



รายงานฉบับสมบูรณ์

โครงการจัดประชุมเชิงปฏิบัติการ

"Interface of Analytical Science: Workshop of US and
Thai Analytical Scientists"

โดย

ศาสตราจารย์ ดร.เกตุ กรุดพันธ์ และคณะ

เสนอต่อ

สำนักงานกองทุนสนับสนุนการวิจัย (สกว.)

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สนับสนุนโดยสำนักงานกองทุนสนับสนุนการวิจัย (สกว.)

Background

INTERFACES OF ANALYTICAL SCIENCE: WORKSHOP OF U.S. AND
THAI ANALYTICAL SCIENTISTS

Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

4 – 8 January 2006, Chiang Mai, Thailand

Background

Some few years ago, the Director of the Postgraduate Education and Research Program in Chemistry (PERCH) (Professor Vichai Reutrakul) and the Deputy Director of the Thailand Research Fund (TRF) (Professor Vudhipong Techadamrongsin) suggested to Professor Kate Grudpan of Chiang Mai University the possibility of organizing a workshop to provide opportunities of U.S. and Thai Scientists, especially in analytical sciences, to meet together and have discussions and exchange information so that collaborations may be established. U.S. support for such a workshop should be requested from the National Science Foundation (NSF).

In January 2005, Professor Gary D. Christian came to Chiang Mai University for his honorary doctoral degree. Together with Professor Kate Grudpan, he discussed the workshop proposal with the Secretary General of the Commission on Higher Education (CHE) (Professor Pravich Tongroach) and was informed of financial support also by CHE. Professor Christian submitted a proposal for the Workshop to NSF. Professors Vichai Boonsaeng and Wanchai De-Eknamkul are also involved in the workshop preparation.

The workshop, designating Professor Gary D. Christian as a PI and Professor Kate Grudpan as co-PI, is granted by the NSF to provide financial support of leading U.S. scientists, together with postdoctoral fellows and Ph.D. and undergraduate students for the travel cost to Thailand, while the cost of organizing of the workshop and of Thai participants are borne the Thai organizations, namely, CHE, TRF and PERCH. The workshop is organized by the staff of Chiang Mai University, chaired by the Vice-President, academic affairs (Professor Pong-In Rakariyatham). Apart from the members of the Research Laboratory of Excellence in Development of Miniaturization in Flow-based Analysis (active members: Professor Kate Grudpan, Dr. Jaroon Jakmunee, Dr. Somchai Lapanantnoppakhun and Dr. Supaporn Kradtap Hartwell), a number of others have contributed to the organization and success of the workshop. The workshop venue is in Chiang Mai, during 4-8 January 2006. Post-visits after the workshop to various University laboratories in Thailand will be made by the U.S. scientists before their journeys back home.

Intellectual Merit of the Workshop

The goal of the workshop is to provide opportunities for leading U.S. analytical and related scientists to present an overview of their ongoing research to scientists from universities in Thailand, with the objective of facilitating collaboration. Thai scientists will also be invited to present their work.

The focus of the workshop will be the analytical sciences broadly, including bioanalytical chemistry and techniques for the investigation of biochemical processes.

Success of the workshop will result in international collaborations that will advance knowledge and understanding of specific analytical methodologies, and through interdisciplinary approaches, of challenging biochemical processes, particularly in the neurosciences. This would be very much supported by TRF (especially the Basic Research Division), CHE and PERCH.

Broader Impact of the Workshop

The broader impact of the workshop will include the participation of students in international collaborative research. It is anticipated that underrepresented students will participate in exchange programs in Thailand. The participants include senior staff, younger faculty and students from across geographical regions of the U.S. and Thailand. Opportunities may result for U.S. universities to accept top Thai students selected and supported on a competitive basis by the Commission on Higher Education to obtain training in three areas of focus: neuroscience, infometrics, and nanoscience.

Collaborative partnerships should result from the workshop. The results of the Workshop will be disseminated broadly through publication and national meeting presentations to make the chemical community aware of collaboration opportunities in Thailand. Benefits to society will include exposure of students and faculty to different cultures.

ข้อมูลการติดตามผลความก้าวหน้า

ในความร่วมมือ การดำเนินการวิจัย โดยนักวิทยาศาสตร์ของไทย และ
จากประเทศสหรัฐอเมริกา ภายหลังจากการสิ้นสุดโครงการประชุมฯ

ข้อมูลการติดตามผลความก้าวหน้า ในความร่วมมือ การดำเนินการวิจัย โดยนักวิทยาศาสตร์ของไทย และ จากประเทศสหรัฐอเมริกา ภายหลังจากการสิ้นสุดโครงการประชุมฯ

ลำดับ ที่	US PARTICIPANTS	THAI PARTICIPANTS	นักศึกษาไทย หรือนักศึกษา จากสหรัฐอเมริกา ที่ได้มีโอกาส เดินทางเพื่อทำงานร่วมกันทั้ง ทางด้านวิชาการ และการวิจัย	ผลงาน (list of publication) จากความร่วมมือ ที่เกี่ยวข้องสืบเนื่องจากการ จัดการประชุมฯ	กิจกรรม และอื่นๆ ที่เกิดความร่วมมือ การพัฒนา และแลกเปลี่ยนความรู้ และประสบการณ์
1	Bakker Eric	-	Thammakhet C.	Chumbimuni-Torres, K.Y., Thammakhet, C., Galik, M., Calvo-Marzal, P., Wu, J., Bakker, E., Flechsig, G.-U., Wang, J. High-temperature potentiometry: Modulated response of ion-selective electrodes during heat pulses (2009) Analytical Chemistry, 81 (24), pp. 10290-10294. Cited 2 times.	
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		1. Thavarungkul Panote 2. Kanatharana Proespichaya	Numnuam A.	Numnuam, A., Chumbimuni-Torres, K.Y., Xiang, Y., Bash, R., Thavarungkul, P., Kanatharana, P., Pretsch, E., Wang, J., Bakker, E. Potentiometric detection of DNA hybridization (2008) Journal of the American Chemical Society, 130 (2), pp. 410-411. Cited 16 times.	
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7	Sem Daniel	Hannongbua Supa	1. Mr.Andrew L. Olson Ms. Pornthip Boonsri	Olson, A. L., Yao, H., Saparpakorn, P., Hannongbua, S., Herdendorf, T.J., Miziorko, H. M., Cai, Sheng, and Sem, D. S. *, Substrate Induced Structural and Dynamics Changes in Human Phosphomevalonate Kinase and Implications for Mechanism, (2009)PROTEINS, 75(1), 127 – 138. (IF2009 = 3.085)	Prof.Sem has been a co-advisor of Ms.Pornthip and will come to Thailand within 2011-2012 to give special seminar and being committee for student examination	

8	Wang Joseph	Chailapakul Orawan	Pinwattana K.	Pinwattana K., Wang J., Lin C.-T., Wu H., Du D., Lin Y., Chailapakul, O. CdSe/ZnS quantum dots based electrochemical immunoassay for the detection of phosphorylated bovine serum albumin(2010) Biosensors and Bioelectronics, 26 (3), pp. 1109-1113.	
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INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT
DIRECTORS(PI/PD) and co-PRINCAPAL INVESTIGATORS/co-
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**02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and
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Submit only ONE copy of this form for each PI/PD and co-PI/PD identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.B. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. **DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.**

PI/PD Name: Gary D Christian

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
☐ American Indian or Alaska Native
☐ Asian
☐ Black or African American
☐ Native Hawaiian or Other Pacific Islander
☒ White

Disability Status: (Select one or more)
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☐ Visual Impairment
☐ Mobility/Orthopedic Impairment
☐ Other
☐ None

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Ethnicity Definition:

Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.

Race Definitions:

American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.

Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.

Black or African American. A person having origins in any of the black racial groups of Africa.

Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.

White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

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The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information received from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Mark Arnold
Alan J. Bard
John G. Dorsey
William R. Heineman
Cynthia K. Larive
Mark E. Meyerhoff
Adrian Michael
Royce W. Murray
Apryll Stalcup

REVIEWERS NOT TO INCLUDE:

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

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NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF Awardee ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
University of Washington			University of Washington			
AWARDEE ORGANIZATION CODE (IF KNOWN)			1100 NE 45th St, Suite 300			
0037986000			Seattle, WA. 981050000			
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PERFORMING ORGANIZATION CODE (IF KNOWN)						
IS Awardee ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		☐ SMALL BUSINESS ☐ FOR-PROFIT ORGANIZATION		☐ MINORITY BUSINESS ☐ WOMAN-OWNED BUSINESS		☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE
TITLE OF PROPOSED PROJECT Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists						
REQUESTED AMOUNT	PROPOSED DURATION (1-80 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
\$ 29,260	12 months	10/01/05				
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
☐ BEGINNING INVESTIGATOR (GPG I.A)						
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C)						
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.B, II.C.1.d)						
☐ HISTORIC PLACES (GPG II.C.2.j)						
☐ SMALL GRANT FOR EXPLOR. RESEARCH (SGER) (GPG II.D.1)						
☐ VERTEBRATE ANIMALS (GPG II.D.5) IACUC App. Date _____						
☐ HUMAN SUBJECTS (GPG II.D.6) Exemption Subsection _____ or IRB App. Date _____						
☒ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j) TH						
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.E.1)						
PI/PD DEPARTMENT		PI/PD POSTAL ADDRESS				
Chemistry		Box 351700				
PI/PD FAX NUMBER		Seattle, WA 98195				
206-685-3478		United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
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CO-PI/PD						
CO-PI/PD						
CO-PI/PD						
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the individual applicant or the authorized official of the applicant institution is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, and lobbying activities (see below), as set forth in Grant Proposal Guide (GPG), NSF 04-23. Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

In addition, if the applicant institution employs more than fifty persons, the authorized official of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of Grant Policy Manual Section 510; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Appendix C of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency?

Yes ☐

No ☒

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Appendix D of the Grant Proposal Guide.

Certification Regarding Lobbying

This certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding \$100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding \$150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Adelia Yee		Electronic Signature	Apr 22 2005 3:18PM
TELEPHONE NUMBER 206-685-4249	ELECTRONIC MAIL ADDRESS ayee@u.washington.edu		FAX NUMBER 206-685-1732

*SUBMISSION OF SOCIAL SECURITY NUMBERS IS VOLUNTARY AND WILL NOT AFFECT THE ORGANIZATION'S ELIGIBILITY FOR AN AWARD. HOWEVER, THEY ARE AN INTEGRAL PART OF THE INFORMATION SYSTEM AND ASSIST IN PROCESSING THE PROPOSAL. SSN SOLICITED UNDER NSF ACT OF 1950, AS AMENDED.

International Programs Cover Page Addendum

Country #1: Thailand

Country #2:

Country #3:

Proposal Category: Planning Visit or Workshop (W)

Foreign Counterpart Investigator/Organizer/Host #1:

Name: Grudpan, Kate

Department: Chemistry

Institution: Chiang Mai University

Address: Faculty of Science
Chiang Mai 50200, Thailand.

Phone: 665394191

Fax: 6653892277

Email: kate@chiangmai.ac.th

For Planning Visit or Joint Seminar or Workshop:

Location

City: Chiang Mai

Country: Thailand

Start Date: 01/06/05

End Date: 01/09/05

Demographics(people that will be supported by this project):

- * Number of senior U.S. scientists and engineers (excluding those within 6 years of their Ph.D. and graduate and undergraduate students): 10
- * Number of U.S. scientists within 6 years of the Ph.D.(including the PI and/or Co-PI if applicable): 0
- * Number of U.S. graduate students: 0
- * Number of U.S. undergraduate students: 0
- * Number of foreign scientists and engineers (including post-docs, graduate and undergraduate students) associated with the foreign institution. Include only those who will be supported under this NSF proposal. Do not count foreign participants who will be supported by non-NSF funds: 0

PROJECT SUMMARY

1. Intellectual Merit of the Proposed Activity.

The goal of the proposed workshop is to provide opportunities for leading U.S. analytical and related scientists to present an overview of their ongoing research to scientists from universities in Thailand, with the objective of facilitating collaborations. Thai scientists will also be invited to present their work.

The focus of the workshop will be the analytical sciences broadly, but with an emphasis on bioanalytical chemistry and techniques for the investigation of biochemical processes.

Professor Kate Grudpan, Chiang Mai University, will be co-organizer for the workshop. Other key collaborators for the organization and support of the workshop include Professor Vichai Reutrakul, Mahidol University, Director of the Postgraduate Education and Research Program in Chemistry (PERCH), and Professor Pavich Tongroach, Secretary General of the Commission on Higher Education (CHE). There will be ten to twenty invited scientists from Thailand and nine from the U.S.

Success of the workshop will result in international collaborations that will advance knowledge and understanding of specific analytical methodologies, and through an interdisciplinary approach, of challenging biochemical processes, particularly in the neurosciences. The latter is a focus for research initiatives in Thailand.

2. Broader Impact of the Proposed Activity.

The broader impact of the workshop will include the participation of undergraduate and graduate students in international collaborative research. It is anticipated that underrepresented undergraduate students will participate in exchange programs in Thailand.

The majority of students and faculty in Thailand research universities are women, and they will serve as role models for U.S. students and faculty. U.S. faculty participants will include women, younger faculty, an African American, and others from across geographical regions of the U.S.

Collaborative partnerships should result from the workshop. The results of the workshop will be disseminated broadly through publication and national meeting presentation to make the chemical community aware of collaboration opportunities in Thailand. Benefits to society will include exposure of students and faculty to different cultures.

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For font size and page formatting specifications, see GPG section II.C.

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Table of Contents	1	_____
Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	9	_____
References Cited	1	_____
Biographical Sketches (Not to exceed 2 pages each)	22	_____
Budget (Plus up to 3 pages of budget justification)	4	_____
Current and Pending Support	1	_____
Facilities, Equipment and Other Resources	0	_____
Special Information/Supplementary Documentation	12	_____
Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
Appendix Items:		

*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

2. Project Description

The proposed workshop will bring together U.S. and Thai scientists of similar interests with the goal of catalyzing collaborations.

2a. Overview/Background. The Thai government in recent years has invested in and promoted the growth and advancement of research at universities through programs such as the Thailand Research Fund (TRF), for example, TRF Senior Research Scholar Grants, TRF Research Grants, Young Generation Research Grants, the Royal Golden Jubilee Ph. D. Program, and the Postgraduate Education and Research Program in Chemistry (PERCH). The Thailand Research Fund is a State research funding agency. In 1996, TRF, in cooperation with the former Ministry of University Affairs (presently the Commission on Higher Education) and the National Science and Technology Development Agency, initiated a Ph.D. support program to help alleviate a shortage of needed faculty for newly established universities, called the Royal Golden Jubilee Ph.D. Program. The grants provide support for students to gain 6-12 months international research experience. Students are required to produce international publications before graduation.

PERCH is part of the Higher Education Development Project, with financial support by way of a loan from the Asian Development Bank and the government counterpart fund. PERCH is a consortium of five major universities in Thailand (Mahidol, Khon Kaen, Prince of Songkla, Chiang Mai, and Kasetsart Universities), with members selected on the basis of their strength, complementarity, and strategic locations. Priority areas of support are analytical chemistry, inorganic chemistry, chemical physics, physical chemistry, and organic chemistry. The objectives of the consortium are to produce high quality M.Sc. and Ph.D. graduates, to carry out cutting edge research in the disciplines.

Similarly, other programs, the "Collaborative Ph.D. Program" and Post-graduate Education Development Program", have been supported by CHE. As a result of these investments, the infrastructure and opportunities for research in Thailand have increased significantly. These programs have promoted exchanges between faculty and students at universities around the world. The P.I. and his colleagues at the University of Washington have benefited from the programs by exchange visits of faculty, postdoctoral investigators, and students between the University of Washington and Chiang Mai University. Professors Kate Grudpan and Mongkon Ryanakorn (Currently Dean of the Faculty of Science), Dr. Jaroon Jakmunee, and Dr. Rattikan Khantiwan from Chiang Mai University have visited our department to learn about ongoing research, and have arranged for four students to spend extended times in our department to perform joint research as part of their dissertation research. The students were supported by scholarships and funding from the TRF, the RGJ Ph.D. Program, and PERCH. Professor Grudpan received the Thailand Outstanding in Chemical and Pharmaceutical Sciences award in 1999, and was named Thailand Outstanding Scientist of the Year in 2001 and Outstanding Person in Science and Technology in 2004. His collaborations with our faculty have helped establish his successful research program, and so these have been

mutually beneficial. Support under a TRF Senior Research Scholar Grant has been very effective.

Our faculty have served as co-advisors for the students' dissertation research. Professors Christian, Ruzicka, Synovec, and Turecek have visited Chiang Mai University to present invited lectures on their research, funded by the Thai agencies, and have collaborated extensively on research and served on thesis examination committees. Postdoctoral fellow, Dr. Bryan Prazen, had extended visits to Chiang Mai University for collaborative research.

These collaborations have been very beneficial to the University of Washington faculty and students. The Thai students, selected competitively for the scholarships, have been excellent, and several joint publications have resulted from their research (1-8), as well as others with collaborating Chiang Mai University faculty (9-12). At the same time, the Thai scientists have benefited from introduction of state-of-the-art analytical research and technologies into their laboratories.

We propose to build on these successes to provide opportunities for other U.S. scientists to collaborate with Thai scientists, and facilitate student exchange and perhaps applications of qualified Thai students to U.S. universities for graduate study. Because of the geographical distance of Thailand from the U.S., scientific advances and opportunities in the country have perhaps not received the attention of the American chemical community, in particular in the analytical sciences, that they deserve. Hence, the proposed workshop is timely and should facilitate the development of cooperative activities that will enable students, postdoctoral investigators, and faculty to gain access to the expertise, talent, facilities, and unique environment in Thailand. Thailand has recently very much raised its intention to build up research group capabilities in various prominent research area such as through TRF Senior Research Grants.

2b. Research Initiatives in Thailand. Thailand has made good progress in the support of graduate research in the sciences, and in particular in the chemical sciences through the Postgraduate Education and Research Program in Chemistry (PERCH). It is expected that will continue, and PERCH should be a source of support for new collaborations catalyzed by the proposed workshop, as well as the Thailand Research Fund (TRF) through various schemes such as TRF Senior Research Scholar Grants, Young Generation Research Grants, and the RGJ PhD program .

Looking ahead more broadly, the Commission on Higher Education created a group of eminent scientists in Thailand to map out a strategic plan for the training of scientists in focused areas of emerging science. Professor Grudpan is a member of that panel. Some areas of focus identified in which to create future excellence in Thailand include nanoscience, neuroscience, and bioinformatics. A funding program has been created to provide scholarship support, on a competitive basis, for initially at least eighty students a

year to pursue Ph. D. studies in these three general areas at overseas universities, including in the U.S. Scholarship support will be for 4 or 5 years to cover living expenses and tuition costs as necessary. They are in the final stages of selecting the first class of 80 students, narrowed first from over 500 applicants to 120, based on performance on a general exam. The final 80 will be selected following individual interviews. Selections will be based on academic achievement, recommendations, foreign language competence, appearance, and performance in the interview.

The goal will be to train these students at leading universities and programs around the world, with the idea of their returning to Thai universities, perhaps as interdisciplinary teams, to establish programs and create a base for Thai leadership in these areas. There will be joint mentors from Thailand with the overseas mentors, for close collaboration to help assure success in creating the proper infrastructure in Thailand for success by the young scientists. Obviously, if these scholarship students are admitted to U.S. universities for graduate study, they will represent a potentially outstanding source of graduate students, which will benefit the research programs of faculty members.

While the present workshop is focused on the analytical sciences, several of the proposed U.S. participants are conducting research very relevant to the focus areas identified by the Commission on Higher Education. As a consequence, the Commission is very interested, along with the Thailand Research Fund and PERCH, in supporting the workshop.

The P.I. met, in May, 2004, with Professor Vichai Reutrakul, Director of PERCH, who suggested the workshop in chemical sciences, hence the focus on the analytical and related sciences. Professor Reutrakul provided input on potential U.S. participants. In addition, the P.I. met in Bangkok in February, 2005 with the Secretary General of the Commission on Higher Education (CHE), Professor Pavich Tongroach, and the members of the panel, chaired by Professor Wanchai De-Eknamkul, a biochemist. They all expressed enthusiasm for the workshop after seeing the list of proposed participants from the U.S. Professor Grudpan has spoken with Professor Vudhipong Techadamrongsin, Deputy Director of the TRF, and the TRF has agreed also to be a co-host. Professors Reutrakul, Techadamrongsin, and De-Eknamkul will work with Professor Grudpan to select potential Thai scientist participants for the workshop. Professors Reutrakul and Tongroach, and perhaps other members of the panel, will participate in the workshop.

2c. Justification for Holding the Workshop with the Thai Scientists. The P.I. has close contacts with analytical scientists and other chemists at several Thai Universities, including Mahidol University, Chulalongkorn University, Chiang Mai University, and others. These scientists have expressed interest in establishing collaborations with other U.S. scientists, and the funding agencies have offered to support a workshop to facilitate potential collaborations. The P.I. has contacted a number of leading U.S. analytical scientists, and they, without exception, expressed enthusiasm for such a workshop.

2d. Funding in Thailand. As indicated above, the TRF, PERCH and the Commission on Higher Education are very interested in supporting the proposed

workshop, and their joint participation will leverage each other's funds and foster an interdisciplinary approach to collaborations. They have agreed to share funding expenses within Thailand for the workshop: CHE 35%, TRF 35%, PERCH 30%. This will include local travel, lodging, and workshop expenses. They will work with interested participants to arrange post workshop visits to Thai universities.

2e. Foreign Co-Organizer. Professor Kate Grudpan from Chiang Mai University has offered to be co-organizer for the workshop. He will be assisted in arrangements by Chiang Mai University. He will organize funding for support within Thailand. He will arrange lodging and transportation in Thailand, and arrange the venue for the workshop. He will work directly with Thai scientists to select participants. He will work with the scientists to arrange potential visits of the U.S. scientists to their universities following the workshop. These visits will be funded by the Thai agencies and/or universities. The P.I. will work with the U.S. scientists to facilitate possible and appropriate follow-up visits.

2f. Planning Outline. The challenge will be to arrange a time when all the scientists are free to travel, with minimal interruption of teaching duties. Discussions with potential participants and Thai colleagues suggest the following timeline:

January 2nd, fly to Thailand, arrive in Bangkok on January 4th. Most U.S. carriers arrive in Bangkok shortly before midnight.

Overnight in Bangkok.

January 5th, fly to Chiang Mai, the proposed venue site.

January 6th-January 9th – workshop

January 10th, follow-up visits to Thai universities, or return to Bangkok for return home. Most will probably have to overnight in Bangkok for morning flights home.

Papers to be prepared for the workshop will be brief C.V.s and research interests of each participant (U.S. and Thai participants), an abstract of their presentations, and a detailed agenda for presenters. It is anticipated that three days will be required for presentations, and one day for discussions, more informally, as well as additional time for presentations as needed.

2g. Dissemination Plan/Opportunities for Future Cooperative Activities. It is anticipated that following the workshop and subsequent discussions and visits to Thai universities that appropriate collaborations will be initiated. This may take the form of formal or informal exchanges between the universities, with funding arrangements to be made independently. For example, the Thai funding agencies will support travel of students and faculty to the U.S. for study or research. Tuition requirements or waivers will be arranged as needed. Also, participants will be encouraged to prepare proposals for joint research, including applying for disciplinary programs across NSF for support of

resulting collaborative research, international research fellowships, and East Asia summer institutes for U.S. graduate students. These, of course, will need to be initiated by the scientists as they see appropriate.

The P.I. plans to prepare a publication to report on the workshop and its outcome, perhaps for an A-page article for *Analytical Chemistry*, which will make other analytical scientists aware of opportunities for cooperation in Thailand. A presentation is also planned for a national ACS meeting or Pittcon. Professor Grudpan will prepare a publication in a Thailand journal/magazine to report on the workshop too.

2h. Agenda Details. The site for the workshop proposed by Professor Grudpan is Chiang Mai. It will be held either at a local hotel or at Chiang Mai University facilities. Participants will be together at the venue for the duration of the workshop, and group activities can be arranged for the evenings.

The proposed dates for the workshop are January 6th through January 9th. The first three days will be for introduction of and formal presentations by the participants. Probably one hour will be scheduled for the U. S. speakers and 30-45 minutes for the Thai speakers, since a main goal will be to inform the Thai scientists of research that may interest them. Follow-up visits to the Thai universities will allow the U.S. scientists to learn more details about their counterparts' research and facilities, and to meet students and other collaborators. The P.I. and Professor Grudpan will try to make follow-up arrangements in advance of the workshop so participants can plan their schedules. Other arrangements may be made while at the workshop. The fourth day will be for additional presentations as needed (depending on number of Thai participants), and for more detailed informal discussions, in working groups, that will help in forging new alliances. Also, follow up visits may be arranged.

2i. Prospective U. S. Participants. The following faculty have expertise and interests that represent a cross-section of leading analytical science research, with an emphasis on the development and use of novel analytical tools to study and model biological processes, including the implementation of nanotechnology for problem solving. Nine scientists besides the P.I. have been invited. Each has agreed to participate in the workshop.

Eric Bakker, Aumni Professor, Auburn University. Professor Bakker is a leader in the modeling and development of novel potentiometric and optically-based chemical sensors. He has revolutionized the understanding and performance of potentiometric sensors, both with respect to selectivity and sensitivity. He will move to Purdue University this summer as Professor.

Purnendu Dasgupta, Professor, Texas Tech University. Professor Dasgupta's research encompasses a broad range of modern analytical chemistry, with emphasis on ultratrace atmospheric analysis (gases and chemical composition of particles), membrane, film and drop-based devices, and capillary-based separations. He is a pioneer in ion

chromatography developments. He develops inexpensive and simple to use devices for chemical measurements, particularly in the field. This will be of particular interest to the Thai scientists since they try to emphasize cost-effective means for measurements. Professor Dasgupta is developing a fieldable arsenic analyzer on a CHE grant and Thailand is one of the countries where arsenic has been a problem.

Robert Kennedy, Professor, University of Michigan. Professor Kennedy's primary goal is to develop nanoscale analytical techniques and explore their use in the measurement of neurotransmitters and hormones, both *in vivo* and at single cells. This goal requires development of techniques capable of measuring zeptomole (10^{-21} mole) quantities in chemically complex nanoliter samples.

For *in vivo* measurements, he is coupling capillary zone electrophoresis (CZE) and capillary liquid chromatography (LC) with *in vivo* sampling methods. In the area of single cell analysis, he has focused on development of microensors and confocal fluorescence microscopy for measurement of insulin secreted from cells with millisecond resolution. He is also pursuing analytical methods that allow simultaneous detection of intracellular messengers such as Zn^{2+} , Ca^{2+} , oxygen, and glucose at the same cells. The combination of these methods will provide a complete chemical picture of the cell as it functions. In addition, he is developing techniques based on capillary electrophoresis, fluorescence detection, and mass spectrometry to detect and monitor intracellular signal transduction.

All of these techniques involve development of novel analytical chemistry as well as instrumentation. Recently, a significant effort has been made in developing microfabricated instruments for micro-total analytical systems (μ TAS) to perform the analyses described above. In addition to the fundamental analytical work, application of these methods to studies of brain and endocrine function as well as diseases such as diabetes and Alzheimer's are underway in various collaborations.

Jeanne Pemberton, Professor, University of Arizona. Professor Pemberton studies chemistry at interfaces using a wide array of surface and interfacial spectroscopies and microscopies. Of particular interest for the focus of the proposed workshop are her studies of interfaces important in the environment. Specifically, she has been investigating the surface and interfacial behavior of a series of biosurfactants produced in soil by bacteria. These biosurfactants are known to strongly complex toxic heavy metals, potentially making them mobile in groundwater. Since these biosurfactants were discovered only recently, Professor Pemberton's group has been characterizing the metal complexation behavior of these species and the fundamental surface interactions of these biosurfactants and their metal complexes using an array of techniques including the vibrational spectroscopies, mass spectrometry, surface analysis tools and scanning probe microscopies. This work fits into the broader efforts in Professor Pemberton's laboratories that seek to develop methods for characterizing the molecular structure of solid-liquid interfaces and apply them to important electrochemical, separations, and environmental systems.

