

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

Role of the pectinase (Cry j 1, Cry j 2) in pollen tube growth of Cryptomeria japonica

Cry j 1 and Cry j 2 are the major allergic proteins of *Cryptomeria japonica* pollen. These proteins are presumed to play important roles in pollen germination and tube growth because they have pectinase activity. Their distribution patterns shown *in vitro* suggest that Cry j 1 and Cry j 2 are not involved in pollen germination and tube growth. However, their pectinase activities suggest that Cry j 1 and Cry j 2 may facilitate the growth of the gymnospermous pollen tube in the nucellus through the degradation of nucellar pectins. In the present study, we examined the *in vivo* localization of Cry j 1, Cry j 2, and pectins in the pollen tube and the nucellus of *C. japonica* to clarify the role of these pectinases.

Cry j 2 was detected in the cytoplasm of the pollen tube, tube wall, nucellar cells that came in contact with a pollen tube, and the middle lamella. In contrast, Cry j 1 was not observed throughout the pollen. De-esterified pectins were localized in nucellar cell walls, and methyl-esterified pectins were localized in nucellar cell walls and the middle lamella. These findings indicate that Cry j 2 is synthesized in the pollen tube and is secreted to the nucellus via the tube wall and degrades pectins of the nucellar cell wall and the middle lamella to facilitate pollen tube growth. The absence of Cry j 2 in the pollen tube wall *in vitro* also indicates that interaction between the pollen tube and the nucellus is necessary to induce the secretion of Cry j 2.

Publications

Hiratsuka R, Terasaka O. Pollen tube reuses intracellular components of nucellar cells undergoing programmed cell death in *Pinus densiflora*.

Protoplasma 2011; **248**: 339-51. Epub 2010 Jul 10.

Physics

Koichi Satoh, *Professor*

Katsumi Kasono, *Assistant Professor*

General Summary

1. Dipalmitoylphosphatidylcholine (DPPC) membranes have been studied from several points of view, including formation, liquid crystals, phase transitions, interaction with ions, and optical characteristics.
2. Phase transitions, critical phenomena, interacting many-body systems, computer simulation.

Research Activities

Ripple phase of the DPPC membrane

The ripple phase of the DPPC membrane is assumed to be caused by the presence of about 20% fluid lipids in the gel phase. This assumption consistently explains both the surface charge density of multilamellar vesicles and the dielectric increment of unilamellar vesicles during the ripple phase.

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

We have made cluster update and Metropolis single-spin update simulations to the study of systems with the first-order phase transition. We calculated surface tension of a square lattice.

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

Theoretical analysis of molecular interactions of Cu(II) bis(diarylpropanedionate) complexes with benzene ligands

Arene-polyfluoroarene interaction was found between the Cu(II) bis[3-oxo-1,3-bis(pentafluorophenyl)prop-1-en-1-olate] complex and benzene as the guest molecule.

This weak interaction occurs only when 2 fluorine substituents exist at the *o*- and *o'*-positions of the ligand aryl groups. Density functional theory calculation predicted larger torsional angles of aryl rings against the central square-planar Cu(II) complex in *o,o'*-difluorinated phenyl diketonate complexes than in the parent phenyl diketonate complexes. This distortion makes a binding pocket for a guest benzene molecule to form stable host-guest complexes.

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 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 amino acids were investigated. We found that the amino acid-Ca carboxylate salts are the most effective among the carboxylate salts of amino acids tested for coupling with Boc-amino acid active esters in organic solvents, such as *N,N*-dimethylformamide and dimethylsulfoxide.

Social Science (Law)

Ryuichi Ozawa, *Professor*

General Summary

Problems of constitutional law in present-day Japan

Research Activities

I address the problem of constitutional law in present-day Japan, especially pacifism, parliamentary democracy, public finance, right of free speech, judicial system, and local government. I participate in the “Unequal Society and Safety-Net” working party and the “Structural Change of Publics” working party of the Legal Committee of the Science Council of Japan.

Reviews and Books

Ozawa R. Argument over article 9 reformation of Japanese constitution, past and present (in Japanese). In: Japan Scientists' Association, editor. *Kenpou to Genjitsu Seiji*. Tokyo: Honnoizumisha; 2010. p. 83-92.

Ozawa R. Political right and democracy of today (in Japanese). In: Japan Scientists' Association, editor. *Kenpou to Genjitsu Seiji*. Tokyo: Honnoizumisha; 2010. p. 214-33.

Ozawa R. Japan-U.S. security system and financial control (in Japanese). In: The Law Section of the Association of Democratic Scientists, editor. *Anpo kaitei 50 nen*. Tokyo: Nippon Hyoronsha; 2010. p. 111-6.

