the LIMS Program to their students.

There are several students from abroad want to apply for the LIMS Program, however, the requirement to come to Kyoto University by their own budgets for taking the on-site entrance examination at one of the indicated graduate schools associated with the LIMS program, before applying to the LIMS program is still a big obstacle for them. Therefore, in order to assist them to resolve this problem, I have also tried to find out some summer programs with financial supports at Kyoto University for oversea students to have a chance to come to Kyoto in summer 2015.

2) International student Support

Adapting to the Japanese culture as well as a new research environment is easy for many international students, but not for the others. Some international students have had very hard time in finding out the suitable way for them to adapt with a new life, a new studying environment in Japan. In such a case, an open discussion and supporting consultation with persons they feel trust is a very important key for them to overcome their difficulties, their stressful status and even though, their psychological disorder condition. I would note this issue again here, by a case of one LIMS student we helped in 2015.

Universities in Vietnam, March 2016

① March 28, 2016

Professor Vo Van Toi, Ph.D., Chair

Biomedical Engineering Department

International University, Vietnam National Universities at Ho Chi Minh City

Ho Chi Minh City

② March 29, 2016

Dr. Nguyen Thi Thanh Kieu, Vice Dean

Associate Professor Le Minh Tri, Vice Dean of Faculty of Pharmacy

Dr. Nguyen An Binh Head of International Relations Office

Dr. Nguyen Tuan Kiet, Deputy Head of Academic and Student Affair Office

Dr. Nguyen The Dung, Lecturer

School of Medicine, VNU-HCMC

Ho Chi Minh City

3.

国際連携

International Cooperation

平成27年度　外国からの招へい実績一覧

	実施日	氏名	所属	職名	
1	2015年4月8日、9日、16日	Denis Le Bihan	フランス ニューロスピン研究所　超高磁場MRI研究センター	所長	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（LIMS）に係るディベートクラスの実施
2	2015年6月22日	Michael Weiner	アメリカ カリフォルニア大学	教授	LIMS Special Seminar 「Accelerating development of effective treatments forAlzheimer's Disease」の講演
3	2016年2月29日～ 3月2日	Robert Turner	ドイツ マックス・プランク　認知神経科学研究所	名誉所長	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外部評価

Lecturers from Abroad in Academic Year 2015

	Date	Name	Affiliation	Title	Purpose of visit
1	April 8,9,16,2015	Denis Le Bihan	NeuroSpin CEA-Saclay Center France	Director	English debate class (special class) for LIMS Students
2	June 22, 2015	Michael Weiner	University of California San Francisco USA	Professor	LIMS Special Seminar "Accelerating development of effective treatments forAlzheimer's Disease"
3	February 29 - March 2,2015	Robert Turner	Emeritus Max Planck Institute for Human Cognitive and Brain Sciences Germany	Director	External evaluation for LIMS Program

平成27年度 海外渡航一覧

	出発日	日数	目的地	氏　　名	所属	職名	渡航目的
1	2015/5/15	6	アメリカ フィラデルフィア	富塚　太郎	健康長寿社会の総合医療開発ユニット（LIMS）	特定講師	ISPOR 20th Annual International Meetingに参加し、リーディングプログラムに係る情報収集を行う。
2	2016/3/27	5	ベトナム ホーチミン	Dinh Ha Duy Thuy	健康長寿社会の総合医療開発ユニット（LIMS）	特定助教	ホーチミン市国際大学、ベトナム国家大学ホーチミン市校を訪問し、リーディングプログラムに係る広報活動・学生勧誘活動を行う。

Activities in Foreign Countries (Academic Year 2015)

	Date of Departure	Days	Destination	Name	Position	Affiliation	Objective
1	2015/5/15	6	Philadelphia, USA	Taro Tomizuka	LIMS	Program-Specific Senior Lecturer	Information collection for LIMS Research Project at the ISPOR 20th Annual International Meeting.
2	2016/3/27	5	Ho Chi Minh City, Vietnam	Dinh Ha Duy Thuy	LIMS	Program-Specific Assistant Professor	Public relation activities for LIMS Program and introduction / presentation to students at Ho Chi Minh City International University , and Vietnam National University, Ho Chi Minh City.

4.

学生の活動

Student Activities

表紙秘話：遠野宏季受賞記念インタビュー

LIMS には本当、感謝しています。１だった選択肢が数倍に広がりました。

遠野宏季 Profile：京都大学大学院工学研究科修士課程２年、LIMS 履修生
医療福祉関係で起業するため平成２８年４月より休学予定

―GTEP*受賞おめでとうございます。どんな様子だったか教えてください。

京大がやっている海外企業研修で、社会人としての参加費は 25 万円なんですが、学生だと５万円なんです。こんないい機会参加しないのはもったいないなあ、っというセコい思いで参加しました（笑)。研修ではイギリスのオックスフォード大学とスウェーデンのルンド大学を訪問しました。その中で与えられたシーズから起業案を立案するコンペがあって、それでベストビジネスプランアイデア賞をいただきました。

―LIMS のことを聞いてもいいですか？　LIMS に参加してどうでしたか？

LIMS には本当、感謝しています。１だった選択肢が数倍に広がりました。僕は自分の考えで世の中をより良くしたいという想いで京大に入って今に至りますが、工学部の研究の世界だけ見ていた自分は、そのための手段ってアカデミアの世界にしか無いと思い込んでいた節がありました。それが、あ、こんな手段もあるんだ、って気づかせてくれて、見えない世界が見えるってすごいなと思いました。

―具体的に LIMS のどこがあなたを変えたのですか。

大きく２つあります。１つはプログラムです。特にその中でも座学より実習です。烏丸の高齢者の施設とか地域医療包括センターに行ったんですよ。

―それって医療生活支援システム学の実習ですよね？

はい、そうです。実際に介護や医療を受けている人がいる生々しい現場を見たのは本当に勉強になりました。その現場に最新の方法を取り入れたらもっと楽になるんじゃないかと思うこともありましたが、現場の皆さんは毎日の業務に精一杯なんです。だからこそ僕のような現場を見せてもらって技術も学んできた工学部の学生が現場に還元できるようなものを作る必要がありますし、作るべきだと感じました。

―LIMS のことが役に立っているというのは、じかに聞いたのは始めてでうれしいです。

地域包括医療センターには今年もいったんですけど、あ、あのとき来た学生さん、って覚えてくれてうれしかったです。ビジネスっていうと、お金儲け？って風に見られて構えられたりするんですけど、こういうのって継続していかないとだめなんですよね。１回ボランティアで無料のソフトを作ってもそれだけだと続けていけないじゃないですか。提供する側には報酬が入って、施設はそれで楽になってその分空いた時間をほかに回せて、なおかつ利

用する人たちはより快適になる、っていうウィン、ウィン、ウィンの関係が築ければいいなと思っています。

―もうひとつの LIMS にはいってよかったこととは？

研究費です。自由に使える研究費、もちろん LIMS のテーマに沿ってですが。そのおかげで自分の研究室のテーマとは違うが以前から興味のあった ICT 分野について研究・開発することができました。またその研究費から学会費や遠方にいる大学教授とディスカッションをするための交通費なども捻出して頂けたことで、より自分の視野を広める助けになりました。

―起業の話も聞かせてもらっていいですか？

それは、またうまくいった時に、ということで（笑）。

―わかりました。今日はこちらにとっても嬉しい話を聞かせてもらってありがとうございました。第２弾のインタビューを楽しみにしています。

こちらこそありがとうございました。

京都大学大学院医学研究科にて

遠野宏季君とそのメンターの先生方、鳥井先生（左）、高橋先生（右）

*GTEP: Global Technology Entrepreneurship Program
京都大学がおこなっている起業推進プログラム。

平成27年度 履修生の学外活動 【外国】

	出発日	日数	目的地	氏　　名	所属	学年	渡航目的
1	2015/5/31	8	デンマーク コペンハーゲン	五明　美香子	医学研究科 人間健康科学系専攻	博士課程 1年	International Summer School on Advanced Ultrasound Imagingに参加し、LIMS研究テーマ「音響放射力を用いた弾性イメージング法における組織発熱解析による安全性の評価」に係る研修・情報収集。
2	2015/6/23	7	スウェーデン ストックホルム	松本　朋子	医学研究科 人間健康科学系専攻	修士課程 2年	International Society for Stem Cell Research（ISSCR）2015 ANNUAL MEETINGに参加し、LIMS研究課テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
3	2015/8/4	7	アメリカ ロサンゼルス	遠野　宏季	工学研究科 合成・生物化学専攻	修士課程 2年	HCI International 2015に参加し、LIMS研究テーマ「仮想現実デイケアプラットホームの開発」に係るポスター発表および情報収集。
4	2015/9/6	9	1)スウェーデン 2)イギリス	遠野　宏季	工学研究科 合成・生物化学専攻	修士課程 2年	平成27年度GTEP海外起業研修に参加。
5	2015/10/9	7	ドイツ ベルリン	MBENZA MBAMBI NAASSON	医学研究科 医科学専攻	修士課程 2年	World Health Summit 2015 および WHS Night at the Allianz Form Berlin に参加し、LIMS研究テーマ「日本の健康保険制度から学ぶ；今後民主共和国との比較政策的検討」に係る情報収集。
6	2015/10/14	7	スロベニア リュブリャナ	宮之原　遵	薬学研究科 薬科学専攻	博士課程 1年	第9回国際血管性認知症会議/欧州認知障害会議（The 9th International Congress on Vascular Dementia ）に参加し、LIMS研究テーマ「FAERSによる混合型認知症リスク薬剤の検出」に係る情報収集を行う。
7	2015/10/20	6	台湾 台北	五明　美香子	医学研究科 人間健康科学系専攻	博士課程 1年	IEEE International Ultrasonics Symposiumに参加し、LIMS研究テーマ「光超音波顕微鏡による組織光超音波物性の定量的評価に関する研究」に係る情報収集。
8	2015/11/9	13	オーストラリア メルボルン	栗原　令	工学研究科 高分子化学専攻	博士課程 1年	14th Transplantation Society SymposiumおよびIPITA IXA CTS Joint Congressへ参加し、LIMS研究テーマ「薬剤担持アガロースゲルデバイスによる皮下における免疫寛容部位形成とその部位への膵島移植」に係るポスター発表および情報収集。
9	2015/12/14	9	アメリカ ハワイ	西谷　暢彦	工学研究科 合成・生物化学専攻	修士課程 2年	The International Chemical Congress of Pacific Basin Societies 2015に参加し、LIMS研究テーマ「生体超分子の構築を目指した協同的組織化プロセスの制御」に係るポスター発表および情報収集。
10	2016/3/5	8	パナマ パナマシティ	SAHA Liton Kumar	医学研究科 医科学専攻	修士課程 2年	Westin Playa Bonita Panamaに参加し、LIMS研究テーマ「Establishment of in vitro micronucleus assay using DNA repair deficient human lymphoblastoid TK6 cell line to detect genotoxic chemicals」に係るポスター発表および情報収集。

平成27年度 履修生の学外活動 【国内】

	出発日	日数	目的地	氏　名	所　属	学年／職名	目　的
1	2015/4/12	1	京都市	五明　美香子、宮之原　遼、来原　令、水藤　拓人、山口　一真、松原　弘幸、松本　朋子、篠田　昂樹、堂上　久美子、宇野　雅俊、末永　和真、遠野　宏季、西谷　暢彦	医学研究科、薬学研究科、工学研究科	修士課程1年、修士課程2年、博士課程1年	第29回日本医学会総会2015関西に参加し、リーディングプログラムに係る展示を行う。
2	2015/4/13	1	京都市	Aila Johanna	医学研究科・医科学専攻	修士課程2年	World Health Summit Regional Meeting Asia KYOTO 2015に参加し、リーディングプログラムに係る情報収集。
3	2015/4/23	3	名古屋市	宇野　雅俊	工学研究科・分子工学専攻	修士課程2年	第59回日本リウマチ学会総会・学術集会に参加し、LIMS研究テーマ「サイトカインネットワークの異常に基づく自己免疫疾患の発症機構の予測及び検証」にかかる情報収集。
4	2015/4/23	1	東京都	(1)松本　朋子、(2)篠田　昂樹、(3)遠野　宏季、末永　和真	(1)医学研究科 (2)薬学研究科 (3)工学研究科	修士課程2年	日本アイ・ビー・エム株式会社　豊洲事業所を来訪し、LIMS「医療工学特別講義Ⅱ」の見学実習を行う。
5	2015/5/22	3	東京都	五明　美香子	医学研究科・ 人間健康科学系専攻	博士課程1年	日本超音波医学会 第88回学術集会に参加し、LIMS研究テーマ「音響放射力を用いた弾性イメージング法における組織発熱解析による安全性の評価」に係る情報収集。
6	2015/5/26	5	札幌市	末永　和真	工学研究科・ 高分子化学専攻	修士課程2年	第64回　高分子学会年次大会に参加し、LIMS研究テーマ「生体分子定量のための有機－無機ハイブリッド材料を基盤とした機能性光学材料の開発」に係る口頭発表および情報収集。
7	2015/6/12	3	横浜市	篠田　昂樹	薬学研究科・薬科学専攻	修士課程2年	第29回日本老年学会総会、第38回基礎老化学会大会に参加し、LIMS研究テーマ「時間生物学から見た加齢に伴うバイオリズムの変化と疾患発症・治療に関する研究」にかかる情報収集。
8	2015/6/12	2	大阪市	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	第17回　日本医療マネジメント学会　学術総会へ参加し、LIMS研究テーマ「再生医療の実現」における医療倫理問題・課題について」にかかる情報収集。
9	2015/6/20		札幌市	(1)松原　弘幸、(2)遠野　宏季、西谷　暢彦、(3)尾山　翔平	(1)医学研究科 (2)工学研究科 (3)薬学研究科	(1)(2)修士課程2年 (3)修士課程1年	第3回全国博士課程教育リーディングプログラム学生会議へ参加し、リーディングプログラムに係る情報収集。
10	2015/7/1	3	宇都宮市	篠田　昂樹	薬学研究科・薬科学専攻	修士課程2年	日本睡眠学会第40回定期学術集会に参加し、LIMS研究テーマ「時間生物学から見た加齢に伴うバイオリズムの変化と疾患発症・治療に関する研究」に係る情報収集。
11	2015/7/17	3	横浜市	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	第22回日本遺伝子診療学会大会へ参加し、LIMS研究テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
12	2015/8/6	4	広島市	MBENZA MBAMBI NAASSON	医学研究科・医科学専攻	修士課程2年	The Second Asian Symposium on Healthcare Without Borders に参加し、LIMS研究テーマ「Learning from Japanese health care Insurance System for improving DRCongo health care Insurance System」に係る情報収集。
13	2015/9/2	3	堺市	西谷　暢彦	工学研究科・ 合成・生物化学専攻	修士課程2年	The Seventh East Asia Symposium on Functional Dyes and Advanced Materials (EAS7)へ参加し、LIMS研究テーマ「生体超分子の構築を目指した協同的組織化プロセスの制御」に関するポスター発表および情報収集。
14	2015/9/7	5	札幌市	尾山　翔平	薬学研究科・薬科学専攻	修士課程1年	The 10th Pan-Pacific Continence Society Meeting SAPPORO 2015、および第22回日本排尿機能学会に参加し、LIMS研究テーマ「過酸化水素注入による慢性膀胱炎モデルの機序解明」に関する情報収集。
15	2015/9/8	1	久世郡 久御山町	Rahman Md Maminur、Shamima Sultana、松本　明宏、李　雪氷、松村　保之、三浦　理紗子	医学研究科、薬学研究科、工学研究科	修士課程1年	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」における画像診断機器・検査分析機器の見学実習を行う。
				近藤　健悟（引率）	医学研究科・ 人間健康科学系専攻	特定助教	
17	2015/9/14		京都市	Rahman Md Maminur、Shamima Sultana、松本　明宏、尾山　翔平、李　雪氷、松村　保之、池田　燎亮	医学研究科、薬学研究科、工学研究科	修士課程1年	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」における医用画像機器開発現場の見学実習を行う。
				(1)杉本　直三、(2)近藤　健悟（引率）	医学研究科・ 人間健康科学系専攻	(1)教授 (2)特定助教	
18	2015/9/14	4	仙台市	末永　和真	工学研究科・ 高分子化学専攻	修士課程2年	第64回高分子討論会に参加し、LIMS研究テーマ「生体分子定量のための有機－無機ハイブリッド材料を基盤とした機能性光学材料の開発」に係るポスター発表および情報収集。
19	2015/9/24	3	松山市	西谷　暢彦	工学研究科・ 合成・生物化学専攻	修士課程2年	第26回基礎有機化学討論会に参加し、LIMS研究テーマ「生体超分子の構築を目指した協同的組織化プロセスの制御」にかかる口頭発表、および情報収集。
20	2015/9/25	1	奈良市	Rahman Md Maminur、Shamima Sultana、松本　明宏、尾山　翔平、李　雪氷、松村　保之、三浦　理紗子、池田　燎亮	医学研究科、薬学研究科、工学研究科	修士課程1年	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」における運動特化型デイケアの見学実習を行う。
				近藤　健悟（引率）	医学研究科・ 人間健康科学系専攻	特定助教	

21	2015/9/29	1	京都市	Rahman Md Maminur、Shamima Sultana、松本　明宏、尾山　翔平、李　雪氷、松村　保之、三浦　理紗子、池田　燎亮	医学研究科、薬学研究科、工学研究科	修士課程1年	高齢者福祉施設　本能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」における地域包括支援センターの見学実習を行う。
				(1)石井　加代子、(2)近藤　健悟（引率）	(1)健康長寿社会の総合医療開発ユニット(LIMS)、(2)医学研究科・人間健康科学系専攻	(1)特定教授 (2)特定助教	
22	2015/10/8	3	名古屋市	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	第74回日本癌学会学術総会へ参加し、LIMS研究テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
23	2015/10/9	1	横浜市	遠野　宏季	工学研究科・ 合成・生物化学専攻	修士課程2年	慶應義塾大学大学院メディアデザイン研究科　稲見昌彦教授とLIMS研究テーマ「仮想現実デイケアプラットホームの開発」に係る意見交換を行う。
24	2015/10/12	4	東京都	末永　和真	工学研究科・ 高分子化学専攻	修士課程2年	第5回CSJ化学フェスタに参加し、LIMS研究テーマ「生体分子定量のための有機－無機ハイブリッド材料を基盤とした機能性光学材料の開発」に係るポスター発表および情報収集。
25	2015/10/24	2	東京都	桒原　令、Aila Johanna、松本　朋子、松本　明宏、李　雪氷	医学研究科 薬学研究科 工学研究科	修士課程1年 修士課程2年 博士課程1年	博士課程教育リーディングプログラムフォーラム2015へ参加し、リーディングプログラムに関する情報収集、および学生フォーラムでの討論・発表を行う。
26	2015/10/24	2	東京都	水藤　拓人、山口　一真、松原　弘幸、篠田　昂樹、堂上　久美子、宇野　雅俊、末永　和真、西谷　暢彦、Rahman Md Maminur、Shamima Sultana、松村　保之、三浦　理紗子、池田　燎亮			博士課程教育リーディングプログラムフォーラム2015へ参加し、リーディングプログラムに関する情報収集。
27	2015/10/30	1	名古屋市	遠野　宏季	工学研究科・ 合成・生物化学専攻	修士課程2年	慶應義塾大学政策・メディア研究科　横田浩一特任教授とLIMS研究テーマ「仮想現実デイケアプラットホームの開発」に係る意見交換を行う。
28	2015/10/31	1	富山市	(1)Aila Johanna、(2)松本　明宏 (3)李　雪氷	(1)医学研究科・医科学専攻 (2)薬学研究科・薬科学専攻 (3)薬学研究科・医薬創成情報科学専攻	(1)修士課程2年 (2)修士課程1年	富山駅、富山市立図書館ほかを見学し、富山市長　森雅志　氏とリーディングプログラムに関する「高齢社会を意識したコンパクトなまちづくり」について意見交換、情報収集。
				(1)福山　秀直、82)石井　加代子、(3)富塚　太郎、(4)Dinh Ha Duy Thuy（引率）	健康長寿社会の総合医療開発ユニット(LIMS)		
29	2015/11/9	2	京都市	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	第37回日本バイオマテリアル学会へ参加し、LIMS研究テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
30	2015/11/13	2	福岡市	宇野　雅俊	工学研究科・分子工学専攻	修士課程2年	Cutting Edge of Technical Innovations in Structural and Systems Biology 2015へ参加し、LIMS研究テーマ「サイトカインネットワークの異常に基づく自己免疫疾患の発症機構の予測及び検証」にかかる情報収集。
31	2015/11/17	4	札幌市	宇野　雅俊	工学研究科・分子工学専攻	修士課程2年	第44回日本免疫学会学術集会に参加し、LIMS研究テーマ「サイトカインネットワークの異常に基づく自己免疫疾患の発症機構の予測及び検証」にかかる情報収集。
32	2015/11/20	3	東京都	篠田　昂樹	薬学研究科・薬科学専攻	修士課程2年	第22回日本時間生物学会学術大会へ参加し、LIMS研究テーマ「時間生物学から見た加齢に伴うバイオリズムの変化と疾患発症・治療に関する研究」にかかる情報収集。
33	2015/12/1	4	神戸市	堂上　久美子	薬学研究科・ 医薬創成情報科学専攻	修士課程2年	第38回日本分子生物学会年会・第88回日本生化学会大会 合同大会に参加し、LIMS研究テーマ「シフトワーカーがかかりやすい病気の研究」に係るポスター発表および情報収集。
34	2015/12/1	4	神戸市	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	第38回日本分子生物学会年会、第88回日本生化学会大会へ参加し、LIMS研究テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
35	2015/12/1	4	神戸市	水藤　拓人	工学研究科・ 合成・生物化学専攻	博士課程1年	第38回日本分子生物学会年会、第88回日本生化学会大会合同大会に参加し、LIMS研究テーマ「加齢に伴う健康障害と腸内細菌との関わりについて」に係る口頭・ポスター発表および情報収集。
36	2015/12/2	1	東京都	遠野　宏季	工学研究科・ 合成・生物化学専攻	修士課程2年	慶應義塾大学政策・メディア研究科　横田浩一特任教授とLIMS研究テーマ「仮想現実デイケアプラットホームの開発」に係る意見交換を行う。
37	2015/12/8	4	東京都	篠田　昂樹	薬学研究科・薬科学専攻	修士課程2年	第36回 日本臨床薬理学会学術総会へ参加し、LIMS研究テーマ「時間生物学から見た加齢に伴うバイオリズムの変化と疾患発症・治療に関する研究」にかかる情報収集。
38	2016/1/8	3	東京都	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	日本機械学会 第28回バイオエンジニアリング講演会へ参加し、LIMS研究テーマ「再生医療の実現における医療倫理問題・課題について」に係る情報収集。
39	2015/12/8、 2016/1/15	2	東京都	松本　朋子	医学研究科・ 人間健康科学系専攻	修士課程2年	医療産業イノベーションフォーラムへ参加し、LIMS研究テーマ「再生医療の実現にともなう医療倫理問題の現状と今後の課題」に係る情報収集。
40	2016/3/3	3	広島市	桒原　令	工学研究科・ 高分子化学専攻	博士課程1年	第43回日本膵・膵島移植研究会に参加し、LIMS研究テーマ「薬剤担持アガロースゲルデバイスによる皮下における免疫寛容部位形成とその部位への膵島移植」に関する口頭発表および情報収集。
41	2016/3/5	1	東京都	五明　美香子	医学研究科・ 人間健康科学系専攻	博士課程1年	第2回日本医療安全学会学術総会に参加し、LIMS研究テーマ「音響放射力を用いた弾性イメージング法における組織発熱解析による安全性の評価」に係る情報収集。
42	2016/3/26	1	熱海市	五明　美香子	医学研究科・ 人間健康科学系専攻	博士課程1年	全国博士課程リーディングプログラム合同女子会に参加し、リーディングプログラムに係る情報収集。

Genotoxicity and Genome integrity

Department of Medical Science
Graduate School of Medicine
M1 Rahman Md Maminur

(1) Academic

It was a great opportunity for me to be a participant of different outstanding academic activities in Kyoto University and others well known organizations through LIMS. I attended different course work which helped me to understand and develop my skills in various ways. The English debate class was a great platform for me to learn the presentation and to develop the communication skills with others. The Human Physiology class was very interesting and the observation of the human body organs was a fascination for me. The medical life support course gave me the opportunity to visit different institution through which I gathered practical experience, how to provide facilities to the elderly people for better life, which will help me to serve humanity in my country as well as any part of the world I live. In this academic year I attended many seminars and course meeting from which I motivated to contribute to the society through research activities.

(2) Research activities

Identification and characterization of toxic chemicals by establishing new bioassays:

The identification of genotoxic chemicals by establishing a new sensitive bioassay is based on our present idea. By observing the micronucleus in a very sensitive process we are trying to develop new method to eliminate the false negative result of current methods using a set of DNA repair mutants.

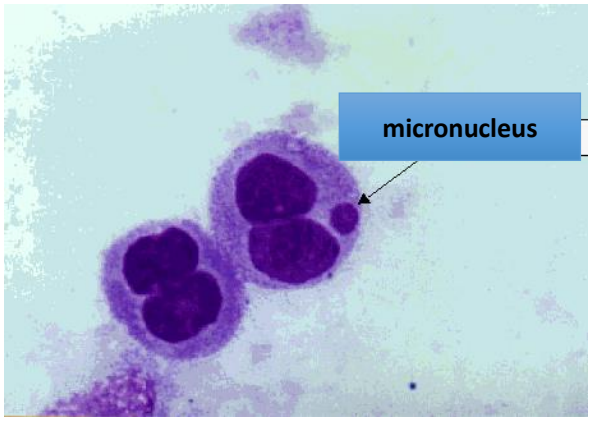


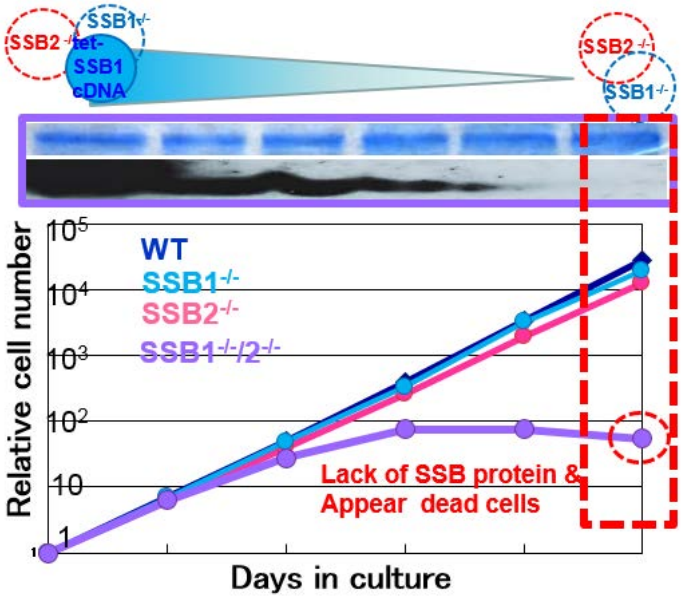
Figure 1. Micronucleus

Micronucleus is small nucleus that forms whenever a chromosome or a fragment of a chromosome is not incorporated into one of the daughter nuclei during cell division (Figure 1). We knocked out different DNA repair genes (FANCD2, XRCC1) to optimize the method. In present the other genotoxic identifying methods are not sufficiently sensitive, because all the bioassays use wild-type cells, which are capable of accurately repairing DNA damage induced by genotoxic chemicals. We are trying to develop a new method using DNA repair mutants derived from the TK6 cell line, which is

widely used including the US and Japanese Governments for the genotoxicity test. We hope our new method will be sensitive enough to identify the genotoxicity of the chemicals that were previously considered as non-mutagenic.