Jonathan Sweedler, Professor, University of Illinois. Professor Sweedler is Director of the Biotechnology Center at the University of Illinois, and is associated with the Beckman Institute, Neuroscience Program, and Bioengineering Program. His research interests are in bioanalytical chemistry, and focus on developing new methods for nanoliter volume samples, and applying the methods to study the distribution and dynamic release of neurotransmitters and neuropeptides from individual neurons. He is a pioneer in the development of micro-NMR systems.

Sheryl Tucker, Associate Professor, University of Missouri-Columbia. Professor Tucker's research focus is the characterization of novel macromolecular media for chemical analysis using molecular spectroscopy. Her interests range from nanomaterials to biological systems. Currently, she has projects and collaborations ongoing in the following areas: characterization and application of dendrimers in chemical separations; probing supramolecular, self-assembling pyrogallol nanocapsules via fluorescent reporter molecules; design and characterization of a new generation of space lubricants; characterization and application of hyperbranched and dendritic polymers, as dopant carriers in chemo/biosensors; use of selective fluorescence quenching agents to improve detection and identification of environmental pollutants, polycyclic aromatic hydrocarbons; use of fluorescent probe techniques to ascertain the conformational changes, during the transport cycle of the N and P domains of the Na,K pump; and spectroscopic determination and quantification of photodynamic therapy agents, such as Photofrin®, following periocular subcutaneous injection into the squamous cell carcinoma tumor bed.

Joseph Wang, Professor, Arizona State University. Professor Wang is Director of the Center for Bioelectronics and Biosensors at Arizona State University. The research interests of Dr. Wang include the development of microfluidic ("Lab-on-Chip") biochip devices, nanomaterials-based sensors, enzyme electrodes, DNA and proteins recognition and diagnostics, bioelectronics, nanobiotechnology, electrochemical sensing devices for environmental, security, and clinical monitoring, design of nanostructures, microfabrication and miniaturization, counterterrorism-detection, the development of new interfaces, sensor/recognition coatings, and remote sensing.

Isiah Warner, Professor, Louisiana State University. Professor Warner's research involves fundamental studies in analytical chemistry as well as the development and application of new methods (chemical, instrumental and mathematical) for analytical measurements. The overall goal of these studies is to provide improved methodology for the analyses of complex systems.

Several current ongoing research projects involve varying degrees of chemical, instrumental, and data reduction strategies for the analyses of complex systems. Selected examples of these projects include:

- development of chiral separation procedures using novel chiral polymers;
- development of novel analytical schemes for environmental measurements;
- characterization of human atherosclerotic plaque; and

- studies of the influence of guest/host chemistry, e.g., organized media, on chemical systems of analytical interests.

A number of projects are in the general area of organized media. One type of organized media utilized in separation studies are polymeric surfactants, in particular, cyclodextrins. These have allowed baseline separation of all 16 PAHs on the EPA priority pollution list.

John Wright, Professor, University of Wisconsin. Dr. Wright has pioneered the development of a new family of highly selective analytical spectroscopies that use nonlinear optical processes to provide unique capabilities for measuring the intra- and intermolecular interactions in chemical systems. In particular, he has created laser techniques where multiple coherent beams excite different molecular resonances. The excitation of a particular resonance perturbs all the molecular resonances that are coupled to it by intra- or intermolecular interactions. This coupling gives rise to cross-peaks between resonances that form the basis for multidimensional vibrational and electronic spectra.

The methods have a close relationship to multidimensional NMR methods. Instead of generating higher order spin coherences by carefully controlled $p/2$ and p pulses, higher order vibrational and optical coherences are generated by intense, ultrafast laser excitation. The coherences radiate new beams in directions and frequencies that are fingerprints of all the different possible $p/2$ and p pulses. One spatially and spectrally selects the particular coherence sequence of interest.

His group's mission is to both continue developing this exciting new family of spectroscopies and applying the methods to chemical measurement and coherent control of hydrogen bonding, electron transfer dynamics, chemical analysis, surface spectroscopy, protein-protein, protein-DNA, and DNA-DNA interactions, and environmentally important problems. It is expected that coherent multidimensional nonlinear methods will take their place beside multidimensional NMR as one of our most powerful structural tools for studying chemical and biochemical systems.

2j. Prospective Thai Participants. A total of ten to twenty scientists from Thai universities will be invited to attend and participate in the workshop. Professor Grudpan is working with Professors Reutrakul, Techadamrongsin, and De-Eknamkul and other members of the panel to select the participants. Selection will be based on expressed interest in the research of the proposed U.S. participants, complementary expertise, and possible collaboration with them, the research record of the faculty member, English proficiency, the research infrastructure and support at the university, geographical distribution in Thailand, and in addition to more broadly in the analytical sciences, possible relevance to one of the three focus areas described above. The selected participants will include junior faculty and women faculty.

2k. Broader Impacts Resulting from the Proposed Activities. By promoting international collaborations (which will include tenured junior, women and African American faculty from the US), the faculty, postdoctoral investigators, and graduate and

undergraduate students each will benefit scientifically and culturally. It is important in this global economy age that students become exposed to other cultures. The collaborations will be mutually beneficial for access to research infrastructure and study in the two countries, and will create long-term partnerships. Research results will be disseminated through publications in peer reviewed journals and presentations at local, national, and international meetings, by participants from both countries. A website on the workshop will be created by Professor Grudpan's team at Chiang Mai University and maintained on their server. He has previously created a website for the P.I. for an international conference.

The proposed structure of the workshop will broaden participation by underrepresented groups. The invited U.S. scientists include two women (Professors Pemberton and Tucker) and an African American (Professors Warner). Professor Dasgupta is of Indian descent. Professor Warner is nationally recognized for his training of underrepresented students, and as Chair of the Department of Chemistry at Louisiana State University created an environment that has resulted in the largest number of African American graduate students in any U.S. chemistry department (13-15). He has expressed interest in sending underrepresented undergraduate students to Thailand, and this should be a unique opportunity for them to be exposed to other cultures. The Universities of Arizona, Arizona State, and Texas Tech have Hispanic and American Indian student populations that are above the averages in the U.S.

Approximately 60 to 70 percent of science faculty members at Thailand research universities are women, many of them junior. Since they will be well represented at the workshop, they will serve as excellent role models for U.S. collaborating students and faculty.

REFERENCES CITED

- (1) Quigley WWC, Nabi A, Prazen BJ, Lenghor N, Grudpan K and Synovec RE. Dynamic surface tension analysis of dodecyl sulfate association complexes. *Talanta* 55, 551-60 (2001).
 - (2) Grudpan K, Ampan P, Udnan Y, Jayasvati S, Lapanantnoppakhun S, Jakmunee J, Christian GD and Ruzicka J. Stopped-flow injection simultaneous determination of phosphate and silicate using molybdenum blue. *Talanta* 58, 1319-26 (2002).
 - (3) Ampan P, Lapanantnoppakhun S, Sooksamiti P, Jakmunee J, Hartwell SK, Jayasvati S, Christian GD and Grudpan K. Determination of trace iron in beer using flow injection systems with in-valve column and bead injection. *Talanta* 58, 1327-34 (2002).
 - (4) Tanikkul S, Jakmunee J, Rayanakorn M, Grudpan K, Marquardt BJ, Gross GM, Prazen BJ, Burgess LW, Christian GD and Synovec RE. Characterization and use of a Raman liquid-core waveguide sensor using preconcentration principles. *Talanta* 59, 809-16 (2003).
 - (5) Lenghor N, Grudpan K, Jakmunee J, B. A. Staggemeier, W.W.C. Quigley, Bryan J. Prazen, Christian GD, Ruzicka J. and Synovec RE. Sequential injection analysis with dynamic surface tension detection: high throughput analysis of the interfacial properties of surface active samples. *Talanta*, 59, 1153 ? 63 (2003).
 - (6) Ampan, P, Ruzicka J, Atallah R, Christian G D, Jakmunee J and Grudpan K. Exploiting sequential injection analysis with bead injection and lab-on-valve for determination of lead using electrothermal atomic absorption spectrometry. *Anal. Chim. Acta*, 499, 167-72 ((2003).
 - (7) Udnan Y, Jakmunee J, Jayasavati S, Christian GD, Synovec RE, Grudpan K. Cost-effective flow injection spectrophotometric assay of iron content in pharmaceutical preparations using salicylate reagent. *Talanta*, 64, 1237-1240 (2004).
 - (8) Tanikkul S, Jakmunee J, Lapanantnoppakhun S, Rayanakorn M, Sooksamiti P, Synovec RE, Christian GD, Grudpan K. Flow injection in-valve-mini-column pretreatment combined with ion chromatography for cadmium, lead and zinc determination. *Talanta*, 64, 1241-1246 (2004).
 - (9) Grudpan K and Christian GD. Report on the Ninth International Conference on Flow Injection Analysis. *Lab. Robotics and Automation* 11, 169 ?74 (1999).
 - (10) Jitmanee K, Kradtap Hartwell S, Jakmunee J, Jayasvasti S, Ruzicka J and Grudpan K. A simple flow injection system with bead injection for trace iron determination. *Talanta* 57, 187-92 (2002).
 - (11) Hartwell S Kradtap, Grudpan K, Christian G D. Bead injection with a simple flow-injection system: an economical alternative for trace analysis. *Trends in Analytical Chemistry*, 23, 619-623 (2004).
 - (12) Hartwell S Kradtap, Srisawang B, Kongtawelert P, Christian GD and Grudpan K. Review on screening and analysis techniques for hemoglobin variants and thalassemia. *Talanta*, in press.
 - (13) Chemistry, Spotlight on ACS member: ?Isiah Warner: Analytical Chemist,? Spring 1999, p. 30
 - (14) C&ENews, Perspective: ?What is Louisiana State Doing Right?? December 10, 2001.
 - (15) C&ENews, Special Report, November 25, 2002, p. 65.
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Gary D. Christian

(a) Professional Preparation

University of Oregon, Chemistry, B.S., 1959

University of Maryland, Analytical Chemistry, M.S., 1961

University of Maryland, Analytical Chemistry, Ph.D., 1964

(b) Appointments

University of Washington, Professor of Chemistry, 1972-present

Acting Chairman, 1990?

Associate Chair for Undergraduate Education, 1991?-1993

Divisional Dean of Sciences, 1993-2001

University of Kentucky, Assistant Professor of Chemistry, 1966-1971?

Associate Professor of Chemistry, 1971?-1972

Walter Reed Army Institute of Research, Research Analytical Chemist, 1961-1966

(b) Publications (meeting organizations and collaborations)

1. International Meeting Examines Analytical Curricula, G. D. Christian, *Anal. Chem.*, **74** (7) 219A-221A (2002).
2. Flow Analysis and Its Role and Importance in the Analytical Sciences, G. D. Christian, *Anal. Chim. Acta* (Special Issue on Flow Analysis IX), **499**, 5-8 (2003).
3. Report on the Ninth International Conference on Flow Injection Analysis, K. Grudpan and G. D. Christian, *Lab. Robotics and Automation* **11**, 169-74 (2003).
4. Pioneers Host Success High in the Andes. Report on 12th International Conference on Flow Injection Analysis (ICFIA 2003), Merida, Venezuela, 7-13 December 2003, G. D. Christian, *Trends Anal. Chem. (TrAC)*, **23**(2), xiv-xvi (2004).
5. Exploiting Sequential Injection Analysis with Bead Injection and Lab-on-Valve for Determination of Lead using Electrothermal Atomic Absorption Spectrometry, P. Ampan, J. Ruzicka, R. Atallah, G. D. Christian, J. Jakmunee, and K. Grudpan, *Anal. Chim. Acta*, **499**, 167-72 (2003).
6. Cost-Effective Flow Injection Spectrophotometric Assay of Iron Content in Pharmaceutical Preparations using Salicylate Reagent, Y. Udnan, J. Jakmunee, S. Jayasavati, G. D. Christian, R. S. Synovec, and K. Grudpan, *Talanta* (Special Issue on ICFIA 12), *in press*.
7. Flow Injection In-Valve-Minicolumn Pretreatment Combined with Ion Chromatography for Cadmium, Lead and Zinc Determination, S. Tanikkul, J. Jakmunee, S. Lapanantnoppakhun, M. Rayanakorn, P. Sooksamiti, R. E. Synovec, G. D. Christian, K. Grudpan, *Talanta*, **64**, 1241-1246 (2004).
8. Review on Screening and Analysis Techniques for Hemoglobin Variants and Thalassemia, S. Hartwell Kradtap, B. Srisawang, P. Kongtawelert, G. D. Christian, and K. Grudpan, *Talanta*, *in press*.
9. Bead Injection with Simple Flow Injection System, an Economical Alternative for Trace Analysis, S. Kradtap Hartwell, G. D. Christian, and K. Grudpan, *Trends in Anal. Chem. (TrAC)*, *in press*.
10. Reagents for Lithium Electrodes and Sensors for Blood Serum Analysis, G. D. Christian, *Sensors* (Special Issue on Ion Sensors), **2** (10), 432-435 (2002).

(c.) Synergistic Activities

The P.I. has been involved in teaching, research, and professional activities over his career. He has over 300 publications in peer reviewed journals, is the author of textbooks on analytical chemistry and instrumental analysis, and is Editor-in-Chief of the journal, *Talanta*. He has chaired the Subcommittee on Analytical Chemistry of the ACS Examination Committee, was a member of the Committee of Examiners for the Chemistry Test of the Graduate Record Examination, and a member of the Scientific Board for the 1992 International Chemistry Olympiad. He served as a member of the Bionalytical Biometallic Study Section of NIH. He is Past Chairman of the ACS Division of Analytical Chemistry.

(d.) Collaborators and Other Affiliations

- Collaborators and Co-Editors:

NATO Science for Peace grant with Professors Yuri Zolotov and Elena Morosonova, Moscow State University, Dr. Victor Andreev, St. Petersburg Russian Academy of Sciences, and Professor Jean-Michel Kauffmann, University Libre de Bruxelles

Research collaborations with Professor Kate Grudpan, Chiang Mai University

The P.I. is Co-Editor-in-Chief with Professor J.-M. Kauffmann of the journal, *Talanta*

- Graduate Advisor:

William C. Purdy, retired from McGill University

- Thesis Advisor and Postgraduate-Scholar Sponsor: Over 50 M.S., Ph.D., and Postdoctoral students. Those currently in academic positions:

1. Ming-Ren Fuh, Soochow University, Taipei, Taiwan
2. Victor Gadzekpo, University of Cape Coast, Ghana
3. Hassan Swaidan, King Faisal University, Saudia Arabia
4. Chu-Ngi Ho, East Tennessee State University, Johnson City, TN
5. Linda McGown, Rensselaer Polytechnic Institute, Troy, NY
6. Abduhrahman Attiyat, Yarmouk University, Jordan
7. Isiah Warner, Louisiana State University, Baton Rouge, LA

Biographical Sketch — Eric Bakker

Professional Preparation

Swiss Federal Institute of Technology, Zurich	Chemistry	Dipl. Chem. 1989
Swiss Federal Institute of Technology, Zurich	Analytical Chemistry	Ph.D. 1993
University of Michigan	Analytical Chemistry	1993-1995

Appointments

August 2003 to present	Alumni Professor, Auburn University
August 2001 to July 2003	Alumni Associate Professor, Auburn University
July 2000 to November 2000	Visiting Associate Professor (sabbatical leave), Swiss Federal Institute of Technology, Zurich
September 1998 to August 2001	Associate Professor of Chemistry, Auburn University
September 1995 to August 1998	Assistant Professor of Chemistry, Auburn University

Selected Publications

- S. Makarychev-Mikhailov, A. Shvarev, E. Bakker, "Pulstrodes: Triple Pulse Control of Potentiometric Sensors" *J. Am. Chem. Soc.*, **2004**, *126*, 10548-10549.
- Y. Qin, E. Bakker, "Elimination of Dimer Formation in In(III) Porphyrin-Based Anion-Selective Membranes by Covalent Attachment of the Ionophore" *Anal. Chem.*, **2004**, *76*, 4379-4386.
- A. Shvarev, E. Bakker, "Reversible Electrochemical Detection of Non-Electroactive Polyions" *J. Am. Chem. Soc.*, **2003**, *125*, 11192-11193.
- A. Shvarev, E. Bakker, "Pulsed Galvanostatic Control of Ionophore-Based Polymeric Ion Sensors" *Anal. Chem.*, **2003**, *75*, 4541-4550.
- A. Ceresa, Y. Qin, S. Peper, E. Bakker, "Mechanistic Insights into the Development of Highly Selective Optical Chloride Sensors Based on the [9]Mercuracarborand-3 Ionophore" *Anal. Chem.*, **2003**, *75*, 133-140.
- Y. Qin, S. Peper, A. Radu, A. Ceresa, E. Bakker, "Plasticizer-Free Polymer Containing a Covalently Immobilized Ca²⁺-Selective Ionophore for Potentiometric and Optical Sensors" *Anal. Chem.*, **2003**, *75*, 3038-3045.
- A. Ceresa, A. Radu, S. Peper, E. Bakker, E. Pretsch, "Rational Design of Potentiometric Trace Level Ion Sensors. A Ag⁺-Selective Electrode with a 100 ppt Detection Limit" *Anal. Chem.*, **2002**, *74*, 4027-4036.
- Y. Qin, S. Peper, E. Bakker, "Plasticizer-Free Polymer Membrane Ion-Selective Electrodes Containing a Methacrylic Copolymer Matrix" *Electroanalysis*, **2002**, *14*, 1375-1382.

I. Tsagkatakis, S. Peper, R. Retter, M. Bell, E. Bakker, "Monodisperse Plasticized Poly(Vinyl Chloride) Fluorescent Microspheres for Ionophore-Based Sensing and Extraction" *Anal. Chem.*, **2001**, *73*, 6083-6087.

A. Ceresa, E. Bakker, B. Hattendorf, D. Günther, E. Pretsch "Potentiometric Polymer Membrane Electrodes for Lead Measurement of Environmental Samples at Trace Levels: New Requirements for Selectivities and Measuring Protocols, and Comparison with ICP-MS" *Anal. Chem.*, **2001**, *73*, 343-351.

Collaborators & Other Affiliations

Collaborators. Erno Pretsch (ETH Zurich), Philippe Buhlmann (University of Minnesota), David Walt (Tufts University), Roland De Marco (Curtin University, Australia), Mohammed N. Abbas (Cairo, Egypt), Zbigniew Brzozka (Warsaw, Poland).

Graduate and Postdoctoral Advisors. Wilhelm Simon (ETH Zurich), Mark Meyerhoff (University of Michigan), Raoul Kopelman (University of Michigan).

Thesis Advisor and Postgraduate-Scholar Sponsor. Yanming Mi (postdoc at University of Florida), Smita Jadhav (postdoc at University of Massachusetts), Ioannis Tsagkatakis (lecturer at University of Crete), Sally Mathison (postdoc at Louisiana State University), Shane Peper (postdoc at Los Alamos National Lab), Yu Qin (faculty position at Renmin University, Beijing), Alexey Shvarev (faculty position at Oregon State University). Current Ph.D. students: Robert Long, Aleksandar Radu, Chao Xu, Vishnupryia Bhakthavatsalam, Nastassia Rubinava, Nan Ye, Yida Xu, Kebede Gemene. Current postdocs: Sergey Makarychev-Mikhailov (from St. Petersburg University, Russian Federation), Katarzyna Wygladacz (from Technical University Warsaw, Poland).

Purnendu K. Dasgupta Biosketch, March, 2004

EDUCATION

- 1977 Louisiana State University, Baton Rouge, Ph.D. in Analytical Chemistry with minors in Inorganic Chemistry and Electrical Engineering.
1976 Bell and Howell Diploma in Advanced Electronics, DeVry Institute of Technology, Chicago, IL.
1970 University of Burdwan, WB, India, M.Sc. in Inorganic Chemistry.
1968 University of Burdwan, WB, India, B.Sc. with Honors in Chemistry.

EXPERIENCE

- 1992- Paul Whitfield Horn Professor, Department of Chemistry, Texas Tech University (TTU)
1988-1991, 1985-1988, 1981-1985 Professor, Associate Professor, Assistant Professor, TTU
1979-1981 Assistant Research Chemist, adjunct Assistant Professor, California Primate Research Center and Department of Civil and Environmental Engineering, U of California, Davis.

HONORS AND AWARDS

National Science Talent Search Scholar, Government of India, 1965-1968; Atomic Energy Commission of India Graduate Fellow in Chemistry, 1969-1970; Government of India Doctoral Research Fellow, 1972; Frank R. Blood Award for best annual publication, Society of Toxicology and Pharmacology, 1981; Institute Medal, Institute of Industrial Sciences, University of Tokyo, 1987; P. A. Traylor Creativity Award, Analytical Sciences, Dow Chemical Company, Midland, MI, 1989, Barney E. Rushing, Jr. 1990 Faculty Distinguished Research Award, Texas Tech University Dads and Moms Association, 1991; A. A. Benedetti-Pichler Memorial Award for contributions to Microchemistry, American Microchemical Society, 1998; William J. Probst Lecturer, Southern Illinois University, 2001, Royal Australian Institute of Chemistry National Lecturer in Analytical Chemistry, 2003

APPOINTMENTS

Chairman, Subcommittee on Sulfur Compounds, Intersociety Committee on Methods for Air Sampling and Analysis. 1986-; Consultant: Dow Chemical Company 1986-. Dionex Corporation 1987-. Shell Development Company 1988-. EG & G Chandler Engineering 1989. W. R. Grace & Co. 1990; Eastman Chemical, 1993, Eastman Kodak, 1994, Union Carbide Corp., 1994; Associate Editor, Atmospheric Environment, 1990-; Editorial Advisory Board Member, Talanta, 1990-; Editorial Board Member, Analytica Chimica Acta, 1994-; Journal of Process Control and Quality, 1995-; Journal of Microcolumn Separations, 1996-; Analytical Chemistry A-Pages, 1997-2000. Editor, Analytica Chimica Acta, 2004-

PUBLICATIONS

Over 270 publications in primary journals and 110 abstracts, 15 US Patents.

RESEARCH INTERESTS

Sensors for atmospheric chemistry and process analytical chemistry. Measurement of trace atmospheric and waterborne species, atmospheric chemistry, environmental toxicology, automated intelligent analyzers, microscale analytical systems, automated process analysis in the chemical industry, novel approaches to ionic chromatography and electrophoresis, thin film specific chemical sensors, affordable instrumentation for chemical analysis in the developing world.

Five Selected Relevant Publications

A Continuous Analyzer for Soluble Anionic Constituents and Ammonium in Atmospheric Particulate Matter, Al-Horr, R.; Samanta, G.; Dasgupta, P. K. *Environ. Sci. Technol.* **2003**, *37*, 5711-5720..

A Membrane Based Parallel Plate Denuder for the Collection and Removal of Soluble Atmospheric Gases; M. Takeuchi, J. Li, K. J. Morris and P. K. Dasgupta. *Anal. Chem.* **2004**, *76*, 1204-1210.

Vertically Stratified Flows in Microchannels. Computational Simulations and Applications to Solvent Extraction and Ion Exchange. Kuban, P.; Berg, J.; Dasgupta, P. K. *Anal. Chem.* **2003**, *75*, 3549-3556.

An Energy-Efficient Self-Regulating Heater for Flow-Through Applications. Dasgupta, P. K. Loree, E. L.; Li, J.; Genfa, Z. *Anal. Chem.* **2003**, *75*, 3924-3928.

A Compact Field Portable Capillary Ion Chromatograph. Boring, C. B.; Dasgupta, P. K.; Sjögren, A., *J. Chromatogr.* **1998**, *804*, 45-54.

Five Significant Publications in Career: Synergistic Activities (Development of Research Tools).

Determination of Atmospheric Sulfur Dioxide Without Tetrachloromercurate (II) and the Mechanism of the Schiff Reaction. P. K. Dasgupta, K. DeCesare and J. C. Ullrey, *Anal. Chem.* **52**, 1912-1922 (1980). *This is in use as the reference method of SO₂ measurement in a number of countries.*

Continuous Liquid-Phase Fluorometry Coupled to a Diffusion Scrubber for the Determination of Atmospheric Formaldehyde, Hydrogen Peroxide and Sulfur Dioxide. P. K. Dasgupta, S. Dong, H. Hwang, H.-C. Yang and Z. Genfa, *Atmos. Environ.* **22**, 949-963 (1988). *This was the first practical demonstration of a membrane based gas collector for sub-ppb level gas analysis. Many research groups have since embraced the concept worldwide and commercial instruments have appeared.*

Electrodialytic eluent Production and Gradient Generation in Ion Chromatography. D. L. Strong, P. K. Dasgupta, K. Friedman and J. R. Stillian, *Anal. Chem.* **63**, 480-486 (1991). *The electrodialytic eluent generation and suppression techniques developed at TTU is the basis of current commercial Ion Chromatography.*

Fluorescence Properties of Metal Complexes of 8-Hydroxyquinoline-5-Sulfonic Acid and Chromatographic Application. K. Soroka, R. S. Vithanage, D. A. Phillips, B. Walker and P. K. Dasgupta, *Anal. Chem.* **59**, 629-636 (1987). *This chemistry has since been used by diverse research groups using chromatography and electrophoresis for metal ion detection.*

Luminescence Detection with a Liquid Core Waveguide. P. K. Dasgupta, Z. Genfa, J. Li; C. B. Boring, S. Jambunathan and R. Al-Horr, *Anal. Chem.* **71**, 1400-1407 (1999). *Several new instruments have been built by different research groups using this principle. One commercial instrument has already appeared.*

Collaborators/Co-Editors, Past 48 Months, TTU collaborators not included

David Allen (UT at Austin), Matthew Fraser (Rice University), Donald Collins (TAMU), Susanne Hering (Aerosol Dynamics Corp.), B. Adams (Dow Chemical), S. Kar (Transgenomic Inc.), N. Poor, S. Campbell and C. Amalfitano (all from U. of South Florida), W. Winiwarter (Austrian Meteorological Res. Ctr.), J. Wang (New Mexico State U), K. Toda (Kumamoto U.), S. Motomizu (Okayama U.), A. Dasgupta (Calcutta U.), Neftel (Univ. Bern, Switzerland), K. Srinivasan and C. A. Pohl (Dionex Corp.), Z. Fang (Xiamen U., PRC), H. Tanaka (Tokushima U.), D. Toom-Saunty (Environment Canada), D. J. Eatough (BYU), W. Luke (NOAA), K. Grudpan (Japan), R. P. Baldwin (University of Louisville).

Graduate Students and Post Doctoral Fellows supervised in past 48 Months

Postdoctoral Fellows/Research Associates: N. Teshima (Aichi Inst. of Technol., Japan), G. Coimbatore (IIT Delhi, India), P. Kuban (Mendel U, Czech Rep), J. Li (Fudan U, PRC), G. Samanta (Jadavpur U, India), K. Surowiec (Marie Curie U., Poland), J. Jakmunee (Chiangmai U., Thailand), G. Zhang, T. Takayanagi (Okayama U., Japan), M. Takeuchi (Kanagawa U, Japan), Arnaldo Cardoso (U. Estadual Paulista, Brazil), H. Huiliang, R. Kuldvee (U. Estonia), X. L. Su, K. Shatrugnan (IRRL, India), Z. Yang, S. Zhang, H. Larson, C. Lundgren (both U. Umea, Sweden), M. Milani (UNESP, Brazil), H. Sakai (RTRI, Japan), S. Skiweraski (U. Warsaw, Poland, Career: Over 60 Post doctoral fellows supervised.

Graduate students: N. Amornthammarong (Thailand), K. Tinakorn (Thailand), A. Datta, A. Idowu, J. V. Dyke, R. Al-Horr, I.Y. Eom, K. D. Jo, Q. Li, SMR Ullah, K. Martinelango, T. S. Kephart, K. Tian, B. DeBorba, S. Galanis, S. Jambunathan Career: Over 35 students have graduated with Doctoral degrees and a few with Masters.

My doctoral and postdoctoral advisors are deceased.

