

別記第4号様式【招へい研究者作成/By Fellow】

* Please submit your research report to HUTE through your host researcher within one month after the end of your Fellowship Period in Japan.

To President, HUTE

HUTE SHORT-TERM FELLOWSHIP PROGRAM
FOR RESEARCH IN JAPAN
RESEARCH REPORT

(Cover Page)

Affiliation: National Pingtung University

Name of the Host Researcher: Professor Mitsuhiro FUKUDA

Fellowship Period: From Feb. 2, 2015 To Feb. 15, 2015

Title of the Research:

Studies of the Metal Center of the Hemerythrin from *Methylococcus capsulatus* (Bath)

Date: March 3, 2015

Your Signature: 陳 皇 州

* Future Contact Information

(If you wish HUTE to maintain contact with you after the completion of your fellowship)

(Office/Home)

Fax No.: _____

E-mail Address: _____

Address: _____

NOTES FOR WRITING THE RESEARCH REPORT

Please prepare your Research Report in English or Japanese written within three to four pages in length.

1. Items to be included:
 - (a) Outline of academic activities Discussions, lecture tour, etc.
 - (b) Impressions and thoughts on the present state of science in Japan in your field
 - (c) Comments or suggestions to HUTE, especially concerning this program
 - (d) Other comments
2. If available, please attach photographs of yourself taken during your academic activities, such as experiments, discussions or research trips in Japan.
3. You are required to submit this Research Report within one month of the end of your fellowship period in Japan through your host researcher.

(和訳)

研究報告書を書くための注意事項

長さ3～4ページ以内で英語か日本語で研究報告書を作成してください。

1. 含めるべき項目:
 - (a) 研究活動, 研究討議, 講演旅行等の概要
 - (b) あなたの専門分野における日本の科学の現状に関する印象と考え
 - (c) 特にこのプログラムに関する兵庫教育大学への意見もしくは提案
 - (d) その他の意見等
2. できるならば, 日本での実験, 討議または研究旅行等のような研究活動の間に撮られた自分の写真を添付してください。
3. 研究終了後1カ月以内に受入研究者を通して, 研究報告書を提出してください。

RESEARCH REPORT

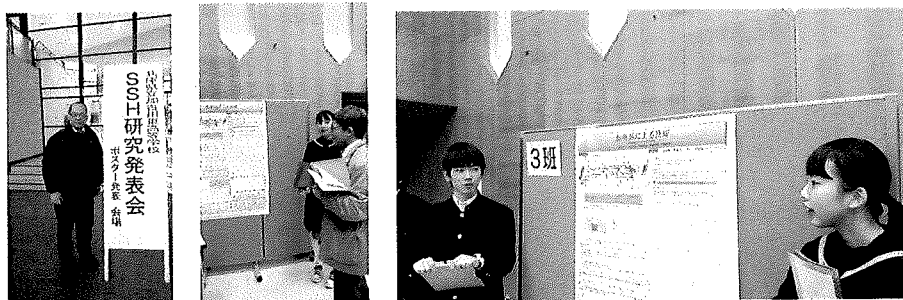
- (a) Outline of academic activities Discussions, lecture tour, etc.
- (b) Impressions and thoughts on the present state of science in Japan in your field
- (c) Comments or suggestions to HUTE, especially concerning this program
- (d) Other comments

RESEARCH REPORT

During my stay period in Japan, I discussed with Prof. Fukuda about our cooperation reserach topic “The studies of the metal center of the hemerythrin from *Methylococcus capsulatus* (Bath)” and make a wonderful scientific trip from Kakogawa city, via Fukui and Toyama as the northland of Japan and toward to Tokyo as the destination. The details of the scientific schedule as following:

1. SSH program (Kakogawa city hall)

On February 3rd 17, I visited University of Fukui, with Prof. Fukuda. With the help of Professor Tamai from Department of applied physics, I had a lecture on my main research, entitled ‘Studies Toward Understand the Structure and Function of Membrane Protein’. After discussion with the three professors and students in master class, Prof. Tamai showed the current situation of computer simulation in the field of protein chemistry. We visited the Kakogawa city hall for the launching performance presentation of Super Science High School program of Kakogawa city high school students. This activity including two parts, those are poster standing and Oral presentation. I am very impress about the research quality and English ability of the high school students. Furthermore, I am very interested about the heat transfer measurement experiment, which is advised by Dr. Fukuda. I shall try to cooperate with Dr. Fukuda depends the Hands-on Science center chemistry working station project.





2. Chemical Lecture at Fukui University

With Prof. Fukuda's help, we visited Fukui University on February 4th and 5th. This is my second time to visit Professor Tamai (玉井良則) since 2009, and provide a talk on the chemical lecture at department of applied physics, Fukui University. The topic of lecture on my main research, entitled "The bacteriohemerythrin from *Methylococcus capsulatus* (Bath): Crystal structures reveal Leu114 regulates the substrate tunnel". The abstract of my talk as following: The bacteriohemerythrin (McHr) from *Methylococcus capsulatus* (Bath) is an oxygen carrier that serves as a transporter to deliver O₂ from the cytosol of the bacterial cell body to the copper methane monooxygenase residing in the intracytoplasmic membranes for methane oxidation. After discussion with the three professors and students in master class, Prof. Tamai showed the current situation of computer simulation in the field of protein chemistry.