The functional overlap of Single strand binding protein 1 (SSB1) and Single strand binding protein 2 (SSB2) in genome stability:

Now I am working on SSB1 and SSB2 protein, which are important in maintaining Genome Stability and DNA repair. We want to know the role of these single strands binding proteins in genome stability. These two proteins have overlapping function and can compensate the absence of another one. So to analyze the role of these two proteins we have to generate cells which are lacking in both SSB1 and SSB2.



But the double knock out cells are not viable, so we have made conditional mutant DT 40 cells to analyze the role of these two protein. We used Tet-Off (tetracycline induced) system to knock out the cells. Now we are optimizing the time point of protein depletion and the phenotypic analysis time point (Figure 2).

Figure 2. Relative cell numbers of SSB protein-lacking cells.

Beside these I am working on to determine:

(1) The role of mismatch repair factors, the MLH3 and PMS2 nuclease in the late step of homologous recombination.

(2) The role of SUMO E3 ligases, PIAS1 and PIAS4 in the promotion of template switch.

I hope, in future by participating different extracurricular activities like business competition or visiting different places I will be continuing to achieve knowledge and learn to overcome the hurdles of life and contribute for the social welfare.

Ref: http://www.crios.be/genotoxicitytests/micronucleus_test.htm
http://global.britannica.com/science/micronucleus.

Network-based, remote reading system of digital-electroencephalogram in nationwide- or global area

Department of Medical Science
Graduate School of Medicine
M1　Shamima Sultana

(A) LIMS Research

(1) Background: Electroencephalogram (EEG) is useful in the diagnosis of or monitoring of epileptic seizures, acute stroke, brain injury, acutely developed cerebral disorders and coma conditions. Digital EEG (dEEG) techniques have well developed in recording, reviewing and storing EEG. With the remarkable advantage of information technology, remote dEEG reading system has been established in North America and European countries in the very restricted area but is not popular yet at all. In this system, certified EEGers in the large hospitals (e.g., University hospitals) are able to access, read, and make a report of dEEGs recorded in other remote hospitals. This innovative system enabled physicians at remote hospitals to obtain reliable dEEG report written by certified EEGers of large hospitals that improved global quality and patient care in the society. However, no systematic remote dEEG reading system was established not only in Japan, but also in many countries such as Asian Oceanian area so far.

(2) Objective: In order to establish network-based, remote dEEG reading system in nationwide- or global area, medico-engineering collaboration is essential. Besides engineering system, its success largely depends on the degree of flexibility for clinical utility and economic factors. We will evaluate these presumably important factors (clinical utility, cost effectiveness, privacy, rapidity and so on) and will know how these factors are important for the remote dEEG reading system.

(3) Methods: We will setup preliminary remote dEEG reading system in cooperation with other remote hospitals and EEG manufacturer by using infrastructures and services commercially provided by a Japanese telecommunications enterprise. The general concept of the preliminary remote dEEG reading system is as follows. First, clinical EEGs will be recorded at other remote hospitals and the recorded EEG data will be uploaded to the server as the encrypted files. Second, certified EEGers of Kyoto University hospital will access, read and upload a report of the dEEG data to the server without downloading process. Third, doctors at other remote hospitals will access and

read the dEEG report. After setup of the system, we will evaluate the clinical utility and cost effectiveness of the preliminary remote dEEG reading system. The preliminary trial is currently in submission of the Ethical Committee of Kyoto University Graduate School.

(4) Expected Outcome: We will be able to evaluate presumably essential important factors (clinical utility, cost effectiveness, privacy, rapidity and so on) to establish the system, and will find how these factors contribute to this system. It will help to introduce remote dEEG reading system widely in the nationwide- or global field (e.g., Bangladesh).

(5) Research Progress of the fiscal year 2015: My research topic is Network-based, remote reading system of digital-electroencephalogram in nationwide- or global area. From April- July, 2015, we have been doing literature survey and I will mention some the results of my literature survey below.

a) In many cases data transfer is achieved by stopping the acquisition device and sending the resulting EEG data to the remote location for analysis. This technique introduces a significant delay as no analysis is performed until acquisition has stopped and the data transfer has been completed.
   ⇒So we should think about elimination of the delay from data acquisition to transfer.
b) Difficulties may arise with hospital firewalls; confidential patient information may be visible on-screen, possibly in breach of hospital policy.
   ⇒So we should to be concerned about these difficulties related with hospital firewalls and maintain patient privacy.
c) Care must be taken to avoid the leaking of sensitive patient information, potentially in breach of data protection regulations.
   ⇒So for preserving confidentiality we should to avoid the acquisition of unnecessary patient data.

I learned about these important factors and we will try to minimize these to successfully implement the system. We will focus on to reduce the delay between the acquisition of data and its availability in the viewing application and reduce the time of diagnosis. We will also evaluate cost-effectiveness of the system.

From July-present, we are now trying to set up remote digital EEG reading system and collaborate our project with some of the companies.

(6) References:

1. P. D. Healy, R. D. O'Reilly, G. B. Boylan and J. P. Morrison, "Web-based remote monitoring of live EEG," *e-Health Networking Applications and Services*

(Healthcom), 2010 12th IEEE International Conference on, Lyon, 2010, pp. 169-174.

2. David Holder, Jim Cameron & Colin Binnie "Tele-EEG in epilepsy: review and initial experience with software to enable EEG review over a telephone link" *Seizure* 2003; 12**:** 85–91, doi:10.1016/S1059–1311(02)00229-7
3. Vespa, P. M., Nenov, V. and Nuwer, M. R. Continuous EEG monitoring in the intensive care unit: early findings and clinical efficacy. *Journal of Clinical Neurophysiology* 1999.

(B) **LIMS Activities:**

During the first semester (April-July) I took anatomy, math and debate classes from which I reviewed my anatomy knowledge and improved my communication skill in English. Along with LIMS classes I also took all compulsory classes of the Masters' course. The knowledge that I gathered from both courses have helped me to improve my research area.

During the second semester (August-March) I took Medical and life support system, Physiology and Debate classes. During Medical and life support course I attended several lectures and visited Falco Biosystems Ltd., Shimadzu Corporation, some day care centers and rehabilitation unit in hospital. I could learn about these institution and gather practical knowledge on rehabilitation of aging society as well as occupational therapy of disabled children. From Physiology and Debate classes I learned, reviewed my physiology knowledge and improved my communication skill in English. Along with LIMS classes I also took all classes of the Masters' course. During this semester I attended three retreats (Cancer course, Immunology Course and retreat of Neurology department) and participated in oral and poster presentations. The knowledge that I gathered from both courses (Master's and LIMS) and retreats have helped me to improve my research area.

I attended the Program for Leading Graduate Schools Forum 2015 that was held on October 24-25 in Bellesalle Shinjuku Grand, Tokyo. This leading forum gave me a chance to make a network with students from different disciplines and to be exposed to new ways of presenting and discussing issues.

Oral presentation

LIMS external evaluation meeting: "Comparison in slow electroencephalogram (EEG) activity between time constant 0.1, 0.3 and 2 second" and "Network-based, remote reading system of digital-electroencephalogram in nationwide- or global area" held on February 29 (Monday), 2016 in Kyoto University.

Aging Society and Voiding Dysfunction

Department of Pharmaceutical Sciences
Graduate School of Pharmaceutical Sciences
M1　Shohei Oyama

(1) Introduction

Leaders for Integrated Medical System for Fruitful Healthy-Longevity Society (LIMS) is a program to nurture leaders who can cope with various problems of aging society. In Japan, the ratio of elderly people at least 65 years old has already been more than one quarter of the population. Moreover, in 2050, it is statistically expected that the percentage of the population over 65 years old will reach 50%. Hence, it is urgently important to prepare the environment and the facilities for them to improve healthy longevity and high quality of life (QOL). Since the physical or visceral function of the elderly people decay with aging, the risk of various diseases becomes higher. In fact, when I went to nursing home through the LIMS training program, I heard many of the aged people had some voiding dysfunction. Therefore, I focused on bladder problems in the aged people and investigated the urinary issue associated with age through literature research in this year.

(2) Result

First, I surveyed what kind of urinary diseases most people are suffering from.[1)] Then, I found Overactive Bladder Syndrome (OAB) is one of the most popular bladder diseases. In 2002, OAB was defined by International Continence Society (ICS) as urgency, with or without urge incontinence, usually with frequency and nocturia.[2)] Second, I examined the prevalence of OAB and the relationship between OAB and age in Japan. According to Homma et al, among population over 40 years old, the prevalence of OAB was 12.4% (men: 14%, women: 11%) and it increased with age (**Fig. 1**).[3)] Interestingly, the hospital attendance rate for OAB was much lower in women than in men (**Fig. 2**).[3)] The main reason why they didn't visit hospital was that they didn't notice it was one of the urinary diseases. Furthermore, I investigated the influence of OAB on their QOL. Abrams et al mentioned although OAB was not a fatal disease, it certainly decreased QOL of OAB patients.[4)] Next, I explored what caused OAB. Sakakibara et al suggested hemispheric stroke, particularly in frontotemporoparietal area, tended to cause voiding dysfunction.[5)] Nomiya et al revealed increased bladder activity was associated with elevated oxidative stress markers and inflammatory cytokines in rat model of atherosclerosis-induced chronic bladder ischemia.[6)] According to Apostolidis et al, chronic inflammation was induced under the epithelium in 60% of OAB patients.[7)] Finally, I investigated diagnosis and treatments for

OAB. In Japan, for diagnosis, Overactive Bladder Syndrome Score (OABSS) is basically used [8], and Voiding Diary is also known to be useful. In addition, some groups reported Neuron Growth Factor (NGF) and C-reactive Protein (CRP) in urine could be biomarkers of OAB.[9,10] As a treatment of OAB, exercise therapy is primarily chosen. If there is no effect, pharmacotherapy with anti-cholinergic drugs could be conducted as an alternative way. Recently, a variety type of drugs for OAB has been developed, for example beta 3 adrenergic receptor agonist and botulinum toxin A injection.[11,12]. In Japan, the former is prescribed and the latter is off-label use.

(3) Discussion & Comment

I found OAB is a common disease in aged population and seriously influence on their daily life. They tend to avoid going out because of a sudden irritating desire to urinate. Taking account of our LIMS aim, I think OAB is a quite important issue to be solved in order to improve their QOL. Today, various drug therapies are available for OAB treatment as represented by the anti-cholinergic drugs. However, there are not few patients developing resistant to those drugs, despite the unknown. cause It is needed to find new target of drugs or to create novel therapeutic strategy. As I mentioned, many issues exist for OAB. But I think what is the most predominant thing is that few people visit department of urology because they don't recognize their symptoms as a disease. It is also true that the frequency of urination increased with aging. Therefore it would be difficult for us to judge by ourselves whether symptoms originate from disease or aging. Through LIMS program, I'd like to transmit the information of OAB for elderly people and to inform that they have a chance to ameliorate their irritating symptoms by treatments.

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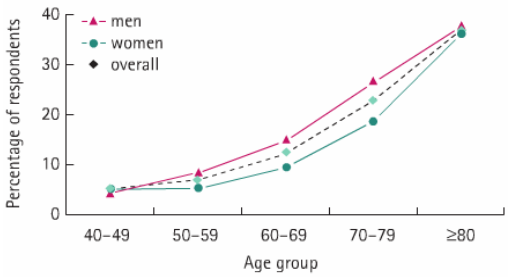

Fig 1. The prevalence of OAB by gender and age group in Japan[3].

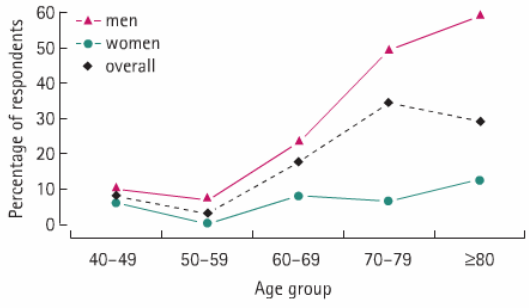

Fig 2. The hospital attendance rate for OAB by gender and age group in Japan[3].

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Development of exosomes-based drug for elderly people

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(1) Overview

In this report, I would like to summarize the activities I contributed in the LIMS program 2015. Starting in April 2015, I was able to gain more knowledge in fields related to my research at my faculty as well as my research field itself. LIMS program provided me with valuable opportunities. For example, initiating a research study in addition to that of graduate school at the same time was really challenging. Taking lectures about business or engineering helped me nurture my background knowledge.

This report consists of the following sections: first, the proposed research plan in LIMS, which is ‘’Development of exosome-based treatment for elderly people”, will be discussed. Next, experiences I gained from various classes, as well as extracurricular activities will be described.

(2) Research Theme for LIMS program

Exosomes are nano-sized cellular vesicles secreted by various kinds of cells. They are released into the extracellular environment upon fusion of multivesicular bodies. Recently, exosomes have been extensively studied for their significant role in intercellular communication such as immune response, and inflammation by transferring mRNA, micro RNA, and proteins between cells. In addition to their biological characteristics, exosomes are thought to be potential candidates for endogenous drug carriers. In our previous work, we discovered macrophages play pivotal roles in the recognition and clearance of intravenously injected exosomes. Therefore, I am trying to elucidate the molecular mechanism on the recognition of exosomes by macrophages.

As the research theme for the LIMS program, I would like to propose a research plan related to elderly society and exosomes. Through one-to-one discussion with mentors in June, they advised me how to integrate requirements for LIMS research with exosomes. I started considering ideas for utilizing exosomes for treatment of elderly diseases. I hypothesized that intranasal delivery of exosomes to the brain may contribute to treatment for central inflammatory diseases. I investigated and acquired the skill for intranasal injection to mice. From the experiments I performed, exosomes administered intranasally to mice were found to reach to brain.

(3) **Experiences in Lectures, and extracurricular activities**

In the LIMS program, there were various extracurricular activities as well as lectures in numerous fields such as engineering, medical science and pharmacology, which greatly stimulated my curiosity. As for lectures, anatomy, medical engineering for society, and minimally invasive therapeutics were especially interesting for me. As for extracurricular activities, I took part in the program for leading graduate schools forum 2015 (Tokyo), Toyama city visiting tour, and GTEP to grasp further understanding of society. These LIMS activities helped me broaden my knowledge.

In the human anatomy class, the complex and sophisticated body structures impressed me. The cadavers that we had used in this class are donated bodies, and these donated bodies and donation are based on the expectations for the development of medicine. In order to answer these expectations, I would like to keep in mind everything I learned from this class. The course on medical engineering for society gave me insights on development of medical equipment, or situation around nursing care. The guest speakers from various companies kindly explained their own valuable experiences or lessons which they thought would be useful for us. As for lectures on minimally invasive therapeutics, this year was special in that I was the only student attending the lecture. Fortunately, I got one-to-one discussion with doctors on their specialty, ranging from radiation therapy, endoscope surgery and catheter surgery. It also stimulated my interest to see the procedure of an operation using MRI, and CT scan in an operating room.

In October, I went to Tokyo for the program for leading graduate schools forum 2015 (Fig 1.). I joined a workshop entitled “Leadership Education”, and exchanged ideas with students from other leading programs. Their different but fresh opinions motivated me for activities in LIMS.

I actively applied for events announced from LIMS. Visiting Toyama city (Fig 2.), famous for its compact city model, was one of the events. Toyama city has tried to create a compact city by revitalizing public transport, including railway track lines, and by concentrating various city functions such as residential, commercial, business and cultural buildings along public transport lines. After observing the city, our group talked about the present and future of Toyama City with the mayor of Toyama. The way of taking measures against an aging society by the government was interesting for me.

Figure 1. Tokyo for the program for leading graduate schools forum

Figure 2. Visiting Toyama city

A molecular targeted chemotherapy of cancer in hypoxia response signals: the UCHL1-HIF Pathway

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(1) Research

In normoxia conditions, a protein called HIF (Hypoxia Inducible Factor) is always degraded. On the other hand, in hypoxia conditions, it is not. So as a result, HIF is activated and then causes a chain reaction such as the activation of cancer causing molecules. UCHL-1(Ubiquitin Carboxyl-Terminal Hydrolase L1) is an important factor in this pathway. A purpose of my research is to find inhibitors through drug repositioning.

I have built up a screening system which contains both in vitro and in vitro cases. In the case of in vitro screening system, E.coli was transfected with UCHL-1 expressing plasmid and cultured to retain a large amount of recombinant protein through incubation. Then I evaluate a deubiquitinating activity by using Ub-AMC which is deubiquitinylated by UCHL-1 and release fluorescence quantitatively. As a result from preliminary test using UCHL-1 inhibitor (LDN57444), this assay can detect the activity changes of UCHL-1. So if drugs possess an anti-UCHL1 activity, it is detected as a decrease in released fluorescence. In the situation of in vivo screening system, I designed and made a UCHL-1 overexpressing cell which releases luminescence under hypoxia conditions. By adding sample drugs in culture medium of these cells incubated under hypoxia conditions, I can estimate the inhibiting activity of each sample by measuring the intense of luminescence. Using these two kinds of screening system, I think it to be promising that some inhibitors will be found in the future.

(2) Leading Forum

I attended as presenter discussing the topic Globalization and Internationalization. Throughout the discussion, I exchanged views with students and teacher from different backgrounds and my understanding of this topic was deepened. I think an annual activity like this is very essential because it links us LIMS members together and let us share our perspective. I also made some friends during the leading forum. So I look forward to participating in this event in the year 2016 very much. (Below are some pictures of me in this event.)

(3) Visit to Toyama City

On Saturday 31 October 2015, together with professor Fukuyama and Ishii, I made a visit to Toyama city to inspect of the achievements that are made in construction of compact city.

We, arrived at Toyama city at 1.pm and listened to a report around the general situation of Toyama city and the how Toyama government and citizens are endeavoring in developing a compact city.

The background of compact city is the cavitation of central city parts since the 1990s. Several problems are pointed out to be related to the cavitation phenomenon of cities. For example, because cars are widely used in a cavitation society, public transportation will shrink, making people with cars become “the week in traffic”. On the other hand, the development of suburbs leads to environmental problems like pollution and heat island phenomenon. So, to concentrate the residents in the central part of the city or along the traffic lines near around the central parts would be a solution to this problem. Japan has been making efforts to the construction of compact cities since 1998 and several cities have made their policies to convert into a compact city like Kobe, Sendai, Aomori and Toyama and Toyama city is considered to be doing a great job.

Many policies have been made by the Toyama city government to build a compact city. First, a Dango pattern is essential. Balls are the central living areas while traffic lines are the strands. The merits are activation of local traffic and central parts of the city. Secondly, light rails are maintained and kept in good condition to make more people to use it. As a result, people who use light rails increased by 260% on working days and 360% on weekends. Moreover, a PPP mode, which involves both government and corporations supplies a guarantee of maintenance and enthusiasm of profiting. Thirdly, the built of the ground plaza makes it possible for Toyama city to hold big events for citizens. According to the data of 2009, over 100 events were held in

the ground plaza. The fourth point is the preferential treatment of traffic fees for the elder people especially for those who live on the major traffic lines of Toyama city. This makes the elderly more accessible to central parts like hospital and shopping malls. Also, to build a beautiful city, buying flowers is encouraged in a form that with flower bought in designated places, taking the bus or light rail will be free. Up to now many people have participated in this activity which makes this city more beautiful. Finally, the attraction of private capital is also emphasized. During the last 5 years, departments, condominiums, and public stadiums were built to attract more citizens to live in the central parts and has successfully prohibit the land price from falling.

As a student in LIMS program, I believe that compact city is a mode which makes the old live better. As the traffic gets more convenient, old people can get more accessible to public areas which makes them feel less lonely and more willing to participate in this society. Moreover, free tickets for the old to travel to the center parts of the city on the other hand stimulates the economy. Finally, a compact city is obvious more easy for old people to get medical care, which means less hospitals or nursing homes will be needed when old people gather in a compact city and this also make them easier to get medical attentions when meet medical emergencies, which is very common in old people.

In conclusion, Toyama city is doing a good job constructing a compact city. As reward, Toyama city was elected as one of the best 5 cities in the construction of compact cities by ODEC, 2012 and been selected by Rockefeller foundation as a model city as a compact city. I have learnt a lot during this visit. Although there are still prompters remained in the construction of a compact city like governments' financial problems, I stills think it to be a good pattern of city construction. Many perspectives and knowledge I learnt in this visit is novel and interesting. I would be glad to pay a visit like this time again if possible. (Below are some pictures of me in this event.)



What I have learned in LIMS and what I should tackle in the future

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(1) Lectures and practices in LIMS

I was able to have a lot of experiences through lectures and practices in LIMS. In LIMS subjects, I took some classes in a wide range of fields such as medical engineering, life science. I could also learn subjects related to life science that are not usually taught in the graduate school of engineering. In particular, the two of the most impressive LIMS subjects are “Human anatomy” and “Medical and Life Support Systems”.

In “Human anatomy”, I learned the precise structure and function of human body through practical lecture. It enabled me not only to acquire knowledges on the human body but also to understand how we can improve medical treatments. Although it seemed to be a little short time for me in comparison with the subjects for medical students, it is essential for me to deepen my knowledges in the future by using my experiences that I had through these subjects.

In “Medical and Life Support Systems”, I visited medical institutions and social welfare facilities (hospitals, day care facility, workshops for medical equipment and so on). Through this class, I met many people who work in medical and research fields, and I was able to have valuable experiences in these fields. By talking with them, I spent precious time to learn clinical medicine. I would like to use my knowledge to solve the problems of fruitful healthy-longevity society in the future.

(2) Research of LIMS program

In LIMS research, I am making a study of bone specific diseases caused by metabolic disorders. My research theme in LIMS program is “Current issues of bone metabolic diseases and movement disorders in elder people”. The number of elder people who are affected by diseases linked to aging is increasing. They have some kinds of musculoskeletal problems such as osteoporosis, osteoarthritis, sarcopenia, and so on. These diseases could cause them to feel chronic pain and decline bodily functions. To make matters worse, these diseases could also cause them to restrict their activities of daily life and to decline in quality of life. It is related to our life exercise, diet, environments and so on. This decline in quality of life is becoming a serious problem for fruitful healthy-longevity society. So, I focus on bone specific diseases of elder people. Through LIMS program, I would like to propose the solution about this problem in future.

Development of Functional Particles for Cancer Vaccine

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(1) Background

In cancer therapy, chemotherapy with anti-cancer drugs has been mainly performed for cancer patients that have rejected further surgery or radiotherapy. However, the drugs harm not only tumor cells but also normal cells, and cause some unpleasant side effects. Cancer vaccine has been developed with high specificity against tumor and less side effects. Especially, prophylactic cancer vaccines targeting the viral origins of cancers, including hepatitis B virus or human papillomavirus, are actively researched because they can successfully prevent associated cancers. On the other hand, most clinical trials for therapeutic cancer vaccines have failed to achieve clinical effectiveness, because most of them induce only Th2 type immune reaction and get low activation of cytotoxic T lymphocyte (CTL). So another antigen delivery system, which deliver antigen to proper position inside body, is needed.

As the material for the antigen delivery system, we have developed CHP (cholesterol-bearing pullulan) self-assembled nanogel (nanometer-sized gel (~ 100 nm)). CHP is composed of a hydrophilic polymer (pullulan) with hydrophobic cholesteryl moieties. The cholesteryl moieties of CHP self-associated by hydrophobic interaction in water and formed physical crosslink points in the network of nanogel structure. CHP nanogel is useful for medical application like cancer vaccine and nasal vaccine [1], and it is known that CHP nanogel can induce not only Th2 type but also Th1 type and, furthermore, MHC class I pathway immune reaction. To develop more efficient vaccine system, it is necessary to define their mechanism of immune reaction and effect.

In this research, as a part of pre-research activity to explore research theme and techniques for LIMS program, we developed antigen delivery system using nanogel as a carrier and ovalbumin (OVA) as a model antigen protein, and evaluated the immunological enhancement effect. We used CH-CDex (cholesterol-bearing cluster dextrin) nanogel as a new nanogel in addition to usual CHP nanogel.

(2) Experiment

CHP (M_w=100,000) and CH-CDex (M_w=100,000) polymer were dissolved with phosphate-buffered saline (PBS) and stirred overnight. Denatured OVA was added to the nanogel solution to form the complex of nanogel with OVA. Their diameters were measured by DLS. Then, the complexes (OVA/CHP or OVA/CH-CDex) were subcutaneously administered to mice (4 times/2 weeks). We examined extent of CTL activation and antigen production.

CTL assay

We harvested spleens from mice and collected spleen cells. We added OVA epitope to

the cells and activated CTL that recognize OVA antigen in mice. CD8 (marker of CTL) and IFN-γ (marker of active CTL) of the spleen cells were stained by fluorescent dye-labeled antibodies and fluorescent intensities of the cells were measured through flow cytometric analysis.

Examination of Antibody Titre

We collected blood from mice and prepared serum by centrifugation. We measured IgG total, IgG1 and IgG2a antibody concentration in the serum by ELISA method.

(3) Result and Discussion

Diameter of CHP nanogel and CH-CDex nanogel were 38.3 nm and 18.1 nm respectively. After forming complex with OVA protein, diameter of OVA/CHP was changed to 50.4 nm and that of OVA/CH-CDex was changed to 22.1 nm.

Flow cytometric analysis showed that number of OVA-activated CTL was increased in mice after injection of OVA/CH-CDex compared to injection of OVA/CHP (**Figure 1**). However, there were no significant differences in the antibody production between injection of OVA/CHP and OVA/CH-CDex (**Figure 2**) measured by using ELISA. These results suggested that OVA/CHP and OVA/CH- CDex produced OVA-specific humoral immunity with same level of antibody productions through MHC class II type pathways. Meanwhile, CH-CDex can present antigens more effectively by MHC class I pathways with high level of OVA-specific cellular immunity than CHP.