Kate Grudpan Biographical Sketch

(a) Professional Preparation

Chiang Mai University, Thailand	Chemistry	B.S. 1974
Liverpool John Moores University , England (Scholarship by Liverpool Education Authority)	Chemistry	Ph.D. 1981
The British Council visit to UK Universities and industries		1980
Post doctorate training at the University of Karlsruhe and the Karlsruhe Research Center, Germany (19 th International Seminar program and DAAD fellowship)		1983-84, 1989, 1994
Fellow of the International Atomic Energy Agency (IAEA) for Analytical Chemistry at University of Ghent, Belgium		1987
Alexander von Humboldt Research Fellow at the Centre for Advanced Technological and Environmental Training, Karlsruhe Research Centre, Germany		1991-92
The Royal Society (UK) visiting research fellow at Liverpool John Moores University		1998

(b) Appointments

Associate Professor in Chemistry 1991-, (presently in a process for approval for full professor)
 Member, Committee on Higher Educational Strategic Scholarships for Frontier Research
 Network, 2004-
 Coordinator, Center of Excellence on Development of Miniaturization in Flow Based Analytical
 Sciences, Faculty of Science, Chiang Mai University, 2004 -
 Coordinator, Research Laboratory for Development of Analytical Instrumentation, 1995-
 Coordinator, the Nuclear and Radiochemistry and Environmental Analysis Research Group, 1985-2002
 Coordinator, Committee on Ph. D. Analytical Chemistry Program under collaboration with oversea
 universities (a support scheme of the Commission on Higher Education), 1997-
 Member, Coordinating Board, Postgraduate Education and Research Program in Chemistry
 (PERCH), 1999-
 Member, National Research Council of Thailand (Chemical and Pharmaceutical Sciences), 2002-

(c) Publications

Five publication related to the project (out of approx 80 publications)

1. Lenghor N, Grudpan K, Jakmunee J, B. A. Staggemeier, W.W.C. Quigley, Bryan J. Prazen ,
Christian G D, Ruzicka J. and Synovec R E (2003) Sequential Injection Analysis with Dynamic
Surface Tension Detection: High Throughput Analysis of the Interfacial Properties of Surface Active
Samples. *Talanta*, **59**, 1153 – 63.
2. Pattanapong A, Ruzicka J, Atallah R, Christian G D, Jakmunee J and Grudpan K (2003) Exploiting
Sequential Injection Analysis with Bead Injection and Lab-On-Valve for Determination of Lead Using
Electrothermal Atomic Absorption Spectrometry. *Anal. Chim. Acta*, **499** (1-2), 167-72.
3. Tanikkul S, Jakmunee J, Rayanakorn M, Grudpan K, Marquardt BJ, Gross GM, Prazen BJ, Burgess
LW, Christian G D and Synovec RE (2003) Characterization and use of a Raman liquid-core
waveguide sensor using preconcentration principles. *Talanta* **59**, 809-16.
4. Hartwell S Kradtap, Grudpan K, Christian G D, (2004) Bead injection with a simple flow-injection
system: an economical alternative for trace analysis. *Trends in Analytical Chemistry*, **23**(9), 619-623.
5. Tanikkul S, Jakmunee J, Lapanantnoppakhun S, Rayanakorn M, Sooksamiti P, Synovec RE,

Christian GD, Grudpan K (2004) Flow injection in-valve-mini-column pretreatment combined with ion chromatography for cadmium, lead and zinc determination. *Talanta*, **64**(5), 1241-1246.

Other selected publications

1. Grudpan K, (2004) Some recent developments on cost effective flow-based analysis, *Talanta*, **64**, 1084-90.
2. Hartwell S Kradtap, Srisawang B, Kongtawelert P, Jakmunee J and Grudpan K (2005) Sequential injection-ELISA based system for online determination of hyaluronan *Talanta*, in Press
3. Lenghor N, Staggemeier BA, Hamad ML, Yuthapong U, Tanikkul S, Jakmunee, J, Grudpan K, Prazen BJ and Synovec RE (2005) A dynamic liquid-liquid interfacial pressure detector for the rapid analysis of surfactants in a flowing organic liquid. *Talanta*, **65**(3), 722-729.
4. J. Jakmunee, L. Patimapornlert, S. Kradtap and K. Grudpan, (2005) Novel approach for mono-segmented flow micro-titration with sequential injection using lab-on-valve system: a model study on assay of acidity in fruit juices, *Analyst*, **130** (2005) 299-303.

(d) Synergistic Activities

1. Training Courses/Workshops: Course Director, IAEA (South Asian) Regional Training Course on "Nuclear and Related Techniques for Water Monitoring" at Department of Chemistry, Faculty of Science, Chiang Mai University (3-21 November 1997), The first course on its type, after having organized 5 national courses (under support of IAEA and/or DAAD) since 1987); Organizing committees and lectures for international courses including workshops on FIA at Monash University (Australia) (2-7 December 1990) and Universiti Pertanian Malaysia (14-16 December 1993); Watershed monitoring, May 1981. (MAB, UNEP, UNESCO); The management of water resources in tropical Region (AIDAB/Australia), June 1986.
2. International Journals: 2000-present Editorial Advisory Board, *Talanta*, (Elsevier), 1998-2000 Editorial Board, *Laboratory Robotics and Automation* (Wiley), 2003-2006 *Water Research* (Elsevier).
3. Consultancy to the Electrical Generating Authority of Thailand on the projects of on-line water monitoring system and other environmental analyses.
4. Initiated in 1993 a project for Chiang Mai University graduate students to perform research as parts of theses at overseas universities (Germany, England and Australia) under DAAD fellowships and the Ministry for University Affairs. 6 Ph. D. and 3 M. S. students have joined such a program. Extension has made for similar activities to cover more than 10 overseas universities for more than 20 students.
5. Awards: Thailand Outstanding in Chemical and Pharmaceutical Sciences award (1999), Thailand Outstanding Scientist of the Year (2001), The Japanese JAFIA Scientific award (2003) Outstanding Person in Science and Technology (2004), Thailand Research Fund (TRF) Senior Research Scholar.

(e) Collaborators & Other Affiliations

Collaborators and co-editors, (48 months), CMU not included: Duangjai Nakapreecha, Mahidol Univ.; Gary D. Christian, USA; Horst Geckeist, Germany; Ian McKelvie, Australia; Jaromir Ruzicka, USA; Paul Worsfold, UK; Pernendu Dasgupta, USA; Orawan Chailaopakul, Chulalongkorn Univ.; Rob Synovec, USA; Ron Becket, Australia; Tadao Sakai, Aichi Institute of Technology, Japan; Shoji Motomitsu, Okayama University, Japan, Supalax Srijaranai, Khon Kean.

Thesis Advisor and postgraduate-Scholar Sponsor: Total numbers of graduate students advised: 17 PhDs (12 completed); 80 MSs (75 completed). Some of the PhDs include: Polayuth Sooksamiti, Jaroon Jakmunee, Somchai Lapanantnoppakhun, Kritsana Jitmanee, Yuttapong Udnan, Sumalee Tanikul, Pattanapong Ampan, Siripat Suteerapatranon, Rattikan Chantiwas.

Total number of postdoctoral scholars advised 8: Dr. Duangjai Nacapricha, Dr. Rasamee Chaisuksan, Dr. Jaroon Jakmunee, Dr. Supaporn Kradtap, Dr. Arpinat Rujiwatra, Dr. Rattikan Chantiwas, Dr. Rodjana Burakhum, Dr. Kritsana Jitmanee

Biosketch for Robert T. Kennedy

Professional Preparation

University of Florida, Chemistry, B.S., 1984

University of North Carolina-Chapel Hill, Chemistry, Ph.D., 1988

University of North Carolina-Chapel Hill, Chemistry and Neurobiology, 1988-1991

Appointments

Hobart H. Willard Professor of Chemistry, University of Michigan (8/1/02 to present)

Professor of Pharmacology, University of Michigan (8/1/02 to present)

Professor of Chemistry, University of Florida (8/2/98 to 7/31/02)

Associate Professor of Chemistry, University of Florida (8/2/96 to 8/1/98)

Assistant Professor of Chemistry, University of Florida (8/2/91 to 8/1/96)

NSF Presidential Faculty Fellow (1996-1998)

Selected Publications

Whelan, R.J.; Sunahara, R.K.; Neubig, R.R.; Kennedy R.T. "Affinity Assays Using Fluorescence Anisotropy with Capillary Electrophoresis Separation", *Analytical Chemistry*, in press, (currently on the journal's website with November 17, 2004 release date).

Roper, M.G.; Shackman, J.; Dahlgren, G.; Kennedy R.T. "Microfabricated chip for chemical monitoring of live cells", *Analytical Chemistry*, **2003**, *75*, 4711-7.

Jameson, E.E.; Cunliffe, J.; Neubig, R.R.; Sunahara, R.; Kennedy, R.T. "Detection of G Proteins by Affinity Probe Capillary Electrophoresis Using a Fluorescently Labeled GTP Analogue", *Analytical Chemistry*, **2003**, *75*, 4297-4304.

German, I. and Kennedy, R.T. "Reversed-phase Capillary Liquid Chromatography Coupled On-line to Capillary Electrophoresis Immunoassays", *Analytical Chemistry*, **2000**, *72*, 5365-5372.

Schultz, N. M.; Kennedy, R. T., "Rapid Immunoassays using Capillary Electrophoresis with Fluorescence Detection", *Analytical Chemistry*, **1993**, *65*, 3161-3165.

Haskins, W.E.; Cellar, N.A.; Watson, C.J.; Powell, D.; Kennedy, R.T. "Discovery and screening of peptides in vivo by chemical analysis of microdialysis samples", *Analytical Chemistry*, **2004**, *76*(18):5523-33.

Shackman, J.G.; Dahlgren, G.M.; Peters, J.L.; Kennedy, R.T. "Perfusion and chemical monitoring of live cells on a microfluidic chip", *Lab on a Chip*, **2004**, to be published in first of 2005.

Jung, S.-K.; Kauri, L.; Qian, W.; and Kennedy, R.T. "Correlated oscillations in glucose consumption, oxygen consumption, and intracellular Ca^{2+} in single islets of Langerhans", *Journal of Biological Chemistry*, **2000**, *275*, 6642-6650.

German, I.; Buchanan, D.; and Kennedy, R.T. "Aptamers as ligands in affinity probe capillary electrophoresis", *Analytical Chemistry*, **1998**, *70*, 4540-4545.

Lada, M.W.; Vickroy, T.W.; and Kennedy, R.T. "High Temporal Resolution Monitoring of Glutamate and Aspartate in Vivo Using Microdialysis On-line with Capillary Electrophoresis with Laser-Induced Fluorescence Detection", *Analytical Chemistry*, **1997**, *69*, 4560-4565.

Synergistic Activities

Chair, Gordon Conference on Analytical Chemistry (2003, vice-chair for 2001)

Editorial Board of *Electrophoresis* (1996-1999), *Journal of Microcolumn Separations* (1996-2001), and *Journal of Chromatography* (2000-present)

Scientific Advisory Board of Cell Biosciences (2004-present)

Committee of Visitors, NSF 2004

NIH Scientific Review Organization committee, 2003

Collaborators and Other Affiliations

Collaborators and co-editors:

Jeffery Barker, NIH	Steve Benner, U. Florida	Andrew Ellington, U. Texas
Kyle Gee, Molecular Probes	Gary Glick, U. Michigan	Peter Hansen, U. Florida
Niels Heegaard, SSI, Belgium	C. R. Kahn, Harvard U.	Rohit Kulkarni, Harvard U.
Janus Pawvliszyn, U. Waterloo	Mark Lewis, U. Florida	Abdul Malik, U. South Florida
Richard Neubig, U. Michigan	Joanna Peris, U. Florida	Robert Strecker, Harvard U.
Roger Sunahara, U. Michigan	Thomas Vickroy, U. Florida	

Advisors:

Thesis Adviser: James W. Jorgenson, U. North Carolina

Post-Doctoral Sponsor: R. Mark Wightman, U. North Carolina

Former Students and Post-doctorals (out of a total of 30 advisees, not counting current):

Craig Aspinwall, U. Arizona
Michael Bowser, U. Minnesota
Brendan Boyd, Eastman Chemical
Sunday Brooks, Eli Lilly
Danielle Buchanan, Procter and Gamble
Laura Cole, U. Wisconsin-Stevens Point
Qing Deng, Epix Medical, Inc., Boston, MA
Rebecca R. Foley, Los Alamos National Laboratory
Igor German, Dental School
Waldemar Gorski, U. Texas at San Antonio,
William E. Haskins, Sandia National Lab
Lan Huang, U. California- Irvine
Sung Kwon Jung, Bayer Corporation
Liisa Kauri, Ottawa Health Research Institute

Nobuhiro Kobayashi, Sankyo Co., LTD.
Mark Lada, Minute Maid
Jacinth McKenzie, Supelco
Wejun Qian, Pacific Northwest Natl. Lab
Michael Roper, U. Virginia (post-doc)
Nikki Scanlan, Eastman Chemical
Hong Shen, Aventis Pharmaceuticals Inc.
Charina Paras-De Silva, United Lab. Inc.
Li Tao, Bristol-Myers Squibb
Jonathan Thompson, Troy State U.
Ziqiang Wang, Pfizer, Ann Arbor, MI
Steven Witowski, Epix Medical, Inc.
Scott Burns, Naval Research Lab.

Biographical Sketch - Jeanne E. Pemberton

Professional Preparation

University of Delaware, Newark, DE	Chemistry	1977, B.S. (with Distinction)
	Biology,	1977, B.A.
University of North Carolina, Chapel Hill, NC	Chemistry	1981, Ph.D.

Appointments

July 2001 to present	John and Helen Schaefer Professor of Chemistry, University of Arizona
July 1992 to June 2001	Professor of Chemistry, University of Arizona
July 1987 to June 1992	Associate Professor of Chemistry, University of Arizona
November 1981 to June 1987	Assistant Professor of Chemistry, University of Arizona

Selected Publications

C.J. Orendorff, J.E. Pemberton, "Electrolyte and pH Effects on the Conformational Order of Octadecylsilane Stationary Phases by Raman Spectroscopy" *Anal. Bioanal. Chem.*, **2005**, in press (Online First, March 16, 2005).

S.P. Pasilis, J.E. Pemberton, "Speciation and Coordination Chemistry of Uranyl(VI)-Citrate Complexes in Aqueous Solution" *Inorg. Chem.*, **2003**, *42*, 6793-6800.

D.J. Tiani, J.E. Pemberton, "Emersion of 11-Mercapto-1-undecanol-Modified Ag Substrates from Aqueous and Nonaqueous Solvents: The Effect of Emersion Velocity on the Emerged Solvent Layer Thickness" *Langmuir*, **2003**, *19*, 6422-6429.

M. Hawkrige, J.E. Pemberton, "Model Aluminum-Poly(p-phenylenevinylene) Interfaces Studied by Surface Raman Spectroscopy" *J. Am. Chem. Soc.*, **2003**, *125*, 624-625.

V. Ochoa, A. Lebron-Paler, J.E. Pemberton, R.M. Maier, "Organized Assemblies of the Biosurfactant Rhamnolipid on Surfaces: The Effect of Metal Complexation" Manuscript in preparation.

S.P. Pasilis, J.E. Pemberton, "Spectroscopic Investigation of Uranyl(VI) and Citrate Coadsorption to Al₂O₃" *Environ. Sci. Technol.*, submitted.

A. Lebron-Paler, J.E. Pemberton, R.M. Maier, "Quantitative Determination of Adsorption Behavior for Monorhamnolipid on Alumina using FTIR-ATR" Manuscript in preparation.

C.J. Orendorff, M.W. Ducey, Jr., J.E. Pemberton, L.C. Sander, "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy. 4. Effects of Neutral and Basic Aromatic Compounds" *Anal. Chem.*, **2003**, 75, 3369-3375.

C.J. Orendorff, M.W. Ducey, Jr., J.E. Pemberton, L.C. Sander, "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy. 3. Effects of Self-Associating Solvents" *Anal. Chem.*, **2003**, 75, 3360-3368.

S.C. Ringwald, J.E. Pemberton, "Adsorption Interactions of Aromatics and Heteroaromatics with Hydrated and Dehydrated Silica Surfaces by Raman and FTIR Spectroscopies" *Environ. Sci. Technol.*, **2000**, 34, 259-265.

Recent Synergistic Activities

- Training of students: In the past five years, five postdoctoral research associates have worked with Dr. Pemberton. In addition, six Ph.D. degrees and two M.S. degrees have been awarded to students who have worked under her guidance during this time. Seventeen undergraduates and one high school student have also had research experiences in the Pemberton laboratory since 1998. These students are broadly trained in multidisciplinary areas involving interfacial science.
- Significant recent activities in chemistry education: Participant on Chemistry Subpanel, Bio2010 Study, National Research Council (*Bio2010: Transforming Undergraduate Education for Future Research Biologists*, National Academies Press: Washington, DC, 2003); Chair, National Science Foundation Education and Human Resources/Mathematical and Physical Sciences Joint Subcommittee of the Advisory Committees for the Study of Undergraduate Education in the Mathematical and Physical Sciences; Member (1993-present) and Chair (2000-2003) American Chemical Society Committee on Professional Training; Project Kaleidoscope National Steering Committee; Co-organizer, National Science Foundation Workshop on Undergraduate Research Centers
- Significant recent activities on national committees/panels: National Science Foundation Directorate for Mathematical and Physical Sciences Advisory Committee (Chair, 2003-2004); National Research Council Board on Chemical Sciences and Technology; Department of Energy Council on Chemical Sciences; U.S. National Committee of the International Union of Pure and Applied Chemistry (Young Observer Program Sub-committee, Chair)

Collaborators and Other Affiliations

Collaborators: Neal R. Armstrong (University of Arizona), Jean-Luc Brédas (Georgia Institute of Technology), Raina M. Maier (University of Arizona), Seth R. Marder (Georgia Institute of Technology), Vicki H. Wysocki (University of Arizona), Jani C. Ingram (Northern Arizona University), Cynthia K. Larive (University of Kansas), Lane Sander (NIST)

Graduate Advisor: Dr. Richard P. Buck

Postdoctoral Sponsor: None

BIOGRAPHICAL SKETCH

Jonathan V. Sweedler, Ph.D.

Professor of Chemistry and Professor of the Beckman Institute

Address: University of Illinois at Urbana-Champaign, Department of Chemistry, Roger Adams Laboratory, Box 63-5, 600 S. Mathews Avenue, Urbana, IL 61801

Phone: (217) 244-4398; FAX: (217) 244-5180; E-mail: sweedler@scs.uiuc.edu

a. Professional Preparation

University of California, Davis	Chemistry	BS	1983
University of Arizona	Chemistry	PhD	1988
Stanford University	Chemistry and Neuroscience	Postdoc	1988-1991

b. Appointments

2002-present	Director of the Biotechnology Center, University of Illinois.
2002-present	Lycan Professor, Dept. of Chemistry and the Beckman Institute, University of Illinois.
2000-present	Professor, Dept. of Chemistry and Beckman Institute, University of Illinois.
1996-2000	Associate Professor, Dept. of Chemistry and Beckman Institute, University of Illinois.
1994-present	Co-Founder and Vice President, Magnetic Resonance Microsensors.
1991-1996	Assistant Professor, Dept. of Chemistry and Beckman Institute, University of Illinois.
1980-1982	Research Scientist, Lawrence Livermore National Laboratory.

c. Publications

Five publications most closely related to proposed project (out of 130 publications and patents)

- *Engineering the morphology and electrophysiological parameters of cultured neurons by microfluidic surface patterning*, E.V. Romanova, K.A. Fossler, S.S. Rubakhin, R.G. Nuzzo, J.V. Sweedler, *FASEB J.* 11, 2004, 1267-69.
- *The Chemistry of Thought: Neurotransmitters in the Brain*, J.N. Stuart, A.B. Hummon, J.V. Sweedler, *Anal. Chem.* 76, 2004, 121A-128A.
- *Systemic Serotonin Sulfate in Opisthobranch Mollusks*, J.N. Stuart, J.D. Ebaugh, A.L. Copes, N.G. Hatcher, R. Gillete, J.V. Sweedler, *J. Neurochemistry* 90, 2004, 734-42.
- *Spatial Profiling with MALDI MS: Distribution of Neuropeptides within Single Neurons*, S.S. Rubakhin, W.T. Greenough, J.V. Sweedler, *Anal. Chem.* 75, 2003, 5374-80.
- *Nanocapillary arrays effect mixing and reaction in multilayer fluidic structures*, T.C. Kuo, J.K. Kim, D.M. Cannon, Jr., M.A. Shannon, J.V. Sweedler, P.W. Bohn, *Angew. Chem., Int. Ed. Engl.* 43 2004, 1862-65.

Five other significant publications

- *Hybrid Three-Dimensional Nanofluidic/Microfluidic Devices Using Molecular Gates*, T.-C. Kuo, D.M. Cannon, Jr., M.A. Shannon, P.W. Bohn, J.V. Sweedler, *Sensors and Actuators A* 102, 2003, 223-233.
- *NMR Detection with Multiple Solenoidal Microcoils for Continuous-Flow Capillary Electrophoresis*, A.M. Wolters, D.A. Jayawickrama, A.G. Webb, J.V. Sweedler, *Analytical Chemistry* 72, 2002, 5550-5555.
- *Sample Concentration and Separation for Nanoliter-Volume NMR Spectroscopy Using Capillary Isotachophoresis*, R.A. Kautz, M.E. Lacey, A.M. Wolters, F. Foret, A.G. Webb, B.L. Karger, J.V. Sweedler, *Journal of American Chemical Society* 123, 2001, 3159-3160.
- *Monitoring Activity Dependent Peptide Release from the CNS using Single-bead Solid Phase Extraction and MALDI TOF MS*, N.G. Hatcher, T.A. Richmond, S.S. Rubakhin, J.V. Sweedler, *Analytical Chemistry* 77, 2005, ASAP.
- *Experimental Factors Controlling Analyte Ion Generation in Laser Desorption/Ionization Mass Spectrometry on Porous Silicon*, R.A. Kruse, X. Li, P.W. Bohn, J.V. Sweedler, *Analytical Chemistry* 73, 2001, 3639-3645.

d. Synergistic Activities

1. *Editorial and Advisory Boards*

Analytica Chimica Acta 1994-1999; Analytical Chemistry A-page advisory panel, 1995-1997; J. Microcolumn Separations, 1996-1999; Fresenius Journal of Analytical Chemistry, 1999-2002; Electrophoresis, 2000-2004; NIDA Emerging Technologies Workshop, 2002; National Research Policy Workshops, 2002-2003; Journal of the American Chemical Society, 2002-2004; Analytical and Bioanalytical Chemistry, 2002-2004; Journal Separation Science, 2002-2004. Analytical Chemistry advisory board, 2005-7.

2. Recent Awards

Special Creativity Extension, National Science Foundation, 2002-2004; Instrumentation Award, ACS Analytical Division, 2002; The Heinrich-Emanuel Merck Prize, Merck Co., 2002; Fellow, American Association for the Advancement of Science, 2001; Associate, Center for Advanced Study, 2001; Gill Prize in Instrumentation and Development, Indiana University, 2000; Benedetti-Pichler Award in Microanalysis, Microchemical Society, 1999; University Scholar, University of Illinois, 1997-1999; Camille Dreyfus Teacher Scholar Award, Dreyfus Foundation, 1997; Alfred P. Sloan Research Fellow, 1995-1997; Beckman Fellow, Center for Advanced Study, UIUC, 1993-1994; Searle Scholar Award, Chicago Community Trust, 1993-1996; Young Investigator Award, NSF, 1992-1997; Fellowship in Science and Engineering, David and Lucile Packard Foundation, 1992-1997; Arnold O. Beckman Research Award, UIUC, 1991; Lester Strock Award (co-recipient), Society for Applied Spectroscopy, 1991; New Faculty Award, Dreyfus Foundation, 1991; Ronald Belcher Memorial Award, Talanta, 1990; NSF Postdoctoral Fellow, NSF, 1989-1991.

3. Besides formal training in Chemistry, a considerable effort is devoted to research and knowledge dissemination in the neuroscience and physiology fields. This effort is aided by affiliations with other University of Illinois programs, including: the Department of Integrative Physiology, UI Neuroscience Program; Neuronal Pattern Analysis Group; Biological Sensors Group; Cell and Molecular Biology Training Program; Biotechnology Center; and Bioengineering Faculty.

4. *Physiology and marine science experience includes:* a semester release time to learn additional invertebrate neurophysiology with Rhanor Gillette (Department of Integrative Physiology) as my advisor through the UI's "Second Discipline" program, Spring 1999; a sabbatical during the Spring of 1998 working with Prof. Gilly (Hopkins Marine Station, Stanford University) to identify and study neurotransmitters and neuropeptides in cephalopods, as well as isolate and characterize several novel marine toxins and study their effects on ion channels; and the summer of 1997 at Friday Harbor Marine Laboratory, University of Washington, studying the functional and biochemical roles of several families of peptide hormones using opisthobranch mollusks as model systems. Lastly, I have taught an NSF-sponsored neuroscience short course at the University of Puerto Rico during the summer of 2001 on measuring the neurotransmitters in simpler nervous systems.

e. Collaborators and Other Affiliations

(i) **Collaborators:** A. Eddison, University of Florida; Irving Epstein, Brandeis University, Y. Furukawa, Hiroshima School of Medicine; W. Gilly, Stanford; H. Gutstein, Anderson Cancer Center; B. Karger, Northwest University; M. Kirk, University of Missouri; C. Larive, University of Kansas; E. Marder, Brandeis University; A. Manz, Imperial College, London; GT Nagle, UTMB; SD Painter, UTMB; W. Roeloffs, Cornell; R. Smith, Pacific Northwest National Laboratories; W. Thormann, University of Bern; S. Vilim, Mt. Sinai School of Medicine; G. Whitesides, Harvard; K. Weiss, Mt. Sinai School of Medicine.

(ii) **Graduate Advisor:** M. Bonner Denton, Ph.D.

Postdoctoral Advisors: RH Scheller, Ph.D.; R. Zare, Ph.D.

(iii) **Graduate students advised:** LouAnn Cruz, Robin Dahlgren, Philip Floyd, Robert Fuller, Rebecca Garden, Amanda Hummon, Wayne Kelley, Rebecca Kruse, Michael Lacey, Lingjun Li, Hai Maio, Kurt Oldenburg, Jason Page, Loranelle Schultz, Sarah Sheeley, Scott Shippy, Jeffrey Stuart, Aaron Timperman, Andrew Wolters, Scott Tracht, Xin Zhang

Postdoctoral scholars sponsored: Donald Cannon Jr., Wenju Feng, Jeff Jankowski, John Jurchen, Tzu-Chi Kuo, YiMing Liu, Leonid Moroz, Dean Olson, Raju Subramaniam, Jessica Tan, Joe Tulock, Nian Wu

Biographical Sketch Sheryl Ann Tucker

Biographical Sketch
Sheryl Ann Tucker

(i) Profession Preparation

- | | | |
|---|----------------------|--------------|
| • Kent State University, Kent, OH | Chemistry | B.S. (1990) |
| • University of North Texas, Denton, TX | Chemistry | Ph.D. (1994) |
| • Duke University, Durham, NC | Analytical Chemistry | 1994–1996 |

(ii) Appointments

- | | | |
|--|---------------------|--------------|
| • University of Missouri, Columbia, MO | Associate Professor | 2002–present |
| • University of Missouri, Columbia, MO | Assistant Professor | 1996–2002 |

(iii) Publications: (i) most closely related to proposed project

- D.L. Richter-Egger, A. Tesfai and S.A. Tucker, *Analytical Chemistry*, **73**, 5743 (2001). Spectroscopic Investigations of Poly(Propyleneimine) Dendrimers Using the Solvatochromic Probe Phenol Blue and Comparisons to Poly(Amidoamine) Dendrimers
- D.L. Richter-Egger, J.C. Landry, A. Tesfai and S.A. Tucker, *Journal of Physical Chemistry A*, **105**, 6826 (2001). Spectrofluorometric Investigations of Polyamido Amine Starburst Dendrimers Using the Solvatochromic Probe Phenol Blue
- C.L. Larson and S.A. Tucker, *Applied Spectroscopy*, **55**, 679 (2001). Intrinsic Fluorescence of Carboxylate Terminated Polyamido Amine Dendrimers
- D.L. Richter-Egger, H. Li, and S.A. Tucker, *Applied Spectroscopy*, **54**, 1151 (2000). Spectroscopic Investigations of Polyamido Amine Starburst Dendrimers with Reichardt's ET-30 Dye
- D.A. Wade, P.A. Torres and S.A. Tucker, *Analytica Chimica Acta*, **397**, 17 (1999). Spectrochemical Investigations in Dendritic Media: Evaluation of Nitromethane as a Selective Fluorescence Quenching Agent in Aqueous Carboxylate-Terminated Polyamido Amine (PAMAM) Dendrimers

Publications: (ii) other significant publications

- "Optimization of Micellar Liquid Chromatographic Separation of Polycyclic Aromatic Hydrocarbons with the Addition of Second Organic Additive", C. Mao, K.E. McGill and S.A. Tucker, *Journal of Separation Science*, **27**, 991 (2004).
- "Micellar Liquid Chromatography of Polycyclic Aromatic Hydrocarbons: Alkylpyridinium Chloride as Mobile Phase Modifier and Selective Fluorescence Quencher", C. Mao, K.E. McGill and S.A. Tucker, *Journal of Separation Science*, **26**, 1643 (2003).
- C. Mao and S.A. Tucker, *Journal of Chromatography A*, **966**, 53 (2002). High Performance Liquid Chromatographic Separation of Polycyclic Aromatic Hydrocarbons Using Pyridinium Chloride as a Selective Fluorescence Quencher to Aid Detection
- "Spectrochemical Evaluation of Diisopropylamine as a Selective Fluorescence Quenching Agent of Polycyclic Aromatic Hydrocarbons in Acetonitrile", C. Mao, C.L. Larson and S.A. Tucker, *Polycyclic Aromatic Compounds*, **22**, 99 (2002).