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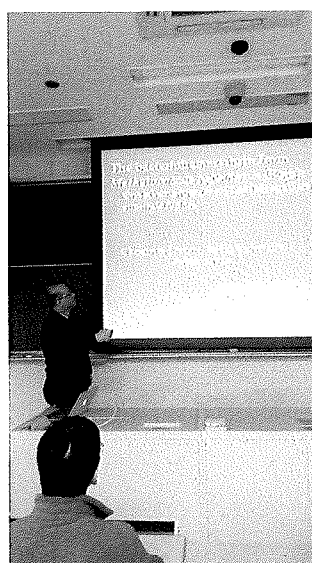
The bacteriohemerythrin from *Methylococcus capsulatus* (Bath):
Crystal structures reveal Leu114 regulates the substrate tunnel

講師：台湾 屏東大学理学院应用化学科
准教授 陳益州 先生

日時：平成 27 年 2 月 5 日(木) 16:00~17:00
場所：総合大 2 講義室（総合研究棟 1 西館）

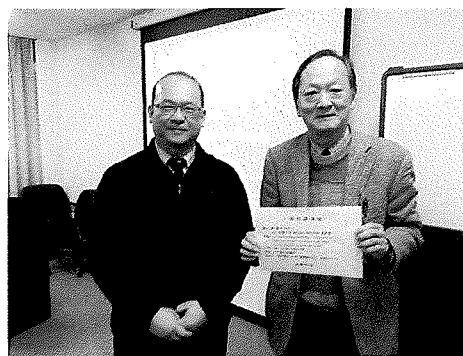
概要：
The bacteriohemerythrin (McHr) from *Methylococcus capsulatus* (Bath) is an oxygen carrier that serves as a transporter to deliver O₂ from the cytosol of the bacterial cell body to the copper methane monooxygenase residing in the intracytoplasmic membranes for methane oxidation. Here we report X-ray protein crystal structures of the recombinant wild type (WT) McHr and its L114A, L114Y and L114F mutants. The structure of the WT reveals a possible substrate tunnel in the McHr that might be linked to its faster auto-oxidation relative to hemerythrin in aerobic prokaryotes. With Leu114 positioned at the end of this putative substrate tunnel, the hydrophobic side chain of this residue seems to play a prominent role in establishing the access of the water molecule required for the auto-oxidation. This hypothesis is examined by comparing the auto-oxidation rates of the WT McHr with those of the L114A, L114Y and L114F mutants. The biochemical data are correlated with structural insights derived from analysis of putative substrate tunnels in the various McHr proteins provided by the X-ray structures.

連絡先：工学研究科物理工学専攻 玉井良則（内線 4726）



3. Academic Lecture at University of Toyama

The third phases of my scientific trip is visiting University of Toyama, Department of Chemistry. I deeply appreciated for the warmly host by Professor Kitano (北野博己). I enjoyed the discussion with the young faculties, students and visit the research laboratory. After two hours campus tour and scientific discussion, I just learned a lot about the research field of protein structure and function from those outstanding Japanese researchers. Of course, I took around one hour to introduce my latest research result about the hemerythrins from bacteria. We report X-ray protein crystal structures of the recombinant wild type (WT) McHr and its L114A, L114Y and L114F mutants. The structure of the WT reveals a possible substrate tunnel in the McHr that might be linked to its faster autoxidation relative to hemerythrin in marine invertebrates. With Leu114 positioned at the end of this putative substrate tunnel, the hydrophobic side chain of this residue seems to play a prominent role in controlling the access of the water molecule required for the autoxidation. This hypothesis is examined by comparing the autoxidation rates of the WT McHr with those of the L114A, L114Y and L114F mutants. The biochemical data are correlated with structural insights derived from analysis of putative substrate tunnels in the various McHr proteins provided by the X-ray structures.



4. Tokyo Gakugei University

The final destination of my 2105 winter scientific trip in Japan is Tokyo Gakugei University. I visit Professor Kamata's laboratory to observe the frontier of chemical education research result and introduce the Hands-on Science Center from National Pingtung University to Professor Kamata's group. The most impress activity is the Zero-Gravitation experiment by

special aircraft team. Around six in-service high school nature science teachers has a wonderful chance to experience the non-gravitated environment. I have a great time in Tokyo Gakugei University and look forward to join the 2015 NICE conference at Tokyo this summer.



Japan is one of the most advanced countries on the biochemistry and protein chemistry field in Asia. It's a BEST February that I ever had in my life due to the amazing 2105 winter scientific trip in Japan scheduled by Dr. Fukuda. I'd like to deliver my deeply appreciated to Professor Fukuda and all of the hosted Professors who I meet in Japan this February. Of course, I thank the finance support from HUTE SHORT-TERM FELLOWSHIP PROGRAM, Hyogo University of Teacher Education. This is a nice program for international visitor. The international exchange and scientific trip provided a wonderful Japan experience to me. I was satisfied with the circumstances of HUTE such as the academic fresh air. Again, I would like to offer my heartfelt thanks to President Kagisa and Dr. Fukuda for the kind and generous hospitality during my visit HUTE. It was good to interact with Japanese faculties and students again this year. The experience was wonderful. I hope more of my colleagues will join the international research project between HUTE and NPUE and visit the beautiful campus in the near further.