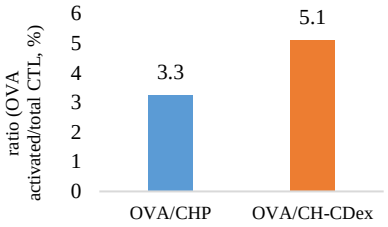

Figure 1. Ratio of OVA-activated CTL to total CTL after administration.

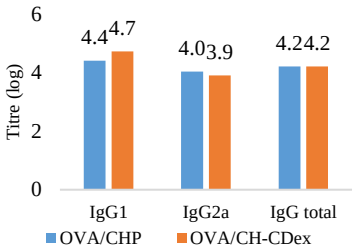

Figure 2. Titre of IgG1, IgG2a and IgG total in mice blood serum after administration.

We concluded that CH-CDex nanogel is superior to CHP nanogel as an antigen carrier to produce cellular immunity through MHC class I pathways. The size of OVA/CH-CDex nanogel was much smaller than that of OVA/CHP nanogel. We assume that the size of the carrier is one of the important factors to deliver the antigen protein to lymph node and antigen presenting cell. The mechanism should be clear in detail in the future LIMS research activity.

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The Medical Lectures in LIMS program

Department of Synthetic Chemistry and Biological Chemistry
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(1) Introduction

I participated in LIMS program at April last year. While I have majored in chemistry at the Faculty of Engineering as an undergraduate student, I was interested in the human development or medicine-engineering cooperation, because I did volunteer activities for people with developmental disabilities. I also felt that I want to try to view the human body in macroscopic scale. These feeling encouraged me to participate in LIMS program. In this program, I discussed with other field people about new research theme, or I took lectures about medical science. In one-year, I was able to gain valuable experiences. I introduce two lectures in LIMS program, which especially I was impressed.

(2) Anatomy class

One of them is the anatomy class. In this lecture, I learned the human body's structure and functions using the actual donated body. It was unusual experience for students in the faculty of engineering. It was unfortunate that we cannot learn deeply because of the time limitation, or cannot handle surgical knife because we were not medical students. However, I was able to get the macroscopic perspective, not microscopic view that I used in the lab. Furthermore, I have interest in medical science more deeply.

(3) Medical and life support systems class

The other lecture is medical and life support systems class. In this class, I went to the nursing homes or hospitals, and learned how to help patients with physical or occupational therapy. Among them, what impressed me most was to see the occupational therapy for a little girl with a balance disability. This therapy has been done in a room with a lot of playground equipment, where she took rehabilitation well using them. I witnessed her growth and I was moved by her power. In this experience, I strongly think I would like to help such a people with disabilities to overcome their handicap.

(4) Conclusion

I learned a lot of things in the one-year at this LIMS program. I became very impressed and have feeling to learn medical science more by myself. Thus, I spent a very meaningful time through a year.

Induction of Natural killer cells from human pluripotent stem cells under chemically defined condition

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(1) Objective of this study

Natural killer cells (NKCs) have been proposed as a new source for immunotherapies in various malignancies. Previous studies have developed peripheral blood NKC expansions or NKC differentiation from cord blood cells. More recently, NKC inductions from pluripotent stem cells (PSCs), have unlimited growth potential, were reported. However, due to the usage of xeno- or allo-derived components, there are various impediments to the clinical applications of those methods in the aspects of safety and reproducibility. To resolve those problems, we tried to induce functional NKCs from PSCs under a completely chemically defined condition free from any non-autologous serum or stroma.

(2) NKCs induction

Simply changing cytokine combinations (BMP4, VEGF, SCF, Flt3L) and chemically defined media in step-wise manner, we first induced $CD34^{+}CD43^{+}$ hematopoietic progenitor cells (HPCs) from PSCs with 79% purity by 12 days culture. After harvesting HPCs, we applied them to NKC specification by replacing cytokines with the combination containing SCF, Flt3L, IL-7 and IL-15. Additional 24 days culture (36 days of differentiation) included 80.9±1.27% $CD56^{+}$ cells, which exhibited similar phenotypes to peripheral blood NKCs in terms of morphology (Fig.1.) and surface markers (Fig.2.).

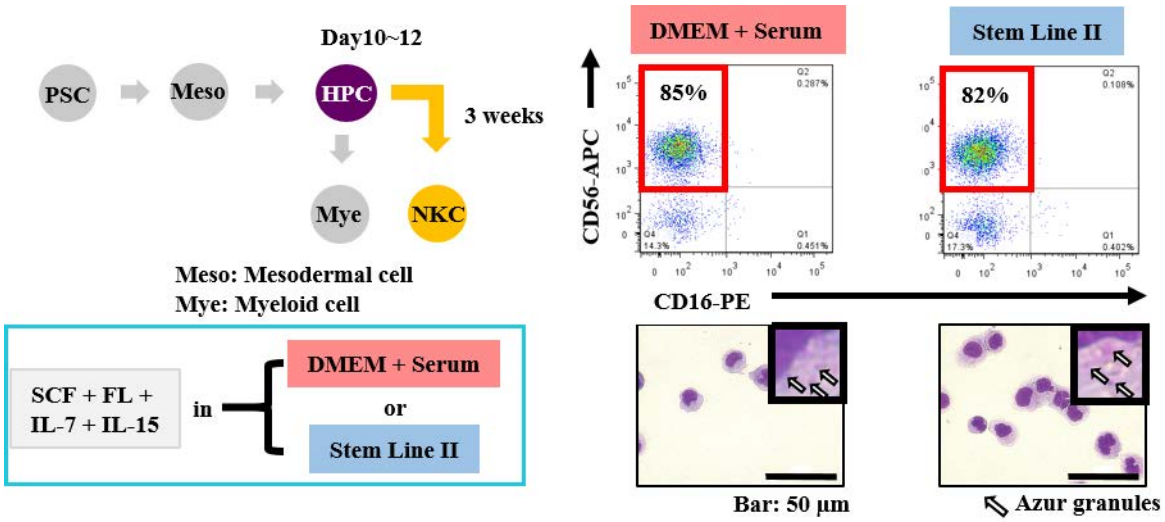

Fig.1. PSC-derived NKCs

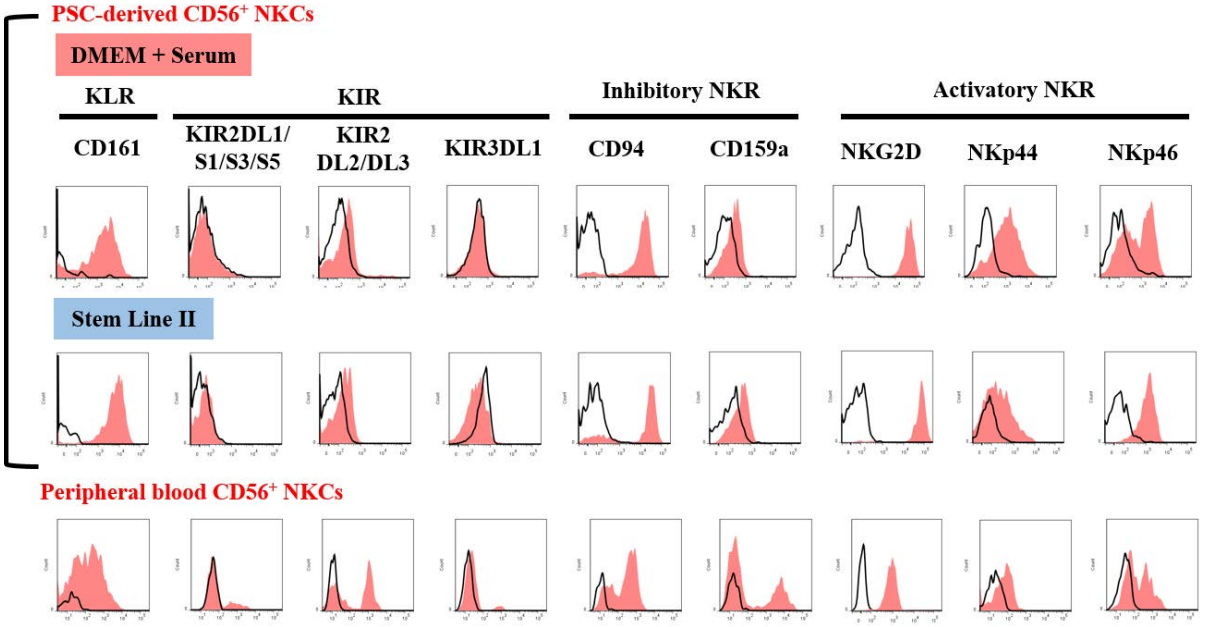

Fig.2. Surface marker

(3) NK killer assay

In 2014, I tried to create the NK killer assay system using NK cells from PBMC (Peripheral Blood Mononuclear Cell). K562, a leukemia cell-line, was co-cultured with NKCs for 4 hours at 37℃, and cytotoxicity of NKCs was analyzed using FACS. K562 cells were labeled with PKH2 Green Fluorescent Cell Linker to identify each cell. The cytotoxic activity of NKCs was confirmed by increased number of DAPI+ cells in PKH-labeled K562 cells co-cultured with NK cells. As a result, PSCs derived NKCs showed the cytotoxicity against K562 (Fig. 3.).

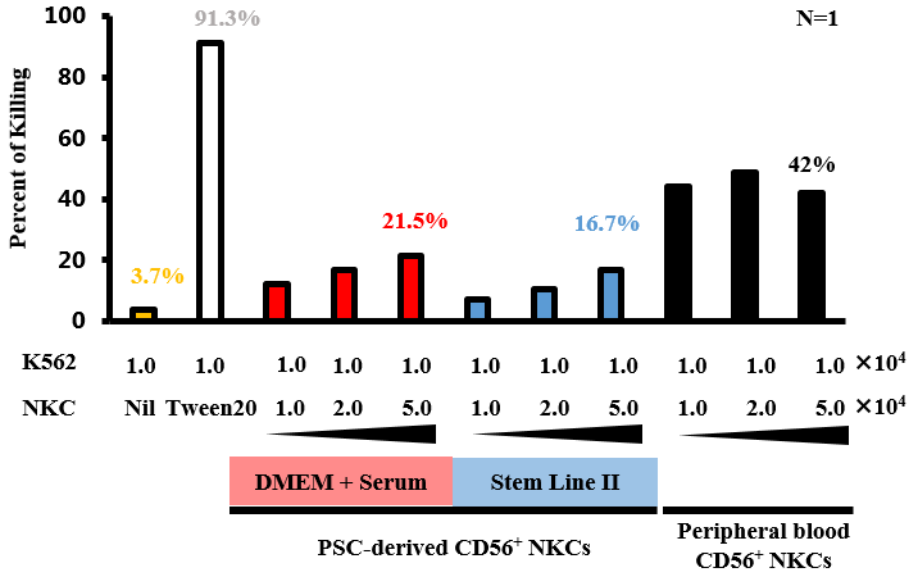

Fig.3. Cytotoxicity of NKCs

Establishment of a Method of Characterizing DNA Lesions Caused by Industrial Chemical Compound

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(1) Summary of research finding

Background

To detect mutagenic potential in industrial chemical compounds, regulators have used several *in vitro* bioassays including the micronucleus (MN) test. The sensitivity and specificity of the conventional MN test are still major concern for the regulators. A major reason for the limited sensitivity is the usage of only *wild-type* cells, which accurately repair DNA damage caused by chemical compounds. I hypothesized that the usage of DNA-repair-deficient strains could allow for identifying putative genotoxins with significantly greater sensitivity than existing assays. I propose the development of new methodologies to perform the MN assay using DNA-repair-deficient as well as *wild-type* cells derived from the TK6 B cell line, a unique human cell line widely used for the MN test.

Results

I disrupted the following five DNA damage response (DDR) factors, which cover the repair of a wide range of DNA lesions. The disrupted genes encode FANCD2 for interstrand crosslink repair, DNA polymerase zeta (REV3) for translesion DNA synthesis (TLS), and XRCC1 for base excision repair and single-strand break (SSB) repair, leading to generation of *FANCD2*$^{-/-}$, *REV3*$^{-/-}$, and *XRCC1*$^{-/-}$ cells. I also simultaneously disrupted two genes (RAD54 and LIG4) involved in double-strand break (DSB) repair and generated *RAD54*$^{-/-}$/*LIG4*$^{-/-}$ cells. I conducted the MN test for four typical DNA damaging agents: methyl methane sulfonate (MMS), hydrogen peroxide (H_2O_2), γ-rays and mitomycin C (MMC). I determined genotoxicity based on a comparison of MN frequency between wild-type and DNA-repair–deficient mutants at 48 hr after exposure of the cells to given DNA damaging agents. I found that the percentages of *RAD54*$^{-/-}$/*LIG4*$^{-/-}$ cells having micronuclei induced by γ-rays, H_2O_2, MMS and MMC are 6.3, 6.4, 7.1 and 7.5 times, respectively, higher than those of parental wild-type TK6 cells. The percentages of *XRCC1*$^{-/-}$ cells having micronuclei induced by γ-rays, H_2O_2, MMS and MMC are all more than 5 times higher than that of wild-type cells. In summary, the usage of *RAD54*$^{-/-}$/*LIG4*$^{-/-}$ and *XRCC1*$^{-/-}$ TK6 cells increases the sensitivity of the MN test by several times in comparison with the conventional MN test.

Discussion

The DNA-repair-proficient *wild-type* cells would serve as a negative control in this analysis,

providing higher specificity than the conventional MN test. These results demonstrate the utility of this genetic approach for screening environmental mutagen and also for re-evaluating the genotoxicity of chemical compounds detected by the conventional MN test as well as for further characterizing the nature of detected genotoxicity which focus has been on the use of DNA repair-deficient TK6 models for the development of a new more sensitive, physiologically relevant and *in vitro* MN assay with greater specificity.

(2) Visiting at University of Copenhagen

My project was to optimize a method of detecting ultra-fine DNA bridges (UFBs) in the human TK6 B cell line in collaboration with Professor Ian D. Hickson in University of Copenhagen. He firstly identified UFBs (Figure 1), which are a biomarker of examining the process of mitosis. I studied his laboratory for two months from October, 2015, and have established a method of detecting UFBs in the human TK6 B cell line. I here explain (i) ultra-fine DNA bridges (UFBs), (ii) why the collaboration was required, (iii) the results I obtained in Copenhagen, and (iv) future research plan in Kyoto.

i) Chromosomal instability predominantly arises either during the process of mitosis, where the chromosomes are segregated, or during cytokinesis when the cell divides. Common forms of conventional mitotic chromosome aberrations are lagging chromosomes, chromatin bridges, micronuclei, binucleation, aneuploidy and polyploidy, as well as the more recently identified UFBs (Figure 1). UFBs are a reliable biomarker for detecting a defect in segregation of sister chromatids. I wished to detect UFBs in order to analyze defective resolution events of homologous recombination (HR) intermediates involving two sister chromatids. This is because no phenotypic assay is available to examine the resolution of HR intermediates. In addition, monitoring UFBs may provide a reliable bioassay of analyzing the resolution step of HR.

(ii) Our joint research is to analyze UFBs in the human lymphoblastoid TK6 B lymphocyte line, in which a number of genes being involved in HR have been disrupted at our laboratory. Professor Ian D. Hickson established a method of detecting UFBs in fibroblasts but did not yet optimize the method for floating cells such as TK6 cells. Thus, I needed to thoroughly learn from them in order to newly establish the method of detecting UFBs in the TK6 cells.

(iii) I have successfully established the method as shown below a representative image of UFBs.

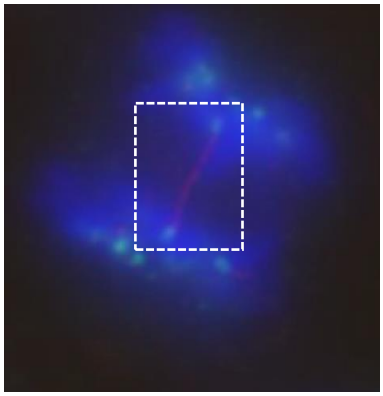

Figure 1: Ultrafine DNA bridges: Immunofluorescent microscopy images of PICH (red) on C-UFBs originating from CENPB (green) foci representing centromere. Blowup shows UFBs, which originate from centromere. Genomic DNA present between two dividing sister chromatids in mitotic cells had been undetectable by staining DNA. Professor Ian D. Hickson demonstrated that the bridge structure stained by antibody against the PICH protein (red) includes genomic DNA, and has

(iv) The Mre11-Rad50-Nbs1 (MRN) complex plays an important role in the initial step of HR. My laboratory generated Mre11-deficient cells from the human TK6 B cell line, and obtained circumstantial experimental evidence for the role of MRN complex in processing HR intermediates for proper resolution. The purpose of my research plan is to provide convincing evidence. To this end, I will set up the UFB analysis in the Department of Radiation Genetics, where I have studied in Kyoto. To confirm that UFBs are caused by defective resolution of HR intermediates, I will establish to a new method, by which I can examine UFBs and sister chromatid exchange (SCE) events simultaneously (Figure 2). SCE represents HR associated with crossover between sister chromatids. Hopefully, I will be able to demonstrate the role of MRN in processing HR intermediates by showing increased numbers of UFBs colocalized with SCEs (Figure 2).

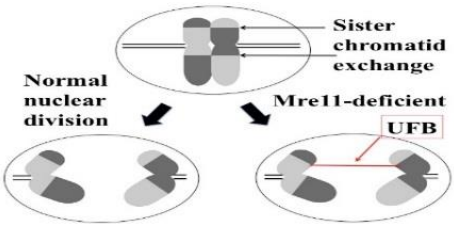

Figure 2: UFBs associated with SCE, which represents HR between sister chromatids.

Neural impact of native language during speech processing of non-native language

Department of Medical Science
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(1) Neural impact of native language during speech processing of non-native language

Although the influence of native language (L1) literacy on reading a non-native language (L2) has been suggested, it is not yet clear whether any influences exist for L2 speech processing. Literacy skills can differ based on the writing system a language uses. We can distinguish these writing systems into two broad category: morphemic and phonetic writing systems. Morphemic writing system uses characters to represent meaning, while phonetic writing system uses characters to represent sound unit. The former includes the Chinese characters and Japanese kanji, whereas alphabets and Japanese kana are two examples of the latter. Thus, to answer whether native language literacy skills influence speech processing in non-native language, we need to compare two groups: one whose native language uses pure morphemic writing system (Chinese) and another who uses pure phonetic writing system (in this study, Vietnamese) and give both the tasks to process speech in a non-native language that uses both writing systems (Japanese).

With this strategy, we compared brain activation of Chinese native speakers and Vietnamese native speakers when they produce speech and recognize speech sounds in Japanese. The participants recruited are only ones who are late bilinguals (had only started to learn Japanese after twelve years old), showed high proficiency in Japanese language, and had been staying in Japan for a minimum of six months by the time they joined the study. We made sure that the participants are used to having conversations in Japanese in their daily lives.

The participants performed two tasks, a speaking task and a listening task, while lying supine in a 3T MRI scanner. For speaking task, they were shown images of objects on the monitor, then they had to call out the Japanese names for that object. For the listening task, they listened to spoken Japanese words. Then they had to decide if each word represented a man-made or a natural object. They gave their responses by pressing buttons.

A set of 120 stimuli was chosen for both tasks. Pictures of objects were selected from a normative set published by Nishimoto and colleagues in 2005. We selected those that were regarded as being highly familiar, and used those pictures as visual stimuli for the speaking task. Then we used the audio recording of the same objects as the stimuli for the listening task.

We found stronger activation on the left posterior parietal cortex in Chinese relative to Vietnamese, while the Vietnamese group showed stronger activation in the left superior temporal gyrus relative to Chinese. The results suggested that differences in literacy skills of L1 facilitated by the writing system of L1 do influence the neural correlates of L2 speech processing.

(2)Intellectual rights application

LIMS helped in applying for patent for the idea 'foot stamp and smart film' which was eventually obtained in July, 2015 (patent No. 1157427049, July 31st 2015). I was thus able to learn first-hand on the procedure for intellectual rights application.

(3) Participation in the Program for Leading Graduate Schools Forum 2015

In October 24-25th, 2015, I participated in a student discussion session at the Program for Leading Graduate Schools Forum 2015, held in Tokyo. I presented at the 'interdisciplinary education' session, sharing the experience obtained through LIMS program that emphasized on the topic. In my presentation, I highlighted the importance of interdisciplinary education and how it can be conducted as a student. I also talked of how program staff could follow up on students' ideas.

Brainstorming with students of other leading programs on interdisciplinary education.

From the discussions, I learned that the best practices for a leading program include internship and cross-teaching, in which a student teaches his/her own field to another student of different educational background, allowing them both to gain new knowledge and develop effective communication capabilities.

The final idea from the session was creating an idea pool, a web-based platform in which all leading programs can show their own activities and students can share any issues

or find ideas. Since this idea is too vague to develop specific aspects of the program, its application should largely depends on how each program harvests the data from it.

(4) Field trip to Toyama City

In October 31, 2015, I participated in LIMS trip to Toyama city. The city was named the world's most resilient city, and I had previously learned of it from a session at the World Health Summit Regional Meeting, which was held in Kyoto, April 13-14, 2015.

In the field trip, we were introduced to the tools of the city, such as its transportation system and local spots. Afterwards, we discussed the attributes and considerations of resilient city planning at the city office with Mayor Masashi Mori and Joseph Runzo-Inada, the city's policy adviser.

Toyama city transportation programs involve public bicycles (left) and light-weight tram (right).

Toyama serves as a model of a city which recognizes the challenges of demographic changes and the escalating need for intensive care. It responded by restructuring the city to what it refers to as a 'compact city'. They targets three main aspects: public transportation, relocation of residents and businesses around public transport lines, and reviving the city center. For transportation, they focused on building light rail trams. The operation is carried out by private sector, whereas the track itself was constructed by the public sector. This 'compact city' policy was shown to increase the number of population who moves back near the city center and the number of public transportation users.

Present Status and Future Problems in Medical Ethics for the Development of Regenerative Medicine

Department of Human Health Sciences
Graduate School of Medicine
M2 Tomoko Matsumoto

(1) Aim of my research

Today the influence that the development of the medical technology give in the society increase more and more, such as the regenerative medicine by using iPSCs (induced pluripotent stem cells). With the medical technological change, new ethical problems and social problems are highlighted. For example, research ethics like STAP paper and folk medicine without evidence. In this research, I aim at pursuing three steps. First, I grasp the actual situation of the ethical social problems that occurred with developing medical technology. Second, based on past examples, I predict problems which is possible in future. Third, I suggest better solutions for these problems. Therefore I hope this study support to make a new guideline for the future medicine.

(2) Research activities

In this year, I concentrated on the following things. 1. To grasp the actual situations of medical ethics and technology in regenerative medicine. 2. To investigate the domestic policy in regenerative medicine. 3. Comparative survey of guidelines about medical ethics. I report two meetings which is particularly interesting in this year.

I. 13th Annual Meeting of International Somatic Stem Cell Research
Master, Zubin , Martinson, Brain C.(Alden March Bioethics Institute, Albany)
"The moral responsibilities of academic research institutions to safeguard the integrity of research"

They presented and pointed out problems about the moral responsibilities of academic research in detail. Then they indicated some solutions. Through hearing this presentation, I could understand the present situation about the integrity of research in the world. I reported their summary below.

Safeguarding research integrity, is not only the responsibility of scientists, but also of academic research institutions. In high-profile cases of research misconduct, scientists are typically labeled "bad apples" while their employing institutions escape opprobrium. Seldom are questions raised about the role of the institution to prevent misconduct or the organizational climate and culture, which may have led to

misconduct. Yet institutions have moral obligations to their faculty, students, and to the public; traditionally their primary benefactor. However this implied network of social contracts has been shifting over several decades, blurring the lines of who is responsible to whom, and for what; introducing new challenges to research integrity.

In presentation, they asked three questions to audiences and made them think about something. ①What happens when faculty become less valued for their pure intellectual contributions, and increasingly valued as "cash cow"? ②What are the implications of graduate and postdoctoral trainees being relied upon as relatively in expensive skilled? ③What role have such changes played in generating the hyper competition science leaders have recently pointed to as a threat to research integrity?

Next, they introduced feelings of stem cell researchers they are under greater scrutiny and have higher pressure to publish incomplete or unverified results. Stem cell researchers also warrant concern that the current environment of high-stakes competition for increasingly scarce resources may be adversely affecting stem cell research and other fields. They explained these problems by using the STAP cell misconducts case. (The STAP cell misconduct case at the Center for Development Biology (CDB) at RIKEN led an investigation committee to recommend dismantling the CDB and to the implementation of a plan address misconduct, which may have contributed to the suicide of a CDB lead-scientist.) This eye-opening example of the competitive, high-stakes nature of stem cell and biomedical research environments can be used to examine the dynamics of these settings, and where academic institutions need to take active roles in promoting research integrity, preventing misconduct, and reshaping the scientific research environment.

They explored the moral responsibilities of research institutions to prevent misconduct and other undesirable research-related behavior, and how they may begin redirecting the academic environment towards a more positive and sustainable future.

II. 38th annual meeting of the Biochemistry of Japan and 88th annual meeting of Molecular Biology society of Japan (BMB2015)

"Consider the relationship between the life science and the society"

These days, some misconduct occurred in the life science again. For example, matters of STAP cell and fraudulent researches in clinical case study and so on. Therefore both government and academic societies issued several reports and the guidelines. Specially, in this year (on April, 2015), the ministry of Education, Culture, Sports, Science and Technology put the guideline into effect in order to prevent misconducts such as falsification of data in papers. In the same time, researchers included in basic fields have to keep the data from destruction and get training

systematically. The organizer reported a lot of academics required much effort to comply these regulations. Certainly, it would be important to tackle this problem concretely for keeping credibility of science papers.

On the other hand, researchers make efforts only to keep these regulations. However, they suggested another two points which researchers need to do. First point is to transmit opinions about the values, interests and difficulties of the science to the society. Second point is to discuss and interact about various views of research included social problems.

In this forum, they looked back over the past. And then they discussed with researchers and media about what to do and what to need. A lot of researchers suggested the problems and improvements about the research ethics systems.

(3) Future plan

I gather information sequentially. Next year I'm going to make efforts in step 2 of my plan.

Study in age-related changes of biorhythm and disease onset

Department of Pharmaceutical Sciences
Graduate School of Pharmaceutical Sciences
M2　Kouki Shinoda

In this year, I mainly conducted literature search and attended academic meetings on chronobiology to understand pathogenic mechanisms of diseases and methods of clinical treatment for them.