(iv) Synergistic Activities

- Developed a hands-on, inquiry-based educational program, "Magic of Chemistry", designed to ignite and retain girls' interest in science at an age where national studies indicate they begin to lose this curiosity. The program has been nationally recognized by the American Chemical

Society and Girl Scouts of the USA. Workshops are held twice a year at MU for 200 girls, during National Chemistry and Girl Scout Weeks. Three different workshops — “Case of the Unsigned Letter”, “Fun with Polymers”, and “Chemistry of Color” — rotate annually.

- Served as an advisory board member and workshop facilitator for five years for the Expanding Your Horizons Conferences, which promotes math, science, technology, and nontraditional careers to 7th and 8th grade girls through hands-on Saturday workshops.
- Actively participate in the EXPRESS (EXposure to REsearch for Science Students) program that attracts traditionally underrepresented, undergraduates to science. These students enter the program, as freshmen or sophomores, and one of the PIs research students was named a Barry Goldwater Scholar. Mentored 20 undergraduates in their research endeavors.
- Remain committed to developing new laboratory experiments and have published several in the *Journal of Chemical Education*.
- Introduced problem-based learning into the quantitative analysis curriculum – a first for our program. Students developed an analysis procedure that gave precise and accurate results for a common household product, wrote up the experiment as a journal article, and enjoyed the experience of developing a new procedure, not just following it. The student response was overwhelmingly positive, and the synergy it created in the lab was wonderful. My colleagues have adopted this approach.

(v) Collaborators & Other Affiliations

(a) Collaborators

- Dr. Kenneth W. Street, Jr., NASA Glenn Research Center, Cleveland, OH
- Professor Mark A. Milanick, University of Missouri, Medical Pharmacology & Physiology
- Professor Elizabeth A. Giuliano, University of Missouri, Veterinary Medicine & Surgery
- Professor Jerry L. Atwood, University of Missouri, Department of Chemistry
- Numerous University of Missouri and Lincoln University professors involved in an NSF IGERT proposal on Sensors. Co-PIs: Professors Meera Chandrasekhar (Physics), Shubhra Gangopadhyay (Electrical Engineering), Sheila Grant (Biological Engineering) and Milanick

(b) Graduate and Postdoctoral Advisors

- Graduate Advisor: Professor William E. Acree, Jr. (University of North Texas, Denton, TX)
- Postdoctoral Sponsor: Professor Linda B. McGown (Rensselaer Polytechnic Institute, Troy, NY)

(c) Thesis Advisor (11 Students) and Postgraduate-Scholar Sponsor (1 Associate)

- Ms. Ling Yi (M.S. 2004, Research Associate, Durect Corporation, Cupertino, CA)
- Dr. Chunfeng Mao (Ph.D. 2002, University of Missouri, Dept. of Biochem., Columbia, MO)
- Ms. Erin L. Jacobs (M.S. 2002, Quintiles, Kansas City, MO)
- Ms. Rebecca D. Otte (M.S. 2002, Quintiles, Kansas City, MO)
- Dr. Charlotte L. Larson (Ph.D. 2001 and Postdoc, Cardinal Health, San Diego, CA)
- Professor Dana L. Richter-Egger (Ph.D. 2001, University of Nebraska, Omaha, NE)
- Dr. Deborah A. Wade (Ph.D. 2000, Quintiles, Kansas City, MO)
- Mrs. Hong Li (M.S. 1999, Barr Laboratories, Pomona, NY)
- Miss Elizabeth J. Morgan (Ph.D. Candidate, May 2005 graduation)
- Mr. Daniel B. Bassil (Ph.D. Candidate)
- Miss Jena L. Whetstine (Ph.D. Candidate)

E. BIOGRAPHICAL SKETCHES

PI: Dr. J. Wang

EDUCATION: D.Sc., Chemistry, Technion, I.I.T., Israel, 1978
M.Sc., Chemistry, Technion, I.I.T., Israel, 1974
B.Sc., Chemistry, Technion, I.I.T., Israel, 1972

APPOINTMENTS: Professor of Chem. Eng. and Chem., Arizona State University, 2004-present
Director – Center of Bioelectronics and Biosensors, Biodesign Institute, 2004-present
Regents Professor, NMSU, 2002-2004
Manasse Chair, NMSU, 2000-2002
Professor of Chemistry, New Mexico State University, 1988-2004
Associate Professor of Chemistry, New Mexico State University, 1984-1988
Assistant Professor of Chemistry, New Mexico State University, 1980-1984

The Principle Investigator, Joseph Wang, is a Professor of Chemical Engineering and Chemistry at Arizona State University. Dr. Wang is internationally known for his work on electrochemical sensors and environmental monitoring systems, with over 650 papers, 20 chapters, 6 books, and 12 patents. This work has involved the design of chemical sensors and biosensors, bioelectronic, nanobiotechnology, electrochemistry, microfluidic devices, nanoparticle-based detection DNA and proteins, and microfabrication. He is the recipient of the 1999 American Chemical Society National Award for Chemical Instrumentation, of the ISI 'Citation Laureate' Award for being the Most Cited Scientist in Engineering in the World (during 1991-2001), of the 1994 Heyrovsky Medal (Czech Republic) of an Honorary Professor from National University of Argentina, and the 1990 NMSU's (top researcher) Westhafer Award. The PI serves as the Chief Editor of *Electroanalysis* and on the editorial board of eight other major international journals.

c. i. Five Related Publications

1. "DNA-based Amplified Bioelectronic Detection and Coding of Proteins" J. Wang, G. Liu, B. Munge, L. Lin and Q. Zhu, *Angew Chemie Int. Ed.*, **2004**, 43, 2158.
2. "Dendritic Nucleic Acid Probes for DNA Biosensors", J. Wang, J., Jian, M., Nilsen, T. and Getts, R., *J. Am. Chem. Soc.*, **1998**, 120, 8281.
3. "Ultrasensitive Electrical Biosensing of Proteins and DNA: Carbon-Nanotube Derived Amplification of the Recognition and Transduction Events", J. Wang, G. Liu, and M. Jan, *J. Am. Chem. Soc.*, **2004**, 126, 3010.
4. "Peptide Nucleic Acids Probes for Sequence-Specific DNA Biosensors", Wang, J., Palecek, E., Nielsen, P., Rivas, G., Cai, X., Shiraishi, H., Dontha, N., Luo, D., Farias, P., *J. Am. Chem. Soc.* **1996**, 118, 7667.
5. "Magnetically-Induced Solid-State Electrochemical Detection of DNA Hybridization", J. Wang, D. Xu, and R. Polsky, *J. Am. Chem. Soc.*, **2002**, 124, 4208.

c. ii . Five other Significant Publications

1. "Oxygen-Rich Carbon Paste Enzyme Electrodes for Operation in Oxygen-Deficient Solutions", Wang, J. and Lu, F., *J. Am. Chem. Soc.*, **1998**, 120, 1048
2. "Self-Assembled Sol-Gel Networks", Wang, J., Pamidi P. and Zannette, D., *J. Am. Chem. Soc.* **1998**, 120, 5852.
3. "Carbon Nanotube Fiber Microelectrodes", J. Wang, R. Deo, P. Poulin and M. Mangey, *J. Am. Chem. Soc.*, **2003**, 125, 14706.
4. "On-Chip Integration of Enzyme and Immunoassays: Simultaneous Measurements of Insulin and Glucose", J. Wang, A. Ibáñez, and M.P. Chatrathi, *J. Am. Chem. Soc.*, **2003**, 125, 8444.
5. "DNA Biosensors and Gene Chips", J. Wang, *Nucleic Acids Research*, **2000**, 28, 3011.

d. Synergistic Activity

- * Advisory Board – Sandia National Lab Biofuel Cell Program, 2002 – present
- * Chief-Editor, "Electroanalysis", VCH Publishers, 1988 – present; member of editorial board of 8 other journals.
- * Revising my textbook "Analytical Electrochemistry" for its 3rd edition (in 2006).
- * Battelle PNL, Affiliate Scientist, 1994-present
- * NIH Study Section/Panel Member – 2000 – 2002
- * Arizona State University, Director, Center for Bioelectronics and Biosensors, Biodesign Institute, 2004-present
- * U.S. representative, IUPAC Commission V5 on Electroanalytical Chemistry, 1991- 2002
- * Project director, NATO, 2002 - present

e. Collaborators

Dr. A. Mulchandani (UC-Riverside); Dr. Gregg Collins (ONR); Dr. W. Sadik (SUNY-B.)

Former graduate students, post-doctoral fellows, and visiting professors (over past 5 years):

Dr. E. Palecek (Brno), Dr. X. Cai (Nova Biomed. Inc.) , Dr. G. Rivas (Argentina), Dr. X. Zhang (WPI Inc.), Dr. A. Walcarius (France), Dr. S. Daniele (Italy), Dr. M. Chatrathi (NRL), Dr. N. Kawde (Egypt; student), Dr. B. Munge (WNM Univ.), Dr. M. Chatrathi (NRL, student), Dr. R. Polsky (Hebrew Univ.; student)..

Advisors

D.Sc. Advisor: M. Ariel - IIT (Israel)
Post-doc Advisor: W. Blaedel - UW (Madison)

ISIAH M. WARNER
Vice-Chancellor for Strategic Initiatives
Boyd Professor and Philip W. West Professor of Chemistry
240 Thomas Boyd Hall, Louisiana State University, Baton Rouge, LA 70803
Tel.: (225)578-2829; Fax: (225)578-3971; E-mail: iwarner@lsu.edu

EDUCATION

Ph.D., Analytical Chemistry, University of Washington, 1977
Non-Degree Course Work, Joint Center for Graduate Study, Richland, WA, 1969-73
B.S., Chemistry (Scholar, Cum Laude), Southern University, 1968

PROFESSIONAL APPOINTMENTS

(Academic)

2001 - present Vice Chancellor for Strategic Initiatives
2000 - present Boyd Professor of Louisiana State University
1994 - 1997 Chair, Department of Chemistry, Louisiana State University
1992 - present Philip W. West Professor of Chemistry, Dept. of Chemistry, Louisiana State Univ.
1987 - 1992 Samuel Candler Dobbs Professor of Analytical Chemistry, Emory University
1986 Professor, Emory University, Chemistry Department
1982 - 1986 Associate Professor, Emory University, Chemistry Department
1977 - 1982 Assistant Professor, Texas A&M University, Chemistry Department

Granted tenure and promoted to Associate Professor effective 09/1982

HONORS

2005 Tuskegee University, George Washington Carver Achievement Award, January 27, 2005.
2004 Recognized by the House of Representatives of The Louisiana Legislature during a joint session of the Louisiana Congress for Outstanding Accomplishments and Contributions to Louisiana State University, June 16, 2004
2004 University of Washington, College of Arts & Sciences, Distinguished Alumnus Award, May 20, 2004
2004 Recognized by the House of Representatives of The Louisiana Legislature during a joint session of the Louisiana Congress for Outstanding Accomplishments and Contributions to Louisiana State University, June 16, 2004
2004 University of Washington, College of Arts & Sciences, Distinguished Alumnus Award, May 20, 2004
Quality Education for Minorities (QEM) Network Giants in Science Award, February 21, 2004
2003 Council for Chemical Research (CCR) Diversity Award
2003 Elected to the status of Fellow, by the American Association for the Advancement of Science (AAAS) Council
2003 Sigma Xi's College of Distinguished Lectures, 2003-2004
2003 ACS Camille & Henry Dreyfus Award for Encouraging Disadvantaged Students into the Chemical Sciences
2003 Eminent Scientist Lectureship, presented to undergraduates at ACS National Meeting, New Orleans
2000 Carnegie/CASE Louisiana Professor of the Year
2000 LSU Distinguished Faculty Award
2000 ACS Eastern Analytical Symposium Award
2000 AAAS Lifetime Mentor Award
1998 Fulbright Fellowship for Research/Teaching in Kenya
1997 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring
1996 Southern University award for the Most Outstanding Graduate from the Southern University Department of Chemistry
1994 American Microchemical Society Bennedetti-Pichler Award
1993 National Organization for the Professional Advancement of Black Chemists & Chemical Engineers (NOBCChE), Award for Outstanding Teacher at their 20th Annual Meeting, held in Indianapolis, IN.
1992 Philip W. West Chair in Analytical and Environmental Chemistry, LSU
1992 1992 Faculty Appreciation Award, Office of Multicultural Programs and Services, Emory University
1992 Charles Holmes Herty Medal awarded by the Georgia Section of American Chemical Society
91/92 Vice Chairman Elect of the 1991 Analytical Gordon Conference and Chairman Elect of 1992 Analytical Gordon Conference
1991 New York SAS Gold Medal

FIVE RECENT PUBLICATIONS

- (1) Billiot, E., Thibodeaux, S., Shamsi, S., and Warner, I.M., "Evaluating Chiral Separation Interactions by Use of Diastereomeric Polymeric Dipeptide Surfactants," Analytical Chemistry, 71(18), 4044-4079 (1999).
- (2) Yarabe, H., Shamsi, S.A., and Warner, I.M., "Characterization and Thermodynamic Studies of the Interactions of Two-Chiral Polymeric Surfactants with Model Substances: Phenylthiodantoin Amino Acids," Analytical Chemistry, 71(18), 3992-3999 (1999).
- (3) McCarroll, M.E., Billiot, and Warner, I.M., "Fluorescence Anisotropy as a Measure of Chiral Recognition," Journal of the American Chemical Society, 123(13), 3173-3174 (2001).
- (4) Rugutt, J.K., Billiot, E.J., and Warner, I.M., "An NMR Study of Chiral Recognition Relevant to Capillary electrophoresis Separation of Enantiomers by Polymeric Surfactants," Langmuir, 16(7), 3022-3029 (2000).
- (5) Jin, H., Ham, K., Chan, J.Y., Butler, L.G., Kurtz, R.L., Thiam, S., Robinson, J.W., Agbaria, R.A., Tracy, R.E. and Warner, Isiah M., "High Resolution Three-Dimensional Visualization and Characterization of Coronary Atherosclerosis in Vitro by Synchrotron Radiation X-ray Microtomography and Highly Localized X-ray Diffraction", Physics in Medicine and Biology, (2002), 47(24), 4345-4356.

FIVE RELEVANT PUBLICATIONS

- (1) *Lu, W., Shamsi, S. A., McCarley, T. D. and Warner, I. M. "On-Line Capillary Electrophoresis-Electrospray Ionization Mass Spectrometry Using a Polymerized Anionic Surfactant" Electrophoresis, (19)2193-2199(1998).
- (2) Rugutt, J. K., Thiam, S., Henry, C. W. III, Ndalt, P. K. and Warner, I. M. "An NMR and Molecular Mechanics Study of Pyrethrins I and II" Journal of Agricultural & Food Chemistry, 47 3402-3410 (1999).
- (3) *Thiam, S., Shamsi, S., Henry, C., Robinson, J., and Warner, I. "Capillary Electrochromatography of Cholesterol and Its Ester Derivatives" Analytical Chemistry, 72:(11) 2541-2546 (2000).
- (4) Zhu, X., Thiam, S., Valle, B. C., and Warner, Isiah M., "A Colloidal Graphite Coated Emitter for Sheathless Capillary Electrophoresis-Nanoelectrospray Ionization Mass Spectrometry", Analytical Chemistry, (2002), 74(20), 5405-5409.
- (5) Abidi, S. L., Thiam, S. and Warner, I.M., "Elution Behavior of Unsaponifiable Lipids With Various Capillary Electrochromatographic Stationary Phases", Journal of Chromatography A, (2002), 949(1-2), 195-207.

PROFESSIONAL BOARDS (selected):

- Editorial Advisory Board of Analytical Chemistry, 1999-2001.
- National Advisory General Medical Sciences Council Board of the National Institute of Health, 1999-2002.
- Editorial Board for the Journal of the Kenya Chemical Society, 1998-present.
- Editorial Board for Applied Spectroscopy, 1997-2000.
- Editorial Review Board for the Journal of Fluorescence, 1997-2001.
- Editorial Board of Microchemical Journal, 1991-2002.
- Editorial Advisory Board of TALANTA, 1990-2001.

ADVISOR AND COLLABORATORS:

Advisor- Gary D. Christian, University of Washington

Collaborators- Shahab Shamsi, Georgia State University; Robert Strongin, LSU

BIOGRAPHICAL SKETCH

BIOGRAPHICAL SKETCHES

John C. Wright

Professional BS in Physics, Union College, Schenectady, New York, 1965

Preparation PhD in Physics, Johns Hopkins University, Baltimore, Maryland, 1970

Postdoctoral Student in Chemistry, Purdue University, 1970-1972

Appointments Chair, Department of Chemistry, University of Wisconsin, 2001-2004

Andreas C. Albrecht Professor of Chemistry, 2001-present

Professor of Chemistry, UW-Madison, 1980-present

Associate Professor of Chemistry, UW-Madison, 1978-1980

Assistant Professor of Chemistry, UW-Madison, 1972-1978

Selected Publications (183 publications total)

1. W. Zhao and J. C. Wright, Physical Review Letters 83, 1950-1953 (1999). "Measurement of $\delta\epsilon_{1539}(3)$ for Doubly Vibrationally Enhanced Four Wave Mixing Spectroscopy?."
2. W. Zhao and J. C. Wright, J. Am. Chem. Soc. 121, 1094-10998 (1999). "Spectral Simplification in Vibrational Spectroscopy Using Doubly Vibrationally Enhanced Four Wave Mixing".
3. W. Zhao and J. C. Wright, Physical Review Letters 84, 1411-1414 (2000). "Doubly Vibrationally Enhanced Four Wave Mixing- The Optical Analogue to 2D NMR?."
4. K. M. Murdoch, N. J. Condon, W. Zhao, D. M. Besemann, K. A. Meyer, and J. C. Wright, Chem. Phys. Letters 335, 349-356 (2001). "Isotope and Mode Selectivity in Two Dimensional Vibrational Four Wave Mixing Spectroscopy".
5. J. C. Wright, Int. Rev. Phys. Chem. 21, 185-255 (2002). "Coherent Multidimensional Vibrational Spectroscopy."
6. John C. Wright, Nicholas J. Condon, Keith M. Murdoch, Daniel M. Besemann, and Kent A. Meyer, J. Phys. Chem. A 107, 8166-8176 (2003). "Quantitative Modeling of Nonlinear Processes in Coherent Two-Dimensional Vibrational Spectroscopy?."
7. Kent A. Meyer and John C. Wright, Chem. Phys. Letters 381, 642-649 (2003). "Coherent Two Dimensional Spectroscopy with Triply Vibrationally Enhanced Infrared Four Wave Mixing?."
8. Kent A. Meyer and John C. Wright, J. Phys. Chem. A 107, 8388-8395 (2003). "Interference, Dephasing, And Coherent Control In Time-Resolved Frequency Domain Two Dimensional Vibrational Spectra?."
9. Kent A. Meyer, David E. Thompson, and John C. Wright, J. Phys. Chem. A 108, 11485-11493 (2004). "Frequency and Time-Resolved Triply Vibrationally Enhanced Four-Wave Mixing Spectroscopy?."
10. Daniel M. Besemann, Kent A. Meyer, and John C. Wright, J. Phys. Chem. B, 108, 10493-10505 (2004). "Spectroscopic Characteristics of Triply Vibrationally Enhanced Four Wave Mixing Spectroscopy?."

Synergistic Activities

1. Developed courses in analytical chemistry, introductory quantum mechanics, instrumental chemical analysis, and experimental spectroscopy that used active learning methods to serve as national models in the NSF-funded "New Traditions" project for national reform in chemical education. This work formed the heart of 5 publications in the educational literature.
 2. Performed assessment of these courses to demonstrate the improved competence of students who use active learning methods
 3. Participated in seminars, workshops, and conferences to disseminate active learning
-

BIOGRAPHICAL SKETCH

(This is a continuation page)

methods to the national audience.

4. Active participant in the NSF-funded Center for the Integration of Research, Teaching, and Learning (CIRTL) that promotes the development of a national faculty in science, technology, engineering, and mathematics (STEM) committed to implementing and advancing effective teaching practices for diverse student audiences as part of their professional careers.

5. Outreach to the local community including the NSF-funded K Thru Infinity program (Terry Millar), College for Kids, Madison Arboretum's Naturalists, and Chemistry Demonstrations in Elementary Schools

Collaborators and Other Affiliations

1. Professor Minh Cho- University of Korea, Seoul, Korea
2. Professor Shaul Mukamel- University of Rochester, Rochester, NY

Graduate and Postdoctoral Advisors

1. Professor Frank Fong, formerly at Department of Chemistry, Purdue University, West Lafayette, IN- Postdoctoral Advisor
2. Professor Warren Moos- Department of Physics, Johns Hopkins University, Baltimore, MD- Graduate Advisor

Recent Graduate Advisees and Postgraduate Scholar Advisees

1. Mitchell LaBuda, PhD 1996, currently at Crystal Technology Associates, Mountain View, CA.
2. Ding Xiaoya, PhD 1996, currently at Prism Analytical, Incorporated.
3. Robert Lascola, PhD 1998, currently at Savannah River Research Center.
4. David Thompson, PhD 1998, currently Assistant Professor at Lawrence University
5. Keith Murdoch, postdoctoral scholar, 1998-2001, currently staff scientist at Coherent, Inc.
6. Wei Zhao, postdoctoral scholar, 1998-2000, currently Assistant Professor at the University of Alabama, Little Rock, AK
7. Nicholas Condon, PhD 2001, currently staff scientist at Naval Research Laboratories, Washington, DC
8. Daniel Besemann, PhD 2003, currently Assistant Professor at Hamline College.
9. John Bak, PhD 2003, currently staff scientist at PPD, Inc.
10. Kent A. Meyer, PhD 2004, currently postdoctoral student at Oak Ridge National Laboratories.

Our research group has had 39 students graduate with a PhD degree and 11 postdoctoral scholars have studied with our group. Currently, there are 3 graduate students and 2 postdoctoral students.

SUMMARY YEAR 1 PROPOSAL BUDGET

ORGANIZATION				FOR NSF USE ONLY			
University of Washington				PROPOSAL NO.		DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.		Proposed	Granted
Gary D Christian							
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Gary D Christian - none				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. (0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							1,700
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 20,000							
3. SUBSISTENCE 4,700							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							24,700
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							200
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							200
H. TOTAL DIRECT COSTS (A THROUGH G)							26,600
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
Total Direct Costs (Rate: 10.0000, Base: 26600)							
TOTAL INDIRECT COSTS (F&A)							2,660
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							29,260
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.J.)							0

PI/PI NAME	FOR NSF USE ONLY		
Gary D Christian	INDIRECT COST RATE VERIFICATION		
ORG. REP. NAME*	Date Checked	Date Of Rate Sheet	Initials - ORG
AUG 11 1998			

1 *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

SUMMARY Cumulative PROPOSAL BUDGET

ORGANIZATION				FOR NSF USE ONLY			
University of Washington				PROPOSAL NO.		DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR				AWARD NO.		Proposed	Granted
Gary D Christian							
A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1. Gary D Christian - none				0.00	0.00	0.00	\$ 0 \$
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (1) TOTAL SENIOR PERSONNEL (1 - 6)				0.00	0.00	0.00	0
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1. (0) POST DOCTORAL ASSOCIATES				0.00	0.00	0.00	0
2. (0) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				0.00	0.00	0.00	0
3. (0) GRADUATE STUDENTS							0
4. (0) UNDERGRADUATE STUDENTS							0
5. (0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)							0
6. (0) OTHER							0
TOTAL SALARIES AND WAGES (A + B)							0
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							0
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							0
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							1,700
2. FOREIGN							0
F. PARTICIPANT SUPPORT COSTS							
1. STIPENDS \$ 0							
2. TRAVEL 20,000							
3. SUBSISTENCE 4,700							
4. OTHER 0							
TOTAL NUMBER OF PARTICIPANTS (0) TOTAL PARTICIPANT COSTS							24,700
G. OTHER DIRECT COSTS							
1. MATERIALS AND SUPPLIES							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							200
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							-200
H. TOTAL DIRECT COSTS (A THROUGH G)							26,600
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							2,660
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							29,260
K. RESIDUAL FUNDS (IF FOR FURTHER SUPPORT OF CURRENT PROJECTS SEE GPG II.C.6.)							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							\$ 29,260 \$
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME				FOR NSF USE ONLY			
Adelia yee				Date Checked	Date Of Rate Sheet	Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification

F. Participant Support

2. Travel

Support is requested for travel of ten U.S. participants, including the P.I., to Chiang Mai, Thailand. A web search of current U.S. carrier airfares for the proposed participants ranges from about \$1,000 to \$1,700, with an average of about \$1,250. An amount of \$1,350 is requested to allow for inflationary costs, with \$150 added for local ground transportation. All the domestic carriers arrive in Bangkok between 11 p.m. and midnight, and so participants must overnight there. Also, most departures from Bangkok to the U.S. are early morning flights, so participants will have to return to Bangkok the evening before. The only hotel at the airport is the Amari Hotel (very convenient with a walkway to the hotel). The travelers will be very tired upon arrival, and staying at this airport hotel will eliminate the necessity of having someone meet them after clearing customs very late to transport them somewhere else. Likewise, since many departure flights will be around 6 a.m., and check-in will have to be a couple of hours earlier, staying at this hotel will be much more convenient than off-airport lodging. Hence, a request is made for two nights per participant. The maximum U.S. government per diem rate for Bangkok is \$125, and so \$250/person is requested for the two nights (\$2,500). The current rate on the hotel website is \$201 + 17% taxes/fees, or about \$236 per night. Professor Grudpan is negotiating with the hotel for a lower rate, around \$150 if reserved soon, and the Thai agencies will cover any cost over \$125/night.

An additional \$250 is added for transportation within Thailand, in case this might be needed for follow up visits after the workshop.

The total, then, is \$2,000 per participant, or \$20,000.

3. Subsistence

Lodging in Thailand will largely be taken care of by the Thai hosts. Standard government per diem for other living costs is requested for a total of ten days for each participant, assuming most will have follow-up visits (\$37/day Chiang Mai, 5 days; \$57/day Bangkok rate, 5 days. \$470@; total \$4,700).

The actual apportionment of travel and subsistence costs may vary, depending on airfares at the time and/or duration of stay.

E. Travel

1. Domestic

Support is requested for registration and travel to a national meeting (e.g., ACS or Pittcon) to present the activities and outcome of the workshop, and opportunities for collaboration in Thailand:

Registration	\$300
--------------	-------

Airfare	300
Ground transportation	200
Lodging	700
Per diem	200
Total	\$1,700

G. Other Direct Costs

2. Publications, Documents and Dissemination

For publication of report on the workshop, as well as preparation of documents for distribution at national meeting and from requests (\$200).

H. Indirect Costs

10% allowed as administrative costs is requested.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.	
Investigator: Gary Christian	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support Project/Proposal Title: On-line Sorption Preconcentration Flow Injection Analysis and Electroinjection System for Environmental Samples	
Source of Support: NATO Science for Peace Total Award Amount: \$ 248,736 Total Award Period Covered: 03/01/00 - 05/31/05 Location of Project: Seattle, Moscow, St. Petersburg, Brussels Person-Months Per Year Committed to the Project. Cal: 1.00 Acad: 1.00 Sumr: 1.00	
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:	
Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support Project/Proposal Title:	
Source of Support: Total Award Amount: \$ Total Award Period Covered: Location of Project: Person-Months Per Year Committed to the Project. Cal: Acad: Summ:	

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.



