

Premedical Course

Biology

Osamu Terasaka, *Professor*

Rie Hiratsuka, *Assistant Professor*

General Summary

The main research subject of our laboratory is the reproductive system of seed plants. Our research is now focused on the relation between pollen tube growth and the programmed cell death of pollen tube conducting tissue.

Research Activities

The mechanism of engulfment of the generative cell by the pollen tube cell

During the ontogeny of angiospermous pollen, a small generative cell (GC) is produced by unequal cell division of a microspore. The GC subsequently detaches from the pollen grain wall (intine) and is engulfed within the cytoplasm of the pollen tube cell (PC) to create a “cell within a cell” structure. Then the GC is allowed to migrate through the pollen tube. Although intracellular migration of the GC is required for successful fertilization, the manner of detachment of the GC is poorly known. In this study, the GC detachment mechanism, especially the roles of cytoskeletal elements, were investigated in *Liriope muscari* pollen. This species produces lenticular GC on the side of the pollen grain through microspore division. Soon after the division, methyl-esterified pectins and callose were deposited in the cell wall between the GC and the PC. However, they subsequently disappeared, and the cell wall became thin. The GC underwent circumferential constriction near its attachment site on the intine, it thereby became spherical and projected into the PC. The constriction finally became so tight that opposing ends of the cell membranes met and fused. The GC detached from the intine to be engulfed within the PC. Actin filaments were localized around the GC, particularly the constriction domain. Cytochalasin B, an actin inhibitor, and 2,3-butanedione monoxime, an ATPase inhibitor of myosin, prevented the GC from being engulfed within the PC. On the other hand, colchicine, a microtubule inhibitor, did not affect GC engulfment. These results suggest that the softening of the cell wall through the degradation of pectins and callose and the constriction by actin-myosin interaction play important roles in the engulfment process of the GC.

Publications

Hiratsuka R, Terasaka O. Role of pectinase Cry j 2 during pollen tube growth in *Cryptomeria*

japonica (in Japanese). *Nihon Kafun Gakkai Kai-shi*. 2012; **58**: 51-9.

Physics

Tsuyoshi Ueta, *Professor*

Katsumi Kasono, *Assistant Professor*

General Summary

1. Since 1998, by artificially introducing lattice vibration to a photonic crystal, we have investigated the direct interaction of incident light and lattice vibration and have found out that the incident light is amplified. We have proposed a metal photonic crystal as a system enhancing the dynamic Casimir effect, and have been investigating the properties of the dynamic Casimir effect within a metal photonic crystal.
2. Phase transitions, critical phenomena, interacting many-body systems, computer simulation.

Research Activities

New superconducting phase in a high magnetic field

The microscopic theory of superconductivity in a magnetic field has been studied by reforming the Gor'kov theory in terms of the exact Green function in a magnetic field. We have found that a superconducting domain exists on the higher-field side of the domain according to the parabolic law. These results were presented at the International Conference on Superconductivity and Magnetism 2012 held in Istanbul, Turkey.

Monte Carlo simulations of the $q=10$ Potts models

We have performed Monte Carlo simulations to study systems with the first-order phase transition. Multigrid method Cluster Monte Carlo simulations are used to study 10 state ferromagnetic Potts models on square lattices. We calculated the relaxation times of energy and magnetization.

Publications

Ueta T, Miyagawa Y (Chiba Univ). Local gauge finite element method for electron waves in magnetic fields. *Phys Rev E Stat Phys Plasmas Fluids Relat Interdiscip Topics*. 2012; **86**: 026707.

Ueta T, Hioki T (Chiba Univ). Gor'kov theory with exact green function in magnetic field. *Journal of Superconductivity and Novel Magnetism*. 2013; **26**: 1921-6. Epub Dec 22, 2012.

Fujii G (Akita Pref Univ), Ueta T. Finite element analyses for random laser action in metallic disordered structures. In: *Metamaterials 2012: 6th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics Proceedings*; 2012 Sep 17-22; St. Petersburg, Russia. *Metamorphose VI*; 2012. p. 758-60.