(1) A list of the conferences I attended during the 2015 academic year

- The 38th Annual Meeting of the Japan Society for Biomedical Gerontology (The 29th General Meeting of the Japan Gerontological Society) (12 to 14 June, 2015)
- The 40th Annual Meeting of Japanese Society of Sleep Research (2 to 3 July, 2015)
- The 22nd annual Meeting of the Japanese Society for Chronobiology (21 to 22 November, 2015)
- The 36th Annual Meeting of the Japanese Society of Clinical Pharmacology and Therapeutics (9 to 11 December, 2015)

(2) Activity report

Through attending these academic conferences, I took an interest in sleep disorder which can be caused by age-related change in biorhythm, and in drug efficacy and toxicity influenced by our circadian rhythm.

Half of the healthy elderly are thought to have sleep problem such as nocturnal awakening and early morning awakening. Moreover, 70% of dementia patient have sleep-disease, mainly insomnia. Especially, patients with Alzheimer's disease are more prone to sleep disorders than unaffected people. Drug therapy is partially effective for these sleep disorders, but might cause oversedation and tumbles. In order to decrease the dose of drug, I think it would be important to propose a tailor-made sleep environment, such as a precise room lighting and temperature depending on each patient's condition (including their chronotype).

Additionally, we will need to consider the drug efficacy based on chronobiology. I found that the expression of transporters and metabolic enzymes also showed circadian changes and influenced drug efficacy and toxicity. Hence, analyzing therapeutic uses for known drugs from a viewpoint of biorhythm will help to decrease or improve side effects of those drugs and allow us to propose more effective treatment.

To examine a precise timing for drug administration or suitable drug combinations involved in personal circadian activity, I am going to use Meta-analysis based on the factors influenced by biorhythm such as dose time and duration in my future study.

Elucidation of Molecular Mechanisms of Circadian Clock in Shift Workers

Department of Bioinformatics and Chemical Genomics
Graduate School of Pharmaceutical Sciences
M2　Kumiko Dojo

(1) Problems to solve

In Japan, 27% of labors are shift workers and/or midnight workers, and the population is increasing. These days, it is getting recognized that shift works have higher risks of several diseases, including dyslipidaemia, hypertension, diabetes, vascular disease, and cancer. About diabetes, its relation to inadequate sleep in shift workers have been focused. In the workshop on "Impact of Sleep and Circadian Disruption on Energy Balance and Diabetes" held in 2015, various studies alerted the relationship between sleep/circadian disruption and type 2 diabetes. As for cancer, International Agency for Research on Cancer (IARC) categorized cancer by shift work as group 2A, which is second highest of five categories. One of the reasons of those phenomena is the gap between their circadian clock and environmental light-dark (LD) cycle. In other words, they are in "social jet-lag", discrepancy between biological and social timing. Shift workers keep exposed to light at "wrong" time, which make their circadian clock perturbed. In addition, since the endogenous circadian clock adapts gradually to the external time, shift workers are hard to adjust their circadian clock to new LD cycle. Although there are several ways to reduce burden of the endogenous-external-timing gap shift workers get, still fundamental problems are remained. Moreover, the molecular mechanism of the jet-lag is still unknown. In order to establish the pathological treatment for shift workers, elucidation of molecular mechanisms of circadian clock in shift work is essential.

(2) Future Plan

This year, I have done literature search on shift workers related diseases, and search clock relate genes in Suprachiasmatic nucleus (SCN). By using Real Time PCR and RI *in situ* hybridization, I observed several genes expressing at SCN. They are expected to work for light input and/or entrainment to environmental LD cycle. Next year, I would like to continue literature search to keep catching up the most recent studies and, elucidate the role of the genes expressing at SCN.

Functional analysis of TIARP for treatment of rheumatoid arthritis

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M2 Masatoshi Uno

(1) Research objectives

Rheumatoid arthritis (RA) is a systematic auto-immune disease. Its main symptoms are joint deformation and systematic inflammation[1]. Recently, some anti-rheumatoid antibody drugs targeting inflammatory cytokine signals were developed, and they improved sweep efficiency. However, these drugs are very expensive (\2,000 ~ 5,000 /day) and require long term use. So my research presentation objective, is presenting cheaper therapeutic drugs that target small molecules.

(2) Previous activities

I researched inflammatory cytokine signals especially TNF-α/NF-κB pathway and IL-6/Jak-STAT pathway because targets of anti-rheumatoid antibody drugs were TNF-α and IL-6. Since the IL-6/Jak-STAT signal takes an important role in the pathomechanism of RA, I focused on the IL-6/Jak-STAT signal[2]. I attempted to simulate the signal network with mathematic methods in order to understand details of the whole image and the relationships of the cytokine network. As a result, I found an interesting protein called TIARP.

(3) New target "TIARP"

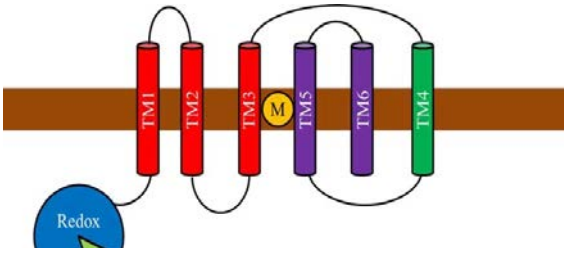

Fig.1 Shematic structural model of TIARP

TNF-α induced adipose related protein (TIARP) is a membrane protein of six-pass transmembrane type and one of metal reductive enzyme (Fig.1)[3]. Molecular functions of TIARP are tri-valent iron reduction with NADPH and physiological functions are adipose differentiation and metabolic regulation of sugar and ROS. Moreover, TIARP has been associated with type-II diabetes and prostatic cancer.[4,5] Therefore, TIARP had been regarded as a metabolism related protein. However, Professor Sumida reported that TIARP inhibited inflammatory cytokine signals related to RA[6]. In reports, TIARP inhibited NF-κB and STAT3 which are inflammatory transcriptional factors in TNF-α/NF-κB and IL-6/Jak-STAT pathways and overexpression of TIARP inhibited joint deformation in RA mice.[6,7] So, I thought this protein would make an ideal drug target.

(4) Previous research of TIARP as anti-inflammatory protein

Because TIARP was regarded as a metabolic related reductase, detailed functions of ferric reductase were solved.[3,8] Molecules which interacted with TIARP were identified, for example, Fe^{3+}, Cu^{2+}, NADPH, FAD, Heme-Fe^{3+}, FAK1[8,9]. However, these molecules and the reductase functions of TIARP could not exacerbate inflammatory responses, but inhibited inflammation.[10,11] Moreover, TIARP might be not able to interact directly with transcriptional factors because TIARP is a membrane protein.

So, I proposed that there could be unknown molecules which were able to inhibit inflammatory transcriptional factors and interact with TIARP (Fig.2).

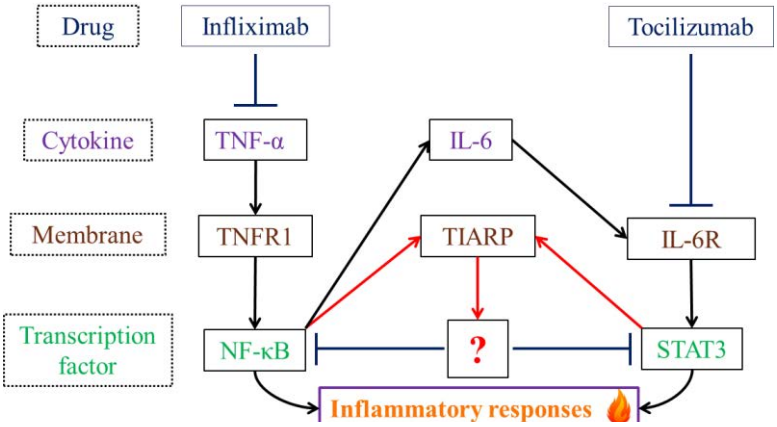

Fig.2 Signal diagram of TIARP and proposed molecules

(5) Future plan

In order to find the proposed molecules, I am going to try four experiments [1] ~ [4].

[1] Construction of TIARP expression cell system

I selected the mouse Macrophage cell line - RAW264.7 to search for the molecules related in immune system.

[2] Examination of soluble condition of TIARP

I would have to select soluble condition of TIARP since TIARP is a membrane protein.

[3] Search for unknown interactive molecules with Pull down or Co-immunoprecipitation

Pull down and Co-immunoprecipitation are typical methods for searching unknown interactive proteins.

[4] Identification of the protein found, using Peptide mass fingerprinting (PMF)

PMF is a mass spectrometry method used in order to identify certain protein amino acid sequences.

(6) Reference

1. Iain B. M. et al., *N Engl J Med,* (2011), 2. Malemud, C., *Int J Infereron Cytokine Mediator Res,* (2010), 3. Gauss, G.H. et al., *J Biol Chem* (2013), 4. Freyhaus, H. et al., *Cell Metab,* (2012), 5. Waki, H. et al., *Cell* (2007), 6. Inoue, A. et al., *Arthritis Res Ther,* (2009), 7. Inoue, A. et al., *Arthritis Rheum* (2012), 8. Kleven, M.D. et al., *J Biol Chem* (2015), 9. T. Tamura et al. *Int J Mol Med,* (2009), 10. Wong, V.W. et al., *Nat Med*, (2012), 11. Zhou, J. et al. *J Biol Chem* (2013)

Development of Functional Optical Materials for Quantifying Biomolecules Based on Organic-Inorganic Hybrids

Department of Polymer Chemistry
Graduate School of Engineering
M2　Kazumasa Suenaga

(1) Development of chemosensors with aggregation-induced emission-active polymers

The aggregation of β-amiloids and following accumulation causes the critical diseases in human being. Thereby, the precise evaluation of the cohesion behaviors of the protein is still strongly required not only for the diagnosis but also for the maintenance of the quality of the proteins. However, it can be forecasted that the small molecule-based probes would be adsorbed to the specific site on the protein such in the hydrophobic pockets. Therefore, to precisely evaluate the cohesion ability of the protein from a whole molecule, new detection strategy should be needed.

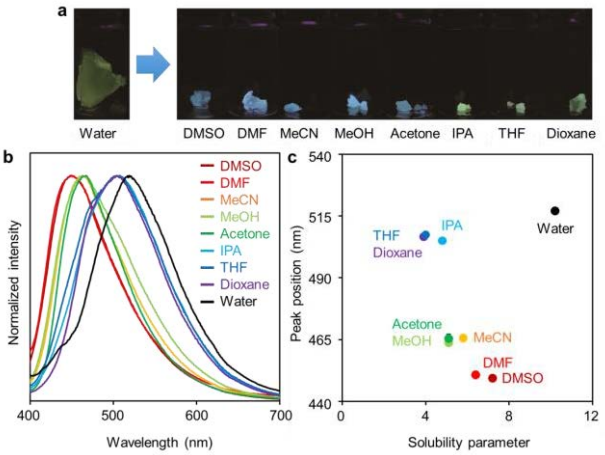

Figure 1. (a) The emission behaviors of the sample g50 at the shrinking states with various organic solvents under UV irradiation (365 nm). (b) Emission spectra of the shrunk gels containing various organic solvents. (c) The relationship between the peak positions in the emission spectra and solubility parameters of each organic solvent.

In this year, I accomplished to show the sponge-type optical sensors for evaluating protein cohesion based on the AIE-active hydrogels. The AIE-active hydrogels were prepared by employing boron ketoiminate having the AIE property. Initially, the typical AIE behaviors were observed from the synthesized hydrogels. The emission intensity can be reversibly modulated by swelling and drying. Eventually, I found that the AIE color was changed by exposing the hydrogels to organic solvents for shrinking the hydrogels. Interestingly, after the treatments with organic solvents, the AIE color of the hydrogel was diverse. This unique behavior can be explained as aggregation-induced blue shift emission. Furthermore, these shrunk hydrogels showed additional color changes by immersing into the buffer solutions with different salt concentrations. Finally, it was shown that the color changes of the hydrogels can be significantly induced by the protein solution. This is the first example, to the best of my knowledge, to offer the facile chemosensor for the protein detection based on the new photophysical process, aggregation-induced blue shift emission.

(2) What I have learned in LIMS program in this two years

During two years in the LIMS program, I can have precious opportunities to study essences and current topics not only in biochemistry but also in medical science. Especially, in the lectures of Human Anatomy and Minimally-Invasive Therapeutics, impressive issues which can be useful for making new research themes were demonstrated. In this report, these points are mainly reviewed.

In the lecture of Human Anatomy, the mysteries in our human bodies were illustrated. Various types of organizations exist in our bodies. They formed well-ordered systems by the connection according to the preprogrammed design. Generally, from the cooperation of each organization, most of the bioactivities are maintained. However, the specific organization is critically responsible for the whole system of the bioactivity. For example, human brains are composed of large numbers of domains. Surprisingly, the size of the most important tissue for maintaining all systems in human body is small enough to fit in my hands. From the standpoint in molecular biology, the roles and the communication mechanism of each elemental cell are interested for me.

Next topic is concerned to the lecture of Minimally-Invasive Therapeutics in which the surgeries to reduce the damage to human tissues using various medical equipments including laparoscopic and remote manipulators are introduced. Compared to an abdominal operation, the surgeon makes several small incisions in a laparoscopic surgery. For patients, there are many benefits such as quicker recover, shorter hospital stays, less pain and so on. From the same viewpoint, I understood that the non-invasive protocols for monitoring biological events should be strongly required.

Except for the special knowledges, in the LIMS program, I had several opportunities to make a presentation and a debate in English. These chances were useful to improve my English conversation skill. Furthermore, the professionals in the different research fields gave me valuable advices for my research. I appreciate them for their kind instructions. In the next term of the LIMS program, I would like to continuously study for the development of unique and advantageous bioprobes not only for presenting new idea of material design but also for improving social health.

Research on the rural area problems with the government and the possibility of artificial intelligence toward the Aging Society.

Department of Synthetic Chemistry and Biological Chemistry
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M2　Hiroki Enno

(1) Field Works on Toyama and Chiba

Last winter, I went to Toyama and Chiba prefecture with Professor Yokota of Waseda Univ. and discussed the social problems in these areas. One of the most impressive trials in Kimitsu-cho, Toyama, is how Kuroneko-delivery company is tackling the problem of underpopulated-areas. Using its deep delivery network, the company provides "daily service" to elderly people, such as cleaning their house and doing their daily shopping. In comparison, I saw a lot of inefficiencies in both city governments. Even simple IT solutions are not supplied to office processing. For example, they type paper script to the PC software, print it and this is passed to another department as paper, so they type it again to another PC software. This is a complete waste of time. Just one cloud service is enough to omit this repetitive process. If they can stop wasting time by IT solutions, they can spend it for much more important matters like listening to the problems of local people. At present, I am surveying what kind of service is needed in these areas with Professor Yokota.

(2) Establishment of the company ' Exaintelligence' for the AI platform

From this year, I joined Exaintelligence as initial members. One of the founder is the former chairman of DeNA 'Makoto Haruta'. I am discussing with Professor Ogata of Waseda Univ. and several companies about the application of AI toward the Aging society.

(3) Top 18% in the world on Kaggle; 'Predict Left Ventricle Volume from MRI'

This March, we attended one of the biggest World Data Science Competitions 'Kaglle' with prize money of $20,000, and we won 18% in the world. In this competition, we analyzed MRI images of 700 patients' hearts and predicted left ventricle volumes. We applied Fourier Transfer technique to identify periodic movement of heart area and Deep Learning to predict the volumes. Development of this technique will become strong support tools for doctors.

Image 1 Result of Fourier Transfer Technique to Detect Left Ventricle Volume¥

Investigation into Cooperative Self-Assembly Processes on 2-D Surface

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Graduate School of Engineering
M2　Nobuhiko Nishitani

(1) Introducton: Self-assembly and Aβ Formation

Self-assembly is a process that molecules aggregate *via* noncovalent interactions such as van der Waals and hydrogen bonding interactions, and form periodic nano structures. Amyloid beta (Aβ) is one of the self-assembled biomolecule, and is associated with neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease. The key component of Aβ is the β sheet that has two dimensional (2-D) self-assembled structure composed of peptides, and it is known that formation of a hydrogen-bond network *via* an amide group is a key driving force for self-assembly. To fully understand β sheet formation (the early stage of Aβ formation), and further development of the treatment strategies, fundamental investigation of the effects of intermolecular interactions on self-assembly processes is important.

In this research, I focused on cooperative self-assembly of 2-D structure. In a cooperative process, a self-assembly pathway can be separated into slower nucleation process and faster elongation process. This process also can be often seen in biomolecules including Aβ. By using scanning tunneling microscopy (STM), we can visualize and access to surface structures of 2-D self-assembly at the single-molecule level. At the beginning of my research, I designed model compounds to simplify intermolecular interactions in 2-D self-assembly, and analyze intermolecular interactions quantitatively.

(2) Results and Discussion

To discuss the effect of intermolecular interactions on self-assembly processes, rod-coil-like aromatic compounds bearing amide (**1a**–**3a**) and urea group (**1u**–**3u**) were synthesized (Figure 1). Hydrogen bond *via* a urea group is intrinsically stronger than that of an amide group. Their self-assemblies at octanoic acid/ highly oriented pyrolytic graphite (HOPG) interface were investigated by STM at the single-molecule level. Concentration dependence of surface coverage is shown in Figure 2a. As clearly seen in the steep increase of surface coverage with increasing concentration in the solution phase, the formation of molecular orderings is very sensitive to the concentration change, except compound **1u**. The critical concentration, defined as the concentration at which the surface coverage saturates, tends to be lower when compounds have more alkyl chains and a larger aromatic core. Moreover, the critical concentration for urea derivatives **1u**–**3u** is almost one order of magnitude smaller than that for the corresponding amide derivatives **1a**–**3a**, suggesting the formation of a stronger hydrogen-bond network. Concentration dependence of surface coverage was quantitatively analyzed by a nucleation–elongation model for 2-D self-

assembly. In this model considering molecule–substrate interactions at the liquid/solid interface, the degree of cooperativity σ (= K_n / K_e) is defined by the ratio of nucleation (K_n) to elongation (K_e) equilibrium constants. As a result, experimental adsorption curve was able to be well reproduced and every compound except **1u** showed high cooperativity.

The K_n and K_e values provide a numerical estimate of the Gibbs free energy for nucleation and elongation of molecular orderings at the liquid/solid interface. Interestingly, the plot of the natural logarithm of ΔG_e (= $-RT \ln K_e$) against number of non-hydrogen atoms composing the adsorbates follows a linear relationship (Figure 2b). The slopes of the linear regressions for each amide and urea derivatives were almost the same. In addition, the difference in the strength of hydrogen bond between amide and urea groups can be clearly seen in the intercept of the plot. This result suggests that the strength of the hydrogen bond (i.e., amide or urea) and the the size of adsorbate (i.e., size of core and length of alkyl side chain) play a primary role in determining stabilization energy during nucleation and elongation processes of 2-D self-assembly.

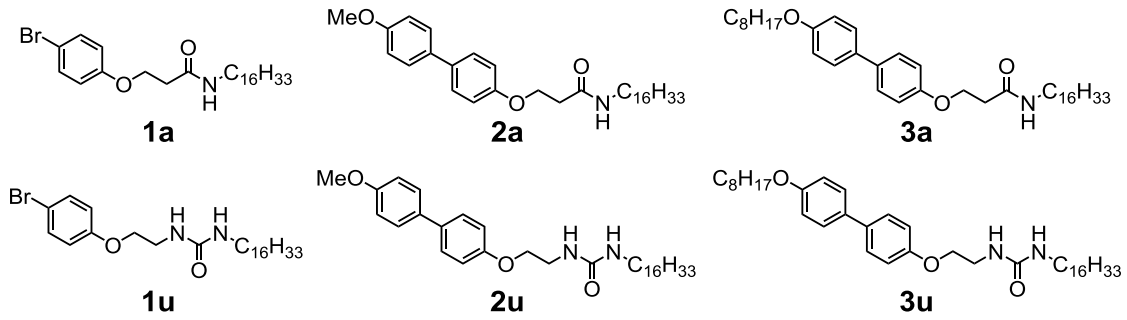
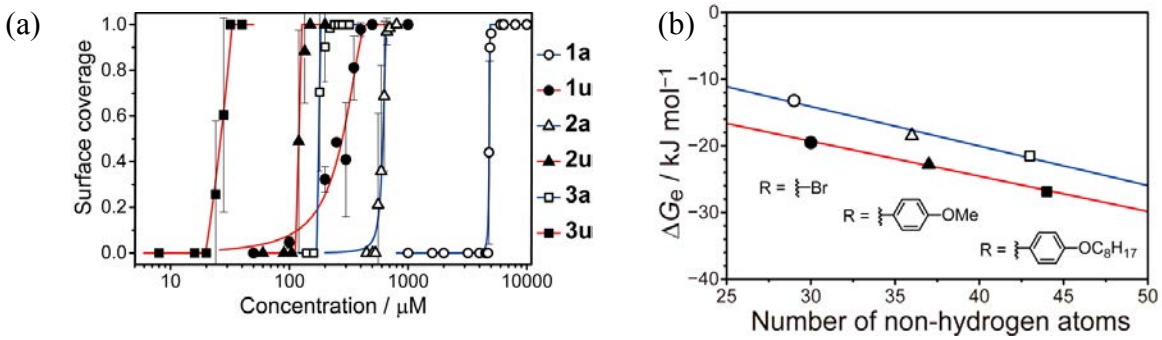


Figure 1. Chemical structures of compounds**1a**–**3a** and **1u**–**3u**.



(3) Conclusions

Figure 2. (a) Concentration dependence of surface coverageof **1a**–**3a** and **1u**–**3u** at the octanoic acid/HOPG interface. (b) The plot of the Gibbs free energy for elongation (ΔG_e) against the number of non-hydrogen atoms composing the adsorbates.

In summary, I have demonstrated that growth mechanisms at a liquid/solid interface can be quantitatively investigated based on the analysis of the concentration dependence of surface coverage using STM. This method enables us to quantify and estimate the effects of intermolecular interactions on stabilization of self-assembled structure. Towards the investigation into the mechanism of Aβ formation, work is underway to create more complicated systems using model compounds bearing multiple hydrogen bonds or peptides.

This research was supported by LIMS. I would like to appreciate the support from this program.

(4) Publication

This work has been published in *Chemistry–An Asian Journal* (**2015**, *10*, 1926–1931), and selected as a VIP (Very Important Paper) and cover picture (Figure 3). This paper was highlighted in *ChemistryViews* (July 11, **2015**) and *ATLAS of Science* (January 7, **2016**).

(5) LIMS activities / presentations

I also made poster or oral presentations about the research and activities in LIMS. The presentations with the support of LIMS are listed below.

1) The 29th General Assembly of the Japan Medical Congress (April, 2015)
2) Kyoto University Leading Graduate School Program Joint Workshop (June, 2015)
3) The 3rd Student Meeting of Leading Graduate Schools (June, 2015)
4) The 7th East Asia Symposium on Functional Dyes and Advanced Materials (September, 2015)
5) The 26th Symposium on Physical Organic Chemistry (September, 2015)
6) The 2015 International Chemical Congress of Pacific Basin Societies (December, 2015)

As a LIMS activity, I participated in 7) the Program for Leading Graduate Schools Forum 2015 (October, 2015). About the conferences numbered 3–7), I reported individually in this annual report.

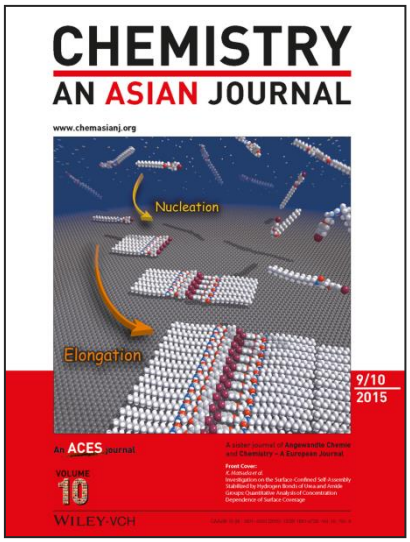


Figure 3. The cover picture on *Chemistry–An Asian Journal*

Safety Assessment of Thermal Effect for Ultrasound Elastography in LIMS Research and Activities

Department of Human Health Sciences
Graduate School of Medicine
D1　Mikako Gomyo

(1) Research in LIMS

My researches focus on novel measurement methods of ultrasound elastography; viscoelasticity as my laboratory subject, and safety assessment of thermal effect as the LIMS research.

Background

Ultrasound is increasingly needed for this aged society in that it enables to diagnose various diseases early and non-invasively, which contributes to improve quality-of-life after the patients. In particular ultrasound elastography, measurement technique for elasticity, is remarkable in recent days because elastography diagnosis for liver diseases was approved for health insurance (http://www.miyazaki.med.or.jp/2016kaitei/h28kaitei_hayamihyou.pdf, March 2016). My research in the laboratory aims to invent a new measurement method of viscoelasticity applying elastography to detect tumor or cancer in a much earlier stage. For both elasticity and viscoelasticity measurements by ultrasound, many cases need to radiation force which is enough high in intensity to generate shear wave.

Therefore, as the research in LIMS program, I attempt to assess thermal effect produced by high-intense radiation force in elastography, and to prove safety for human body in elastography and its applied technology.

Methods and Results

My plans to assess safety of thermal effect in elastography are as follows: 1. Surveys of current researches about thermal effect in ultrasound through LIMS activities (as described in **(2) Activities**), 2. Simulation of heat distribution generated by ultrasound radiation force and comparison between simulations and experiments in mimic materials of human tissue. Along of analyzing these simulations and experiments, my research enables to elucidate the effect of thermal energy against human body.

At first, as referred to theories from the survey, the distribution of sound pressure generated by ultrasound radiation force was visualized on a simulator (Fig. 1). MATLAB with k-wave toolbox was utilized as an appropriate simulator in consequence of the survey. In the next academic year, mapping heat distribution will be realized by means of transforming sound pressure to heat energy. Formulas of heating value by ultrasound attenuation (Eq. 1) and of bio-heat transfer equation (Eq. 2) are considered to be suitable by my research at present.