Faculty of Science, Chiang Mai University, Chiang Mai 50200 ,Thailand

Tel.(053) 043323, 043322, 222180 Fax : 053-222268 , 892274, <http://www.science.cmu.ac.th>

E-mail : kate@chiangmai.ac.th Tel. +6653941910 Fax, +6653222268

7 April 2005

Professor Gary D. Christian
Department of Chemistry
University of Washington
Seattle, WA 98195-1700
USA

Dear Professor Christian,

I am writing to confirm you that I am willing to be a co-organizer for the workshop. on "Interface of Analytical Sciences : Workshop of U.S. and Thai Scientists". This would involve the local arrangement in connect with the workshop taking place in Chiang Mai, Thailand and with pre- and the following activities.. I will organize with the Thai organizations and their support which include the Commission on Higher Education (CHE), the Postgraduate Education and Research Program In Chemistry (PERCH) and the Thailand Research Fund (TRF). I will coordinate the selection and invitation of appropriate scientists from Thailand for potential collaboration with the U.S. scientists.

Looking forward to co-organizing the Workshop.

Yours sincerely,

A handwritten signature in cursive script, appearing to read "Kate Grudpan".

Kate Grudpan, PhD
Associate Professor



MOE 0501/4874

Commission on Higher Education
328 Si Ayutthaya Road
Bangkok 10400, Thailand
Tel. 662 644 5913
Fax 662 354 5570

March 24, 2005

Professor Gary D. Christian
Department of Chemistry
University of Washington
Seattle, WA 98195-1700
USA

Dear Professor Christian,

Your proposed workshop on "Interface of Analytical Sciences : Workshop of U.S. and Thai Scientists" is of great interest to Thailand's Commission on Higher Education. The proposed topic from the U.S. scientists is highly consistent with our strategic direction of research and training program in Thailand.

This letter of intent is a commitment from the Commission on Higher Education, in collaboration with the Thailand Research Fund (TRF) and the Post Graduate Education and Research Program (PERCH), to provide financial support for expenses of U.S. and Thai scientists during their workshop participation in Thailand, including local transportation, lodging, and workshop venue expenses. The Commission will assign Dr. Wanchai De-Eknamkul to coordinate with Prof. Kate Grudpan, the co-organizer, in the selection of qualified and appropriate Thai scientists to attend the workshop. We will also consult you on the arrangement for follow up visits of the U.S. scientists to Thai universities.

We look forward to the Workshop.

Your sincerely,

(Professor Pavich Tongroach, Ph.D.)
Secretary-General
Commission on Higher Education



**Postgraduate Education and Research Program in Chemistry
(PERCH)**

Higher Education Development Project, Ministry of Education

April 11, 2005

Professor Gary Christian
Department of Chemistry
University of Washington
Seattle, WA 98195-1700
U.S.A.

Re: Interfaces of Analytical Sciences: Workshop of the U.S. and Thai Analytical Scientists

Dear Professor Gary Christian,

On behalf of the Consortium of The Postgraduate Education and Research Program in Chemistry (PERCH), I am pleased to offer the support and the financial contribution toward the proposed workshop in the form of local expenses related to the workshop in Thailand. PERCH will also be willing to be one of the co-hosts of the meeting.

I believe that the workshop will be mutually beneficial to both the U.S. and Thai scientists in analytical sciences and related areas.

Research staff of PERCH looks forward to establishing tangible collaboration with the U.S. scientists in the areas of mutual interests.

Sincerely yours,

Vichai Reutrakul

Vichai Reutrakul, Ph.D.
Director, PERCH

Auburn University

Auburn University, Auburn, Alabama 36849-5312, U.S.A.

Dr. Eric Bakker
Alumni Professor
Department of Chemistry and Biochemistry

Telephone: (334) 844-6973
Fax: (334) 844-6959
e-mail: eric.bakker@auburn.edu
homepage: www.auburn.edu/~bakkeer

Gary D. Christian
Department of Chemistry
University of Washington
Box 351700
Seattle, WA 98195-1700

Auburn, March 9, 2005

Dear Gary,

This letter is to confirm my willingness to participate in your proposed workshop in Thailand, tentatively planned for the beginning of January 2006,

Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

I am enthusiastic in teaming up with Thai scientists and students during this workshop and hope that we can build relationships that will result in good collaborations as well as drawing talented students to the U.S. for their graduate studies. Thank you for your willingness to organize this important event.

Sincerely,



Eric Bakker

TEXAS TECH UNIVERSITY

Department of Chemistry and Biochemistry

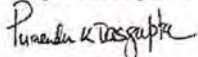
Box 41061
Lubbock, Texas 79409-1061
(806) 742-3067
Fax (806) 742-1289

Dr. Gary D. Christian
Department of Chemistry
University of Washington
Seattle, WA 98195
Japan

Dear Gary:

I would be most happy to participate in the US-Thailand workshop that you propose in early January 2006. I think this is an excellent opportunity. I know that for a variety of reasons, Thailand is one of the best countries where such a program would be particularly valuable. As Someone who is of South Asian descent himself, this is good not just in term of the international progress of Analytical Chemistry, but to build our own goodwill, which in recent years has been suspect to many in that part of the world.

Very Best regards



Purnendu K Dasgupta
Paul Whitfield Horn Professor



University of Michigan
Department of Chemistry

March 4, 2005

Gary D. Christian
Department of Chemistry
University of Washington
Box 351700
Seattle, WA 98195-1700

Dear Gary,

Thank you for the invitation to participate in the **Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists** that you have proposed to the NSF. I am pleased and honored to support this important endeavor by participating in the workshop as you have outlined in the proposal. I believe that our work in microscale bioanalysis will fit in well with the goals of the program. Furthermore, you have assembled an outstanding team of other participants that will provide a stimulating and interactive atmosphere. I look forward to working with you on the workshop.

Best regards,

Robert T. Kennedy
Hobart H. Willard Professor of Chemistry &
Professor of Pharmacology

April 7, 2005

Dr. Gary Christian
Department of Chemistry
University of Washington
Box 351700
Seattle, WA 96195-1700

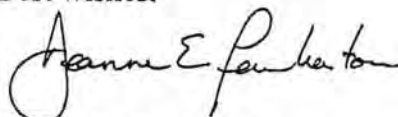
Dear Gary:

The purpose of this letter is to convey my enthusiastic support of and willingness to participate in the workshop with analytical scientists from Thailand that you propose to organize with Dr. Kate Grudpan from Chiang Mai University for January, 2006. Based on your past and existing interactions with the Thai analytical community, this seems like an excellent opportunity to establish a network of interactions between the U.S. analytical chemistry community and the Thai analytical community that is sustainable for the foreseeable future.

In terms of the specifics of our participation, I think that some of our more recent collaborative multidisciplinary research involving the impact of metabolites produced by bacterial colonies in soil on processes such as the fate and transport of toxic heavy metal contaminants would fit nicely into the bioanalytical theme that you propose for this workshop. Some of the new methods that we have developed for characterizing molecular structure at solid-liquid interfaces might also be of interest for their potential applications in bioanalytical chemistry.

Thank you again for the invitation to participate in this workshop if the proposal is funded. I very much hope that your proposal to the National Science Foundation for this workshop meets with complete success!

Best wishes.



Jeanne E. Pemberton
John and Helen Schaefer Professor of Chemistry

**University of Illinois
at Urbana - Champaign**

Department of Chemistry
600 S. Mathews Ave. 63-5
Urbana IL 61801



Jonathan V. Sweedler
March 9, 2005

Gary D. Christian
Department of Chemistry
University of Washington
Box 351700
Seattle, WA 98195-1700

Dear Gary,

I am writing to express my enthusiasm for your NSF Proposal on the joint Thai US Workshop you are proposing for next January (2006). I am certainly willing to participate in this workshop.

I envision several new collaborations resulting from this trip. My research on developing new bioanalytical methods and applying them to understanding fundamental neuroscience-related questions in simpler model systems fits in well with several research themes being pursued in Thailand. You have put together an exciting group of faculty participants from both countries and I expect the interactions from this workshop to continue for multiple years.

As you can tell, I am enthusiastic about this project and look forward to new and productive interactions with our colleagues in Thailand.

Yours sincerely,

Jonathan Sweedler
Lycan Professor of Chemistry
Director of the UIU Biotechnology Center
Professor of Neuroscience, Bioengineering and Physiology



Department of Chemistry
University of Missouri-Columbia

Sheryl A. Tucker • 125 Chemistry Bldg. • Columbia, MO 65211
Telephone (573) 882-1729 • FAX (573) 882-2754 • E-mail: TuckerS@missouri.edu

March 2, 2005

Professor Gary D. Christian
Department of Chemistry
Box 351700
Seattle, WA 98195-1700

Dear Professor Christian:

It is with great delight that I confirm my willingness to participate in the "Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists". My research interests in analytical chemistry range from nanomaterials to biological systems and fit well with the recent initiatives of the Thai government. My own research program has become very collaborative in last few years, and I am currently working with several individuals across an array of disciplines.

Furthermore, my interests in mentoring underrepresented groups in the chemical sciences are well known. Therefore, I will bring a distinctive aspect to the workshop and address another of the long term goal of this exchange program. I am eager to serve as a mentor to future international research students.

I look forward to working with you to bring this collaborative partnership to fruition.

Sincerely,

Sheryl A. Tucker

Professor Sheryl A. Tucker
Department of Chemistry



J. Wang, Professor and Director
Chem. Eng., Biodesign
Institute, ASU
Tempe, AZ 85287-5001, USA

March 9,05

Dr. G. Christian
Chem-Dept, UW
Seattle

Dear Gary:

This is to confirm my willingness to participate in the NSF-sponsored Analytical Chemistry workshop in Thailand early 2005. I am looking forward for this stimulating visa, as I am having an excellent experience with Thai students visiting my lab.

Best regards!

Sincerely,

A handwritten signature in black ink, appearing to read "J. Wang". The signature is stylized with a large, sweeping "J" and a long, horizontal stroke extending to the right.

Joseph Wang, Professor and Editor
Director – Center of Bioelectronics and
Biosensors
Biodesign Institute
ASU, Tempe

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LOUISIANA STATE UNIVERSITY
AND AGRICULTURAL AND MECHANICAL COLLEGE

Warner Research Group, Department of Chemistry

March 10, 2005

Dr. Gary D. Christian
Department of Chemistry
University of Washington
Box 351700
Seattle, Washington 98195-1700

Dear Dr. Christian:

I am writing to express my willingness to participate in the proposed National Science Foundation Workshop in Thailand. This is an exciting opportunity to share knowledge and interact with other scientists outside of the American scientific community, and I am looking forward to the opportunity that this presents. If I can be of further assistance in the preparation or execution of this project, please let me know.

Sincerely,

Isiah M. Warner, Vice Chancellor for
Strategic Initiatives; Boyd Professor and
Philip W. West Professor of Analytical
and Environmental Chemistry; Howard
Hughes Medical Institute Professor
Phone: (225) 578-2829; 578-7230
FAX: (225) 578-3971; 578-7231
E-mail: iwarner@lsu.edu



March 9, 2005

Gary D. Christian
Professor of Chemistry
Department of Chemistry
University of Washington
Box 351700
Seattle, WA 98195-1700

Dear Gary:

I would like to accept your invitation to participate in the proposed Workshop of U.S. and Thai Analytical Scientists. My participation in the workshop will focus on the new coherent methods for multidimensional spectroscopy that are becoming available for advanced chemical measurements.

Sincerely yours,

John C. Wright
Andreas C. Albrecht Professor

The Thailand Research Fund

Academic Research Division

The Thailand Research Fund

Academic Research Division

Address

Academic Research Division
The Thailand Research Fund
14th Floor, SM Tower Condominium
979/17-21 Paholyotin Road, Samsennai, Phayathai, Bangkok 10400
Tel: 0-2278-8251-56 08-4643-8333
Fax: 0-2278-8248
E-mail: trfbasic@trf.or.th
Home Page: <http://www.trf.or.th>

Historical Background

The Thailand Research Fund (TRF) is the first agency in Thailand to recognize the importance of basic research, which will serve as the basis of research and development, and provide the nation with a strong knowledge-based development. The Academic Research Division which is one division of TRF, has awarded grants to support basic research in academic disciplines including science, technology, social science, and the humanities since 1994. Its main mission is to nurture the career of researchers and create a strong research community. Through this process, it is hoped that new knowledge is generated, that could lead to the development of technologies, which are essential for the future progress of the knowledge-based economy. These grants stress the outputs that have high quality and impact, including publications in international academic journals, patents, and other applications for the benefit of the country.

In 1994, the Academic Research Division began awarding the first type of grant called the Researcher Development Grant. This attracted a large number of applicants and generated great excitement in the research community. In that year, grants were awarded to 33 highly qualified researchers. At present, some of these grant recipients have received grants at the higher level, such as Basic Research Grants (12 persons) and Senior Research Scholar Awards (4 persons). And a few of these researchers have also received many other awards, including one Thailand Outstanding Scientist of the Year Award, two Outstanding Researcher Awards from the National Research Council, 4 Young Scientist Awards, and one Robert O. Bass Award. In the year 1995, the academic research division began awarding Senior Research Scholar Awards and Basic Research Grants. In the year 1999, the Post-Doctoral Grant was initiated in order to support new researchers, who have recently finished their studies and started working, to develop their research capabilities, gain experience, and become professional researchers. Then in the year 2002, other research grant to support the new researchers were created, including the Young Researcher Grant, Grant to Develop the Research Potential of New Faculty Members (jointly awarded by TRF and the Commission on Higher Education (CHE)), and a grant to support post-doctoral training abroad. All of the research grants mentioned so far have been awarded to investigator-initiated projects which are judged on their scientific merit.

Later, in the year 2002, it was deemed that there should be more of targeted basic research to stress the research programs, each consisting of a set of projects that are related in research aims. And these aims are identified from national agenda or issues that are considered necessary for national development. This began with the grants to support the study of rabies virus in bats, dogs, and humans, and the Medicinal Chemistry Research Program. Up to the present, the Academic Research Division has awarded 1,510 grants which support the work of researchers. Any qualified researchers, both Thai national and expatriates who work in Thailand, can apply for the

TRF grants at the beginning or higher levels from Academic Research Division. This is to ensure that high quality research do receive sufficient funding on a continuous basis, and researchers can be confident that their research career can be as stable as other good careers.

In the near future, increasing variety of grant types will be created such as the Research Grant for Mid-Career Researchers and University Faculty, which is co-sponsored by TRF and CHE. More targeted basic research will also be put into action, including Organic Agriculture, The Production and Health of Aquatic Animals, Renewable Energy, Emerging Diseases, etc.

Mission

The main mission of the Academic Research Division (ARD) is to provide financial support in forms of research and career development grants to qualified researchers, to enable them to become professional researchers, and have their findings published in high impact international journals and/or for applications, therefore, help to strengthen the research community and encourage the use of research findings in national development.

Aims

1. To support basic research that is deemed relevant to the social and economic development of the country.
2. To support the career path of qualified researchers so that they could become professional, realize their full potential, and be leaders in their own respective fields.
3. To encourage the publication of research findings in high impact international journals as well as the applications for patent rights that could be exploited for economic and social benefits.
4. To create critical masses and networks of researchers and promote research collaborations at both national and international levels.
5. To support targeted basic research programs that are answerable to the current social and economic needs or provide instruments of development for the nation.
6. To instil the value of basic research as the basis for applied research, and mobilize the support from both government and private sectors.

Areas of Research Support

The policy of Academic Research Division (ARD) is to provide support for research commensurate with the status of the Thai economy and the need of Thai society. The research that receives high priority is the targeted basic research whose findings are publishable in high impact-factor international journals, or patentable for further economic or social exploitations. The ARD prioritizes and allocate the support for research grants in the following order:

1. Targeted basic research projects or programs that are highly relevant to national needs and development.
2. Investigator-initiated basic research projects in fields that are deemed to be the necessary bases for all disciplines, such as physics, chemistry, biology, mathematics, as well as humanities and social sciences.

3. Investigator-initiated basic research projects in any fields in which the researchers have shown innovative thinking or breakthrough findings.

Types of Research Grants

The research grants are classified into 9 categories.

1. Targeted Basic Research Grant

This newly initiated research grant is aimed at supporting the projects within the research programs or research consortia that are engaged in areas of basic research whose findings could be applied in formulating public policies, answering to social and economic needs, creating competitiveness for the country that are necessary for the development, either with intermediate or long-term goal. At present, ARD is supporting the first of such programs on "Medicinal Chemistry". The program's objectives are to define goals of research in medicinal chemistry pertaining to the drug discoveries, to foster the cooperative network of researchers in related fields, and to encourage the teams in working toward the common goals. In its starting phase, the program will mainly focus on the syntheses of drugs whose patents have expired, research on finding bioactive compounds from natural products, research related to the development of specific drugs, research according to the researchers' experience and interests which is highly innovative.

Interested researchers can request further information and submit concept paper (pre-proposal) to the TRF Academic Research Division.

In the near future, other programs of targeted-basic research, such as, Production and Health of Aquatic Animals, Organic Agriculture, Renewable Energy, Emerging Diseases, Rubber & Polymer Technology will be initiated.

2. TRF Research-Team Promotion Grant

This type of grant provides support for distinguished senior researchers who have shown ability, integrity and excellence, and are well-known in his/her research area. The major objective is to provide support for the development of research teams lead by the TRF senior research scholars, and to build up long-term intellectual and training bases for the new generations of researchers in the country.

Requirements: Eligible candidates must not hold administrative position at the level of Dean or higher. The successful candidate will be named "TRF Senior Research Scholar."

Process of selection: Committee consisting of knowledgeable persons will select the candidates from the lists of eminent researchers, for example, professors in Thai universities, winners of Outstanding Scientist or Outstanding Researcher Awards, award-winning researchers in universities, distinguished senior researchers in universities or faculty members who have excellent and well-known academic records. The eligible researchers will be invited to write full proposals, which will be assessed by committees of experts.

3. TRF Basic Research Grant

This type of grant is for researchers who already have some research experience and have shown tangible research achievement.

Requirements: The candidate must have publications in international journals based on his/her work performed in Thailand not fewer than 3 publications in the past 5 years. The project leader must be the first author or corresponding author of these publications. The summed impact factor of these publications considered to be satisfactory depends on the field, for instances, not less than 5.0 for the biological and medical sciences, and not less than 2.0 for the physical sciences and engineering. The impact factor is not taken into account for social sciences. The candidate who obtains this type of grant will be named "TRF Advanced Research Scholar".

Budget: The total budget per project is not more than 3,000,000 bahts. The granting period is not more than 3 years. Part of the funding is for salary supplement to the project leader, which could be between 15,000-25,000 bahts per month, depending on the achievements and experience of the candidate.

4. TRF Research Career Development Grant

This grant aims to strengthen researchers and institutions and motivate universities to increase their investment in supporting research.

Requirements: The candidate must have at least one publication in international journals within the past 5 years that was based on the work performed in Thailand, and was not a part of his/her Ph.D. thesis. The candidate's research must be of excellent standard. The candidate must not be over 45 years old, and must not hold an administrative position at the level of departmental head or higher. The candidate who is awarded this type of grant will be named "TRF Research Scholar."

Budget: The total budget per project is not more than 1,200,000 bahts. The granting period is not more than 3 years. Each yearly budget will be divided into 2 parts: 220,000 bahts for conducting the research and 180,000 bahts (15,000 bahts per month) for salary supplement. The successful candidate is encouraged to acquire additional support from their own institution as the counter-part funding. A qualified scholar can apply for this grant again or other types of grants after the first grant ends.

5. Research Grant for Mid-Career University Faculty

This type of grant is jointly funded by TRF and the Commission on Higher Education (CHE), Ministry of Education. It is aimed to strengthen the research capability and the research of mid-career faculty members of universities, which is the vital part that contributes to the education and training of graduate students.

Requirements: The candidate must be a faculty members in institution of tertiary education (eg. universities or equivalence), and must have at least one publication in international

journals within the past 5 years that was based on the work performed in Thailand, which was not a part of the Ph.D. thesis. The candidate's research must be of excellent standard. The candidate must not hold an administrative position at the level of departmental head or higher. The successful candidate who is awarded this type of grant will be named "TRF-CHE Research Scholar".

Budget: The total budget per project is not more than 1,200,000 bahts. The grant period is not more than 3 years. Each yearly budget will be divided into 2 parts: 220,000 bahts for conducting the research, and 180,000 bahts (15,000 bahts per month) for salary supplement. A qualified scholar can apply for this grant again or other types of grants after the first grant ends.

6. TRF Grant for New Researcher

Requirements: The candidate must have earned a doctoral degree, or a degree in medicine or dentistry within the past 5 years. The candidate should have a good educational and work background, and must have at least one international publication within the past 5 years (or other output in case of social sciences and humanities), must not be over 45 years old, and must not hold an administrative position at the level of departmental head or higher. The candidate must have experienced mentor, who has shown outstanding research output in the field similar to that of the candidate and has sufficient time to give advice throughout the granting period.

Budget: The total budget per project is not more than 480,000 bahts. The grant period is not more than 2 years. Part of the funding, 10,000 bahts per month, is for supplementing the salary of the successful candidate.

7. Research Grant for New Scholar

This type of grant is jointly funded by TRF and the Commission on Higher Education (CHE), Ministry of Education. It is aimed to support young faculty members in Thai tertiary educational institutes to continue doing research after obtaining their Ph.D.

Requirements: The candidate must be a faculty member of institution of tertiary education (eg universities or equivalence), and must have obtained Ph.D. degree or equivalence in their field. The candidate must not hold an administrative position at the level of departmental head or higher.

Budget: The total budget per project is not more than 480,000 bahts. The granting period is not more than 2 years. Part of the funding (10,000 bahts per month), is for the salary supplement to the successful candidate.

8. Post-doctoral Research Grant

This type of grant aims to promote and support researchers who have just received Ph.D. degree to conduct their research full-time under the supervision of established senior researchers who also act as their advisors.

Requirements: The advisors must be senior researchers working in research organizations or universities in Thailand, have regularly published their work in international journals, running active research groups, and already have other research funding to support the research of the successful candidates. The advisor will select a postdoctoral researcher who has received his/her Ph.D. within the past 5 years, is not over 45 years old, and has at least one international publication, as the first author, in the past 5 years. The postdoctoral fellow shall work full time in the advisor's laboratory.

Budget: The postdoctoral fellow will be paid 30,000 bahts per month for 2 years. The mentor should take responsibility for all other expenses. The postdoctoral fellow who already has a regular salary will be topped up with the difference amount between the TRF's specified salary rate and their own regular salary.

9. Post-doctoral Grant for Doing Research Abroad

Candidates must have Thai nationality, and must have earned Ph.D. within the past 5 years, in the same field in which they will conduct research abroad. They must be under 45 years old. Candidates who are already employed will need their employers' permission to undertake this post-doctorate research grant for at least 1 year. Three types of grants are available:

9.1 Visiting Fellowship from the National Research Council of Canada (NRC)

There are 5 fellowships per year for Ph.D. graduates from Thailand, who must compete with applicants from other countries. This fellowship supports airfare and living expenses in Canada (3126.66 CAD per month) for work at any of the NRC research institutes for 1 year. The fellowship may be extended for the second year, in which case TRF will support a two-week trip back to Thailand to visit his/her Thai institution.

Applicants can download application form from <http://www.nserc.ca> and should apply directly to NRC.

9.2 TRF Post-doctoral Fellowships in Cooperation with the National Research Council of Canada (NRC)

These are fellowships jointly supported by NRC and TRF. Five one-year fellowships will be offered annually. The Thai side (which may be TRF or another allied organizations that will benefit from the post-doctoral research) will pay for the airplane ticket, and the living expense at 825 CAD per month, and NRC will provide additional support of 1708.67 CAD per month. Applicants must present a research plan and explain how they can continue that line of research after they return to Thailand.

Applicants should submit the application form, which can be downloaded from <http://rgj.trf.or.th/thai/rgj51.htm>, to TRF along with curriculum vitae listing international publications and other academic outputs. Applications are accepted twice per year, during January and July.

9.3 Post-doctoral Fellowships in Cooperation with Other Foreign Institutions

This is aimed to provide partial (counter-part) support for those who have already secured post-doctoral fellowships from creditable foreign institutions. Five one-year fellowships will be offered annually. The applicant must contact foreign institution that will support their research directly, and they must show the letter of acceptance and the amount of financial support that will be provided. The committee set up by TRF will consider the amount of additional support on a case-by-case basis.

Additional Activities for Coordination and Support to Research and Researchers

The Academic Research Division takes into account the need to support academic and research cooperation among researchers, to create conducive environment for research, and to commend the researchers for their achievement and output. The following activities are thus carried out:

1. *Ceremony to Honor TRF Senior Research Scholars.* The ceremony is organized in order to present certificates of merit and commend the TRF senior research scholars. As a consequence, it is hoped that the ceremony could help to motivate and stimulate new researchers by using senior research scholars as exemplars.
2. *Presentation of TRF Research Publication Awards.* The occasion where an award of 50,000 bahts and a testimonial plaque are presented to the researchers, working in Thailand who have international publications with the highest citation frequencies. The aim of the awards is to honor the quality research work carried out in Thailand and to commend the researchers for their achievement. In addition, TRF hopes that the honor will stimulate younger researchers to producing high quality international publications.
3. *Annual Academic Meetings of Individual TRF Senior Research Scholars.* On this occasion the research group lead by a TRF senior research scholar presents its work that has been carried out in the past year. Representatives of TRF and other researchers working in similar and related fields are invited to share their views and experience. This will encourage the formation of research network and collaboration among researchers in the same and related disciplines, thus help to strengthen the research in that particular field in Thailand.
4. *Presentations of Research Progress from TRF Advanced Research Scholars and TRF Research Scholars.* Several of these meetings are organized each year for the grantees to make oral presentations of their research progress. Established researchers and experts are invited to attend the meetings to give their views and suggestions.
5. *The Annual Conference of Research Progress by New Researchers.* Such a conference will include keynote and invited lectures, panel discussions, and presentations by TRF senior research scholars and recipients of Grants for New Researcher and New Scholar in different fields. Established researchers and outside experts are invited to attend and to give their views and suggestions. The number of attendants at the meeting is usually around 550.
6. *The "Creation of New Researchers" Project.* This project aims to communicate, advise and train beginning researchers on the technique of writing grant proposals, how to perform research, how to publish, how to work toward becoming professional researchers and eventually research leaders in the future. This project aims to recruit a new pool of talented young researchers.
7. *Brainstorming Meetings.* These meetings are organized regularly to define the goals for targeted basic research programs, for examples, the meetings of the Thailand Post-genomic program, the problem-based chemistry research seminars, the emerging diseases, the basic research on economic aquatic animals, organic agriculture, etc.
8. *Special Seminars by Honorary TRF Fellows.* These seminars are given by distinguished persons, such as, Nobel laureates. Recent examples of such seminars are:

“Research as a Way of Life” by Prof. William N. Lipscomb, Nobel Laureate in Chemistry, 1976.

“How Basic Science Drives Technological Progress” by Prof. Sheldon Lee Glashow, Nobel Laureate in Physics, 1979.

“Supramolecular Chemistry: Concepts and Perspectives” by Prof. Jean-Marie Lehn, Nobel Laureate in Chemistry, 1987.

“Aquaporin Water Channels: From Atomic Structure to Clinical Medicine”
by Prof. Peter Agre, Nobel Laureate in Physics, 2003.

9. *Site visits.* These are conducted to monitor the young researcher’s progress, and also to learn about problems encountered, so as to find ways to improve the granting process as well as helping the researchers to overcome to obstacles.