Ozawa R, Maruyama S. *Minshutou seikenka no nichibei-anpo* (in Japanese). Tokyo: Kadensha; 2011.

Human Science

Takao Fukuyama, *Professor*

General Summary

The study of Western philosophy and ethics

Research Activities

The feeling of trust in the world

I study several aspects of the human relationships of support and care. Through this support of others, people acquire the feeling of trust in their world. However, when people have failed to earn this support, they cannot lead an ordinary life. For example, abused babies, bullied school children, battered women, and patients with life-threatening illnesses can be cured after learning to trust others.

Philosophically, these situations require a new theory of relationship, especially a theory of responsibility and total affirmation of individuals.

Japanese

Ikuko Noro, *Associate Professor*

General Summary

Suitability for patients of informed consent documents written in Japanese

A study was continued of the suitability for patients of informed consent documents written in Japanese. This year, I used the protocol analysis method to analyze comprehensibility and the uncertainty patients feel about informed consent documents.

Effects of physician-patient gender combination of physician and patient on medical communication

To examine the effects of the physician-patient gender combination on medical communication, physician-patient conversations were recorded at 3 hospitals and were analyzed with the Roter Interaction Analysis System.

Research Activities

Suitability for patients of informed consent documents written in Japanese

A paper about the study was presented.

Noro I, Muramoto T. Incomprehensibility and uncertainty of informed consent docu-

ments-protocol analysis. *Ars Linguistica* (Linguistic Studies of Shizuoka 2010; 17: 95-113.

Effects of gender combination of physician and patient on medical communication

I presented on the relationships among communication, gender, and patient satisfaction at the second annual conference of the Japanese Association of Health Communication held at Kyoto University in September 2010.

Publications

Noro I, Muramoto T. Incomprehensibility and uncertainty of informed consent documents-protocol analysis (in Japanese). *Ars Linguistica* 2010; **17**: 95-113.

Noro I, Oba R, Ota M. Medical communication and Japanese language education (in Japanese). *Nihon Health Communication Kenkyukai Zasshi* 2010; **1**: 13-7.

Mathematics

Katsuya Yokoi, *Professor*

Hiroshi Shiraishi, *Assistant Professor*

General Summary

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

Research Activities

1. We summarized results of the size of the chain recurrent set for generic maps. We studied omega-limit sets of nonautonomous discrete dynamical systems.
2. We discussed resampling procedures in the estimation of optimal portfolios when the financial returns are vector-valued non-Gaussian stationary processes. On the basis of the bootstrap method, we constructed an estimator of the lower tail of the estimation error. Moreover, we introduced the Estimation Error Efficient Portfolio, which considers the estimation error as the portfolio risk.

Publications

Shiraishi H. Resampling procedure to construct estimation error efficient portfolios for stationary returns of assets. *J Jpn Stat Soc* 2010; **40**: 189-206.

Reviews and Books

Yokoi K. The size of the chain recurrent set for generic maps (in Japanese). *Suri Kaiseki Kenkyujo Kokyuroku* 2011; **1728**: 79-83.

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 an investigation concerning how to make useful digital images and XML files of fifteenth century manuscripts, especially of the *Stonor Letters*. The results of this investigation were discussed in papers read at an international conference.

Fujii joined a project team to compile English textbooks for high school students. The team is aiming to receive approval for the textbooks from the Ministry of Education, Culture, Sports, Science and Technology. In addition, Fujii is working on teacher's manuals and exercise materials.

Research Activities

Ohara presented a paper at a session titled "Stylistic Consistency in the Letters of Thomas Betson" at the International Medieval Congress 2010 held at the University of Leeds in the United Kingdom. In this historical-sociolinguistic study of the *Stonor Letters*, Ohara focused on the usages of auxiliaries and showed how they are different. Ohara visited the National Archives of the United Kingdom and studied the *Stonor Letters*. Making use of the results of the study, Ohara continued his research on the graphemes of the *Stonor Letters*.

Fujii analyzed and collected authentic English materials to meet the needs of high school textbooks based on current teaching methodologies, theories, and research findings on learning English as a foreign language. These materials will be used to compile textbooks following the revised teaching guidelines set out by the Ministry of Education, Culture, Sports, Science and Technology. The first textbook of the series, *Communication English I, II, and III*, will be used in high schools starting in April 2013.

First Foreign Languages

Yoshiaki Shirasaki, *Professor*

General Summery

1. I have continued educational activities for the purpose of verbal and nonverbal communication. These activities are also connected with the aim of developing moral and philosophical abilities in the field of intellectual relationships.
2. I have also studied Friedrich Schiller. This is a sort of paradigm innovation for this classic and ideological poet. Lang regarded Schiller to be a classical poet, and he was most productive writer of romantic operas. This is the reason I have continued this study.