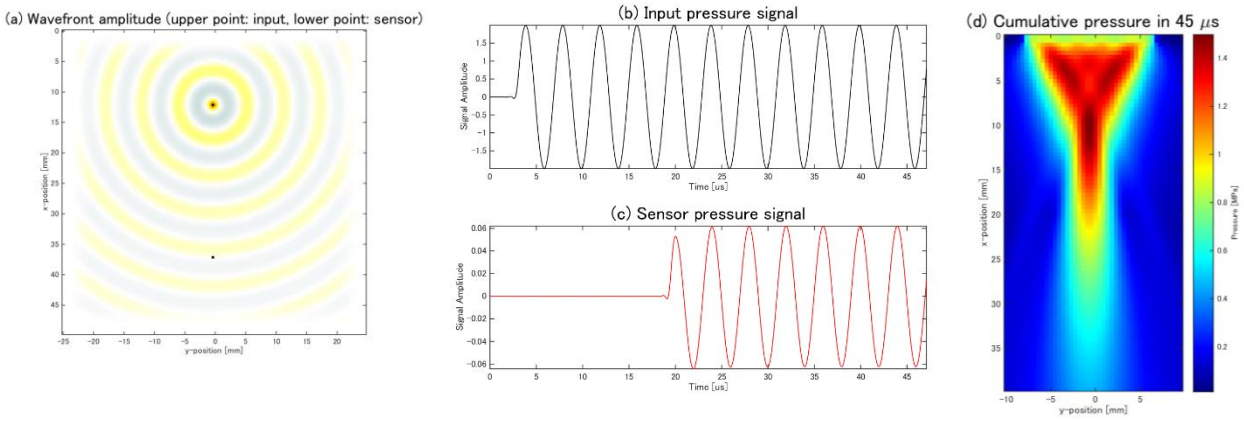


Fig.1 Distribution of sound pressure:
(a) Wave front amplitude generated from the upper point and measured in the lower point
(b) Input pressure at the upper point in (a) (c) Sensor pressure at the lower point in (a)
(d) Cumulative sound pressure propagated from the input point in 45 μs

$$Q = 2aW_0\alpha(f)\exp(-2L\alpha(f)) \tag{1}$$

Q: heating value by attenuation a: constant of absorption ($0 < a < 1$)
W_0: incident energy α: attenuation coefficient f: frequency L: propagation distance

$$C\frac{\partial T}{\partial t} = \kappa\left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2}\right) + Q - w_B C_B T \tag{2}$$

C: thermal conductivity of soft tissue T: temperature rise t: time κ: diffusivity of soft tissue
w_B: perfusion rate of blood C_B: thermal conductivity of blood

As the other study for assessment of thermal effect, phantom experiments was conducted for validating the simulation results. A mimic phantom of human tissue was made of agarose with a thermosensing ink in order to visualize thermal distribution inside a phantom (Fig. 2). Consequently, visualization inside phantom has failed because thermal resolution of the thermosensing ink was not higher than expected. Therefore, quitting a use of the thermosensing ink in expectation of spatial resolution, a thermocouple sensor is planning to be used in the next academic year to achieve validation as results of simulation in the point of temporal resolution.

Fig. 2 Experiment of agarose phantom with a thermosensing ink
(left: overview, right: close up after generating radiation force)

Conclusions

My research on analysis of thermal effect in ultrasound elastography is following the plan I proposed last April. This plan in the next academic year is going to be at the stage of comparison with advanced simulation and precise experiments, then this research will progress toward practical situation. The opportunity of LIMS research enables me to take into account the fact that I should focus on various aspects, not only technique but also safety, of my research to be published or released.

(2) Activities

LIMS program provided me with many opportunities for improving both my LIMS research and myself as a researcher.

I attended an academic conference “The Japan Society of Ultrasonics in Medicine (JSUM)” in May 2015 to gather cognitions and opinions from a clinical viewpoint. This conference is the largest in Japan for medical ultrasound of diagnosis and treatment. I could find out from the conference that thermal effect of ultrasound existed but was examined only in treatment. My purpose and meaning of the research were clearly determined owing to JSUM.

For the purpose of acquiring knowledge and technique ultrasound simulation, I participated in “Summer School on Advanced Ultrasound Imaging (AUI)” at Technical University of Denmark. This workshop was held for doctoral students who study or research on ultrasound imaging both of engineering and of medicine. Though I studying ultrasound in medical use found the contents of lectures difficult so that most attendees including lecturers have a degree of engineering, lecturers and students helped me understand by course works and practical trainings. The practical training was really rewarding because the simulator “MATLAB with Field II toolbox (invented by the host of this workshop)” has broad utility and this popular simulator is worth using after going back to each laboratory. Although finally I decided not to use this simulator for my LIMS research, the experience on AUI formed the basis for any ultrasound simulation on LIMS research and my own research in the laboratory.

In the course of LIMS study, in October I gained the chance of attending the largest conference involving in ultrasound imaging in the world; “ IEEE International Ultrasonics Symposium (IUS)” in Taipei, and I could obtain the latest knowledge and opinions from foreign researchers as well.

Besides, I could get valuable experiences inside our campus, especially in LIMS program. Home room was held from the beginning of this academic year and gave us to the opportunity to inform all those who belong to LIMS program of the progress on LIMS research. Since there was few chance to discuss LIMS research each other before then, at last I could obtain many valued questions and opinions given by teachers and students each of whom has a different background in April and September.

Every experience I had in LIMS program enabled me to develop me as a researcher. In the next semester I will aggressively keep on trying my research and activities.

Acknowledgments

I would like to express my profound gratitude to Prof. M. Toi offered me practical advice as a LIMS supervisor and to Prof. T. Shiina as an academic supervisor. I would also like to thank Dr. M. Matsuhashi and Dr. T. Kinoshita who spared so much of their valuable time to discuss my research and give me constructive suggestions as LIMS mentors.

Clinical and fundamental approaches for understanding of dementia

Department of Pharmaceutical Sciences
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D1 Jun Miyanohara

Detection of high-risk medicines in dementia cases using FAERS

Dementia is a progressive cognitive disorder, from which over 35 million people suffer all over the world. The global aging of populations accelerates the number of the patients and therefore addressing the threat of the disease is an urgent issue for all nations. There is, however, no effective treatment available for dementia, necessitates alternative approaches to tackle the problem. As a LIMS student, I attempted to offer new insight into potential strategies, by combining clinical data with basic study. In the present study, I used the Food and Drug Administration Adverse Event Reporting System (FAERS; http://www.fda.gov/Drugs/GuidanceComplianceRegulatoryInformation/Surveillance/AdverseDrugEffects/), a database publicly available for all researchers. Briefly, I calculated odds value from each drug as an indicator for the risk of side-effects of interest and determined the correlation between the uses of identified drugs and the frequencies of specific adverse events.

First, I found patients treated with propiverine, a muscarinic acetylcholine receptor antagonist used for overactive bladder, tend to suffer from dementia compared with the other acetylcholine receptor antagonists. This suggests that propiverine-specific mechanisms of action may play a role for the development of cognitive impairment, regardless of anti-cholinergic effects. Further investigation would be needed to clarify the possible mechanisms.

Second, I examined fatal cases caused by rivastigmine, an acetylcholine esterase inhibitor frequently used for patients with Alzheimer's disease, which is previously reported (Ali TB *et al*., *PLos One*, 2015). Interestingly, among those cases, cerebrovascular disease had one of the highest correlation with these fatal accidents. This indicates that patients with vascular dementia may be severely affected by rivastigmine treatments. To investigate the hypothesis, fundamental approaches are needed using animal models. In our laboratory, the appropriate models for vascular dementia has been successfully developed so far and evaluating drug candidates in these models could provide new findings in the comprehension for this study. I believe that, not only by using clinical information, but also by conducting basic experiments, could the true causal-relationship be clarified between the drug candidate and the life-threatening event.

The relation between aging and gut microbes

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering
D1　Takuto Suito

(1) Introduction

Inside our bodies, thousands kinds of bacterial cells exist. These microbial community is called “microbiota”. Recent studies showed microbiota plays crucial roles for host physiology, which includes metabolism, intestinal homeostasis, immune development and neurological functions. Several studies suggested that aging and microbiota is also associated with each other.

The leading study about the relationships between microbiota and health in aging have reported by Claesson *et al*. at *Nature* in 2012. They compared composition of fecal microbiota of old and young people. They concluded that microbiota of elderly people shows greater inter-individual variation than that of younger people. Furthermore, they found that elderly people with health problem has less diversity of microbiota or loss of several kinds of bacteria compared to healthy elderlies.

Several other human or mammalian model studies also suggested that changes of microbiota in aging, however these studies didn’t clearly and directly prove the effect of microbiota in aging. So, as LIMS research theme, I attempt to elucidate the role and effect of microbiota in healthy aging using simple *Drosophila* model.

In this study, I set the three factors to be elucidate using *Drosophila*; 1.changes of composition of bacteria in aging, 2. role of commensal bacteria in aging and 3.improving the bacterial community and longevity. To understand these things, I conducted the following experiments.

(2) Experiment and Results

①microbiota affects host longevity

First I generated germ-free fly, which is the fly without microorganisms, in order to know the effect of microbiota. Subsequently, I measured the lifespan of germ-free fly and conventionally reared fly. Lifespan of germ free fly decreased compared to conventionally reared fly (fig. 1).

②microbiota changes in aging

Next, I analyzed the microbiota of fly using next generation sequencer. In order to elucidate the changes of bacterial community in aging, flies that aged in 0, 5, 11, 24, 36 days old (their average lifespan is nearly 25 days) were used for analysis. From the analysis,

microbiota of drosophila was consist of small kind of bacterial genus, *Orbus*, *Acetobacter* and other about 20 bacteria genus. In addition, compositions of microbiota varied in aging (fig.2). Genus *Orbus*, *Acetobacter* bacteria was detected in all ages but their percentages were different in each ages. In addition, several kinds of bacteria were appeared in specific period. *Corynebacterium* and *Staphylococcus* was detected only in young ages, although *Providencia* was detected only in old ages. Moreover, diversity of microbiota decreased with aging. These result may be similar with the changes of microbiota in human.

(3) Discussion and Future plan

I showed that ①microbiota affects host longevity and ② microbiota changes in aging like human microbiota. These results suggest that Drosophila model study is valid for analyzing the relationship between aging and microbiota.

In addition, I determined a few bacterial genus which appear only in young or old age. I plan to make further inspection which bacteria regulates host lifespan using bacteria mono-associated flies. Given loss of bacteria found in the young flies specifically may shorten their lifespan, fly with specific may display longer life span compared to germfree or conventionally reared fly.

I also plan to analyze health parameters, such as energy metabolism, amount of sugar and lipid and RNA expression, of germ-free, conventionally reared and bacteria mono-associated fly in aging.

Finally, I plan to assess the effect of probiotics. Probiotics is defined by guideline of WHO in 2002 as a “live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host”. In particular, I am going to investigate whether life-span and health parameters changes or not when conventionally reared flies are fed probiotics. Through these studies, I would like to validate the drosophila study as a novel model for evaluating relationships between aging and microbiota and try to apply these achievement to human health.

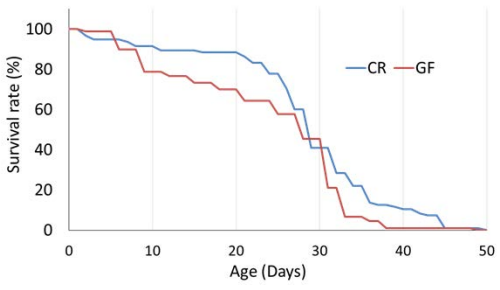


Fig. 1. Shorter lifespan of germ-free fly.
Survival curves of conventionally reared (CR) (n = 95, median survival is 29days) (blue) and germ-free (GF) (n = 90, median survival is 28 days) (red) flies. GF flies showed shorter lifespan compared to CR (p <

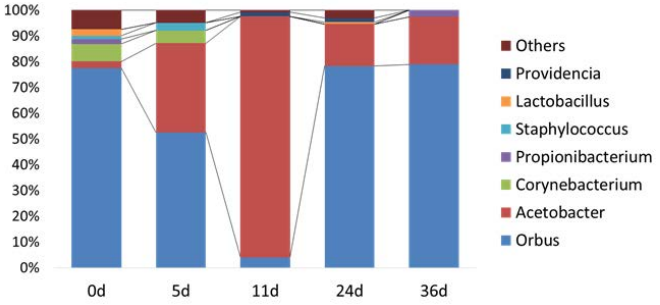


Fig. 2. Microbial communities are changed in aging.
Compositions of microbiota in 0, 5, 11, 24, 36 days old flies. The genus *Orbus* and *Acetobacter* were two main bacteria within fly’s gut.

Elucidating the effects of CAG repeat in mRNA splicing in Spinocerebellar Ataxia type 6

Department of Synthetic Chemistry and Biological Chemistry
Graduate school of Engineering
D1　Kazuma Yamaguchi

Object

Neurodegenerative disorder is a generic name of progressive and incurable diseases that are caused by neuronal death, for example Alzheimer's disease. Because the elderly occupy a majority of the patients who suffer from neurodegenerative disorder, neurodegenerative disorder has become one of the most serious problems in our aged societies. Spinocerebellar Degeneration (SCD) is a generic name of diseases exhibiting cerebellar ataxia as a main symptom. There are over 30,000 SCD patients including 10,000 hereditary patients in Japan. Compared to Europe and America, the proportion of autosomal dominant SCD patients is higher. Autosomal dominant SCD is called Spinocerebellar Ataxia (SCA), and similar to other neurodegenerative disorders SCAs are progressive. Cerebellum, brain stem and spinal cord slowly degrade in SCA patients. SCAs are classified and named from type 1 (SCA1) to SCA37 using the causative genes and the symptoms. However the numbering of SCAs is not complete: It is said that some are vacant, and some of their causative genes overlap. The mechanisms of SCAs onset remain unclear so that there is no way to cure now.

To summarize the information and to elucidate the molecular mechanism of SCAs onset, I set two themes in LIMS program. Last year, I already had reported about most of my research about theme 1. Here, I report the results of research about theme 2.

Themes in LIMS program

1) Molecular pathological study of Spinocerebellar Degeneration.
2) Elucidating the effects of CAG repeat expansion on the mRNA splicing in SCA6.

Plans and Methods

I focused on one of the SCAs in theme 2, SCA type 6 (SCA6), because it is a disease specifically prevalent in Japan, although it is not known well. SCA6 patients show pure cerebellar ataxia, but it is not so severe. The onset is very late and the progression is very slow. SCA6 is not lethal, but the quality of life of patients will be low. SCA6 is caused by a mutation in the *CACNA1A* gene, which encodes one of the voltage-dependent calcium channel alpha 1 subunits. The CAG repeat in Exon 47 of *CACNA1A* is abnormally expanded in SCA6 patient's genome. The carboxyl terminal of the calcium channel is elongated by a poly-glutamine (polyQ) chain translated from the CAG repeat. There are many reports that showed effects of polyQ expansion on calcium channel's function, but there is no common view. I focused on one report that showed an abnormality of alternative mRNA splicing in SCA6 patients. The 3' alternative

splicing at intron 46 of *CACNA1A* produces two variants (one is called "Long" and the other is called "Short") at the same amount, but in that report, they showed that "Long" was dominant in the Purkinje cell in two SCA6 patients. They couldn't elucidate the mechanism how the splicing is mediated.

My aim was to elucidate the effects of CAG repeat expansion on the mRNA splicing; I firstly made a mini-gene expression plasmid DNA, which contains the Exon 46, intron 46 and Exon 47 (schematic structure was showed in Figure. 1). I transfected the mini-gene into the human embryonic kidney cell line (HEK293), human neuroblastoma cell line (SK-N-SH), adenocarcinomic human alveolar basal epithelial cells (A549), human urinary bladder carcinoma (T24), human aneuploid immortal keratinocyte (HaCat), pheochromocytoma of rat adrenal medulla (PC12) and mouse cerebellar granule neuron (mCGN). 48 hours after transfection, I extracted the total RNA from the cells by ISOGEN and performed reverse-transcript polymerase chain reaction (RT-PCR). Using the acrylamide gel electrophoresis, I detected the bands of DNA, which express the proportion of two variants. The results of electrophoresis were analyzed using *ImageJ*. I cut the bands from acrylamide gels and extracted DNA, and then sequenced them by genetic analyzer.

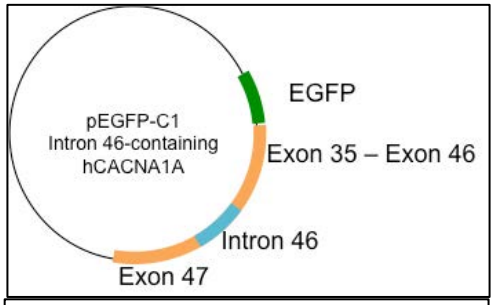


Figure. 1 Schematic structure of mini-gene. Intron 46 is derived from HEK293 cell genomic DNA.

Results and Discussion

From all the types of cells that I used, I only got a single band and it was "Long". This result means that the mini-gene DNA was transcribed in the cells and mRNA was spliced correctly, but this mini-gene could not produce the other "Short" variant. In mCGN, *Cacna1a* is endogenously expressed and I could detect two variants that correspond to human *CACNA1A* "Long" and "Short". But even when I over-expressed the mini-gene, I couldn't detect the "Short". In the next step, I need to elucidate why the mini-gene cannot produce the "Short" variant and I will have to make the mini-gene that can express both variants. When I get the mini-gene which can produce both variants, I will change the length of the CAG repeat and confirm the effects of the CAG expansion on mRNA splicing.

Conference Reports

Pan-Pacific Continence Society 学会レポート

M1 尾山 翔平

日時

9/7(月) ～ 9/8(火)

場所

北海道札幌市札幌コンベンションセンター

会議全体の趣旨・概要

今回の学会は下部尿路障害について最新の研究を基にした討論を行うことを目的とした場であった。本学会は日本だけでなく、中国、韓国、台湾といった近隣諸国から著名な研究者が集まった。

自分の発表に関する報告(事前に記載できる抄録のような内容だけでなく、会議の場で自分の発表に向けられた関心・意見・質問)

今回、発表はなかったため発表に関する報告はない。

他の参加者の発表や講演

ほとんどの発表が非常に素晴らしい発表であると感じたが、その中で特に自分が興味を持った発表３つについて報告する。

1. 過活動膀胱患者と季節に焦点をあてて、データベースを用いてその関係を調べた研究の発表である。National Health Insurance Research Database (NHIRD)というデータベースから病院を受診した患者のデータから過活動膀胱と診断された人数を計算したデータと、台湾の天気局から抽出した各季節の平均気温のデータを用いて解析したところ気温の低下と過活動膀胱患者数は有意に相関することが報告された。
2. 特発性低活動膀胱患者のタンパク質の発現量変化を調べた研究の発表である。高齢者の下部尿路障害患者のうち蓄尿時過活動状態、排尿時低活動状態となる人が2~3割程度存在することが以前から報告されている。この発表ではタンパクの発現変動に注目しており、過活動膀胱患者で増加しているATPの受容体であるP2X3受容体やNOX合成酵素のeNOSが低活動膀胱患者では低下していたことが報告された。
3. 間質性膀胱炎と過敏性膀胱（hypersensitive bladder）についての発表である。間質性膀胱炎はハンナー病変と呼ばれる病変が存在するものとしないものの２種類に分類されるが、現在までその２種類は病名としては区別されなかっ

た。ハンナー病変があるものを間質性膀胱炎、ハンナー病変がないものを過敏性膀胱として区別することが提案された。

自分の今後の学修・研究にとって有益な情報

先述した通り、今回の学会の中で発表されていた研究の中にデータベースを用いた研究があった。温度と膀胱機能については以前から注目されているが、データベースを用いた研究を見たのは初めてであった。この研究から、どのようなテーマが適切かは閃いていないが、病院のビッグデータを用いて研究を行うという新たな着想を得た。私は現在高齢者の過活動膀胱というテーマでLIMSで研究を行っているが、近年では過活動膀胱だけでなく、低活動膀胱が注目されているということを知った。またその有効な治療薬は私の知る限り存在しない。これらの事実は重要であり、過活動膀胱に限らず、低活動膀胱にも視野を広げる必要があると感じた。

同会議に参加しない、プログラム関係者にとって有益と思われる情報

先述したデータベーススタディを行う上で、台湾では病院のデータ整備が進んでおり、研究目的であれば誰でも使用することができるということを情報として挙げたい。私の知る限りにおいてだが日本ではそのようなシステムを聞いたことがない。日本でも病院と大学、政府が連携して一刻も早くデータ利用の整備を行う必要があると強く感じた。

排尿機能学会レポート

M1 尾山翔平

日時　9/9(水)　～　9/11(金)

場所　北海道札幌市京王プラザホテル

会議全体の趣旨・概要

今回の学会は排尿機能障害について基礎、臨床を問わず、最新の研究を基にした討論を行うことを目的とした場であった。

自分の発表に関する報告(事前に記載できる抄録のような内容だけでなく、会議の場で自分の発表に向けられた関心・意見・質問)

今回、発表はなかったため発表に関する報告はない。

他の参加者の発表や講演

招待講演では生理学研究所の富永先生が「TRPチャネルとPiezoチャネルの排尿機能への関与」というテーマで、ピッツバーグ大学のLori A. Birder先生が「Recent Progress on

Receptors and Molecules Expressed in The Urothelium: Potential Target for New Therapy of Lower Urinary Tract Dysfunction」というテーマでそれぞれ講演を行った。発表全体で基礎と臨床は半分ずつ程度、全体の傾向としては過活動膀胱や男性の下部尿路障害についての発表が多かったように思う。非常に意義のある研究紹介がほとんどであったが、特に興味の湧いた2つの発表について紹介する。

1. 高齢社会における排泄ケアというワークショップ内で発表された要介護高齢者の尿失禁ケアというテーマの研究である。高齢者の尿失禁の頻度は在宅要介護高齢者で50%以上、施設入所高齢者で50%などと報告されており、その対処として現在ではおむつが一般的に使用されているが、排尿機能や自立度の維持という点からこの方法は必ずしも望ましいものではない。発表者は超音波補助うながし排尿という方法を用いることでおむつへの依存度を低下させることに成功したと報告していた。この方法は患者の社会機能、自尊心を守るだけでなく、施設のおむつにかかるコストの削減、介護者の負担減少といった点からも非常に意義のある研究と感じた。
2. 携帯式尿流量計の開発というテーマの発表である。高齢者が在宅で簡便に使用できるスクリーニング機器として、排尿の時刻、排尿に要する時間、排尿量など排尿に関する様々なデータを手持ちで測定できる尿流計の開発が行われたという報告であった。

自分の今後の学修・研究にとって有益な情報

高齢者における排尿機能については学会内においても多くの発表者によって取り上げられていたテーマである。その中でも特に印象に残ったのは、認知症などの要介護者の排尿機能障害についてである。認知症患者の多くは排尿障害を併発する。患者の排尿障害は一日数回のおむつの交換を介護者に強いるため、介護者に与える負担も大きい。認知症などの中枢疾患かつ自身でトイレにいくことができない患者の排尿ケアを考えることは、患者自身のQOLを上げる点だけでなく、介護者の負担を減らして社会機能を維持するという点でも重要なことだと認識した。このような点から高齢者における排尿ケアを考えることは社会的な意義があると再認識した。学会内では他の大学の先生方（東京大学コンチネンス医学講座の相澤先生や福井大学医学部の松田先生など）と討論を交わし、基礎研究についてのいくつかアドバイスをいただいた。アドバイスは今後の研究に活かしたい。

同会議に参加しない、プログラム関係者にとって有益と思われる情報

高齢者の排尿ケアはやはり重要であるということを再認識した上で他のプログラム関係者にも伝えたいと思う。高齢者の排尿ケアはおむつなどの金銭的コストだけでなく、患者自身の自立度を高め、社会機能を改善する、あるいは介護者の負担を減らし、社会への貢献度を増加させるといった点からも重要であるということを本学会で私は再度思い知らされた。この事実は排尿に関心を持たないプログラム関係者にも知っておいてほしい情報である。

The Second Asian symposium on Health care Without Borders (HWB) The Asian Symposium on Health Informatics and Nursing Education (SHINE) The Asian Conference on Peace, Humanitarian Aids and Service (PHASE)

From August 6th to August 8th, 2015 at Mitsui Garden Hotel Hiroshima, Japan.

Mbenza Mbambi Naasson (M2)

Attendance Objective

Based on the fact that I am coming from a developing country, which faces several problems related to healthcare system and insecurity due to minor wars in some part of the country. It was a good opportunity to attend these symposiums for which the theme was the importance of Peace, Humanitarian aid, Service, Nursing and Health Informatics along with Healthcare. With the ultimate goal of learning from different experiences in a variety fields that are included in Healthcare System.

The meeting started with the welcome messages from the organizers, especially Mr Takayuki Yamada, Chairman and Mr Michael Sasaoka, Event Program Director, on August 6th, followed by the presentation of Professor Eiko Kawagoe, School of Nursing Kobe City College of Nursing, Japan, on “Challenges for Healthcare Professionals in Japan», during which she presented her research on English Education for Specific purposes, for example, Medical English.

I was very much interested in her presentation as a LIMS student, improving Medical English skill is a very important tool in order to achieve my future career goal, which is to work as leader in the healthcare system, both in national and international environment.

August 7th, Friday, I attended different series of presentation and talk ranging from Oral Health “Prevalence and Risks of habitual snoring and obstructive sleep apnea symptoms in adults dental patients”, Toxicology “Intentional self-harm by Paraquat poisoning”, Drug development and Pharmacology/Toxicology “Detection of tetrodotoxin producing microorganisms in puffer fishes and the risk of tetrodotoxin infection in food”, Sharing Health Data “Open source Health Information: Provides equitable access to practitioners, researchers, and patients”, Communicable/Non-communicable diseases “Chagas disease: Prevalence in Public School students and their families at Canton Molineros, Verapaz, San Vicente, El Salvador”. Later In the same day other presentations on Clinical Information System, E-learning and Education in Healthcare, Public Health/ Community Health, Nutrition and Dietetics, Sexual Health, Environmental Health and Climate Change were given.

More importantly, presentations on Developing Countries: Access to Healthcare, especially “Lessons from Thailand Universal Healthcare Achievements and Challenges” and “Improving Access to Quality Healthcare Services through Health Insurance? Lesson from a comparative case study from South India”. I learnt and exchanged on these two topics, which are quite related to my LIMS Research Project ”Learning from Japanese Healthcare insurance system” and gained new insights for my project.

August 8th, Presentations were on Peace and Conflict Resolution ”Game Engineering for Disarmament, Demobilization and Reintegration”, Disaster Management “ Older People led CCA-DRR initiatives to build safe and resilient Communities in the Philippines”, Food Security “Food security through community owned and managed Institutions- A Reliance Foundation initiative”.

Overall, these symposiums provided me a broad overview of different health related-issues and perspective on how to deal with them. As LIMS student such opportunity broadened my understanding of the healthcare system.