Summary of the Outcome of the Awarded Grants

The Academic Research Division has awarded grants since 1994, which have resulted in 2,904 publications in international journals, and a number of national and international awards, and patents to the TRF grantees as summarized in **Table 1, Annex 1 and 2**

Table 1 Number of Scholars in Various Fields

Types of Grant	Year	No. of Awards	Fields		
			Biological and Medical Sciences	Physical Sciences and Engineering	Social Sciences and Humanities
1. Research Team Promotion Grants	1995	9	3	3	3
	1996	16	6	6	4
	1997	15	7	3	5
	1998	-	-	-	-
	1999	7	1	4	2
	2000	14	8	5	1
	2001	12	6	5	1
	2002	15	4	7	4
	2003	16	8	7	1
	2004	13	6	5	2
	2005	11	5	4	2
Total		128	54	49	25
2. TRF Basic Research Grants	1995	4	4	-	-
	1996	20	13	6	1
	1997	16	8	8	-
	1998	18	8	9	1
	1999	8	3	5	-
	2000	18	8	10	-
	2001	24	11	12	1
	2002	20	9	11	-
	2003	20	7	12	1
	2004	27	11	13	3
	2005	21	7	12	2
Total		196	89	98	9
3. TRF Research Career Development Grants	1994	33	24	8	1
	1995	24	16	7	1
	1996	12	7	5	-
	1997	25	18	7	-
	1998	6	-	6	-
	2000	19	12	5	2
	2001	21	9	12	-
	2002	44	18	24	2
	2003	29	14	15	-
	2004	27	17	10	-
	2005	2	-	2	-
Total		242	135	101	6

Types of Grant	Year	No. of Awards	Fields		
			Biological and Medical Sciences	Physical Sciences and Engineering	Social Science and Humanities
4. Research Grant for Mid-Career University Faculty	2005	49	19	28	2
Total		49	19	28	2
5. TRF Grant for New Researcher	1997	85	51	23	11
	1998	48	24	23	1
	1999	48	23	18	7
	2000	66	29	28	9
	2001	98	46	40	12
	2002	109	51	50	8
	2003	35	19	10	6
	2004	15	8	3	4
	2005	8	6	2	-
Total		512	257	197	58
6. Research Grant for New Scholar	2002	46	21	20	5
	2003	202	85	107	10
	2004	220	70	126	24
	2005	222	86	104	32
Total		690	262	357	71
7. Post-doctoral Research Grants	2002	3	2	1	-
	2003	3	1	2	-
Total		6	3	3	-
Grand Total		1823	819	833	171

Annex 1:

Awards received by TRF grantees

1. Outstanding Scientist Awards from the Foundation for Promoting Science and Technology under the Royal Patronage of His Majesty the King

1997

- Prof. Dr. Prapon Wilairat (TRF Research Team Promotion Grant-1996 and 2000)
- Prof. Dr. Yong Poovorawan, (TRF Research Team Promotion Grant - 1997 and 2001)

1998

- Assoc. Prof. Dr. Apichart Suksamrarn (TRF Basic Research Grant- 1997 and TRF Research Team Promotion Grant-1999)
- Assoc. Prof. Dr. Skorn Mongkolsuk (TRF Basic Research Grant- 1997 and 2000 and TRF Research Team Promotion Grant-2002)

2000

- Prof. Dr. Somchart Soponronnarit (TRF Research Team Promotion Grant-1996 and 2000)

2001

- Assoc. Prof. Dr. Kate Grudpan (TRF Research Career Development Grant-1994 and TRF Research Team Promotion Grant-2001 and 2004)

2002

- Prof. Dr. M.R. Jisnuson Svasti (TRF Research Team Promotion Grant-2001 and 2004)
- Prof. Dr. Sutat Fucharoen, (TRF Research Team Promotion Grant-2002 and 2005)

2003

- Assoc. Prof. Dr. Jumras Limtrakul (TRF Research Career Development Grant-1995 and 1998 and TRF Basic Research Grant- 2002 and TRF Research Team Promotion Grant-2002 and 2005)
- Assoc. Prof. Dr. Supot Hannongbua (TRF Basic Research Grant- 1996 and 2001 and TRF Research Team Promotion Grant-2003)

2004

- Prof. Thiravat Hemachudha (Targeted Basic Research Grant- 2002 and 2005)

2005

- Prof. Rajata Rajatanavin (TRF Research Team Promotion Grant-1997)
- Prof. Boonsong Ongphiphadhanakul, M.D. (TRF Research Career Development Grant- 1994 and 1997 and TRF Research Team Promotion Grant-2003)

2. Outstanding Researcher Awards from National Research Council of Thailand

1996

- Prof. Dr. Prapon Wilairat (TRF Research Team Promotion Grant-1996 and 2000)
- Prof. Dr. Charan Chantalakhana (TRF Research Team Promotion Grant-1995)
- Prof. Dr. Somchart Soponronnarit (TRF Research Team Promotion Grant-1996 and 2000)
- Assoc. Prof. Dr. Medhi Krongkaew (TRF Research Team Promotion Grant-1996)

1997

- Prof. Dr. Yong Poovorawan, (TRF Research Team Promotion Grant - 1997 and 2001)
- Prof. Dr. Rungsun Thanapornpun (TRF Research Team Promotion Grant-1996)

1998

- Prof. Dr. Yongwimon Lenburi (TRF Research Career Development Grant-1994 and TRF Research Team Promotion Grant-1999 and 2002)
- Assoc. Prof. Dr. Jumras Limtrakul (TRF Research Career Development Grant-1995 and 1998 and TRF Basic Research Grant- 2002 and TRF Research Team Promotion Grant-2002 and 2005)
- Prof. Dr. Pasuk Phongpaichit (TRF Research Team Promotion Grant-1997 and 2002)
- Prof. Dr. Wanlop Surakamponporn (TRF Research Team Promotion Grant-2000 and 2003)
- Prof. Dr. Saichol Ketsa (TRF Basic Research Grant-1998 and TRF Research Team Promotion Grant-2002 and 2005)

1999

- Prof. Dr. Sanit Aksornkoe (TRF Research Team Promotion Grant-1996)
- Assoc. Prof. Dr. Kate Grudpan (TRF Research Career Development Grant-1994 and TRF Basic Research Grant- 1998 and TRF Research Team Promotion Grant-2001)

2001

- Prof. Dr. Peerasak Srinives (TRF Research Team Promotion Grant-1996, 2000 and 2003)
- Prof. Dr. Chidchanok Lursinsap (TRF Research Career Development Grant-1995 and Post-doctoral Research Grant-2003)
- Prof. Dr. Apichart Suksamrarn (TRF Basic Research Grant- 1997 and TRF Research Team Promotion Grant-1999 and 2002)
- Prof. Dr. Supot Hannongbua (TRF Basic Research Grant- 1996 and 2001 and TRF Research Team Promotion Grant-2003)

2002

- Prof. Dr. Pramote Dechaumphai (TRF Research Career Development Grant-1996 and TRF Research Team Promotion Grant-2001 and 2004)

2003

- Prof. Dr. M.R. Jisnuson Svasti (TRF Research Team Promotion Grant-2001)
- Prof. Dr. Suranant Subhadrabandhu (TRF Research Team Promotion Grant-2001)
- Prof. Dr. Piyasan Praserttham (TRF Research Team Promotion Grant-1997 and 2001)
- Prof. Vira Kasantikul, M.D. (TRF Basic Research Grant- 1997)

2004

- Prof. Amnuay Kananthai (TRF Basic Research Grant- 1999 and TRF Research Team Promotion Grant-2002)
- Prof. Thira Sirisanthana (TRF Research Team Promotion Grant-2003)
- Prof. Dr. Somsak Ruchirawat (TRF Research Team Promotion Grant-1997 and 2001)
- Prof. Dr. Somchai Wongwises (TRF Research Career Development Grant-1995 and 1998 and TRF Research Team Promotion Grant-2003)
- Prof. Ornsiri Panin (TRF Research Team Promotion Grant-2002)

3. Young Scientist Awards from the Foundation for Promoting Science and Technology under the Royal Patronage of His Majesty the King

1994

- Assist Prof. Dr. Chanan Angsuthanasombat (TRF Research Career Development Grant-1994 and 1997 and TRF Basic Research Grant- 2001)
- Assoc. Prof. Dr. Anchalee Tassanakajon (TRF Research Career Development Grant-1994 and TRF Basic Research Grant- 1998)

1995

- Assoc. Prof. Dr. Sunsanee Chaiyaroj (TRF Research Career Development Grant-1994 and 1997)

1996

- Assoc. Prof. Dr. Pramuan Tangboriboonrat (TRF Research Career Development Grant-1995 and 1998 and TRF Basic Research Grant- 2001 and 2004)
- Prof. Dr. Apiwat Mutirangura, M.D. (TRF Research Career Development Grant-1994 and 1997 and TRF Basic Research Grant- 1997 and 2000 and TRF Research Team Promotion Grant-2005)

1997

- Assoc. Prof. Dr. Supa Hannongbua (TRF Research Career Development Grant-1997 and 2001 and TRF Basic Research Grant-2004)

1998

- Assist. Prof. Dr. Thawatchai Tuntulani (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant-2001 and 2003)

2000

- Assoc. Prof. Dr. Tirayut Vilaivan (Post-Doctoral Research Grant-1997 and TRF Research Career Development Grant-2002 and Research Grant for Mid-Career University Faculty-2005)
- Assoc. Prof. Dr. Taweechai Amornsakchai (Post-Doctoral Research Grant-1997 and TRF Research Career Development Grant-2002)
- Assoc. Prof. Dr. Narongrit Sombatsompop (Post-Doctoral Research Grant-1998 and Research Career Development Grant-2000 and 2002 and TRF Basic Research Grant-2004)
- Assoc. Prof. Dr. Somchart Chantasiriwan (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant-2003)
- Assoc. Prof. Dr. Prasert Auewarakul, (TRF Research Career Development Grant-2000 and 2002)

2001

- Assoc. Prof. Dr. Chakrit Sirisinha (Post-Doctoral Research Grant-1999 and TRF Research Career Development Grant- 2002 and Research Grant for Mid-Career University Faculty-2005)
- Assist Prof. Dr. Teerakiat Kerdcharoen (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant- 2002 and Research Grant for Mid-Career University Faculty-2005)

- Assoc. Prof. Dr. Soottawat Benjakul (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant- 2001)

2002

- Assoc. Prof. Dr. Mongkol Sukwattanasinitt (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant- 2002)
- Assoc. Prof. Dr. Vorasak Shotelersuk, M.D. (TRF Research Career Development Grant- 2001 and TRF Basic Research Grant-2004)

2003

- Dr. Jaroon Jakmunee (Post-Doctoral Research Grant-1999 and TRF Research Career Development Grant- 2003)
- Assoc. Prof. Dr. Palangpon Kongsaree (TRF Research Career Development Grant- 2001 and 2004)
- Assist Prof. Dr. Sarawut Jitrapakdee (Post-Doctoral Research Grant-2000 and TRF Research Career Development Grant- 2003)
- Assoc. Prof. Dr. Suttichai Assabumrungrat (Post-Doctoral Research Grant-2000 and TRF Research Career Development Grant- 2002 and Research Grant for Mid-Career University Faculty-2005)

2004

- Dr. Tienthong Thongpanchang (Post-Doctoral Research Grant-2000 and TRF Research Career Development Grant- 2003)
- Assoc. Prof. Dr. Pornsak Sriamornsak (Research Grant for New Scholar- 2003 and Research Grant for Mid-Career University Faculty-2005)
- Assist Prof. Dr. Supon Ananta (Post-Doctoral Research Grant-2000 and TRF Research Career Development Grant- 2003)

2005

- Assist Prof. Dr. Pimchai Chaiyen (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant- 2002 and Research Grant for Mid-Career University Faculty- 2005)
- Assist Prof. Dr. Yuthana Tantirungrotechai (Research Grant for New Scholar- 2003)
- Assoc. Prof. Dr. Sukit Limpijumnong (TRF Basic Research Grant- 2003 and 2005)

4. Science and Technology Awards from Thailand Toray Science Foundation

1998

- Prof. Dr. Wiwut Tanthapanichakoon (TRF Basic Research Grant- 2001 and TRF Research Team Promotion Grant-1996 and 2002)

2000

- Prof. Dr. Pramote Dechaumphai (TRF Research Career Development Grant-1996 and TRF Research Team Promotion Grant-2001 and 2004)

2001

- Prof. Dr. Panitan Lukkunaprasit (TRF Research Team Promotion Grant-1997 and 2001)

2002

- Prof. Dr. Suranant Subhadrabandhu (TRF Research Team Promotion Grant-2001)

2003

- Prof. Dr. Vithaya Meevuthisom (TRF Basic Research Grant- 1996)

2004

- Prof. Dr. Angsumarn Chanyapatya (TRF Research Team Promotion Grant-2005)

5. “TWAS Prize for Young Scientists in Thailand” Award

1997

- Assoc. Prof. Dr. Somsak Panha (TRF Research Career Development Grant-1994 and 1997 and TRF Basic Research Grant-2001)

1998

- Assoc. Prof. Dr. Supot Hannongbua (TRF Basic Research Grant- 1996 and 2001 and TRF Research Team Promotion Grant-2003)

2001

- Assoc. Prof. Dr. Sunsanee Chaiyarot (TRF Research Career Development Grant-1994 and 1997)

2002

- Assoc. Prof. Dr. Supa Hannongbua (TRF Research Career Development Grant-1997 and 2001 and TRF Basic Research Grant-2004)

2003

- Dr. Piyapong Niumsup (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant-2001 and 2004)

2004

- Assoc. Prof. Dr. Sukit Limpijumnong (TRF Basic Research Grant-2003 and 2005)

6. “The Robert O. Bass” Award

- Assoc. Prof. Dr. Somsak Panha (TRF Research Career Development Grant-1994 and 1997 and TRF Basic Research Grant- 2001)

7. “ASEAN Young Scientist and Technologist Award from Committee on Science and Technology ASEAN”

- Prof. Sirirug Songsivilai, M.D. (TRF Basic Research Grant- 1997)

8. Outstanding Researcher Awards of the Agricultural Science Society of Thailand under the Royal Patronage of His Majesty the King

- Prof. Dr. Sanit Aksornkoae (TRF Research Team Promotion Grant-1996)

9. “2001 Asian Innovation Awards: Bronze”

- Prof. Dr. Wanpen Chaicumpa (TRF Research Team Promotion Grant-2000 and 2003)

10. “For Woman in Science Special Honor Award”

- Prof. Dr. Wanpen Chaicumpa (TRF Research Team Promotion Grant-2000 and 2003)

11. "L'OREAL For Women in Science Award"

2003

- Assoc. Prof. Dr. Sunsanee Chaiyarot (TRF Research Career Development Grant-1994 and 1997)
- Assist Prof. Dr. Pimchai Chaiyen (Post-Doctoral Research Grant-1998 and TRF Research Career Development Grant- 2002 and Research Grant for Mid-Career University Faculty-2005)

2004

- Assoc. Prof. Dr. Anchalee Tassanakajon (TRF Research Career Development Grant-1994 and TRF Basic Research Grant-1998)
- Assist. Prof. Dr. Punnika Niumsup (Post-doctoral Research Grant-2000 and TRF Research Career Development Grant-2003)

2005

- Assoc. Prof. Dr. Porntip Petmitr (TRF Research Career Development Grant-1995 and 2000)
- Dr. Wipa Suginta (TRF Grant for New Researcher-2002)

12. "Mahidol-B Broun" Award

- Prof. Dr. Yong Poovorawan (TRF Research Team Promotion Grant - 1997 and 2001)

13. "2003 UNESCO Science Prize" Award

- Prof. Dr. Somchart Soponronnarit (Research Team Promotion Grant-1996 and 2000 and 2003)

14. "2003 Outstanding Technologist Award"

- Prof. Sirirurg Songsivilai, M.D. (TRF Basic Research Grant- 1997)

15. "JAFIA Scientific Award" from Japanese Association for Flow Injection Analysis, Japan

- Prof. Dr. Kate Grudpan (TRF Research Career Development Grant-1994 and TRF Basic Research Grant- 1998 and TRF Research Team Promotion Grant-2001 and 2004)

16. "Young Technologist Award"

2002

- Assoc. Prof. Dr. Narongrit Sombatsompop (Post-doctoral Research Grant-1998 and TRF Research Career Development Grant-2000 and 2002 and TRF Basic Research Grant-2004)

2004

- Assist Prof. Dr. Sakamon Devahastin (TRF Grant for New Researchers- 2002)

17. "Hy-Line International Research Award, 2005" from Poultry Science Association, USA

- Assist Prof. Dr. Yupaporn Chaiseha (TRF Research Career Development Grant-2004)

18. “2005 Corbett Prize for Young Scientist” from The 23rd International Conference on Defects in Semiconductors

- Assoc. Prof. Dr. Sukit Limpijumnong (TRF Basic Research Grant-2003 and 2005)

Annex 2:

Patents by TRF grantees (approved or pending)

1. Prof. Dr. Somsak Damronglerd
 - Decolorization of pulp mill waste water by cell immobilization in preface fluidized bed bioreactor
2. Prof. Dr. Panitan Lukkunaprasit
 - Hook-Clip for ductility enhancement of reinforced concrete tied columns with 90-degree hook
3. Prof. Dr. Somchart Soponronnarit
 - Equipment and method for drying cereal grains using pulsed fluidized-bed
 - Equipment and method for drying grain with spouted bed
 - Equipment and process for parboiling and drying cereal grains using superheated-steam fluidized-bed
 - Equipment and method for drying products using superheated steam
 - Furnace and method for combusting agricultural wastes for producing clean heat using two vortex chambers
4. Prof. Dr. Somsak Ruchirawat
 - Synthesis of lamellarins and their intermediates
5. Dr. Somchai Wongwises
 - Design of capillary tube for air conditioner and refrigerator
 - Spirally coiled tube heat exchanger
 - Helically coiled tube heat exchanger
6. Assoc. Prof. Dr. Rapepun Wititsuwannakul
 - Production of hybridoma clone Lt 1, capable of secreting monoclonal antibody against 17 kD natural rubber latex lectin. (petty patent)
 - Production of hybridoma clone Lt 2, capable of secreting monoclonal antibody against 17 kD natural rubber latex lectin. (petty patent)
7. Assoc. Prof. Dr. Wanchai De-Eknamkul
 - Geranylgeraniol-18-hydroxylase from *Croton sublyratus*
 - Formation of plaunotol by Geranylgeraniol-18-hydroxylase
8. Prof. Dr. Vithaya Meevuthisom
 - Enzymatic Synthesis of D-phenylglycine and D-p-hydroxyphenylglycine
9. Assoc. Prof. Dr. Watchara Kasinrerak
 - Three-color reagent for measurement of CD4 positive lymphocytes by flow cytometry
 - Monoclonal antibody to Na, KATpase & # 61538; subunit suppress T and B lymphocytes responses
10. Assoc. Prof. Dr. Nopporn Sittisombut

- Dengue Virus Mutant, Strain MBU 01-2002
- 11. Assoc.Prof.Dr. Prachaya Kongtawelert
 - Monoclonal antibody against chondroitin 6-sulfate oligosaccharides and chondroitin 6-sulfate polysaccharide and its application for diagnosis
- 12. Assist. Prof. Dr. Sunee Kertbundit
 - Synthetic Viral Coat Protein Gene, Mahidol 1
- 13. Assoc. Prof. Dr. Sujitra Wongkasemjit
 - Polymeric Membrane for Photocatalytic Degradation
- 14. Assoc. Prof. Dr. Prasert Pavasant
 - A system for the removal of nitrogen compounds from aquacultural pond
- 15. Assoc. Prof. Dr. Jitladda Sakdapipanich
 - Production of liquid functionalized natural rubber using free radical and carbonyl compounds
- 16. Assoc. Prof. Dr. Tirayut Vilaivan
 - Homologous Peptide Nucleic Acids
- 17. Assoc. Prof. Dr. Prakob Kitchaiya
 - Continuous Biodiesel Production Equipment (Petty Patent)
- 18. Assoc. Prof. Dr. Theeraphap Chareonviriyaphap
 - Excito-Repellency Escape Chamber (EREC) for Behavioral Test in Mosquito Vectors
- 19. Dr. Auragun Wibulswas
 - How to use *Curcuma Longa* to inhibit the proliferation and reduce an enzyme of fibroblast-like synoviocytes
- 20. Dr. Prawit Janwantanakul
 - Hot pack contained locally available grains for therapeutic use

Quotations on the Value of Basic Research

The Thailand Research Fund is the first research granting agency in Thailand with explicit policy to support basic research and with a management system to support high quality basic research. Research projects aim to strengthen the nation's academic base can be called **basic research**. The definition used by TRF is the operational definition of research with the goal of publishing results in academic journals, not necessarily leading to direct applications. By defining basic research as research with impact in the form of international journal publication, we are indirectly telling the researchers that the goals of the research project must be to find something substantially novel or original.

*Prof. Vicharn Panich, M.D.
Former Director of the Thailand Research Fund (1993-2001)*

Since research is so expensive, can a developing country like Thailand afford to do basic research?... Thailand cannot afford NOT to do basic research, otherwise it will never be able to compete with the rest of the world.

*Prof. William N. Lipscomb
Nobel Laureate in Chemistry, 1976, and Stang Mongkolsuk Distinguished Professor,
Faculty of Science, Mahidol University*

Production of knowledge is a complex and difficult task demanding time and dedication besides well-equipped laboratories and the necessary resources for their maintenance. The knowledge to be produced should be aimed to meet the needs of society and improve the life quality of our populations. Thus, a task that has to be part of the agenda and be supported by the national social, scientific, technological and industrial policies, which should be harmoniously engaged in short and long term strategies for the welfare of the nation.

*Prof. Eloi S. Garcia,
Former President, FIOCRUZ, Brazil*

Knowledge is a part of universal human culture, and at the same time also have many local characteristics. The Thai society has a potential to grow its own knowledge through research, since it is an open society with a generally tolerant outlook. This will be an even more effective process through collaboration with overseas partners, who can help to bring in knowledge from the outside in addition to indigenous generation of our own knowledge.

*Prof. Yongyuth Yuthavong
Former President, Thai Academy of Science and Technology, Thailand*

Thailand is full of young talent but our scientists urgently need better support. Thereby, the central funding agencies in Thailand must shift their emphasis away from antiquated, short-term PhD programs towards modern, long-term postdoctoral training projects. Only then can centers of excellence be established, which must be guaranteed sufficient funding in order for the research activities to be continued in this country.

*Prof. Sucharit Bhakdi, M.D.
Head of Institute of Medical Microbiology and Hygiene
Hochhaus am Augustusplatz
D - 55101 Mainz Germany*

Unique educational opportunities in the chemical sciences
with Thailand universities

Unique educational opportunities in the chemical sciences with Thailand universities

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The Thai government, through a variety of grant mechanisms, has created opportunities for faculty and students in Thailand universities to collaborate and study with faculty and students in U.S. universities, and to facilitate exchanges. The academic division of the Thailand Research Fund (TRF) provides grants for extended visits by students and faculty at U.S. universities and for faculty and student exchanges. The Post Graduate Education and Research Program (PERCH), under the auspices of the Commission on Higher Education (CHE), provides competitive scholarships for Thai students to attend U.S. universities for part of their thesis research. The recently established Strategic Frontier Research (SFR) program will provide full scholarships on a competitive basis for students to pursue Ph.D. degrees at overseas universities in four focus areas: nanoscience, neuroscience, bioinformatics, and environmental science, broadly defined. The chemical sciences will play a key role in this training. This will provide U.S. chemists opportunities to attract top Thai students to their laboratories and create collaborations. Unique research and educational opportunities in Thailand will benefit U.S. students and faculty. The Thai granting agencies facilitate student and faculty exchanges, and provide an international experience for students.

Strategic Knowledge Consortia :
A Program for Development of University Faculty for
Enhancing Competitiveness of Thai Higher Education

**Strategic Knowledge Consortia :
A Program for Development of University Faculty for
Enhancing Competitiveness of Thai Higher Education**

Human Resource Development Committee
Commission on Higher Education
dwanchai@chula.ac.th

Summary

The Strategic Knowledge Consortia is a human resources development program initiated by The Commission on Higher Education, Ministry of Education. It aims to strengthen the capability of faculty members and the role of higher education institutions in developing the domestic capacity to carry out research and development (R&D) in collaboration with industry. Specifically, the program will assist implementing 20 strategic knowledge consortia that nurture graduate schools and centers of excellence with enough capability to produce creative knowledge in strategically important sectors for Thailand.

Keywords : higher education of Thailand, human resource development, capacity building, strategic knowledge consortia, creative knowledge, research and development

Introduction

Presently, the overall quality of Thai higher education is significantly lower than the international standard. Several key performance indicators have indicated undesirable figures. These include low ratio of faculty with doctoral degrees and professorship, low number of publications, patents and R&D / innovation, and low efficiency of Ph.D. graduate production. This situation has generally affected the quality of research, teaching and academic services in many universities. As a result, the Thai higher education has been relatively inefficient in responding to the government's strategic plan on the enhancement of the country's competitiveness.

Human resources in higher education, especially those who are faculty members and academic staff, are very important for the production of high level manpower, and discovery of new knowledge. At present, the academic staff with Ph.D. degrees in the Thai higher education institutions accounts for only 25 per cent of the overall academic staff. It is, therefore, an urgent need for Thailand to develop this group of human resources.

The main strategy on the academic staff development has been proposed by the Education Reform Steering Committee, Minister of Education and approved by the Cabinet since 16th September 2003. To translate such strategy into action, the Commission on Higher Education has developed a project, Strategic Knowledge Consortia : A Program for Development of University Faculty for Enhancing Competitiveness of Thai Higher Education". This paper describes the concept, objectives and scope of activities of the program.

Project purpose

The main purpose of this project is to speed up Thailand to the knowledge-based society. The project concept is integration of human resource development activities with knowledge creativity. This will be implemented by establishing various “problem-based” consortia which pool experts within country and establishing exchange collaboration relations with world-leading universities to stimulate nurturing highly-qualified human resources.

This program is expected to create environment in which graduate students can exert their efforts mainly on research and study. They will be provided with sufficient stipends and financial support for overseas studies of both “sandwich” and “full time” types.

Each strategic consortium will pursue co-development of curriculums with world-leading universities, distance learning, Faculty/Student exchange programs, and mandatory publication of Ph.D. thesis on international journals. Moreover, relationship with industries/communities will be strengthened by conducting collaborative research. Infrastructure for graduate school such as laboratories, equipment, e-library will be supported.

Types of Support

Applicants must form a research team with certain number of researchers. It can also be a group/network among universities. For management, a group of scientists, technologists, experts from inside/abroad, entrepreneurs, foreign scholars will form a committee for each consortium. Through open competition, the committee will select 2 or more researcher teams per field or area for ensure competition between the research teams. Simultaneously, the committee will conduct follow-up reviews.

Research groups/universities will be supported financially in establishing relations with world-leading universities for International Exchange Program or Collaborative Research Program. The financial support includes scholarship, stipend for Post-doc., and research facilities. For university-industry relation, both university and industry are encouraged to jointly develop research topics.

Networking

Establishing research networks with world leading research groups/centers of excellence/universities in each strategic consortium are encouraged to run joint research program with any world leading universities to enhance international competitiveness. Research internships for graduate students will then be introduced using credit exchange program.

Expectations

- Produce/train 9,600 Ph.D. students
- Develop 2,800 academic staff
- Publish 12,000 international research articles
- Produce 80 industrial products/patents
- Create 500 international research consortia
- Establish 60 centers of excellence in Thai Universities

Scope of activities

The Commission of Higher Education has targeted what it considers the five most important clusters, with twenty consortia, necessary to enhance national competitiveness in the 21st century. The clusters covering from science & technology to art and social science, and the consortia are grouped by convergence of a wide range of disciplines. These include:

1. New Frontier Research

This group puts emphasis on new sciences and future trend of world. It comprises 4 consortia :

- Alternative Energy
- Nanomaterials and Devices
- Converging Technologies in Health Sciences
- Science and Technology for National Defense and Security

2. National Economy Base

This group puts emphasis on increasing productivity and capacity under government's strategies. It comprises 6 consortia :

- Food, Herb and Fruit Safety
- Enabling Technologies for Advanced Agriculture
- Gems, Ornaments and Fashion
- Software and Digital Technology
- Standardization and Instrumentation in Science Technology
- Logistics, Transportation and Aviation

3. Knowledge and Resource Management for Country Scurity

This group comprises 6 consortia :

- Emerging Diseases
- Biodiversity Conservation and Utilization
- Innovation in Chemistry
- Environment and Emergency Management Technology
- Innovation in Education and Knowledge Management
- Intellectual Property and Knowledge Commercialization

4. Culture and Society

This group comprises 2 consortia :

- Languages, Culture, Art and Indigenous Knowledge
- Social Sciences

5. Special Group for Strengthening Basic Science of the Country

This group comprises 2 consortia :

- Mathematics
- Physics

Scopes and disciplines in the 20 strategic consortia are summarize in the following Table.