Chemistry

Takashi Okano, *Professor*

Chikao Hashimoto, *Associate Professor*

General Summary

The research of this laboratory is focused on synthesis-oriented organic chemistry, including the synthesis of bioactive compounds and fluorine-containing materials; the development of new methods for peptide synthesis; and the computer-assisted analysis of materials and synthetic reactions.

Research Activities

Synthesis of a new facile diagnostic agent for Fabry disease

In collaboration with the Department of Gene Therapy, Institute of DNA Medicine, we are developing a new fluorescent diagnostic agent for Fabry disease, a congenital deficiency of α -galactosidase. The difficulty of the synthesis is to create a precise α -glycoside linkage with the fluorescein-based fluorescent moiety and galactose to avoid the effect of β -galactosidase. In addition, we are developing a more readily available ^{13}C -labeled agent that can be detected with mass spectrometry as a new diagnostic indicator.

*Synthesis of *N*-protected peptide acids using amino acid-alkaline earth metal salts*

The protection of a carboxyl group by a metal ion saves the time needed for the incorporation and removal of the protecting group and prevents side reactions caused by the use of esters. The syntheses of *N*-protected peptide acids in organic solvents using alkaline earth metal-carboxylate salts of an amino acid were investigated. We found that the amino acid-Ca carboxylate salt is the most effective among the carboxylate salts of the amino acids tested for coupling with Boc-amino acid active esters in an organic solvent, such as *N,N*-dimethylformamide or dimethylsulfoxide.

Publications

Hashimoto C, Takeguchi K¹, Kodomari M¹
(¹*Shibaura Inst Technol*). An efficient synthetic
method of *N*-protected dipeptide acids using

amino acid-calcium carboxylates in an organic
solvent. *Synlett*. 2011; **2011**(10): 1427-30.

Social Science (Law)

Ryuichi Ozawa, *Professor*

General Summary

Problems of Constitutional Law in present-day Japan

Decision of the Constitutional Council (*Conseil Constitutionnel*) of France

Research Activities

Ozawa published the following articles and books from research activities in 2012.

Publications

Ozawa R. Crises of democracy in the state and the province (in Japanese). *Keizai*. 2012; 203: 41-51.

Reviews and Books

Ozawa R. Civil liberty of public servants and democracy (in Japanese). In: Sugihara Y, Higuchi Y, Mori H, editors. *Sengohougaku to kenpou-rekishi genjou tenbou*. Tokyo: Nihon Hyoronsha; 2012. p. 348-60.

Ozawa R. Procedure for revision of Constitution

(in Japanese). In: Kitano Hirohisa sensei tsuito-ronshu kankoiinkai, editor. *Nozeisha kenron no kadai*. Tokyo: Keiso Shobo; 2012. p. 135-58.

Ozawa R. Close-Up Kenpo (in Japanese). 2nd ed. Kyoto: Horitsubunkasha; 2012.

Ozawa R. 44: Rationalized parliament and budget power, 52: Part determinant of financial autonomy, 53: Financial autonomy (in Japanese). In: Tsujimura M, editor. *Furansu no kenpohan-rei*. Tokyo: Shinzansha; 2013. p. 216-9, 257-60, 261-3.

Human Science

Takao Fukuyama, *Professor*

General Summary

The Study of Western philosophy and ethics

Research Activities

A study of first year experience

I designed a workshop for the Conference of 37th Faculty Development held on December 1, 2012, at the Kokuryou campus premedical department. This Faculty Development Workshop was titled “The Workshop on First-Year Experience.” During the workshop I reported on the birthplace of first year experience, global current of trends, emplacement in the course of undergraduate education, type-classification of the curriculum, and a present situation and problems of The Jikei University. And I insisted that The Kokuryo

Department achieve its own total direction and posture over each aims of subunits.

Japanese

Ikuko Noro, *Professor*

General Summary

1. To develop materials for nursing students to study Japanese language
2. To study patients' decision-making

Research Activities

To develop materials for nursing students to study Japanese language

We developed a textbook and exercises for nursing students to study “study skills,” (hon- orifics, proverbs, and report-writing) and “social skills” (greetings, showing empathy, and rapport-building).