The Japanese Society for Biomaterials: The 37th Annual Meeting

M2 Tomoko Matsumoto

Place：Kyoto TERRSA

Date：9th – 10th of November, 2015

Meeting description

37th meeting of Japanese Society for Biomaterials is an annual event that gathers researchers around Japan and Korea to present their progress on their research on biomaterials. This annual meetings provides opportunities for biomaterials-related academics and industries to exchange the latest information on biomaterial research involving a broad range of topics, from basics to applied science. So many researchers and physicians, businessmen from various field gathered in this 37th annual meeting and gave talks and put up posters of leading study.

Impressive lecture

JK-01 Ryo ISHIHARA (Tokyo University of Science), Yoshitaka UCHINO,
Kazuo HOSOKAWA, Mizuo MAEDA, and Akhihiko KIKUCHI

"Preparation of MicroRNA Detection Power-Free Microchip Utilizing Electron Beam-Induced Graft Polymerization toward Point-of-Care Diagnosis"

As biomarkers for the early detection of Alzheimer's disease or cancers, miRNAs have shown great promise. In their previous study, toward point-of-care (POC) cancer diagnosis, miRNA detection method with laminar flow-assisted dendritic amplification (LFDA) on the power-free PDMS microchip has been developed. In this study, they reported the easy surface modification of poly(dimethylsiloxane) (PDMS) microchip by electron beam-induced graft polymerization (EIGP) and apply the novel portable microchip to micoRNA(miRNA) detection. Using the novel portable microchip, rapid and sensitive miRNA detection is demonstrated.

The features of these techniques indicate that EIGP enables rapid surface modification of PDMS without initiator immobilization or monomers purification. Then in order to improve the sensitivity, they have changed two-dimensional probe DNAs immobilized on a glass slide to three-dimensional higher density probe DNAs immobilized to the polymer on the surface of the microchannels.

They showed results what the limit of detection (LOD) of the microfluidic device was calculated by 3σ criterion from the calibration curve. The LOD of the microchip for has-miR-500a-3p was 0.7 pM. The required sample volume was 0.5 uL and total analysis time was 20 min. This is comparable previous study. Because most of the existing methods take more than a few hours, the rapidity, small sample volumes, and the device portability are ideal advantages for POC cancer diagnosis.

I expect that this technology is put it into practice in medical setting soon. I hope it useful for preventing lots of cancers at early stage. I felt the necessity to improvement of clinical examination system much more for the future.

Report of attending 74th Annual Meeting of Japanese Cancer Association

M2 Tomoko Matsumoto

Place：Nagoya Congress Center

Date：8th – 10th of October, 2015

Meeting description

The annual meeting of Japanese Cancer Association is the largest meeting of cancer research in Japan. This annual meetings provides opportunities for cancer-research-related academics to exchange the latest information on cancer research involving a broad range of topics, from epidemiology and prophylaxis to treatment. So many researchers and doctors, medical staffs from various field gathered in this 74th annual meeting and gave talks and put up posters of leading study.

Impressive lecture

CS4-4 浦野 泰照

"Rapid intraoperative imaging of tiny tumors by newly developed fluorogenic probes for aminopeptidases."

They have succeeded to develop various novel fluorogenic probes for aminopeptidases based on our rational design strategies, which showed marked fluorescence increase upon being hydrolyzed by target enzymes. By applying the probe for γ-glutamyltranspeptidase (GGT), which is well-known to be upregulated in various cancer cells, small tumor foci could be visualized in mouse models of disseminated human peritoneal ovarian cancer in vivo with high tumor to background contrast, within 1 min of topically spraying onto tissue surfaces that are suspected of harboring tumors. The efficacy of fluorogenic probes as intraoperative tumor detecting agents was examined with freshly resected human tumor samples by collaborating with many surgeons. It was clearly demonstrated that GGT probe could visualize remaining tiny tumors on the resection surface of fresh clinical specimen of partial mastectomy. Furthermore, probes for dipeptidyl peptidase-4 were effective for visualizing esophageal cancers, which was evidenced with many clinical fresh specimens. They believe that the ease of spraying fluorogenic probes in open surgery or through catheters will provide alternative image guidance during treatment. And I think this technology can use and apply for diagnosis

a lot of disease at early stage.

Useful information for other LIMS members

CS5-4 佐藤 孝明

“The leading-edge application of mass spectrometry in drug discovery and diagnosis. ”

Driven by the development of high-end mass spectrometry, omics analysis is currently expanding its field beyond conventional quantitative analysis, as demonstrated in biomarker discovery studies, towards in-depth analysis of targeted molecules, such as single-cell imaging and characterization of heterogeneity in post-translational modification. To illustrate this, they presents three main topics in this seminar. : (1) visualization of molecular abundance in biological specimens by mass spectrometry imaging (MSI); (2) high-sensitivity detection of diagnostic markers by Immuno-Beads MS technology; and (3)development of next-generation of mass spectrometry system for contribution in drug discovery and diagnosis field. They ganaim to integrate these novel technologies for tackling diseases (primarily cancer and neurodegenerative disease) in a comprehensive fashion; not only by detecting disease-specific biomarkers but also employing molecular imaging strategies for unraveling the molecular basis of pathology, determining the pharmacokinetics and validating the drug delivery system. I expect that this system is put it into practice in medical setting soon.

The 38th Annual Meeting of the Japan Society for Biomedical Gerontology (The 29th General Meeting of the Japan Gerontological Society)

M2 Kouki SHINODA

Date: 12 June to 14 June, 2015
Place: Pacifico Yokohama, Kanagawa, Japan

Summary of Meeting

This meeting was held as a part of the 29th General Meeting of the Japan Gerontological Society.

The Japan Gerontological Society consists of the Japan Geriatrics Society, the Japanese Society of Gerodontology, the Japan Socio-Gerontological Society, the Japanese Psychogeriatric Society, the Japan Academy of Gerontological Nursing, the Japan Society of Care Management, and the Japan Society for Biomedical Gerontology. To solve the problems of medical and care systems for the aging society, 10 joint symposiums were held.
The Japan Society for Biomedical Gerontology aims to promote basic studies on aging and to contribute to the realization of healthy longevity society in cooperation with clinical and sociomedical researchers. Many researchers on gerontology took part in this meeting, and they presented their latest findings.

Useful information

The Japan Gerontological Society announced the following statement. By the latest scientific data, it was revealed that the body function and the intellectual ability of the elderly people tended to become younger year by year. As for the current elderly people, it is assumed that 5-10 years old becomes younger in comparison with those before 10-20 years. Some of them have the ability to take part in social activities. We need to create society where they can work or participate in volunteer work. It is important to make super aged society vigourous in near future.
However, some researchers presented that people of the 40-50 years old now would not be able to be younger and healthier elderly people. Since hospitals cannot hospitalize all patients when sick elderly people increase, we need to build new medical care systems. Some systems like “Kashiwa model” were implemented as social experiments, but there have not been established yet. LIMS might help create new feasible medical care system.

[P-33] “Aging proteomics of the human aorta media”

Hiroki Tsumoto [1], Machiko Iwamoto [1], Akane Kanehira [2], Yurie Soejima [2], Tomio Arai [1], Akihiko Hamamatsu, Tamao Endo [1], Motoji Sawabe [2], Yuri Miura [1]
[1] Tokyo Metropolitan Institute of Gerontology, [2] Tokyo Medical and Dental University,
[3] Tokyo Medical Examiner's Office

Aging-related medial degeneration occurs physiologically according to aging, and causes the serious symptoms such as aortic dissection or aortic aneurysm. In order to investigate the pathological mechanisms, they performed proteomics-analysis of the aorta media from three groups; young, middle, and elder age. They analyzed the proteins that varied with aging. As a result, it was revealed that actin and actin-depolymerization-related proteins decreased but tropomyosin and myosin increased. This suggested that there would be other proteins which could compensate the functional decline of the smooth muscle contraction when actin decreased. Moreover, it was shown that aorta tissues were exposed more to oxidation stress according to aging since oxidative stress-related proteins were found to be increased.

The 22nd annual Meeting of the Japanese Society for Chronobiology

M2 Kouki SHINODA

Date: 21 to 22 November, 2015
Place: The University of Tokyo, Tokyo, Japan

Summary of Meeting

This meeting had 2 special lectures and 6 symposiums and 124 poster presentations for 2 days. There were presentations on chronobiology from many different fields such as molecular mechanism and mathematical model of circadian rhythm, external environment (*e.g.* light and temperature) and social environment affecting behavior of animals and plants.

Useful information

P091B

Chronopharmacological study of pregabalin for diabetic peripheral neuropathic pain

Takahiro AKAMINE[1], Erika WADA[1], Naoki KUSUNOSE[1], Hana HASHIMOTO[1], Marie TANIGUCHI[1], Naoya MATSUNAGA[1], Satoru KOYANAGI[1], and Shigehiro OHDO[1]

[1]Department of Pharmaceutics, Faculty of Pharmaceutical Sciences, Kyushu University

Aggravation of diabetic peripheral neuropathy causes the pain of limbs. Pregabalin (PGN) is one of the drugs used in the main treatment for the symptoms of peripheral neuropathy. However, in some cases, PGN cause a serious side effect such as fulminant hepatitis, and construction of more effective dosing methods is required.

It is known that expression of transporters and metabolic enzymes shows circadian changes and influences drug efficacy and toxicity. They examined how and what affect a painkilling effect of PGN depending on administration time using a diabetes model mouse. They found that Octn1, a solute carrier transporter, could function as a transporter of PGN and its expression showed circadian changes controlled by the interaction between PPARα and bile acid. It was suggested that the painkilling effect of orally administered drugs was affected by the circadian rhythm of the expression of transporters involved in gastrointestinal absorption. This research will help decrease side effects and effectively relieve the pain.

P122

Association between daytime cold exposure in winter and longer sleep time independent of day length: cross-sectional analysis of the HEIJO-KYO Study

Keigo SAEKI[1], Kenji OHBAYASHI[1], Norio KURUMATANI[1]

[1]Department of Community Health and Epidemiology, Nara Medical University School of

Medicine
The sleep disorder is known to be influenced by a seasonal temperature change. However, since the association between daytime cold exposure and sleep was unclear, they measured indoor temperature, bed temperature and objective sleep parameters using actigraph among elderly people in winter. They found that a lower daytime room temperature was significantly associated with earlier bed time and longer total sleep time. Sleep quality wasn't influenced by the daytime room temperature. However, risk of disease onset increased in both short and long sleep. Temperature management in hospitals and nursing homes designed for each elderly may help preventing disease onset.

S2-2
Whole-brain analysis of neural activity in the sleep/wake cycle with single cell resolution
Hiroko YUKINAGA[1], Dimini Perrin[1,2], Hiroki UEDA[1,3]
[1]Laboratory for Synthetic Biology, RIKEN Quantitative Biology Center (QBiC), [2]Electrical Engineering and Computer Science School, Science and Engineering Faculty, Queensland University of Technology, [3]Department of Systems Pharmacology, The University of Tokyo
They examined neural activity of a whole brain using Arc-dVenus transgenic mice. They express an unstable Venus protein which is controlled by a neural activation marker gene, *Arc*. Brains of mouse were processed to be transparent by CUBIC protocol. Expression of Venus were observed using Light sheet fluorescent microscope. They developed a new imaging method using single-cell resolution, which enabled to compare multiple brains and reveal activated regions under certain condition. They confirmed that the neural activity of brain regions activated in waking condition was suppressed by administration of a sleeping drug. This visualization method will contribute to reveal unclear neural activities in the brain and develop a new drug for cognitive diseases.

The 40th Annual Meeting of Japanese Society of Sleep Research

M2 Kouki SHINODA

Date: 2 to 3 July 2015
Place: Tochigi-ken-Sougou-bunka center, Tochigi, Japan

Summary of Meeting
Japanese Society of Sleep Research aims to promote scientific and medical studies of sleep to

contribute to the promotion of health. In addition to 30 symposiums, 335 oral and poster presentations of a wide variety of studies mainly on sleep were given by doctors, nurses, health care workers and sociologists.

Useful information

A symposium to discuss “social jet lag”, caused by different sleep schedules on weekdays and the weekend was held. Individuals show distinct preferences for various activities over the course of a day. This is called “chronotype”. A simple example is an individual’s preference to sleep at a particular time during a 24-hour period, 'eveningness' (delayed sleep period) and 'morningness' (advanced sleep period). On weekdays, people have to wake up early morning, even if they are an evening chronotype, because of going to work or school. Contrastingly, on weekends, they sleep longer due to their chronotype associated with biorhythm. It was suggested that social jet lag might have negative effects on diseases such as obesity, metabolic disorder, heart disease and depression. Moreover, this can influence social activities, causing reduced productivity, car accidents and/or daydreaming. We might need to establish social systems with consideration for chronotype so that people can live longer and healthier with low stress even when they get older.

Half of healthy elderly people have sleep problem such as nocturnal awakening and early morning awakening. 70% of dementia patient have sleep-disease, mainly insomnia. Especially, patients with Alzheimer’s disease are more prone to sleep disorders than unaffected people. Drug therapy is partially effective for sleep disorders, but might cause oversedation and tumbles. In order to decrease the dose of drug, it would be important to propose a tailor-made sleep environment, such as a precise room lighting and temperature depending on each patient’s condition (including their chronotype), and to control daytime-activity individually to promote falling asleep at night.

The 59th Annual General Assembly and Scientific Meeting of the Japan College of Rheumatology

(2015/04/23~25 / at Nagoya Congress Center in Japan)

M2　Masatoshi Uno

1. Summary of Meeting

. Japan College of Rheumatology is the Society with the aim to improve basic and clinical study of Rheumatoid arthritis(RA) and collagen disease and medical content. Most participants of the meeting were medical researchers or health care workers and most contents of the meeting focused in clinical researches. But some researches treated forefront basic researches of RA, I studied in these researches.

2. Useful information for my research in the conference

(1) Current status of molecular targeted therapy of RA

[EL-4,LS-10,EL-14,EL-12,]

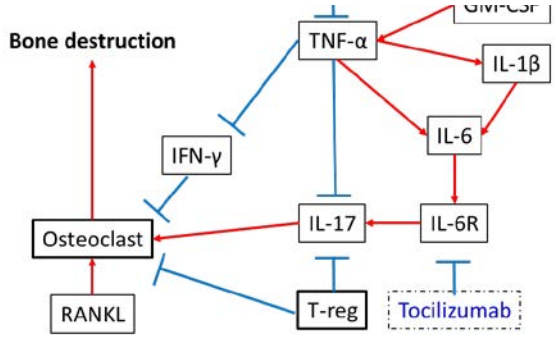
(1-1) Current status of molecular targeted therapy of RA in clinical field[EL-4]

・ In decade, number of cases using Biologics(Antibody medicine) have increased in treatment RA.

・In case using Methotrexate (first-line drug) and Biologics, response rate is 30~50%.

・The target of most Biologics(Infliximab etc.) is TNF-α, but some of Biologics targeting IL-6R(Tocilizumab) and CD80/86(Abatacept) exist. However, the difference of target molecule didn't effect response rate.

Figure 1 Cytokine network in osteoclast activation and Biologics effect point



(1-2) Development of new drug[EL-14]

・Biologics success enhance developing new drug targeting another molecule.

・Anti IL-1β antibody and anti IL-17 antibody had developed as new biologics, but these antibody couldn't treat RA. It's so surprisingly.

・Another developing drugs target IL-6, IL-6&IL-6R complex, RANKL, TNF-α&IL-17.

・Tofacitinib had emerged as a new molecular targeted drug of expected. Tofacitinib was low molecular drug and its function was inhibition of Jak1,3. Jaks were signaling kinase via Jak-STAT pathway and inhibition Jaks caused stopping many cytokine signal. So, pharmaceutical companies were developing Jaks inhibiter.

(2)Genome analysis of RA [LS-10,Sym-9,EL-13]

(2-1) Summary of previous GWAS result[Sym9-3]

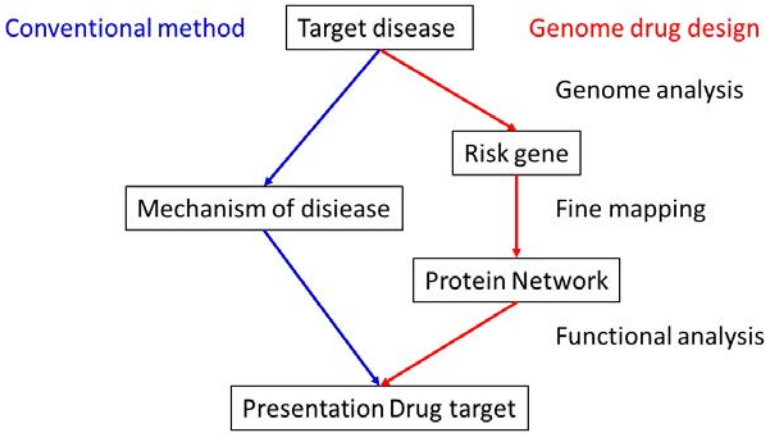
・Previous GWAS research discovered over 100 disease susceptibility genes(DSGs).
・P-value of HLA-DRB1 gene (one of MHC genes) were significantly larger than another DSGs. This tendency were shared by another autoimmune diseases.
・Most DSGs were shared by another autoimmune diseases, but PADI4 was specific gene in RA.
・Most DSGs had existed on immune cell genes and these SNP coded missense mutation or cis-QTL.

(2-2)Application of genome analysis for drug design[Sym9-4]

・Dr. Okada proposed “Genome drug design”, it was presenting system from result of genome analysis.

Up to now, researcher had designed new drug based on molecular mechanisms of diseases, but this method had needed to solve mechanisms of diseases. Nowadays, the speed of solving has been so slow that pharmaceutical companies were losing ability to design new drugs. However, pharmaceutical companies had repertories of compound which had ability to inhibit some kinases and unknown drug effects and technologies of drug design. So, drug discovery based on result of genome analysis might be able to propose drug target without solving mechanisms of diseases.

Figure 2 Conceptual diagram of Genome drug design



・I thought that my research may be able to contribute this method because Genome drug design method needs not only genome analysis but also functional analysis of protein network.

3. Useful information for other LIMS students in the conference

Contents of this meeting were so specialized that I couldn’t provide useful information for other LIMS students

The 25th hot spring harbor international symposium
Cutting edge of technical innovations in structural and system biology 2015
(2015/11/13~14 / at Kyushu University hospital campus in Japan)

M2　Masatoshi Uno

1. Summary of Meeting

. This symposium was organized by members of the “Novel measurement techniques for visualizing 'live' protein molecule”, which is one of Grants-in-Aid for Scientific Research. This grant’s purpose is to research protein dynamics in molecule, cell and biological system levels. In this symposium, speakers presented various topics regarding system biology, one molecular measurement, conventional structure analysis and electron microscopy.

2. Useful information for my research in the conference

*Session 1-1; Transomics analysis of acute insulin action: network reconstruction from multi-omics data　　Presented by Hiroyuki Kubota (Kyushu University)

Dr. Kubota presented his research of multi-omics integrated analysis about insulin. Insulin activates the Akt signal, which in turn affects enzyme regulation and metabolic systems (Fig.1). They collected data from KEGG (Metabolic database), BRENDA (Enzyme regulation database) and phosphorylation measurement. He discussed how multi-omics analysis needed various data measured in the same condition, useful databases, and good selection of parameters. I was impressed by their policy, “Retracing and reconstruction from output (metabolome analysis) to input (insulin signal)”

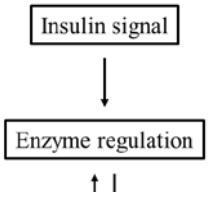


Fig.3　Relationship between systems

3. Useful information for other LIMS students in the conference

*Session 2-2; Novel micro-device for highly sensitive analysis of membrane transporters
Presented by Rikiya Watanabe (University of Tokyo)

Dr. Watanabe introduced a new technique for researching characters of membrane proteins called Arrayed Lipid Bilayer Chambers (ALBiC). It is a micro-device to make micro systems constructed by buffer, lipid bilayer and one molecule membrane protein in the lipid bilayer (Fig.2). This system enables us to measure various characters of membrane proteins, for example, measuring transport rate of transporter for drugs and membrane voltage without patch clamp. In addition, he could construct many of these micro systems at the same time on a single chip.　His aim in the near future is to apply this technique to high throughput research for transport ratio of drug by transporter.

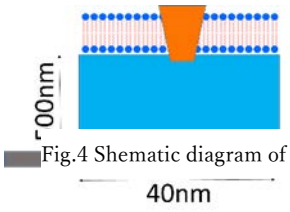


Fig.4 Shematic diagram of ALBiC

The 44th Annual Meeting of the Japanese Society for Immunology (2015/11/18~20 / at Sapporo Convention Center in Japan)

M2　Masatoshi Uno

1. Summary of Meeting

. This Meeting was an annual event of the Japanese Society for Immunology, it was an academic conference of general immunological research. In this meeting, most of the topics concentrated on immune cells functions, immunological diseases, and related molecules.

2. Useful presentation for my LIMS research in the conference

(1) *1-I-W15-7-P; Computer model analysis of the difference between F759 and wild type mice in rheumatoid-like arthritis emergence　　Presented by Satoshi Yamada

Prof. Yamada used F759 mice that develop a rheumatoid arthritis like disease with age. F759 mice have a point mutation at the SOCS3 binding tyrosine residue (Y759F) in the gp130 gene. gp130 is an essential activator of the IL-6_Jak-STAT pathway which plays a critical role in the pathogenesis of rheumatoid arthritis, and the side chain phenyl –OH of Y759 is a reaction point of a gp130 deactivator, SOCS3. As a result, F759 activates inflammatory signal continuously, and this causes arthritis.

He simulated IL-6_Jak-STAT pathway and IL-17_NF-kB pathway in Wild type (WT) and F759 system (Fig.1). Simulation results showed clear deference between WT and F759. An end to the inflammatory signal was observed in WT, but in F759 a weak but continuous exacerbating inflammatory signal was observed (Fig.2). This result corresponded to the F759 character.

However, there was a comment from a clinical researcher that the pain caused by rheumatoid arthritis was periodic therefore he would have assumed the same periodicity in the inflammatory signals. His comment made me wonder if there could be negative feedbacks other than SOCS3 in this inflammatory signal.

(2)*2-B-W17-2-O/P; TIARP regulates CXCL2/CXCR2 mediated neutrophil migration via the inhibition of IL-6　　Presented by Asuka Inoue

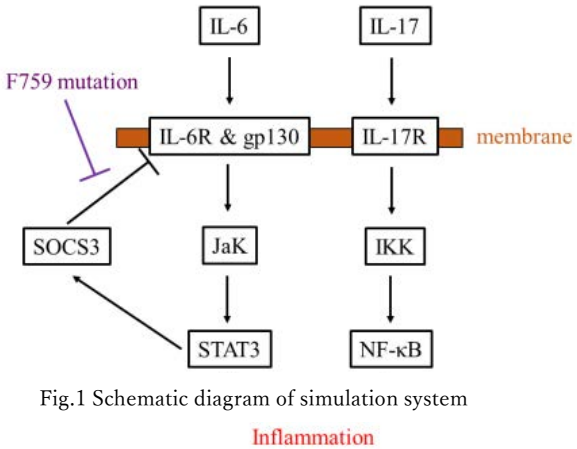


Fig.1 Schematic diagram of simulation system

Dr. Inoue looked into TIARP, a negative regulator of inflammatory signals. Her presentation showed a new

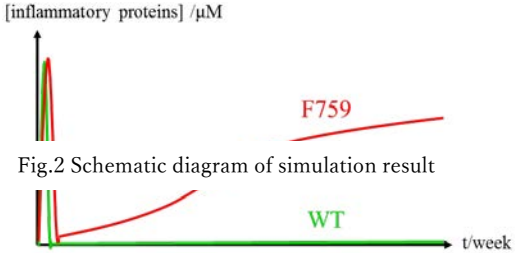


Fig.2 Schematic diagram of simulation result

function of TIARP, namely the negative regulation of CXCL2-CXCR2 (=IL-8/IL-8R) signal which is one of the inflammatory signals in neutrophil.

*Basic information of TNF-α-Induced Adipose-Related Protein (TIARP)

① TIARP is membrane protein of 6-pass transmembrane type.

② TIARP is induced by IL-6 or TNF-α in Mouse macrophage, neutrophil, synovium fibroblast cell. And STAT3 and NF-κB were inhibited in TIARP expressed cells (Fig.3)

③ Human orthologue of TIARP is Six-Transmembrane Epithelial Antigen of Prostate 4 (STEAP4).

④ TIARP and STEAP4 were reported in other areas of research such as in metabolic syndromes and diabetes, and Dr. Inoue's group found a relationship between arthritis and these proteins.

⑤ Most information of TIARP was unclear, including the mechanisms involved, interactive protein, functional domain and protein structure.

My impressions after hearing this presentation were that TIARP was another feedback of IL-6 signal and it was necessary to analyze TIARP and related proteins before further research in IL-6 signal.

3. Useful information for other LIMS students in the conference

In this conference, I could not find useful information for other LIMS students, because this conference covered highly specialized immunological fields and only treated a few general topics.

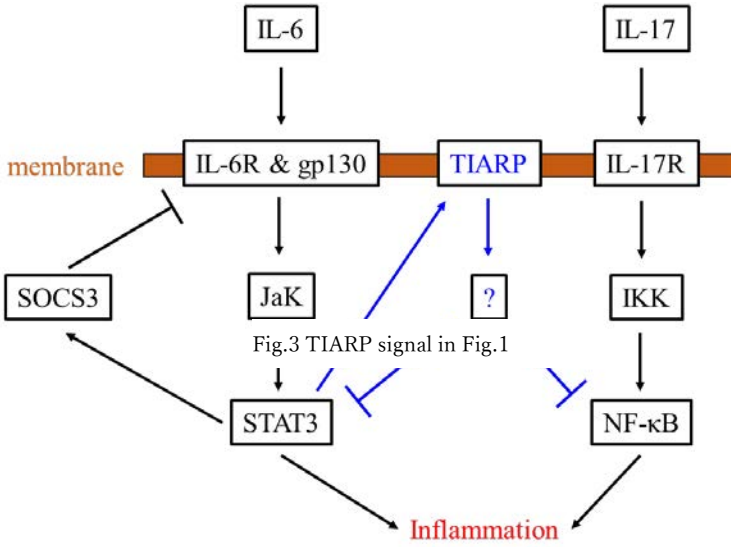


Fig.3 TIARP signal in Fig.1

Report attending 34th SPSJ Annual Meeting

M2 Kazumasa Suenaga

Place: Sapporo Convention Center
Date: 27th, 28th and 29th of May, 2015.

Meeting description:

SPSJ Annual Meeting is conference about polymer science, such as polymer synthesis, physical properties and so on. Moreover, many researchers gathered from around Japan, they presented their latest findings of the research and communicate each other.