20 Strategic research consortiums with scopes and potential disciplines involved

New Frontier Research

Consortium	Scope	Supporting Discipline/Subject
1. Alternative Energy	Solar Energy, Advanced Battery, Bio-Diesel, Fuel Cells, Gas to Liquid Conversion, Pemonalized Energy, Hybrid Technology, etc.	Electrical Engineering, Materials Science, Biotechnology, Microbiology, Agriculture, Physics, Chemistry, Biology, etc.
2. Converging Technologies in Health Sciences	Artificial Sensing, Man-Machine Interface, Nanobiotechnology, Gene Therapy, Artificial Brain, Sensor Networks, Universal Memmory, Omnipresent Computing, Intelligent Computing, etc.	Nanoscience, Bioinformatics, Biomechatronics, Cybernatics Cognitive Science, Neuroscience, Computer Science, Medicine, Mechanical Engineering, Electrical Engineering, Mathematics, Physics, Chemistry, Biology, Medical Biotechnology etc.
3. Nanomaterials and Devices	Drug Delivery System, Biomedical Sensor and Diagnostics, Anti-Aging, Optical Magnetic, Electronic Materials Nanoelectronics, Quantum Wire	Materials Science, Electrical Engineering, Medical Technology, Pharmaceutical Technology, Physics, Chemistry Biochemistry, Medical Biotechnology, etc.
4. Science and Technology for National Defense and Security	Anti Bio/Chemical Warfare, Chemical and Biochemical Sensor, Advanced Warrior System (Soldier Suits etc), etc.	Military Science, Biochemistry, Materials Science, Microbiology, Engineering, GIS, Remote Sensing, Physics, Chemistry, Mathematics, etc.

National Economic Base

	Consortium	Scope	Supporting Discipline/Subject
5.	Food, Herb and Fruit Safety	Food, Herb, Fruit Specification, Processing, Packaging, Toxicity, Functional Foods, Quality Evaluation, Nutraceuticals, etc.	Food Science, Food Technology, Toxicology, Botany, Pharmacognosy, Chemistry, Pharmaceutical Botany, Microbiology, Toxicology, Agriculture, etc.
6.	Enabling Technologies for Advanced Agriculture	Post-Harvest, Agro-Industry, Precision Farming, Organic Farming, Fishery Agricultural Economics and Marketing, etc.	GIS, Animal Production, Plant Production, Genetic Engineering, Agricultural Engineering, Fishery Science, Veterinary, etc.
7.	Gem, Ornaments and Fashion	Design, Color, Patterns, Silk Products, Jewelry, etc.	Geology, Physics, Chemistry, Textile Technology, Design, Architecture, Fine Arts, Textile Engineering, etc.
8.	Standardization and Instrumentation in Science & Technology	Analytical Instrumentations, Scientific equipment, Calibration, Standardization, etc.	Chemistry, Mechanical engineering, Physics, Mathematics, etc.
9.	Software & Digital Technology Software	Multimedia, Digital Entertainment, etc.	Computer Science, Computer Engineering, Information Technology, MIS, etc.
10.	Logistics, Transportation, Aviation, Traffic	Logistics, Transportation, Aviation, Traffic, etc.	Transportation Engineering, Management, Administration, etc.

Knowledge and Resource Management

Consortium	Scope	Supporting Discipline/Subject
11. Emerging Diseases and Bio-Warefare	Emerging Diseases (eg. SAR, Bird Flu, etc.)	Molecular Biology, Immunology, Microbiology, Biochemistry, Pharmacology, Pharmacognosy, etc.
12. Bioresource Conservation and Utilization	Biodiversity, Ecotourism, biodiversity-based Economy, Bioresource, Eco-Technology, etc.	Taxonomy, Biology, Ecology, Systems Biology, Microbiology, Zoology, Genetics, Botany, Paleontology Education, Molecular Biology
13. Innovation in Chemistry	Lab-on-Chip, Micrototal Analysis Biotransformation, Combinatorial Synthesis, Combinatorial Biochemistry, Molecular Modeling , Natural Products, High-Throughput Screening, etc.	Chemistry, Biochemistry, Pharmacognosy, Bioinformatics, mathematical modeling, Natural Product Chemistry, etc.
14. Emergency Management & Technology	Crisis, Disaster, Mob, Forest Fire, Tsunami, Earthquake, Diseases, Atmospheric Science Geo computing & Modeling, 3-D Full Scale, Earthquake Testing, etc.	Geology, Climate Science, Mathematics, Remote-Sensing, GIS, Forestry, Biomedical Sciences, Geography, Astronomy, Mathematics, etc.
15. Education Innovation and Knowledge Management	Knowledge Management, Research management, Knowledge documentation Communication Knowledge, MIS, Publications, Life-Long Education	Management, Communication, Journalism Information Education, MIS, etc.
16. Intellectual Property and Knowledge Commercialization	IP, UBI, Enterprises Entrepreneurs, Technology Liscensing, Technology Transfer, etc.	Business 2 AD Ministration, Law, Technology economy, Technology Management, Management Science, etc.

Culture and Society

Consortium	Scope	Supporting Discipline/Subject
17. Languages, Culture, Art and Indigenous Knowledge	Diversity of languages, Cultures, Arts Indigenous Knowledge	History, Cultural Study, Languages, Philosophy, Arts, Indigenous Knowledge, Tourism
18. Social Science	Social Science	Various disciplines in Social Science

Special Group for Strengthening Basic Science of the Country

Consortium	Scope	Supporting Discipline/Subject
19. Physics	Development of Physics in education, curriculum, knowledge and human resources	Physics, Physical Education
20. Mathematics	Mathematics	- Mathematics - Math. Education

Acknowledgements

This Strategic Knowledge Consortia Program was developed by brain storming with the working group comprising Associate Prof. Dr Wanchai De-Eknamkul, Prof. Dr. Supot Hannongbua (Chulalongkorn University), Prof. Dr. Kate Grudpan (Chiang Mai University), Associate Prof. Dr. Watcharapong Ananchuen (Sukhothai Thammathirat Open University), Assistant Prof. Dr. Teerakiat Kerdcharoen (Mahidol University) and Prof. Dr. Pavich Tongroach (Commission on Higher Education).

Unique Educational Opportunities in the Chemical Sciences
with Thailand

Unique Educational Opportunities in the Chemical Sciences with Thailand

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The Thai government, through a variety of grant mechanisms, has created opportunities for faculty and students in Thailand universities to:

- Collaborate and study with faculty and students in U.S. universities
- Facilitate exchanges

Funding programs:

- Thailand Research Fund (TRF)
 - Grants for extended visits by Thai students at U.S. universities
 - Senior Research Scholar grants for faculty visits to U.S. universities
 - Faculty and student exchanges
- Royal Golden Jubilee (RGB) Ph.D. Project
 - Students spend time at U.S. universities for part of their dissertation research

U.S. faculty serve as co-advisors for Thai student research

**U.S. faculty serve on dissertation
examining committees at
Thai universities**

(Insert picture of student exam?)

Council on Higher Education (CHE)

New program:

Strategic Frontier Research (SRF) for Human Resource and Research Development Project

- **Research Group (“center of excellence”)
grants**
- **Faculty exchange grants**
- **Student scholarships for study at U.S. for part
of thesis research**
- **SRF full scholarships for Ph.D. study at
overseas universities**

Focus areas:

- Nanoscience
- Neuroscience
- Bioinformatics
- Environmental science
- Alternative energy

The chemical sciences will play important roles in many of these areas.

Eighty scholarships will be awarded per year, on a very competitive basis.

Tuition and living costs awarded.

Selections will be based on academic achievement, recommendations, foreign language competence, appearance, and performance in the interview.

The goal will be to train these students at leading universities and programs around the world, with the idea of their returning to Thai universities, perhaps as interdisciplinary teams, to establish programs and create a base for Thai leadership in these areas. There will be joint mentors from Thailand with the overseas mentors, for close collaboration to help assure success in creating the proper infrastructure in Thailand for success by the young scientists.

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for:

TRF info
CHE info

National Science Foundation

**Office of International Science and
Engineering**

(OISE)

**International Planning and
Workshops**

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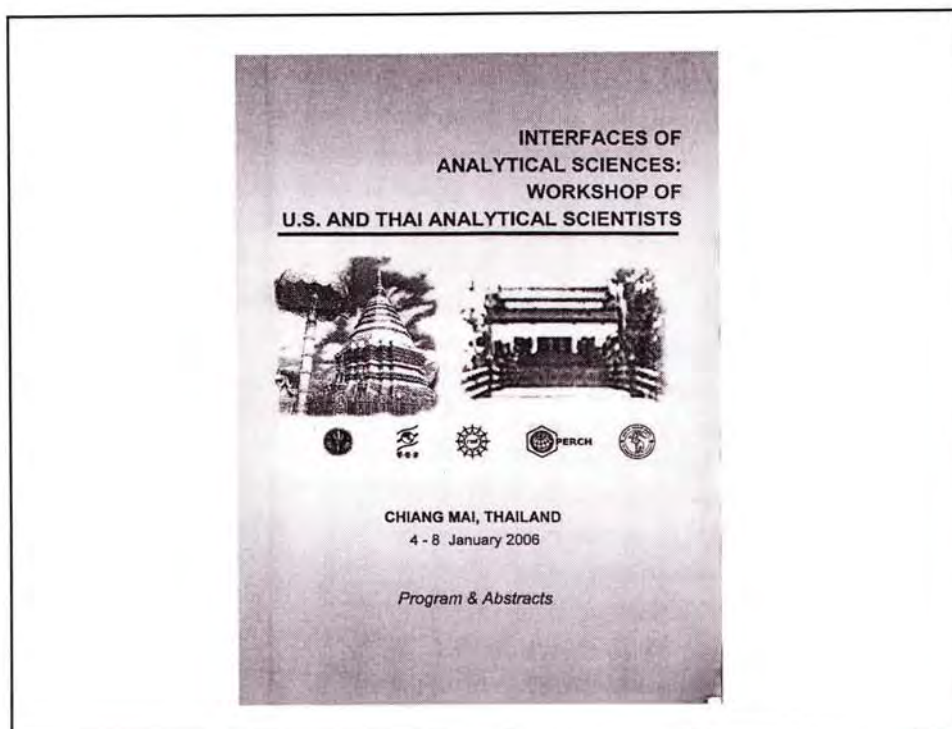
**Interfaces of Analytical Sciences:
Workshop of U.S. and Thai Analytical
Scientists**

**Chiang Mai, Thailand
January 4-8, 2006**

**Gary Christian and Kate Grudpan
Co-organizers**

A workshop was organized by Professors Kate Grudpan from Chiang Mai University and Gary Christian from the University of Washington, who have had long term collaborations between their universities. The National Science Foundation provided funding for travel of U.S. participants to Thailand. Travel, lodging and workshop expenses in Thailand were supported by the Commission on Higher Education (CHE), the Thailand Research Fund (TRF), the Postgraduate Education and Research Program (PERCH), and Chiang Mai University.

The goal of the workshop was to broaden such collaborations in the analytical sciences between U.S. and Thai scientists.



Opening Ceremony



Roundtable Discussions

The workshop concluded with a roundtable discussion. The purpose was to summarize the results of the workshop, and to brainstorm how collaborations can be initiated and supported.

The discussions focused on:

- Initiating Thai-U.S. Collaborations
- Student training
- Funding



Roundtable Discussion

Initiating Thai-U.S. Collaborations

- It is important for Thai faculty to visit U.S. universities to see what is available for possible student training, and to forge closer ties and possible funding.
- U.S. faculty may invite Thai professors as visiting scientists to help them obtain funding or time to come to the U.S., to get to know them personally, to learn more of their work or interests, and to identify top students appropriate for collaboration.
- Thai colleagues should initiate contact with the U.S. participants since they now know their areas of research, and with which they would like to collaborate.

Student Training

Thai students can apply, on a competitive basis, for admission to U.S. departments.

- Thai student visits should be for a minimum of 3 to 6 months, preferably at least 6 months, in order to achieve experimental results and learn technology.
- Students can take advantage of the SRF scholarships to apply to a school of their choice in the focus areas of research.

Funding

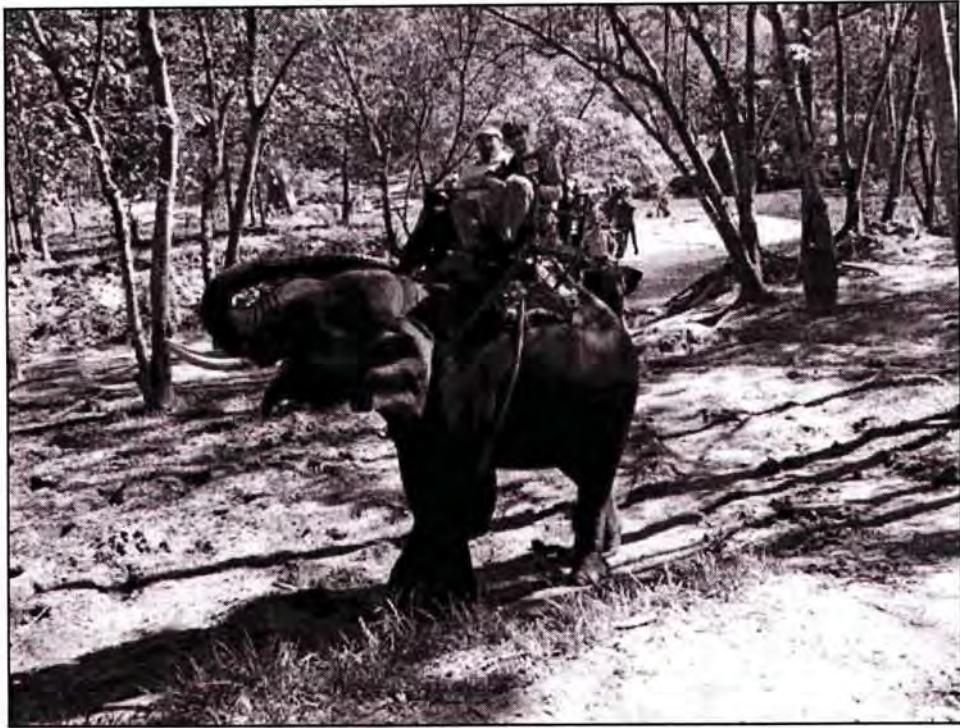
- U.S. faculty are willing to work with Thai faculty and graduate/undergraduate students in preparing proposals to help chemical scientists obtain funding from the Thai agencies.

- It may be possible to obtain funding from, e.g., the National Institutes of Health (NIH) for research in Thailand that is not possible otherwise, for example, research in natural products or tropical diseases.

- Individuals need to identify international funding programs from different agencies. These are the most likely sources for obtaining U.S. support for collaborations.



Workshop participants at Chiang Mai University





GOVERNMENT AND SOCIETY :

Thailand and U.S. strengthen analytical ties

GOVERNMENT AND SOCIETY

Thailand and U.S. strengthen analytical ties

A long-standing collaboration between two analytical chemists, one at the University of Washington (UW) in Seattle and the other at Chiang Mai University (Thailand), led to an international meeting that has furthered ties between researchers in the two countries.

Gary D. Christian, professor emeritus of chemistry at UW, organized the Interfaces of Analytical Sciences workshop, which was funded in the U.S. by the National Science Foundation (NSF) and in Thailand by the Commission on Higher Education, Thailand Research Fund (TRF), Post Graduate Education and Research Program in Chemistry, and Chiang Mai University.

As part of the workshop, 11 analytical scientists from the U.S. went to Thailand in January 2006 to discuss common interests, especially in areas in which the Thai government would like its universities to develop expertise, says Kate Grudpan. These areas include nanoscience and nanoanalysis, neuroscience and bioanalytical science, bioinformatics, and environmental science and analysis, adds Grudpan, a chemistry professor at Chiang Mai University who has collaborated with Christian for >10 years.

Thailand's recent financial investment in basic research also gives students the opportunity to go abroad to learn new analytical tools and techniques. "They've decided they want to get young folks trained in what they consider the 'hot areas', and they're going to send them around the world," says Christian. Grudpan adds, "We try to have focused areas so when they complete their studies, they can start up and have a critical mass" of colleagues working on related research in Thailand.

Possible U.S. funding

As a result of last year's discussions, a group of five U.S. and eight Thai scientists have jointly applied for an NSF Partnership for International Research and



Program participants: (bottom row) Gary Christian and Kate Grudpan; (2nd row) Ariel Lebron-Paler, Sheryl Tucker, Elizabeth Morgan, Jeanne Pemberton, Sandy Dasgupta, and Daniel Sem; (top row) Bob Kennedy, Kristin Fletcher, Isiah Warner, Charles Cao, and Jonathan Sweedler. Not pictured: Joseph Wang and Eric Bakker.

Education grant. If funded, they plan to develop new analytical methods for detecting trace pollutants such as arsenic. "It's a little more urgent for Thailand, because arsenic levels are higher and it's more broadly dispersed," says Daniel Sem, who is the director of the Chemical Proteomics Facility at Marquette University and is leading the initiative in the U.S. A second piece of the grant would explore the use of chemical extracts from plants and other materials indigenous to Thailand for treating exposure to toxins like arsenic. "The Thailand Research Fund is financing [efforts] to build up a collection of natural products that could be a source of drug leads," Sem says.

If the NSF grant is successful, the TRF intends to match it, says Vichai Boonsaeng, director of the TRF Academic Research Division. Either way, the Thai government is committed to pursuing international research collaborations.

Thailand already has some expertise in analytical chemistry, and given the government's interest in preserving the country's strained environment and maintaining the population's current long life expectancy, it is eager to remain strong. "Analytical chemistry is universally important," says Boonsaeng. One priority for Thai people, he adds, is to

analyze the impact of chemical fertilizers on sustainable agricultural processes. They also want to improve medicine and medical diagnoses through nanotechnology.

Recent focus on education

Until the TRF was created in 1992, Thailand did not have the same commitment as other Asian countries to funding advanced education and developing its human resources. The TRF grants awarded to researchers since 1994 aim to do both by supporting basic research in science, technology, social science, and the humanities. "They are trying to expand the population of undergrads

they can accommodate, and to do that, they need high-quality faculty," says Jonathan V. Sweedler of the University of Illinois at Urbana-Champaign.

In 1996, the TRF launched the Royal Golden Jubilee Ph.D. Program to mark the 50th year of His Majesty King Bhumibol Adulyadej's reign. It supports doctoral students in all disciplines, with the aim of producing 5000 Ph.D. graduates by 2011. Through this program, students also have the option of spending 9 months to a year abroad "to do something we don't have the technology for in Thailand," explains Boonsaeng. In addition, the Strategic Frontier Research Project, initiated in 2004 by the Commission on Higher Education, annually funds 40–80 Ph.D. students who have been accepted into overseas programs to study nanoscience, neuroscience, or bioinformatics.

Christian and his colleagues at UW have hosted several Thai students during the past decade. As analytical chemists in other parts of the U.S. develop collaborations with Thai researchers, these exchanges are likely to increase. "With 6 months' training, you can learn a lot in a new environment," says Joseph Wang of Arizona State University. ▀

—Vida Foubister

Unique Education Opportunities in the Chemical Sciences
with Thailand Universities

Unique Educational Opportunities in the Chemical Sciences with Thailand Universities

Gary D. Christian, Department of Chemistry, Box 351700, University of Washington, Seattle, WA 98195-1700: christian@chem.washington.edu

Kate Grudpan, Department of Chemistry, Chiang Mai University, Chiang Mai 50200, Thailand: kate@chiangmai.ac.th, kgrudpan@yahoo.com



The Thai government, through a variety of grant mechanisms, has created opportunities for faculty and students in Thailand universities to:

- Compete for scholarships for full-time Ph.D. study at U.S. universities
- Collaborate and study with faculty and students in U.S. universities
- Facilitate exchanges

► Thailand Research Fund (TRF)

Offering various grants for extended visits by Thai students and faculty at U.S. universities, e.g.:

Senior Research Scholar (faculty visits to U.S. universities, faculty and student exchanges), Royal Golden Jubilee (RGJ) Ph.D. Project (students spend time at U.S. universities for part of their dissertation research, support for visits by co-supervisors (both U.S.-Thai faculty))

U.S. faculty serve as co-advisors for Thai student research

U.S. faculty serve on dissertation examining committees at Thai universities

► Commission on Higher Education (CHE)

New program:

Strategic Frontier Research (SFR) for Human Resource and Research Development Project

- Research Group ("center of excellence") grants
- Faculty exchange grants
- Student scholarships for study at U.S. for part of thesis research
- SFR full scholarships for Ph.D. study at overseas universities

Some focus areas: Nanoscience, Neuroscience, Bioinformatics, Environmental science and Alternative energy

Fifty scholarships will be awarded per year, on a very competitive basis. Tuition and living costs awarded. Selections will be based on academic achievement, recommendations, foreign language competence, appearance, and performance in the interview. The goal will be to train these students at leading universities and programs around the world, with the idea of their returning to Thai universities, perhaps as interdisciplinary teams, to establish programs and create a base for Thai leadership in these areas. There will be joint mentors from Thailand with the overseas mentors, for close collaboration to help assure success in creating the proper infrastructure in Thailand for success by the young scientists.

The chemical sciences will play important roles in many of these areas.

Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

Chiang Mai, Thailand
January 4-8, 2006

Co-organizers: Gary Christian and Kate Grudpan

A workshop was organized by Kate Grudpan from Chiang Mai University and Gary Christian from the University of Washington, who have had long term collaborations between their universities. The National Science Foundation (NSF) provided funding for travel of U.S. participants to Thailand. Travel, lodging and workshop expenses in Thailand were supported by the Commission on Higher Education (CHE), the Thailand Research Fund (TRF), the Postgraduate Education and Research Program (PERCH), and Chiang Mai University.

The goal of the workshop was to broaden such collaborations in the analytical sciences between U.S. and Thai scientists.

Roundtable Discussions

The purpose was to summarize the results of the workshop, and to brainstorm how collaborations can be initiated and supported. The discussions focused on:

- Initiating Thai-U.S. Collaborations
- Student training
- Funding



Student Training

Thai students can apply, on a competitive basis, for admission to U.S. departments.

- Thai student visits should be for a minimum of 3 to 6 months, preferably at least 6 months, in order to achieve experimental results and learn technology.
- Students can take advantage of the SFR scholarships to apply to a school of their choice in the focus areas of research.



• National Science Foundation
Office of International Science
and Engineering (OISE)
International Planning and Workshops
Myra McAuliffe, Program Manager
East Asia and Pacific Programs
Mmcauliff@nsf.gov: (703) 292-8704

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Funding

- U.S. faculty are willing to work with Thai faculty and graduate/undergraduate students in preparing proposals to help chemical scientists obtain funding from the Thai agencies.

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- Individuals need to identify international funding programs from different agencies. These are the most likely sources for obtaining U.S. support for collaborations.



FINAL REPORT FOR AWARD # 0533548



FINAL REPORT FOR AWARD # 0533548

U of Washington

U.S.-Thailand Workshop: Interfaces of Analytical Sciences

Participant Individuals:

Senior personnel(s) : Robert Kennedy; Isiah Warner; Sheryl Tucker; Joseph Wang; Charles Cao; Daniel Sem; Jeanne Pemberton; Jonathan Sweedler

Post-doc(s) : Elizabeth Morgan; Kristin Fletcher

Graduate student(s) : Ariel Lebron-Paler

Post-doc(s) : Cory Scanlan

Graduate student(s) : Andrew Olson

Senior personnel(s) : Eric Bakker; Purnendu (Sandy) Dasgupta

Participants' Detail

Partner Organizations:

Chiang Mai University: Financial Support; Facilities; Collaborative Research; Personnel Exchanges

Dr. Cory Scanlan, a postdoctoral student with Professor Jonathan Sweedler at the University of Illinois, visited Chiang Mai University for two months, from mid-February to mid-April, 2007, for collaborative research with Professor Kate Grudpan's group. Travel was paid by the grant, while per diem support was provided from Thai funds. The project involved developing medical/clinical assays using flow-based sampling with new laser-based fluorescence techniques. The instrumentation technology was transferred to Chiang Mai University. Professor Grudpan is working on funding to send Dr. Supaporn Kradtap Hartwell from his laboratory to Professor Sweedler's laboratory.

Kasetsart University: Financial Support; Facilities; Collaborative Research; Personnel Exchanges

Andrew Olson, a graduate student with Professor Daniel Sem at Marquette University, visited the laboratory of Professor Supa Hannongbua for 1 1/2 months during June and July, 2007. Professor Sem is collaborating with Professor Supa on three projects, dealing with preparing NMR chemical shift reagents for the assay of binding to heme proteins, the screening

of Thai natural products for possible drug discovery for Mycobacterium tuberculosis (TB), and in calculating (by Dr. Supa) fluorescent properties of a screening probe Dr. Sem developed for assaying dehydrogenase drug targets.

Prince Songkla University: Collaborative Research; Personnel Exchanges
Professor Joeseeph Wang at Arizona State University and Professor Eric Bakker at Purdue University are collaborating with Professor Proespichaya Kanatharana at this Southern Thai university in Hat Yai, in the areas of chemical/biochemical sensors. Professor Wang is co-directing students from Prince Songkla University in his laboratory.

Activities and findings:

Research and Education Activities:

Overview/Background

The workshop was organized by Professors Kate Grudpan from Chiang Mai University and Gary Christian from the University of Washington, who have had long term collaborations between their universities. The National Science Foundation provided funding for travel of U.S. participants to Thailand. Travel, lodging and workshop expenses in Thailand were supported by the Commission on Higher Education (CHE), the Thailand Research Fund (TRF), the Postgraduate Education and Research Program (PERCH), and Chiang Mai University. The goal of the workshop was to broaden such collaborations in the analytical sciences between U.S. and Thai scientists. The Thai government has identified several areas in which to build strength in their universities, including nanoscience and nanoanalysis, neuroscience and bioanalytical science, infometrics, and environmental science and analysis. These will be supported by TRF and CHE. The CHE will support some eighty students a year, on a competitive scholarship basis, to study abroad at leading universities to receive Ph.D. degrees in these key areas.

A team of ten broadly based analytical scientists from the U.S. were selected for the workshop, but with an emphasis by most on research very relevant

to the focus areas identified above. So there was good synergism with the proposed programs and the participants. Professor Purnendu (Sandy) Dasgupta from Texas Tech University also participated since he was in Thailand for a Ph.D. thesis exam.

The overall goal of the workshop was to foster collaborations between the U.S. and Thai scientists, which should result in student and faculty exchanges, joint projects, and perhaps applications of some of the scholarship and other students to the U.S. universities.

U.S. participants arrived in Bangkok shortly before midnight on Tuesday, January 3rd, and stayed overnight there. They flew to Chiang Mai the following afternoon.