To study patients' decision-making

We studied how patients with cancer make decisions about chemotherapy to reveal the associations among their decision-making process, their preferred decision-making model, their actual decision-making model, and their satisfaction with their decision.

Publications

Noro I, Muramoto T, Yamaoka A. A video investigation of the effects of physicians' verbal explanations and attitudes concerning informed

consent on patients (in Japanese). *Ninchi Shin-rigaku Kenkyu.* 2012; **10**: 81–93.

Mathematics

Katsuya Yokoi, *Professor*

Hiroshi Shiraishi, *Assistant Professor*

General Summary

- I. To study dimension theory and topological dynamics
- II. To consider the asymptotic behavior of estimators of optimal portfolios when the return processes are various stochastic processes.

Research Activities

- I. We studied omega-limit sets and (strong) chain recurrent sets on topological dynam-

ics.

II. We discussed a resampling procedure in the estimation of optimal portfolios when the financial returns are of the class of time-varying autoregressive conditional heteroskedasticity processes. We also discussed an algorithm to solve a multiperiod portfolio-selection problem based on a bootstrap method.

Publications

Shiraishi H, Ogata H¹, Amano T², Patilea V³, Veredas D⁴, Taniguchi M¹ (¹Waseda Univ, ²Wakayama Univ, ³CREST, ⁴ECARES). Optimal portfolios with end-of-period target. *Advances in Decision Sciences*. 2012; ID703465.

Shiraishi H. A simulation approach to statistical

estimation of multiperiod optimal portfolios. *Advances in Decision Sciences*. 2012; ID341476.

Shiraishi H. Resampling procedure in estimation of optimal portfolios for time-varying ARCH processes. *Scientiae Mathematicae Japonicae*. 2012; **75**: 105-17.

English

Osamu Ohara, *Professor*

Tetsuro Fujii, *Associate Professor*

General Summary

English audiovisual education and the history of the English language (Ohara)

English Language communication and education: material analysis and development (Fujii)

Ohara continued his study of graphology and morphology in the letters of the Celys and the Stonors in the fifteenth century. Ohara also continued to investigate how to make useful digital images and XML files of fifteenth century manuscripts, especially of the *Stonor Letters*.

Fujii joined a project to compile English textbooks for high-school English classes: *English Communication I, II, and III*. Along with the textbooks, Fujii is working on exercise materials and teacher's manuals. In addition, he published a self-study vocabulary exercise book for the Test of English for International Communication.

Research Activities

Making use of the results of the study, Ohara continued his research on the graphemes of the letters of the Stonors.

Fujii analyzed and collected authentic English materials to meet the level and the needs of high-school textbooks based on current teaching methodologies, theories, and research findings on learning English as a foreign language. These materials were used to compile textbooks following the revised teaching guidelines set out by the Ministry of Education, Culture, Sports, Science and Technology. Officially approved by the Ministry, the first textbook in the series, *World Trek-English Communication I*, and its instructional

aids, *World Trek-English Communication I Teacher's Book* and *World Trek-English Communication I Teacher's Manual*, were published.

Reviews and Books

Mochizuki M¹, Aizawa K², Allum P³, Sasabe N⁴, Hayashi Y⁵, Fujii T, Miura S⁶ (*¹Reitaku Univ, ²Tokyo Denki Univ, ³Rikkyo Univ, ⁴Toritsu*

⁵Aoyama High, ⁶Souka High, ⁶Tsurubunka Univ). *World Trek English Communication I*. Tokyo: Kiriara Shoten; 2013.

First Foreign Languages

Katsumi Suzuki, *Associate Professor*

General Summary

German contemporary literature

Research Activities

I am working on the topic of “the modern German literature of nonnative writers in German-speaking areas,” especially the works of Ilija Trojanow, who was born in Bulgaria and now lives in Vienna. His novel *The Collector of Worlds* deals with the 3 different worlds of India, Arabia, and Africa. I had done research on his discourse about India and Africa and the cultural background of this discourse. I have already published the results. I continue researching his discourse about Arabia and studying Arabic culture.