My presentation:

1J28 「凝集誘起型発光特性を有する機能性ゲルの刺激応答性光学特性制御」
"Stimuli-Responsive Regulation of Optical Properties of AIE-active Gels"
Kazumasa SUENAGA, Ryousuke YOSHII, Kazuo TANAKA and Yoshiki CHUJO

My research was AIE-active materials. AIE, Aggregation-Induced Emission is optical property, which was invented in 2009. AIE-active materials show the strong emission only in the aggregation state, such as crystalline state, amorphous state and so on. In this work, aimed to realize the fine-tuning of the control of aggregation states and emission properties for using hydrogels. We synthesized AIE-active molecules and included them into hydrogels which was composed poly-□-glutamic acid. This hydrogel showed the strong green emission in dried state, because inner AIE-active molecular of hydrogel was strongly aggregated. However, when water was added into there, hydrogel was swollen and showed week emission. That is, we could control emission intensity and aggregation states of AIE-active molecular by using dried and swollen states of hydrogels. Moreover, we found that the hydrogel's emission color was changed green to blue, when organic solvents was added into the hydrogels in swollen state. This color change was indicated that the hydrogels have stimuli-responsive properties by changing around environment. So, we tried to sense many kind of chemical substances and change the color. Finally, we can discriminate the magnesium ion and redox state of glutathione.

Useful information for other LIMS members:

2F26 「光照射により細胞接着を制御する機能性フルオロポリマー薄膜表面の構築」
"Intelligent fluoropolymer coated surface for cell adhesion control via light irradiation"
Masamichi NAKAYAMA, Tomonori KANNO, Akihiko KIKUCHI and Teruo OKANO

Surface wettability of biomaterials is one of key factors to control the surface interaction with

various proteins and cells. Especially, it is important for researchers to control adhesion and exfoliation of surface when they cultivate cells. In this study, light-responsive fluoropolymer containing sporobenzopyran moieties was prepared to control between hydrophobicity and hydrophilicity via UV or visible irradiation. In other word, cells were cultivated on hydrophilicity surface in advance. After that, they were irradiated by visible light (530 nm) and exfoliated from surface. This result indicates that we could get large area cell sheet. Large area cell sheet is important in order to examine metabolism, pharmacological activity and so on, however cell sheet is too difficult to exfoliate. So, this research have worth for researchers who use cells.

HCII2015 学会参加報告書

M2 遠野宏季

学会の概要

HCII2015(Human-Computer Interaction International 2015)は 2015 年８月 2 日から７日にかけてアメリカのロサンゼルスにて開かれた。この学会は人間とコンピューターの相互作用に関する理論・応用双方の最新の知見について議論を交わし情報を交換する目的で開かれた。

自分の発表に関して

今回私は「Development of “virtual trip” platform」というタイトルでポスター発表を行った。

この研究は、世界中のカメラソース（主にスマートフォン）と隙間時間を活用し、リアルタイムに世界中のあらゆる場所の状況を確認するネットワークを構築するものである。このシステムにより、例えば病床にいて外出ができない患者、寝たきりで自由に旅行が出来ない高齢者が自分の行きたい場所をリアルタイムに確認することができる。また、興味があるがなかなか訪れることの困難な地方観光地などを手軽に確認する手段となり、従来までは足が遠のいていた観光客に地方の魅力を伝え、 地域興しにも利用可能である。情報の発信側は、自分の隙間時間とスマホ、そして自分の住み慣れた地域の観光資源を有効活用して報酬を得ることが可能である。そのため比較的時間に余裕のあるアクティブシニアが外に出かけ地域を歩き人とコミュニケーションを取るきっかけ作りになることが期待される。

本発表に対して、他の参加者からは比較的好意的な意見を頂いた。ただし今後の検討課題として、どのようにこのシステムを広めるのか、果たして見る側は金を払うのかといったシステムのマネタイズ／仕組みづくりについて深く考えていく必要があるように感じた。

印象に残った発表

Toyota Technological Institute
Masashi Yamashita
Decoding of Upper Limb Movement Using EEG and Sparse Coding
EEG を用いて上腕の動きをコーディングするという研究内容。統計的な処理により上腕の動きを EEG によって読み取ることができるようになるという内容。脳波を読み取ることで上腕の動きをフォローすることができれば、将来的には上腕が無い方の義肢を、脳波によってコントロールする技術につながるため、これからの高齢社会からの需要も非常に大きいと感じた。
Fraunhofer Institute of Optronics, System Technologies and Image Exploitation
Tobias Kahlert, Florian van de Camp, and Rainer Stiefelhagen
Learning to Juggle in an Interactive Virtual Reality Environment
本発表では、ある運動ができていない被験者が仮想現実を用いて運動学習を行うことができるのかについて考察が行われていた。具体的には、ジャグリングができない被験者に対し、ヘッドマウントディスプレイ Ocurus Rift とモーションセンサー Kinect、自家製グローブを用いた仮想現実内でのジャグリング練習による能力向上について評価している。結果としては、仮想現実内部での１０分間の練習によりおよそ３割の被験者がジャグリングを習得した結果となった。この研究に関して、仮想現実を用いない通常状態でのジャグリング練習後の成果との比較が行われていないなど気になる点はあった。しかしこの成果は、現状では多大なコストがかかる手術の実地研修を補い技術習得を促すためのシュミレーターなどへの応用が期待できると感じた。

他の LIMS 生にとっても有益な情報

Chor-Kheng Lim さんが「Memory of Things (MoT)-Interactive Design for the elderly's Reminiscence」というタイトルで発表した内容が、同期の西谷や末永の研究に有益と感じた。この研究は外部環境に応答する物質と人間との相互作用で記憶をその物質に結びつける MoT (Memory of Things)という概念を提唱していた。西谷や末永が研究を行っている外場応答性ポリマー・自己集合分子の活用事例の一つとして、単なる生体材料とした活用法以外に外場環境を記録しそれを高齢者の記憶と結びつける素材として活用するというのも非常に興味深いと考えた。

The 7th East Asia Symposium on Functional Dyes and Advanced Materials

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering

M2 Nobuhiko Nishitani

Place: Osaka Prefecture University, Japan
Date: 2nd–4th September, 2015

Description of the conference

"The 7th East Asia Symposium on Functional Dyes and Advanced Materials (EAS7)" is a biennial international symposium, aiming at development of new materials and technologies in the East Asia region. The symposium covers all areas related to functional dyes and advanced organic materials, including chemistry, physics, biology, materials science, nanoscience, device engineering, and chemical business with sessions on the following topics: (1) functional dyes and pigments (NIR dyes, ink-jet ink), (2) display materials (LCD, OLED, electronic papers), (3) advanced materials in energy storage and conversion device (solar cell, battery, fuel cell), (4) sensors (biosensors for imaging, fluorescent probes, colorimetric sensors for metal ions), (5) advanced organic materials (LC, polymer, 2D, FET, chromic materials), (6) green chemistry materials (advances in catalyst, biomass, artificial photosynthesis), (7) forefront of functional dyes and advanced materials business in East Asia. I participated the symposium to learn about the latest research in leading companies in the East Asia, and to search the application of supramolecular chemistry including my LIMS research to the society.

Report of my presentation

I made the poster presentation titled "STM Observation of Surface-Confined Self-Assembly Stabilized via Hydrogen Bond of Urea and Amide Groups: Nucleation–Elongation Mechanism at a Liquid/Solid Interface." Professor Ayyappanpillai Ajayaghosh, from National Institute for Interdisciplinary Science and Technology, asked me possibility of applying our techniques for nano-devices including organic solar cells. He also asked how disk-like molecules assemble on a surface. I answered that disk-like molecules may take two types of assemblies; edge-on or face-on orientation, and that would control a direction of conduction, therefore control of the orientation on surface is important for design of organic solar cells. I was surprised that many participants gave me ideas for application of my research.

Useful information for future research

Professor Weihong Zhu, from East China University of Science and Technology, commented that investigating where aggregation occurs on a surface or in a liquid phase is very interesting. He advised me to focus on not only aggregation on a surface but also that in a liquid phase, and try to integrate analysis methods in a liquid into our techniques. In previous research, I focused on only the interface, so the suggestion was very useful for me and will expand my research field.

Report of other presentation/Useful information for the members of the LIMS Program

[PS-28] "Optical Detection of Pathogenic Bacteria Using Nanocomposite as a Biomaker"
Takamasa Kinoshita, Maho Fukuda, Hiroshi Shiigi, Tsutomu Nagaoka (Osaka Prefecture University)

Pathogenic bacteria cause infections and food poisoning, and methods for the rapid detection and their identifications are required. For the rapid detection, usual methods including transfection of fluorescent proteins are not appropriate. In the work, they developed nanocomposite material consisting of polyaniline and Au nano-particles (NPs) as the optical biomarker for bacterial detection. In polyaniline matrix, Au NPs with a mean diameter of 5 nm were dispersed and constructed 100 nm composites. The composite dispersion was respectively added to suspension including *E coli* O157, O26, and O111 in which O157 was immobilized using glutaraldehyde as a cross-linker. As a result of observation using dark-field microscopy, significant light scattering was observed at the surface of O157 due to selective binding of the composite by antigen-antibody interaction, while weak light scattering was observed at the surface of O26, O111, and non-labeled O157. This technique is expected as a biosensing method provides rapid detection and identification of pathogenic bacteria.

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering

M2 Nobuhiko Nishitani

Title: The 26th Symposium on Physical Organic Chemistry
Place: Ehime University, Japan
Date: 24th–26th September, 2015

Description of the Conference

"The 26th Symposium on Physical Organic Chemistry" is an annual symposium, focusing on structural organic chemistry, reaction organic chemistry, host-guest chemistry, supramolecular chemistry, and so on. I participated it to present about my research in LIMS and to discuss with researchers from organic chemistry and supramolecular chemistry. I also aimed to learn about other research methods using scanning tunneling microscopy for widening my research techniques.

Report of my presentation

I made the oral presentation titled "STM Observation of Cooperative Self-Assembly Stabilized via Hydrogen Bond of Urea and Amide Groups: Quantitative Analysis of Concentration Dependence of Surface Coverage." Dr. Ie from Osaka University asked that our method can predict whether or not a compound form molecular orderings. I answered that it is possible because our method can roughly estimate the Gibbs free energy during aggregation processes and positive value means that the aggregation process would not proceed. I think that by comparing experimental data and computational data, we will be able to simulate the aggregation processes in the future. Another participant asked about the effect of solvent. I answered that the ordering behavior may differ by solvents and orderings tend to be formed in solvents having lower polarity. The problem is very interesting but difficult, because we have to consider many factors. At a liquid/solid interfaces, there are a substrate, solvent molecules, and adsorbates. Therefore we have to consider not only substrate‐adsorbate interactions but also solvent–solvent, solvent–adsorbate, and solvent–substrate interactions. Moreover, solubility of adsorbates in each solvent can be considered to contribute to self-assembling processes. Now we usually use octanoic acid (mainly) and phenyl octane as a solvent, but I would like to make an deep investigation into effects of solvents on the processes

Report of other presentation/Useful information for future research

[2A03] "Reversing the Handedness of Two-Dimensional Self-Assembly at the Solution-Solid Interface: Competing Two Chirality Induction Pathways"

Kazukuni Tahara[1], Yuan Fang[2], Elke Ghiijsens[2], Oleksandr Ivasenko[2], Hai Cao[2], Aya Noguchi[1], Kunal S. Mail[2], Steven De Feyter[2], and Yoshito Tobe[1] ([1]Osaka University, [2]KU Leuven)

The group works on self-asssembly on 2-D surface and previously reported that perfect chirality induction to an achiral honeycomb structure of a dehydrobenzo[12]annulene derivative at the liquid/solid interface by the addition of a small amount of a chiral DBA molecule. They conducted the detailed investigation on the effect of solute concentration and temperature on the chirality induction. As a result, they found that two discrete chirality induction pathways operated depending on the conditions leading to unprecedented chirality reversal.

From the presentation, I learned about techniques for temperature-controlled STM

experiments and analysis methods of temporal STM observation. Recently thermodynamics and kinetics at an interface attracts a great deal of attention. In the future research, I also plan to perform thermodynamic and kinetic analysis for self-assembly at the liquid/solid interface. From our method in previous research, we can only obtain equilibrium constants K and changes in the Gibbs free energy ΔG during the self-assembling processes. However for more detailed understanding of these processes, we need to discuss the values of ΔH and ΔS (obtained from the equation: $\Delta G = \Delta H - T\Delta S$), and these values can be obtained only from temperature controlled analysis. We already had the temperature-controllable stage in our STM system, but we were not skillful at the technique. From their presentation, I could get the information of the STM system (types or sizes of each component) that they constructed and the experimental parameters (liquid volumes, temperature, rate of heating, and so on) and I would refer to them for our system.

Department of Synthetic Chemistry and Biological Chemistry
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From the presentation, I learned about techniques for temperature-controlled STM experiments and analysis methods of temporal STM observation. Recently thermodynamics and kinetics at an interface attracts a great deal of attention. In the future research, I also plan to perform thermodynamic and kinetic analysis for self-assembly at the liquid/solid interface. From our method in previous research, we can only obtain equilibrium constants K and changes in the Gibbs free energy ΔG during the self-assembling processes. However for more detailed understanding of these processes, we need to discuss the values of ΔH and ΔS (obtained from the equation: $\Delta G = \Delta H - T\Delta S$), and these values can be obtained only from temperature controlled analysis. We already had the temperature-controllable stage in our STM system, but we were not skillful at the technique. From their presentation, I could get the information of the STM system (types or sizes of each component) that they constructed and the experimental parameters (liquid volumes, temperature, rate of heating, and so on) and I would refer to them for our system.

The 9th International Congress on Vascular Dementia 2015

D1 Jun MIYANOHARA

Overview

Vascular dementia is one of the most popular type of dementia and more common to Japanese people. Today people tend to live longer, and this means that there are more people those who are aged, and more importantly that there are a lot of people who have been contracting diseases. Especially, vascular dementia including large and small vessel brain diseases is one of the leading causes of the disability among the old and information on this disease is highly demanded in the aged society. I aimed for collecting the information from both of experimental and clinical point of view.

Presentation and Lecture

On the whole, the topics in the conference concentrated mainly on clinical study, and little research focused on basic study using rodents or other animal models. Nevertheless, a variety of research fields such as imaging, biomarker, and data mining, were discussed there and I recognized that plenty of solutions exist to overcome vascular dementia.

Feedback for my research

Thanks to the conference, I could obtain some tips to study on vascular dementia. In the viewpoint of fundamental researches, we generally use animal models such as rats and mice, which are, for the most part, different from the human case. For example, our experimental mice are induced chronic cerebral hypoperfusion by microcoils and observed rapid decrease in cerebral blood flow. In the human case, however, the flow is decreased slowly and gradually by age. Moreover, the feature of the brain structure such as the ratio of white matter to the brain is different among the species. In summary, I have learned I have to be conscious of that when tackling fundamental experiments.

Other comments

It was my first time to participate in an international congress and I was overwhelmed by the scale. On reflection, I hesitated to ask questions in lectures because discussing speed between natives was very fast. I also regret not having talked to many foreign researchers because I could not find the chance the whole time. I thought it is important to find the timing, for example when the session ends and the speaker gets out of the room. Also, I recognized oral speakers were likely to be talked to by audience and it is a good opportunity for researchers to widen the social network. In the congress, I got motivated to be internationally minded and discuss details of researches with people all over the world.

5.

課外活動

Activities outside a Curriculum

Field trip to Toyama City in 2015

In October 31, 2015, Professor Fukuyama, Professor Ishii, Dr. Tomizuka, I and 3 students of the LIMS Program made a short trip to Toyama city. This city is famous worldwide for its unique model as a compact city, in resolving the challenges of demographic change.

Toyama serves as a good example on how to cope the issues related to an aging society and how to revitalize an aging city to become a vibrant city. By fully recognizing the problems which the City is confronting such as dwindling population, declining public transport use as well as the empty situation of the city center, suitable countermeasures were proposed. Three main aspects were targeted: 1) revitalizing public transportation; 2) relocation of residents and businesses in areas around public transport lines; and 3) concentrating city amenities in the city center. For transportation, the light rail transit (LRT) network and City Tram Loop line were created. This Toyama LRT line is regarded as the nation's first fully converted LRT, in which the private sector runs the business, whereas the public sector constructs the track itself. The City Loop line helps people in remote areas to move around more easily and increase ridership in the downtown area. Reviving the city center is created by concentrating businesses to the center area, building the Grand Plaza, a huge public square with many regular events, applying a special transportation fare for citizens over 65 years old, sharing public bicycles use at indicated points,…

The impact of the compact city policy were shown in increasing of the number of people moving into the city center as well as residence along public transport lines, and the number of public transportation users.

In the field trip, we were introduced all these things and had a practical experience of using Toyama LRT network as well as visited local spots. We also had a chance to discuss on reality of this compact city model with Mayor Masashi Mori and Joseph Runzo-Inada, the city's policy adviser.

Report on visiting Toyama City

M1　Akihiro Matsumoto

Place: Toyama City
Date: 2015/10/31

Presentation about Compact city strategy based on public transport by Toyama city officer

Toyama City is facing mainly five problems; aging society, excessive dependence on cars, loss of attraction of the city center, increasing city management cost, and increasing CO2 emission. Since the land prices of the suburb is lower than that of the center, Toyama residents, who strongly wish to have their own house, tend to live in the outskirts of the city. Such people use their car (the number of retained motor vehicles per household in Toyama prefecture is the second highest in Japan.) rather than public transports. As a result, the number of bus users have decreased by 50% in the past 20 years. Other problems mentioned above are also due to the sprawl phenomenon.

In order to revitalize the city, Light Rail Transit (LRT) was introduced for the first time in Japan. LRT system was developed 7.6km from JR Toyama station to Toyama Bay, which is the northern part of the city. It is also scheduled to connect the southern part of the city with the center by LRT. LRT emits less CO2 and runs more frequently than buses. Next, the city promoted people to live near the LRT network. Subsidies of up to a million yen are provided for the residents if they choose to live near the designated LRT network area.

City tour

Grand-Plaza

A multi-purpose plaza located in the center of the city. Used for various events almost every day.

Jiba-monya

A vegetable shop located in the main shopping street. Vegetables made in the city are available. More than 50% of customers are people aged 60 or above.

MAG.net

A free space mainly for university students located in the main shopping street. On average, 37 students use this facility for studying, holding events, presenting their work and so on. Students can interact with elderly people, and children.

Discussion with Toyama City Mayor

70 minutes discussion with Toyama City Mayor, Mr. Mori, was a precious experience.

The discussion was mainly organized in English.

Visiting Toyama City, Saturday 31 October 2015 Report

M1 LiXueBing

On Saturday 31 October 2015, together with professor Fukuyama and Ishii, I made a visit to Toyama city to inspect of the achievements that are made in construction of compact city.

We, arrived at Toyama city at 1.pm and listened to a report around the general situation of Toyama city and the how Toyama government and citizens are endeavoring in developing a compact city.

The background of compact city is the cavitation of central city parts since the 1990s. Several problems are pointed out to be related to the cavitation phenomenon of cities. For example, because cars are widely used in a cavitation society, public transportation will shrink, making people with cars become “the week in traffic”. On the other hand, the development of suburbs leads to environmental problems like pollution and heat island phenomenon. So, to concentrate the residents in the central part of the city or along the traffic lines near around the central parts would be a solution to this problem. Japan has been making efforts to the construction of compact cities since 1998 and several cities have made their policies to convert into a compact city like Kobe, Sendai, Aomori and Toyama and Toyama city is considered to be doing a great job.

Many policies have been made by the Toyama city government to build a compact city. First, a Dango pattern is essential. Balls are the central living areas while traffic lines are the strands. The merits are activation of local traffic and central parts of the city. Secondly, light rails are maintained and kept in good condition to make more people to use it. As a result, people who use light rails increased by 260% on working days and 360% on weekends. Moreover, a PPP mode, which involves both government and corporations supplies a guarantee of maintenance and enthusiasm of profiting. Thirdly, the built of the ground plaza makes it possible for Toyama city to hold big events for citizens. According to the data of 2009, over 100 events were held in the ground plaza. The fourth point is the preferential treatment of traffic fees for the elder people especially for those who live on the major traffic lines of Toyama city. This makes the elderly more accessible to central parts like hospital and shopping malls. Also, to build a beautiful city, buying flowers is encouraged in a form that with flower bought in designated places, taking the bus or light rail will be free. Up to now many people have participated in this activity which makes this city more beautiful. Finally, the attraction of private capital is also emphasized.

During the last 5 years, departments, condominiums, and public stadiums were built to attract more citizens to live in the central parts and has successfully prohibit the land price from falling.

As a student in LIMS program, I believe that compact city is a mode which makes the old live better. As the traffic gets more convenient, old people can get more accessible to public areas which makes them feel less lonely and more willing to participate in this society. Moreover, free tickets for the old to travel to the center parts of the city on the other hand stimulates the economy. Finally, a compact city is obvious more easy for old people to get medical care, which means less hospitals or nursing homes will be needed when old people gather in a compact city and this also make them easier to get medical attentions when meet medical emergencies, which is very common in old people.

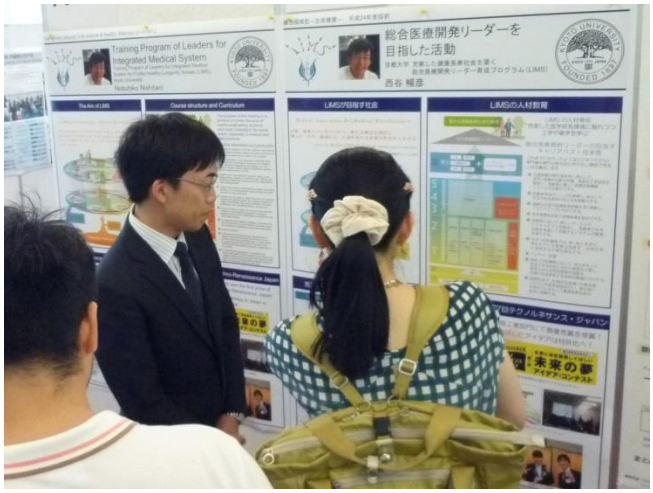
In conclusion, Toyama city is doing a good job constructing a compact city. As reward, Toyama city was elected as one of the best 5 cities in the construction of compact cities by ODEC, 2012 and been selected by Rockefeller foundation as a model city as a compact city. I have learnt a lot during this visit. Although there are still prompters remained in the construction of a compact city like governments' financial problems, I stills think it to be a good pattern of city construction. Many perspectives and knowledge I learnt in this visit is novel and interesting. I would be glad to pay a visit like this time again if possible.

Activity report for Kyoto University Leading Graduate School Programs Joint Workshop 2015

Yasuharu HIRAI (Program-Specific Assistant Professor, LIMS)

Kyoto University offers the five Leading Graduate School Programs across the departments. For facilitating the communication between the teachers and students in different programs, Joint Workshop was held at the International Conference Hall in the Clock Tower Centennial Hall on June 18. This workshop was intended to provide the opportunity for students to make presentations of their research and activities in the program, and also to introduce our activity for people from on and off the campus including undergraduate students who may consider joining the program in the future.

From all programs 155 people participated in the workshop, of which 19 teachers and 16 students were from LIMS. Representative three students made poster presentations for introduction of their research and one student for introduction of student's activity in LIMS. LIMS staffs also exhibited the posters introducing our program's curriculum and activities. LIMS Program-Specific Professor Ishii made a speech for introducing our program's philosophy and overview. Through the communication in the meeting, we knew the detail of other programs and their activities. It gave us a chance to rethink the advantages and disadvantages not only of LIMS but of the Leading Programs itself. Students were actively involved in the meeting and discussed as a poster presentator or as an audience (see photos below). Students who made poster presentations were also active for preparation. Their active participation was very positive things. Many undergraduate students, including foreign students, came our LIMS-introduction poster and shown an interest in LIMS program. They told their mind for a study in graduate school and gave us a lot of questions about the program. We should improve our program to be able to provide enough support for such a motivated student. This workshop was the good opportunity for both staffs and students to know and think not only about other Leading Programs but also about our LIMS program.



Mr. Nishitani (L2) introducing LIMS activity.

Mr. Matsubara (L2, right) introducing his research and discussing with Mr. Miyanohara (L3, left).

Activity Report for Panel Preparation toward Exhibition on the 29th General Assembly of The Japan Medical Congress.

Yu KIMURA (Program-Specific Associate Professor, LIMS)

To prepare for the exhibition at the Congress, LIMS students and staffs held weekly meetings from February 19th (six times as total).

On the materials and concepts offered by collaborating organizations and companies, we developed our future images of fruitful healthy-longevity society and discussed what kinds of advanced technologies are needed to realize seamless and proactive medical care in our houses, towns, and hospitals. Then we decided to divide the contents of our presentation panels into three categories, “walking”, “sitting”, and “sleeping”, the activities that we considered important to increase healthy life expectancy.

Figure. Discussion about contents of the exhibition panels

Through the discussion and brainstorming, we realized again the importance of motivating each individual toward health-promoting activities, as well as analyzing and estimating one's health conditions through various sensors in all scenes of daily life.

Main topics of the panels
“Walking” category:
Virtual and augmented reality motivate us to walk.
“Sitting”' category:
Toilet seats monitor our health conditions everyday.
“Sleeping” category:
Advanced sensing technologies improve quality of our sleep.

Figure. Brainstorming session about prepared panels with students and staffs

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(LIMS)

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

世界に先駆ける超高齢社会の日本モデル
ー求められる総合医療と新たな医療産業ー

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

プログラムの特色

医工薬学の基盤に基づく人材育成

人体を知る　現場を知る　社会規範を知る

人体解剖学や生理学など医学部卒業生に匹敵する知識習得
附属病院・関連医療機関，高齢者施設等での研修を通じた現場ニーズの理解
医療政策，医療経済，医療倫理，知的財産・国際標準化等社会における医療ルールの学修

社会需要に基づいた産学公連携による人材育成

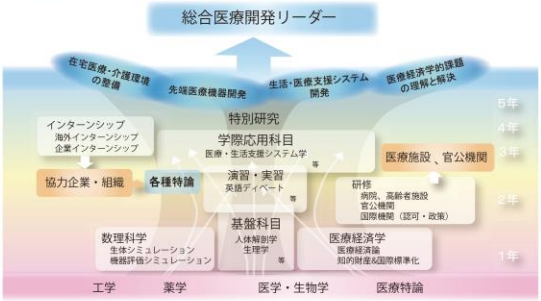
協力企業・組織の講師による特別講義やインターンシップ，社会実証研究への参画により，社会需要に発した技術の創出・統合を柔軟に行えるセンスを養成
履修生あたり4名の指導教授・メンターによるきめ細かなサポートのもと，自ら評価基準，規制のあり方や政策決定の根拠提示が行える俯瞰力やコミュニケーション能力を習得

LIMSプログラムによる総合医療開発リーダーの育成

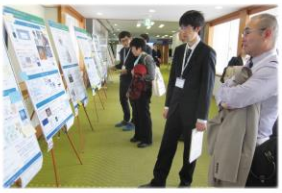
学際応用科目「低侵襲治療学」
腹腔鏡下膵切除手術の見学や手術シミュレータによる模擬体験を実施しています.
（京都大学医学部付属病院）

基盤科目「人体解剖学」
系統解剖を体験するとともに，バーチャル画像や樹脂模型を使い，立体的に人体の「構造」と「機能」の連関を理解します.

学際応用科目「医療・生活支援システム学」
介護施設で筋力トレーニングプログラムに参加し，予防やリハビリテーションの重要性について理解を深めています.



学外合同ワークショップへの参加
M2履修生 松本さん（写真）の班が最も興味深いまとめを行った3班の1つに選ばれました.
（2014/06/2開催「中長期研究インターンシップ実施に向けた学生・教職員・企業担当者の集い」）



約3万人の医療従事者が参加する学会での特別展示
第29回日本医学会総会 2015関西において，
協力企業・組織と履修生のアイデアを組み合わせ医療イノベーションへ向けた技術・システム提案を行い，さまざまなご意見をいただきました.
（2015/04/11-1開催; 国立京都国際会館）

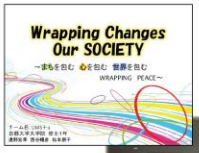
英語ディベート
通常のクラスに加えて，Max Planck認知神経科学研究所名誉所長 Robert Turne先生を招聘し，履修生による研究・履修内容紹介，教員も交えたディベートを行いました.（2014/10/20-2実施）

履修生へのきめ細かな指導
研究指導教授に加えて，1名のLIMS指導教授と2名のメンターをそれぞれ配置し，研究テーマや履修計画，将来のキャリアパス形成に対して綿密にサポートを行っています.

第7回テクノルネサンス・ジャパン

藤森工業部門にて最優秀賞を受賞
発明したアイデアを企業と共願で特許化

日本経済新聞社主催のアイデアコンテストにおいてM2履修生の3名によるプレゼンテーションが企業部門最優秀賞を獲得！
履修生はLIMSスペースでアイデアをまとめあげ，企業との共願による出願作業も行いました.
（特願2015-151542）



選考時のプレゼンテーション

授賞式にて
(M2 遠野宏季さん，松本朋子さん，西谷暢彦さん)

DATA

［学生募集人数］20名／年
［現在の学生数］25名（医学 9, 薬学 6, 工学 10）
［プログラム担当者数］67名
［参画研究科・組織等］
〈研究科〉医学研究科　薬学研究科
工学研究科　経済学研究科
〈研究所・ユニット等〉
数理解析研究所　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
〈その他〉　医学部付属病院
［新雇用教員・職員］25名
特定教員 20名、事務職員5名

Activity report for Program for Leading Graduate Schools Forum 2015

(Bellesalle Shinjuku Grand, Tokyo, on October 24th to 25th, 2015)

Satoshi YAWATA (Program-Specific Assistant Professor, LIMS)

In this Forum, all 62 programs of The Program of Leading Graduate Schools gathered to further enhance the Program by sharing the implementation status and challenges of each program to a broader constituency. From LIMS, 18 students, 18 teachers and 2 staffs were participated. In this forum, Keynote Lecture, Program Workshop, Student Forum, Poster session, and Panel discussion were held. I participated in Student Forum as young faculty member, so I describe details of Student Forum below.

Student Forum held for sharing information and encouraging networking among students, and facilitating broader societal understanding through public awareness of the Program. Students from all programs were participated in the five themes. From LIMS, Mr. Matsumoto (1. Leadership education), Ms. Johanna (2. Interdisciplinary education), Mr. Li (3. Globalization/internationalization), Ms. Kuwabara (4. Partnership with public and private sectors), Ms. Matsumoto (5. Project works addressing social problems), and I were participated. In each theme, 62 students were divided into 10 groups. Students explained the experiments achieved in their educational programs and discussed about the present conditions, the points at issue, and solutions of each theme. They compiled ideas on a large-size paper, and after discussion, presented it to all members. By member voting, three groups including Ms. Matsumoto's group were chosen to make presentations to all participants on the second day. They summarized and presented their ideas about the importance of high expertise and broad experience for addressing social problems.

The 3rd Student Meeting of Leading Graduate Schools

Department of Synthetic Chemistry and Biological Chemistry
Graduate School of Engineering
Nobuhiko NISHITANI

Place: Hokkaido University, Japan
Date: 20th and 21st June, 2015

Summary of the Conference

"The Student Meeting of Leading Graduate Schools" is an annual event that gathers students belonging to Program for Leading Graduate Schools, and aims to deepen their experiences through mutual communication and discuss about what Ph. D. holders should be. It was the third meeting, following the first held in Hyogo Prefectural University and the second in Kumamoto University.

The subtitle of meeting was "Idea generation workshop toward resolution of the problems modern society faced." In the meeting, we mainly had the workshop to find and solve the problems that modern society faced at. Also, the participants were from 27 programs of 20 Universities. It is noteworthy that, nearly half of the participants (49 of 112 people) were foreign students (mostly from Southeast Asian and African nations).

Report of My Presentations

The first day of the meeting, each programs introduced their principles and activities. I also introduced aims, course structure, and curriculum of LIMS program. Especially as our extracurricular activities, I introduced special exhibition in the 29th General Assembly of the Japan Medical Congress and the victory in the 7th Techno-Renaissance Japan. Audiences approved of our aims: development of a novel integrated medical systems and innovation of medical technology by harmonizing medical and engineering fields.

After my introduction, I was asked several questions. The first question from foreign students was about the details and quantity of fieldwork. They aimed to be international talents, and had rich experiences of international conferences and fieldwork. The question seemed to be made from such background. The second question from Japanese student was about my opinion of Continuing Care Retirement Community (CCRC). CCRC is the common system in the U.S., and Japanese government tries to promote it. I answered that CCRC should become a powerful solution for Japanese aging society; however, we have to reform it for Japan because cultures or social systems are fundamentally different between Japan and the U.S. Then we were able to make a fruitful discussion about an ideal CCRC style in Japan.

Report of Lectures and Workshop

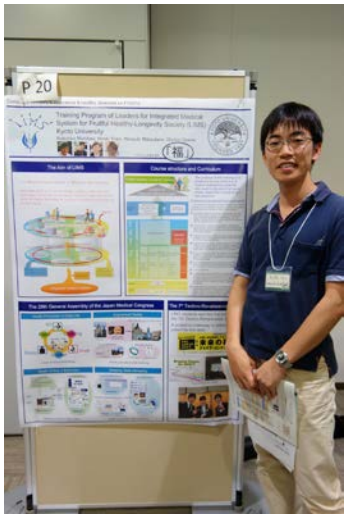
During the meeting, special lectures were given by two experts who are active internationally. The first expert was Dr. Mamoru Mohri (astronaut, chief executive director of the National Museum of Emerging Science and Innovation (Miraikan)). The second was Dr. Jean-Marc Fleury (senior advisor to the World Federation of Science Journalists).

Dr. Mohri gave a lecture titled “Challenging the Unknown –Universology–” from his experience as astronaut and scientist. In his lecture, he gave us the message: To challenge the unknown as a future leader, we have to establish own perspectives, while must not persist it. The most important thing for future leaders is to talk with specialists in different field and broaden our perspectives.

Dr. Fleury gave a lecture titled “Communication Strategies for Future Science Leaders.” He taught us about science communication for future scientists: The significance of announcing our fruits to the society, influence of announcements, and future media or method for exact science communication.

To train our problem-solving skills, the workshop was also held during the two days. We got themes like “Future way of research presentation” or “To suppress the mass consumption of paper.” We discussed to find problems on the first day, and to solve them on the second day. Our group chose the theme: “To suppress the mass consumption of paper,” and made a proposal using our technology. The discussion with foreign students was speedy and exciting, therefore it was a good opportunity to recognize once again the importance of the discussion and presentation skills in English.

Useful Information for future research



As described above, about half of the participants were foreign students, and the meeting was advanced in English. In such a situation, I vividly felt that discussion and presentation skills in English of Japanese students were insufficient. On the other hand, Japanese students were good at putting together different opinions without contradiction. It was a valuable experience for me to know such perspectives of Japanese would be an advantage.

In addition, I obtained one of the guidelines in future career from the lectures by Dr. Mohri and Dr. Fleury. Based on their experiences, both of them emphasized the importance of interacting with others and broadening own perspectives. After the lectures, I strongly want to be such an expert in the future.

Useful Information for the Members of the LIMS Program

The above-mentioned question about CCRC was made by a student from Graduate School of Advanced Leadership Studies (Shishu-Kan), Kyoto University. To discuss with humanities experts in the future, it is necessary to understand not only technologies but also policies. Actually, LIMS provides useful lectures, for example, Intellectual Property & Global Standardization, and Medical Engineering for Society. We should participate in them and discuss about such a policy more actively.

The participants were from various nationality and research fields; thus, this meeting was good practice for future international activity. In addition, personal connections obtained there would be a valuable property in my life. The next meeting is scheduled to be hosted by Chiba University, and I strongly encourage LIMS students including foreign students to participate it.

リーディング学生会議レポート

M2　松原弘幸

初めに『第 3 回全国博士課程教育リーディングプログラム学生会議』に参加させて頂きありがとうございました。全国博士課程教育リーディングプログラム学生会議は、日本全国のリーディング大学院に所属する学生がお互いの交流を通して見聞を深めるとともに、博士人材のあるべき姿について考える会議でした。「アイデア創出型ワークショップ」と銘打ち、現代社会が抱える諸問題を抽出して解決策を議論し合い、多様な専門分野をもつ全国のリーディング生が一堂に会し、問題の抽出から解決までを共に議論し合うことで、様々な価値観を共有できると共に、博士人材として成長できることが期待されます。

初めに行われた各リーディングプログラムの紹介では、LIMS の理念・目的、カリキュラムおよび目指す人物像などを中心に紹介し、『長寿社会を築くためのアイデアは？』や『実現可能な対処法はあるのか？』などのコメントを頂きました。これらは、今後 LIMS が考えるべきであり、実践しなければならない課題であると再確認しました。また、他大学のリーディングプログラムの取り組みから、新たな刺激も頂ました。特に印象的なこととして、多分野の学生で構成されているプログラムが少ないということ、授業を英語で行っていない、もしくは英語で討論する授業（英語 debate）が無いということでした。

そして、招待公演では日本人初の宇宙飛行士である毛利衛さんが『Challenging the Unknown』とう演題で、リーダーになるために意識しなければならない 2 つの命題である『Think ahead』『Big picture』について講義をしてくださいました。研究を楽しんで行うと共に、1 つの視点に捉われることなく俯瞰的に思考し、新しいアイデアを創造する『Big picture』。そして、そのアイデアによって何が実現可能になるかを見越して思考しなければならない『Think ahead』が重要であるとおっしゃっていました。将来、リーダーを目指す LIMS 生は、この二本柱を常に意識しながら研究を行うことで、違った視点・アイデアが発想できるのではないでしょうか。

第三回リーディングプログラム学生会議

アイデア創出型ワークショップ 現代社会が抱える課題の解決を目指して

京都大学大学院工学研究科　修士 2 回生　遠野宏季

会議全体の趣旨

本学生会議は、日本国内のリーディングプログラム履修生の交流促進と、各自の多様な研究背景を生かして現代社会の諸問題について議論することを主な目的としている。二日間の間に、参加者は世界レベルで活躍している方の講演を聞き、各リーディングプログラムの紹介を行うポスターセッションと学生間のワークショップに取り組んだ。

他の講演者・参加者の発表について

印象に残った講演として講演者の元宇宙飛行士の毛利衛さんと、ある学生とのやりとりが挙げられる。毛利さんの講演の趣旨は、自身が経験した宇宙開発を例に新しい物事に果敢に挑戦すべきということであった。その後の質問の時間で、ある学生が「宇宙開発に莫大な金を費やすより、それを発展途上国への支援へ使うべきではないのか」と問うたのに対し、毛利さんは宇宙事業に限らない科学技術の発展の必要性を説いた。この話を聞いたとき、LIMS 分野では、富裕層しか利用できない高額高度医療へ費やす国税の是非に例えることが出来ると感じた。この様な問題は分野を超えた普遍的な課題であり、今後私たちも考え続けなければいけないと思う。

自身の発表に関して

本学生会議では、私は LIMS の基本理念と活動内容に関するポスター発表を行った。その中で、どのように実際の医療や介護の現場に使われるものを生み出すことができるのかという質問を頂いた。私は LIMS の大きな活動の一つである現場実習の重要性を挙げ、実際の手術現場や介護現場に触れることを通して現場のニーズを理解することが、手段の一つであると伝えた。

自分の研究生活や他の LIMS 学生にとって有益と思われることに関して

私は、参加者の多くが積極的に人に話しかけている姿がとても印象的であった。異分野の人と話をすると思わぬ発見が得られることが多いため、自分も含め他の LIMS 学生も積極的に異分野との交流の場へ参加すればよいと感じた。

また LIMS 学生が研究室で行っている研究は LIMS の内容と重なりづらい場合もあるが、そこが私たちの強みだと思うので、すり合せ方法をこれからも模索すればとても面白い結果が得られると感じた。

学会参加報告書

M2 西谷 暢彦

学会名：第 3 回全国博士課程教育リーディングプログラム学生会議
開催場所：北海道大学
期間：2015 年 6 月 20 日～21 日

会議の趣旨・概要

全国博士課程教育リーディングプログラム学生会議は、日本全国のリーディング大学院に所属する学生がお互いの交流を通して見聞を深めるとともに、博士人材のあるべき姿について考えることを目的としている。

本年は兵庫（兵庫県立大学)、熊本（熊本大学）での開催に引き続き 3 回目の開催となる。また、「アイデア創出型ワークショップ –現代社会が抱える課題の解決を目指して–」という副題が設定されており、ワークショップで現代社会が抱える課題の発見・解決を行うことがメインプログラムであった。

自分の発表に関する報告

本会議には 20 大学 27 プログラムが参加し、各プログラム 1 枚ずつポスターで活動紹介を行った。私は LIMS の紹介として、プログラムの根幹理念である健康長寿社会を目指す意義、カリキュラム及び目指す人物像について説明を行った。また、課外活動の例として第 25 回関西医学会総会での発表や、第 7 回「企業に研究開発してほしい未来の夢」アイデア・コンテスト（愛称 : テクノルネサンス・ジャパン）での成果についても紹介を行った。

本プログラムの目指す「病院・リハビリ施設・在宅医療などを包括的に捉えた、新たな総合医療システムの提案」及び「医療・工学の専門家の融合による新たな医療技術の開拓」といった点の意義については好意的に捉えられていたようだ。また、参加学生からは①現場観察及びフィールドワークの内容・量についてや、②アメリカで盛んであり日本でも導入が進められている Continuing Care Retirement Community (CCRC) に対する考えなどについて質問があった。

他の参加者の発表や講演

ここでは本会議中に行われた①他プログラムの紹介、②特別講演、③ワークショップについて述べる。

①他プログラムも同様にプログラムの理念や活動内容を紹介していた。特筆すべきことは、参加学生全 112 名のうち半数近くの 49 名が留学生（大半が東南アジア・アフリカ出身）であり、国際的なキャリアを目指した活動が盛んにおこなわれていることだった。特に国際会議やフィールドワークなどの経験が豊富であり、彼らと将来共に社会を牽引する人材となるためにはこうした国際的な経験が不足していると感じた。また前述したフィールドワークに関する質問は、このような背景からなされたのだと考える。

②特別講義として、毛利衛 氏（元宇宙飛行士、現日本科学未来館館長）および Jean-Marc Fleury 氏（世界科学ジャーナリスト連盟相談役）による講演が行われた。毛利氏からは ”Challenging the Unknown –Universology–“ というタイトルで、宇宙飛行の経験談を交えた講演を受けた。講演の中で、将来リーダーとして未知の課題に挑むためには、自分にしかない視点を持つ必要がある一方でそれに固執してはならず、常に他の専門家と対話することで視野を広げ続けることが必要だというメッセージを頂いた。また Fleury 氏からは “Communication Strategies for Futur Science Leaders” というタイトルの講演を受けた。私たちが将来科学者になるに当たり、社会に成果を発表することの意義や及ぼす影響について正しく理解することや、今後成果を正しく正確に社会に発信するためにどのような媒体や方法が求められているかについて教えていただいた。

③アイデア創出型ワークショップとして、6 名程度のグループによる課題解決演習を行った。ワークショップは 2 日間にわたり、1 日目はあらかじめ与えられたテーマに対する課題の発見について意見を交わし、2 日目でその課題に対する解決策を議論し、最後に全体の場で発表を行うというものだった。留学生を交えたスピーディーな議論は非常に刺激的であり、英語によるディスカッション及びプレゼンテーションスキルの重要性を改めて感じる機会となった。

自分の今後の学修・研究にとって有益な情報

前述のように参加者の約半数は外国人であり、会議は常に英語で進められた。この中で日本人は留学生と比較すると英語によるディスカッション及びプレゼンテーションスキルが圧倒的に不足しているということをまざまざと実感させられた。一方で、複数の意見や異なる意見を打ち消すことなくまとめ上げることは日本人の方が得意としており、私達日本人にしかできないこと・視点があるということを知ることができたのは自分にとって有益な経験であった。

また、毛利氏及び Fleury 氏という国際的に活躍されている専門家による講演から、今後のキャリアにおける一つの指針を得ることができた。両者とも自らの豊富な経験に基づき、常に視野を広げ、他者と対話することの重要性を強調されており、今後自分もそのような人物を目指したいと感じた。

同会議に参加しない、プログラム関係者にとって有益と思われる情報

前述の CCRC に関する質問は京都大学思修館の学生からなされたものである。LIMS では、医療技術・システムに対する学習に比べると、このような医療制度に関しての議論が比較的少ないと思われる。今後、特に人文系の専門家と対話する際にはこうした政策に関する理解も必要になってくるかもしれない。

参加学生の出身国籍・分野は多岐にわたり、今回のような機会は将来国際的に活動する上での非常に良い練習となった。また、ここで得られた交流・人脈は人生において貴重な財産になると感じている。次回は千葉大学主催で野開催が予定されているが、LIMS の学生には留学生も含め、強く参加を進めたい。

北海道リーディングプログラム学生会議出張報告書

薬学研究科 M1 尾山翔平

■日時：2015 年 6 月 20 日 ～2015 年 6 月 21 日

■場所：北海道大学

■会議全体の趣旨・概要

私は今回北海道大学で行われた第 3 回全国博士課程リーディングプログラム学生会議に出席し、LIMS の活動内容や今後の展望に関する発表を行うとともに全国のリーディングプログラム生と意見交換を行った。ポスター発表以外には二日間にわたるワークショップが行われた。

■自分の発表に関する報告

今回、私自身の発表では主に LIMS の目的とカリキュラムについて発表を行った。LIMS の目的は、医薬工連携をキーワードに長寿高齢化社会における医療費や福祉の問題を解決することであると説明した。またカリキュラムについては１，２年次で自分の専門分野外の分野に対する知識を習得するのと並行して自分で設定したテーマに対する研究を行うこと、3 年次では海外インターンシップを行うことについて説明した。加えて実際の活動についても、例として第 29 回日本医学会総会での発表や、第 7 回「企業に研究開発してほしい未来の夢」アイデア・コンテストでの成果を挙げ説明を行った。印象深かったのは、「LIMS に参加している学生は異なる分野から集まっているのか」という質問をされたことであった。他のプログラムは１つの分野から構成されているものがほとんどであった。このことから“医薬工連携”というキーワードのもと複数の分野の学生が同じテーマに取り組むことは他のプログラムと異なる LIMS の特徴であり、重視していくべき部分であると感じた。

■他の参加者の発表や講演

今回、最も印象に残ったのは、宇宙飛行士の毛利衛氏の講演であった。講演は“Challenging the Unknown”というテーマで彼自身の宇宙での経験を元にして行われた。この講演では、新しいことに挑戦する際には自分の持つ視点を重要視すること、しかしながら自分の意見に固執することなく幅広い視野を持って物事を捉えることが重要であると説明されていた。この講演を聞いて LIMS においても自分のバックグラウンドを活かすと共に他の分野と協力して新しいことに挑戦していくことが重要だと感じた。異分野交流という意味で、今回の学生会議に参加できたことは私にとって貴重な経験になった。

■自分の今後の学修・研究にとって有益な情報

前述したワークショップでは、一日目は複数あるテーマ（未来のプレゼンテーション法、DDT のような薬害をなくす方法など）について各グループで意

見を交換して、１つのテーマに絞った。二日目は一日目に決定されたテーマについて更なるディスカッションを行い、解決策を提示し、参加者全員に対してポスター発表を行った。参加者の 3-4 割程度が外国人留学生であったため、ディスカッションは全て英語で行われた。日本人同士でのディスカッションでは支障はなかったが、外国人留学生とのディスカッションはスムーズに行うことができず、英語でのディスカッションスキルの低さを再認識させられた。これは普段日本語を使用している日本人同士で英語を話していても気づけなかったことなので、よい経験だったと思う。

■同会議に参加しない、プログラム関係者にとって有益と思われる情報

前述したが、まず一つ目は異分野の方々と交流を持てるということである。異分野の人と交流することのメリットは自分が持つ考え方以外の考え方を知ることができるということである。私は今回、経済学専攻の研究者と会話する中で考え方の違いを実感することができた。「増加する医療費という問題に対してどうすればいいですか？」という質問に、私は「薬価を抑える、診断にお金を割いて治療が必要な患者を減らす」といった考え方をしたのに対して、彼女は「税金を増やす」といった解決策を提示した。このような考え方は私一人では思いつけなかったであろう。自分と異なる分野の人と繋がりを持つというのは様々な視点から同一の事象を観察するといった点で重要なことだと思う。

二つ目は自分のスキルを実践の中で確認できるということである。今回私は発表やディスカッションの中で、自分の英語でのコミュニケーションスキルの拙さを実感できた。学生会議には数多くの外国人留学生が参加するので、非常に良い練習の機会になると思う。

以上の点から学生会議に参加することは非常に有益なことであり、来年はぜひ他の LIMS 生も参加することをおすすめする。

（写真: 最終日のポスター発表の様子）

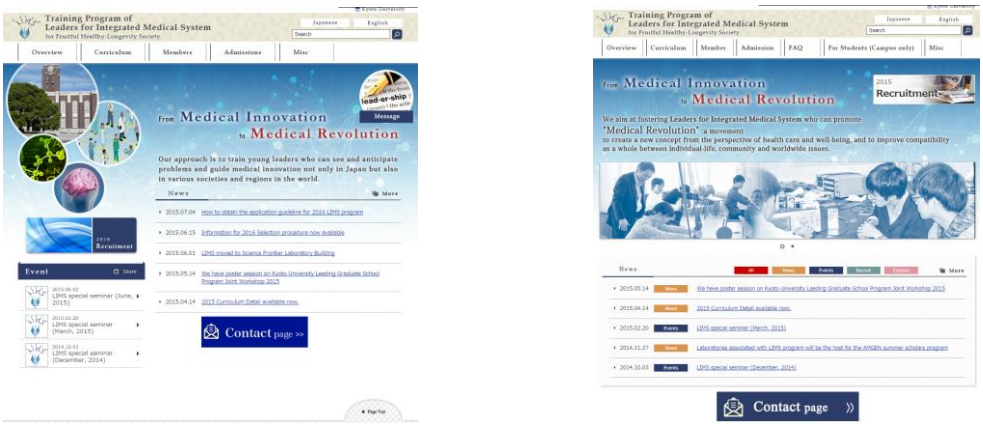
New LIMS website launched

Koji Yamamoto
Program-Specific Associate Professor, LIMS

In 2015 academic year, we finally launched a new LIMS website. On the basis of our historical trend analysis for the previous website, we preferentially focused on the following three points as I described last year.

1. To redesign the front page so that our activities come through.
2. To minimize the inclusion of duplicate information and comprehensively display relation among each content.
3. To locate a Q&A site requested from both domestic and foreign visitors.

Following two figures displayed the design and layout of the front page on the previous version (left) and the current version (right), respectively (Fig. 1). One of the highlights in this version is that all of the important information on LIMS activities, such as News, Events and Recruitment, were arranged on the front page using colored tags, which enabled us to easily sort or access the categorized information we want. In addition, we installed FAQ sites for LIMS program, for Curriculum & degree, for LIMS allowance & Research grant, for Application & selection and for the others. According to the results of access analysis, the visited number of each FAQ site was about 200~350 for Japanese pages and 100~150 for English pages during seven months. These numbers correspond to those of visitors for the Admission page. We hope that these renewal contents would help visitors to profoundly understand the LIMS program.



(previous version) (modified version)

Fig. 1 Comparison of the front page on the previous version and the current version.

6.

産公学連携

Industry-Public-Academia Cooperation

Industry-Public-Academia Cooperation

We have been referring to opinions and comments of companies and local governments since during planning LIMS Program. Twenty some of them are now supporting LIMS program as Cooperators. In collaboration with lecturers from the cooperating organizations, we prepared tree subjects in which students can receive interactive lecture, discussion, problem solving practices on practical issues in the real world.

Subjects:

I. Medical Engineering for Society I:

Eight lecturers from 8 companies (16periods)

Theme of class:

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

II. Medical Engineering for Society II:

Eight lecturers from 7 companies (14periods)

Theme of class:

1. Effective Visualization of Information for Integrated Medical System
2. Building social infrastructure for healthy, ageless society utilizing the brain information cloud
3. Safety and Human Factors of Car Driving
4. Collaboration for Social Experiments
5. Global Technological Development and Marketing Strategy on Healthcare Business
6. Big Data Applications for Healthcare, and Creation of New Societal Systems
7. Strategies to Improve Health through Daily Life Environment

III. Intellectual Property & Global Standardization

Nine lecturers from an independent administrative agency, public organizations, and a company + Kyoto University Staff (14periods)

Theme of class:

1. Overview, introduction
2. R&D Process 1, Drug Discovery Stage
3. R&D Process 2, Clinical Stage
4. Outline of the Patent System
4. Key Points of Patent Practice
5. Patent Specification
6. Search for Prior Art
7. Global standardization of Medical devices
8. Major International Standards
9. Regulation of Medical Devices
10. Regulation of Medical Devices/ International Development of Medical Devices

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

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

http://www.lims.kyoto-u.ac.jp/