Program

Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

4 – 8 January 2006

Phayom Meeting Room, Amari Rincome Hotel,
Chiang Mai, Thailand

Wednesday 4 January 2006

16.00-17.30	Registration
17.30	Opening ceremony & Welcoming Cocktail

Thursday 5 January 2006

08.00-08.45	The Policy on Research in Higher Education (Pavich Tongroach, commission on Higher Education) (for Thai participants (in Thai language))
09.00-09.30	Introduction to the workshop. Gary D. Christian (University of Washington) and Kate Grudpan (Chiang Mai University)
09.30-10.30	L-01 High-Speed Capillary Electrophoresis: A Versatile Tool for Bioanalysis (Robert T. Kennedy) University of Michigan
10.30-11.00	BREAK & Poster Session
11.00-12.00	L-02 Novel Separations Using Molecular Micelles in Micellar Electrokinetic Capillary Chromatography (MEKC) and Capillary Electrochromatography

(CEC) (Isiah M. Warner), Louisiana State University

12.00-13.00 LUNCH

13.00-14.00 L-03 From Nanomaterials to Biological Systems: Analytical Chemistry in the Tucker Group at the University of Missouri (Sheryl A. Tucker), University of Missouri-Columbia

14.00-15.00 Lecture introductions to posters (within 5 min/each)

P-01 Kristin A. Fletcher

P-02 Elizabeth Morgan

P-03 Ariel Lebrón-Paler

P-04-05 Saisunee Liawrungrath

P-31 Juwadee Shiowatana

P-25 Pakawadee Sutthivaiyakit

15.00-15.30 BREAK & Poster Session

15.30-17.30 Lecture introductions to posters (within 5 min/each)

P-29 Supalax Srijaranai

P-32 Duangjai Nacapricha

P-39 Proespichaya Kanatharana

P-16 OrawanChailapakul

P-33 Waret Veerasai

P-17 Supot Hannongbua

P-18 Thawatchai Tuntulani

P-34 Teerakiat Kerdcharoen

P-38 Adisorn Tuantranont

P-06-10 Jaroon Jakmunee

P-19 Wanchai De-Eknamkul

P-27-28 Supa Hannongbua

Friday 6 January 2006

08.30-09.30 L-04 Perchlorate, Wherefrom, Wherein and What About it? (Purnendu K. (Sandy) Dasgupta), Texas Tech University

09.30-10.30 L-05 Nanoparticle-based Bioelectronic Detection of DNA and Proteins (Joseph Wang), Arizona State University

10.30-11.00 BREAK & Poster

11.00-12.30 Visit CMU & Research Laboratories

12.30-13.30 LUNCH

13.00-17.00 Excursion for US participants

13.30-15.00 Discussion for possibility in collaboration among Thai participants

15.00-15.30	BREAK
15.30-16.30	Discussion among Thai participants (continued)

Saturday 7 January 2006

08.30-09.30	L-06 Inorganic Nanocrystals: Synthesis and Biological Labeling (Y. Charles Cao), University of Florida
09.30-10.30	L-07 New directions for ion-selective electrodes: from non-equilibrium potentiometry to pulstrodes (Eric Bakker), Purdue University
10.30-11.00	BREAK & Poster
11.00-12.00	L-08 Complementary NMR and Fluorescence Assays in Drug Discovery and Toxicology (Daniel Sem), Marquette University
12.00-13.00	LUNCH
13.00-14.00	L-09 The Characterization of Solid-Liquid Interfaces using Emersion Vibrational Spectroscopies (Jeanne Pemberton), University of Arizona
14.00-15.00	L-10 Understanding Neurochemistry Neuron by Neuron: New Techniques to Study the Nanoenvironment in and around single cells (Jonathan Sweedler), University of Illinois
15.00-15.30	BREAK & Poster Session
15.30-16.30	Poster Session

Sunday 8 January 2006

Round up Final Session: Chaired by Gary D Christian, Vichai Reutrakul
, Vichai Boonsaeng ,Wanchai De-Eknamkul and Kate Grudpan

08.30-09.00	Status of (Analytical)Chemical Science Research in Thailand (by Kate
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Grudpan/Jaroon Jakmunee/Gary D. Christian)

09.00-10.30	Round table discussion
10.30-11.00	BREAK & Poster Session
11.00-12.00	Round table discussion (continued) and Closing session
12.00-13.00	LUNCH

Format

The workshop was hosted by Chiang Mai University, as was held at the Amari Rincome Hotel, a first class facility. A formal opening ceremony was

held Wednesday evening, with speeches by Prof. Dr. Pongsak Angkasith, President of Chiang Mai University, Professor Gary Christian of the University of Washington, Prof. Dr. Piyawat Boon-Long, Director of the Thailand Research Fund (TRF), Prof. Dr. Juwadda Shoiwatana, Deputy Director of the Post Graduate Education and Research Program in Chemistry (PERCH), and Prof. Dr. Pavich Tongroach, Secretary General of the Commission on Higher Education (CHE), followed by a cocktail reception. The opening ceremonies were attended by a representative from the U.S. Consul General in Chiang Mai. An observer from Laos who is an MS student at Khon Kaen University in Thailand was also present.

The U.S. scholars gave presentations of their research over a two and one-half day period, with breaks for poster presentations by the Thai participants and the three U.S. students/ postdoctoral fellows. The U.S. students and several of the Thai participants gave five minute presentations to introduce their posters. There were over fifty Thai participants from universities across Thailand and with diverse interests. On Thursday afternoon, the U.S. participants enjoyed an excursion to an elephant camp, while the Thai participants discussed a major initiative for new funding by the CHE and the implications for collaborations within Thailand as well as with U.S. scientists. The last morning was devoted to roundtable discussions, and post workshop visits to other universities were finalized.

U.S. Participants

The eleven U.S. faculty participants included nine senior (tenured) faculty and two junior (tenure track) faculty, two women, one African American, one China native, and one native from India. The graduate student from the University of Arizona is from Puerto Rico. The two postdoctoral fellows were women.

The faculty participants were:

1. Professor Gary Christian from the University of Washington, who co-organized the workshop with Professor Grudpan from Chiang Mai University, and is PI on the travel grant.
2. Professor Robert Kennedy, Hobart H. Willard Professor of Chemistry,

University of Michigan. His primary goal is to develop nanoscale analytical techniques and explore their use in the measurement of neurotransmitters and hormones in vivo and in single cells.

3. Professor Isiah Warner, Boyd Professor and Philip W. West Professor of Chemistry, Louisiana State University. His research involves development and application of new methods (chemical, instrumental, and mathematical) for analytical measurements to study complex systems.

4. Associate Professor Sheryl Tucker, University of Missouri-Columbia. Her research focuses on the characterization of novel macromolecular media for chemical analysis using molecular spectroscopy, with interests in nanomaterials and biological systems.

5. Professor Purnendu (Sandy) Dasgupta, Paul Whitfield Horn Professor, Texas Tech University. His research encompasses a broad spectrum of modern analytical chemistry, with emphasis on ultratrace atmospheric analysis, membrane, film and drop-based devices, and separations. Professor Dasgupta was a welcome 'guest' participant since he was in Thailand, and the Thai agencies supported his travel to Chiang Mai from Bangkok, and expenses in Chiang Mai.

6. Professor Joseph Wang, Director of the Center of Bioelectronics and Biosensors, Biodesign Institute, Arizona State University. His research includes the development of microfluidic biochip devices, nanomaterials-based sensors, DNA and protein recognitions, and design of nanostructures.

7. Assistant Professor Charles Cao, University of Florida. Professor Cao's interests include synthesis and biolabeling of inorganic nanocrystals.

8. Professor Eric Bakker, Purdue University. He is a leader in the modeling and development of novel potentiometric and optically-based chemical sensors.

9. Assistant Professor Daniel Sem, Marquette University. Professor Sem employs complementary NMR and fluorescence assays in drug discovery and toxicology.

10. Professor Jeanne Pemberton, Regents Professor, University of Arizona. Professor Pemberton studies chemistry at interfaces important in electrochemistry and electrochemical devices, chromatography, and organized molecular assemblies.

11. Professor Jonathan Sweedler, Lycan Professor, Director of the Biotechnology Center, University of Illinois, and associated with the Beckman Institute, Neuroscience Program, and Bioengineering Program. His research in bioanalytical chemistry focuses on developing new methods for nanoliter volume samples, and applying them to study the distribution and dynamic release of neurotransmitters

and neuropeptides from individual neurons.

There were three post doctoral/student participants:

1. Elizabeth Morgan, Post Doctoral Fellow with Professor Linda McGown at Rennselaer Polytechnic Institute. Her research is in the use of aptamer-modified surfaces for use in affinity Matrix-Assisted Laser Desorption-Ionization (MALDI) mass spectrometry and affinity capillary electrophoresis.
2. Kristin Fletcher, Post Doctoral Fellow with Professor Warner at LSU. Her research is in the use of room-temperature ionic liquids for analytical applications.
3. Ariel Lebron-Paler, graduate student working with Professor Pemberton at the University of Arizona. His research interests involve environmental bioremediation using bacterial produced metabolites.

All presentations were well received and generated lively discussions.

Details of the program with abstracts and c.v.s are provided in the program booklet (sent separately). The presentations provided an excellent overview of research interests and capabilities of the U.S. participants and served as an excellent catalyst for initiation of discussions for potential collaborations.

Roundtable Discussions

The workshop concluded with a roundtable discussion on Sunday morning.

The purpose was to summarize the results of the workshop, and to brainstorm how collaborations can be initiated and supported. Following are some of the points made during the roundtable discussion, organized by relevant topics.

I. Initiating Thai-U.S. Collaborations

It is important for Thai faculty to visit U.S. universities to see what is available for possible student training, and to forge closer ties and possible funding.

U.S. faculty may invite Thai professors as visiting scientists to help

them obtain funding or time to come to the U.S., to get to know them personally, to learn more of their work or interests, and to identify top students appropriate for collaboration.

- A U.S. host may be able to extend the stay of a visiting professor by providing some additional support.

- Thai colleagues should initiate contact with the U.S. participants since they now know their areas of research, and with which they would like to collaborate.

- Thai colleagues are encouraged to ask the U.S. participants for suggestions of other U.S. colleagues to contact in specific areas for possible collaboration/student training.

II. Student Training

- Thai students can apply, on a competitive basis, for admission to U.S. departments. Admitted Ph.D. students are hired as Teaching Assistants (TAs) for the first year or two, to direct laboratories, help grade exams, etc. So reasonable fluency in English is required, usually measured by the TOEFL exam. Students may take intensive courses in English to become proficient. Usually students are paid as Research Assistants (RAs) from grant funds for the remainder of their training.

- It will be helpful to send top students for training/Ph.D. study to U.S. departments. This will lay the groundwork for ready acceptance of future recommended applicants. Knowing the Thai faculty who make recommendations will be of value in evaluating student applications.

- Thai student visits should be for a minimum of 3 to 6 months, preferably at least 6 months, in order to achieve experimental results and learn technology.

- Senior U.S. graduate students will benefit from coming to Thailand universities for completing/writing their dissertations, and can introduce their work to Thai students. This can be more productive than a short postdoctoral stay.

- The opportunities for student training is summarized as:

1. Application for graduate school
2. Thai scholarships
3. Informal collaborations/exchanges

English proficiency will be required for graduate school applicants who will serve as Teaching Assistants, but not so critical when this is not

\$1,000/month).

- Postdoctoral appointments would create long term collaboration between younger scientists.
- Thai Ph.D. graduates should be encouraged to obtain postdoctoral training in allied (new) fields to complement their Ph.D. training. Postdoctoral fellowships may be funded by U.S. grants and the Thai agencies.
- Short term or long term visits by faculty/Ph.D. graduates as visiting scientists are possible.
- V. Sabbaticals
 - Sabbaticals in the U.S. and in Thailand are another opportunity to forge closer ties.
- VI. Website
 - A website will be established for the workshop by University of Arizona graduate student, Ariel Lebron-Paler (alpaler@email.arizona.edu). Participants should create a link to this site from their own website, and include a paragraph of their interests relevant to this workshop.

Post Workshop Visits

One of the goals of the workshop was to forge close collaborations between Thai and U.S. scientists. In order to facilitate this, U.S. participants were invited to several Thai universities by faculty who identified their interests as being complementary. The following visits were arranged:

1. Professors Cao, Sweedler, Sem, and Christian were invited to Chiang Mai University prior to other visits.
 2. Professors Wang and Bakker were invited to Prince of Shonkla University in Hat-Yai (Southern Thailand).
 3. Professors Warner and Tucker were invited to Khon Kaen University in Northeastern Thailand.
 4. Professors Sweedler and Sem were invited to Kasetsart University in Bangkok.
 5. Professors Kennedy and Tucker were invited to Mahidol University in Bangkok.
 6. Professors Cao, Wang, and Bakker were invited to Chulalongkorn University in Bangkok.
 7. Professor Christian was invited to Burapha University in Bangsaen, Southeast of Bangkok, where he presented a lecture.
- Professor Pemberton was invited to Mahidol University, but had to cancel

required.

III. Funding

- U.S. faculty are willing to work with Thai faculty and graduate/undergraduate students in preparing proposals to help analytical scientists obtain funding from the Thai agencies.

- It may be possible to obtain funding from, e.g., the National Institutes of Health (NIH) for research in Thailand that is not possible otherwise, for example, in natural products or tropical diseases.

- It takes 1 to 2 years to obtain funding from U.S. agencies, and perhaps one in three proposals is funded.

- Individuals need to identify international funding programs from different agencies. A list can be compiled to be shared. These are the most likely sources for obtaining U.S. support for collaborations.

- Main funding sources in Thailand include the Thailand Research Fund (TRF) and the Commission on Higher Education (CHE). The focus areas of neuroscience and bioanalytical science, nanoscience and nanoanalysis, infometrics, and environmental science and analysis were discussed at the meeting. The CHE will provide competitive scholarships for students to study abroad for Ph.D. degrees in a number of these focus areas. Analytical scientists can contribute in all these areas, as evidenced by the research of the U.S. analytical scientist participants.

- The U.S. participants identified interest in these areas as follows: nanoscience and nanoanalysis: Professors Pemberton, Wang, Bakker, and Tucker; neuroscience and bioanalysis: Professors Warner, Sem, Wang, Bakker, Sweedler, and Kennedy; environmental science and analysis: Professors Warner, Pemberton, Sem, Wang, Bakker, Tucker, and Dasgupta. This indicates excellent opportunities for collaboration.

- Policy makers may want to interpret these areas broadly in order to widen participation by the most universities with a diversity of expertise, and to have wider impact of research funds.

IV. Postdoctoral Training/Visiting Scientists

- Postdoctoral study in Thailand of U.S. Ph.D. graduates may be attractive to them if opportunities are available that would further their careers, again examples being something like natural products or tropical disease research, that is, learning about local problems. The funding level is not so important so long as they can live on the stipends provided (ca.

because of illness. But the personal contact has been made.

Visit to Thailand Research Fund

U.S. participants were invited to visit the Thailand Research Fund in Bangkok on the last day, Tuesday, January 10th to meet with other Thai scientists who were unable to attend the workshop in Chiang Mai, along with a number of those who were at Chiang Mai. There were some ninety Thai participants. We received an overview of the many programs at TRF and of the new 'megaproject' funding program being implemented. The U.S. participants gave brief presentations of their work. Then everyone broke into three working sessions:

1. Nanoscience and Nanoanalysis. U.S. Chair: Professor Cao
2. Neuroscience and Bioanalysis: U.S. Chair: Professor Sweedler
3. Environmental Science and Analysis: U.S. Chair: Professor Pemberton

Each group invited the Thai participants to give a brief overview of their research interests. From this, three general areas of research interests were identified for each group, which formed the basis for three discussion groups. These were very productive in identifying initiation of a number of collaborations, and ways to pursue funding.

Social Events

We were all treated to the wonderful Thai hospitality. The welcoming reception included traditional local dances and performances by Chiang Mai University students. The TRF invited us to dinner following the first day of the workshop, and Dean Mongkon Ryankorn of the Faculty of Science at Chiang Mai University invited us for the following evening to a typical Northern Thailand meal, followed by traditional musical performances and dances by performing artists in very colorful costumes. Then all were taken to the famous Night Bazaar for shopping, each taken care of by a group of students. A highlight was a visit one afternoon to an elephant camp, which included elephant rides and a raft trip down the river. Visits were arranged to the Doi Suthep Temple outside of Chiang Mai and to the Grand Palace in Bangkok, and to gem shops. On the last evening, following the visit to TRF, we were treated to a wonderful dinner at the Ratchapruet Country Club by PERCH Director Vichai Reutrakul.

Reports of the Workshop and Collaboration Opportunities

In order to make other analytical scientists, as well as other chemists, aware of collaboration opportunities in Thailand, and the desire of the Thailand government to provide training opportunities for top Thai students in the U.S., an A-Page article on the workshop and collaboration possibilities was submitted to Analytical Chemistry by G. D. Christian and K. Grudpan.

It was subsequently published as a Government and Society news article, 'Thailand and U.S. strengthen ties', written by correspondent Vida Foubister, Anal. Chem., 79(3), 794 (2007).

<http://pubs.acs.org/subscribe/journals/ancham/79/i03/pdf/0207government.pdf>).

A news article on the workshop was published in the Society for Electroanalytical Chemistry newsletter, SEAC Communications, Volume 23, Number 2, July 2007, p. 4, 'More news on the international front from Gary Christian, University of Washington'.

A paper, 'Analytical Chemistry in Thailand: Opportunities for U.S. Electrochemists and Analytical Scientists,' was presented at the National American Chemical Society Meeting in San Francisco, September 10-14, 2006, and a presentation was made at the Society of Western Analytical Professors (SWAP) meeting in Tucson, Arizona, January 25-27, 2007, 'Analytical Chemistry in Thailand: Opportunities for Analytical Scientists'. A poster was presented at the 233rd American Chemical Society National Meeting, Division of Chemical Education, March 25-29, 2007, Chicago, IL, 'Unique Educational Opportunities in the Chemical Sciences in Thailand Universities'.

A workshop website was created by Ariel Paler-Lebron, a graduate student who attended the workshop: <http://www.chem.arizona.edu/~alpaler>

Findings:

The major results of this workshop were the forging of a number of collaborations, some underway, others in the works. These involve student/faculty exchanges, co-directing of students, and joint funding. Major areas of interest in Thailand were identified for potential scholarship Thai student enrollment in U.S. university programs.

Training and Development:

U.S. graduate and postdoctoral students have gained international experience, with exposure to different cultures and approaches to research, as have faculty. Likewise, Thai students and faculty have benefited from exposure to top-rated U.S. researchers and their approaches to research.

Outreach Activities:

The main approaches have included a news article in *Analytical Chemistry*, which although being a scientific publication, is publicly available and other informed scientists may make the information more widely available.

Presentations at ACS meetings also provides exposure, and media representatives attend these meetings. In addition, a Powerpoint Research Highlight was submitted to the Analytical and Surface Chemistry Program, which is used for publicity of NSF projects.

Journal Publications:

Vida Foubister (news correspondent), "Thailand and U.S. strengthen analytical ties (a Government and Society news article)", *Analytical Chemistry*, vol. 79, (2007), p. 794., " " Published

Book(s) of other one-time publications(s):

Other Specific Products:

American Chemical Society meeting presentations

Oral presentation at the 232nd. ACS National meeting in San Francisco, Sept. 10-14, 2006: "Analytical Chemistry in Thailand: Opportunities for U.S. Electrochemists and Analytical Scientists", Gary D. Christian and Kate Grudpan

Poster presentation at 233rd. ACS National meeting in Chicago, March 25-29, 2007: "Unique Educational Opportunities in the Chemical Sciences in Thailand Universities", Gary D. Christian and Kate Grudpan

Public presentations at the national meetings.

Invitations/lectures in Thailand

I was invited back to Thailand by Professor Vichai Ruetrakul, who was a driver for arranging the workshop, to present a plenary lecture at the Postgraduate Education and Research Program in Chemistry - Center for Innovation in Chemistry (PERCH-CIC) Congress V, Pattaya, Chonburi, May 6-9, 2007. My lecture was "How to Write (and How Not to Write) a Scientific Paper: Experiences of an Editor", delivered to an audience of some 600, mostly graduate students. It was an excellent learning experience for the students, and even the faculty. While there, I was also invited to Naresuan University, Pitsanulok, Thailand, where I lectured on "Scientific Writing" and to Mahidol University in Bangkok (the largest university in Thailand) to lecture on "What Analytical Chemists Do: A Personal Perspective". I also visited Professor Grudpan at Chiang Mai University, who always has more ideas for collaborations.

The PERCH lecture received wide publicity prior to the congress.

Workshop reports in Thailand

Professor Vichai Boonsaeng mentioned the workshop on various occasions in his capacity as Director of the Basic Research Section of Thailand Research Fund. And he visited the National Science Foundation in April of this year, discussing the workshop and encouraging a similar workshop on nanoscience/technology.

An article on the workshop was included in the TRF Update newsletter, Vol.2, No. 2, May-August 2006, by Professor Dr. Prasert Sophon, advisor to the Academic Research Division of the TRF. In an upcoming issue, a copy of the Analytical Chemistry news article will be published.

The TRF Newsletter is distributed to participants in the TRF program.

Newsletter article

A news article on the workshop was published in the Society for Electroanalytical Chemistry newsletter, SEAC Communications (Anna Brajter-Toth, Editor), Volume 23, Number 2, July 2007, p. 4: "More news on the international front from Gary Christian, University of Washington".

The newsletter was sent to members of the Society for Electroanalytical Chemistry

Report

Professor Grudpan holds an annual symposium at Chiang Mai University for his TRF Senior Scholar Grant and Innovation on Analytical Instrumentation, which includes invited international speakers and participants from Thailand universities. The workshop was discussed in reports for the 5th Annual Symposium (August 12, 2006) and the 6th Annual Symposium (August 16, 2007), including a link to the Analytical Chemistry "Government and Society" news article which reports the results of the workshop. A report of the 5th Annual Symposium was also published in the Japanese Journal of Flow Injection Analysis (JFIA), with a mention of the workshop for facilitating international collaboration.

The reports are available from TRF to researchers in Thailand. The JFIA is published internationally.

Internet Dissemination:

www.chem.arizona.edu/~alpaler

This website was created by graduate student, Ariel Lebron-Paler, a student workshop participant from the University of Arizona. Highlights of the workshop and photos are posted.

Contributions:

Contributions within Discipline:

The significance of this project is that it opens the door for other analytical scientists and students to learn new analytical technologies, tools and

applications, and to forge international collaborations. The work will also be relevant in the areas of neurochemistry, environmental chemistry, and others. Unique student training will result. New research infrastructure will be built in Thailand and possibly in the U.S. Cost-efficient tools for environmental monitoring will be developed.

Contributions to Other Disciplines:

See Contributions Within Discipline. The tools and methods developed will find use in other disciplines to solve problems.

Contributions to Education and Human Resources:

See Contributions Within Discipline. Unique student training will be a major result of the project.

Contributions to Resources for Science and Technology:

Thai universities have had U.S. analytical tools, technology, and training transferred to their laboratories. U.S. students have received training in new methodologies at Thai universities.

Categories for which nothing is reported:

Participants: Other Collaborators

Products: Book or other one-time publication

Contributions Beyond Science and Engineering

Submit

Return



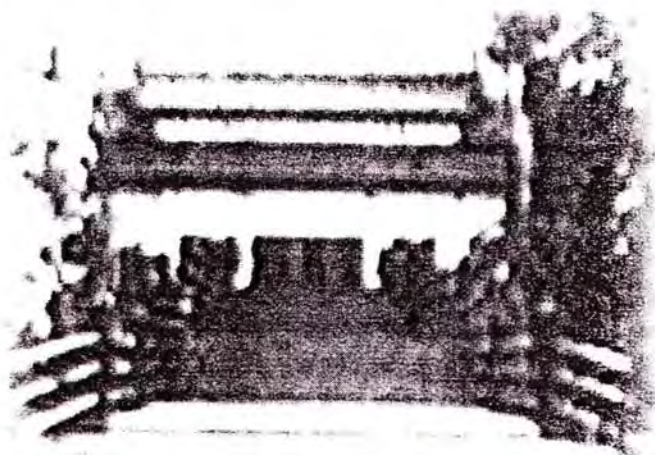
We welcome comments on this system

Interfaces of Analytical Sciences: Workshop of U.S. and

Thai Analytical Scientists

4-8 January 2006, Chiang Mai, Thailand

INTERFACES OF ANALYTICAL SCIENCES: WORKSHOP OF U.S. AND THAI ANALYTICAL SCIENTISTS



CHIANG MAI, THAILAND

4 - 8 January 2006

Program & Abstracts

INTERFACES OF ANALYTICAL SCIENCES: WORKSHOP OF U.S. AND THAI ANALYTICAL SCIENTISTS

4 – 8 January 2006

Chiang Mai University
THAILAND

Under auspices of

- The U.S. National Science Foundation (NSF)
- The Commission on Higher Education (CHE)
- The Thailand Research Fund (TRF)
- The Post-graduate Education and Research Program
in Chemistry (PERCH)
- Chiang Mai University

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 Thai Scientists

CV14 - CV40

List of participants

LP01 - LP07

The local organizing committee

Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

4 – 8 January 2006, Chiang Mai, Thailand

Background

Some few years ago, the Director of the Postgraduate Education and Research Program in Chemistry (PERCH) (Professor Vichai Reutrakul) and the Deputy Director of the Thailand Research Fund (TRF) (Professor Vudhipong Techadamrongsin) suggested to Professor Kate Grudpan of Chiang Mai University the possibility of organizing a workshop to provide opportunities of U.S. and Thai Scientists, especially in analytical sciences, to meet together and have discussions and exchange information so that collaborations may be established. U.S. support for such a workshop should be requested from the National Science Foundation (NSF).

In January 2005, Professor Gary D. Christian came to Chiang Mai University for his honorary doctoral degree. Together with Professor Kate Grudpan, he discussed the workshop proposal with the Secretary General of the Commission on Higher Education (CHE) (Professor Pavich Tongroach) and was informed of financial support also by CHE. Professor Christian submitted a proposal for the Workshop to NSF. Professors Vichai Boonsaeng and Wanchai De-Eknamkul are also involved in the workshop preparation.

The workshop, designating Professor Gary D. Christian as a PI and Professor Kate Grudpan as co-PI, is granted by the NSF to provide financial support of leading U.S. scientists, together with postdoctoral fellows and Ph.D. and undergraduate students for the travel cost to Thailand, while the cost of organizing of the workshop and of Thai participants are borne the Thai organizations, namely, CHE, TRF and PERCH. The workshop is organized by the staff of Chiang Mai University, chaired by the Vice-President, academic affairs (Professor Pong-In Rakariyatham). Apart from the members of the Research Laboratory of Excellence in Development of Miniaturization in Flow-based Analysis (active members: Professor Kate Grudpan, Dr. Jaroon Jakmunee, Dr. Somchai Lapanantnoppakhun and Dr. Supaporn Kradtap Hartwell), a number of others have contributed to the organization and success of the workshop. The workshop venue is in Chiang Mai, during 4-8 January 2006. Post-visits after the workshop to various University laboratories in Thailand will be made by the U.S. scientists before their journeys back home.

Intellectual Merit of the Workshop

The goal of the workshop is to provide opportunities for leading U.S. analytical and related scientists to present an overview of their ongoing research to scientists from universities in Thailand, with the objective of facilitating collaboration. Thai scientists will also be invited to present their work.

The focus of the workshop will be the analytical sciences broadly, including bioanalytical chemistry and techniques for the investigation of biochemical processes.

Success of the workshop will result in international collaborations that will advance knowledge and understanding of specific analytical methodologies, and through interdisciplinary approaches, of challenging biochemical processes, particularly in the neurosciences. This would be very much supported by TRF (especially the Basic Research Division), CHE and PERCH.

Broader Impact of the Workshop

The broader impact of the workshop will include the participation of students in international collaborative research. It is anticipated that underrepresented students will participate in exchange programs in Thailand. The participants include senior staff, younger faculty and students from across geographical regions of the U.S. and Thailand. Opportunities may result for U.S. universities to accept top Thai students selected and supported on a competitive basis by the Commission on Higher Education to obtain training in three areas of focus: neuroscience, infometrics, and nanoscience.

Collaborative partnerships should result from the workshop. The results of the Workshop will be disseminated broadly through publication and national meeting presentations to make the chemical community aware of collaboration opportunities in Thailand. Benefits to society will include exposure of students and faculty to different cultures.

Program
Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists
4 – 8 January 2006
Phayom Meeting Room, Amari Rincome Hotel,
Chiang Mai, Thailand

Wednesday 4 January 2006

- 16.00-17.30 **Registration**
17.30 **Opening ceremony & Welcoming Cocktail**

Thursday 5 January 2006

- 08.00-08.45 The Policy on Research in Higher Education (Pavich Tongroach, commission on Higher Education) (for Thai participants (in Thai language))
- 09.00-09.30 Introduction to the workshop. Gary D. Christian (University of Washington) and Kate Grudpan (Chiang Mai University)
- 09.30-10.30 L-01 High-Speed Capillary Electrophoresis: A Versatile Tool for Bioanalysis (Robert T. Kennedy) University of Michigan
- 10.30-11.00 *BREAK & Poster Session*
- 11.00-12.00 L-02 Novel Separations Using Molecular Micelles in Micellar Electrokinetic Capillary Chromatography (MEKC) and Capillary Electrochromatography (CEC) (Isiah M. Warner), Louisiana State University
- 12.00-13.00 *LUNCH*
- 13.00-14.00 L-03 From Nanomaterials to Biological Systems: Analytical Chemistry in the Tucker Group at the University of Missouri (Sheryl A. Tucker), University of Missouri-Columbia
- 14.00-15.00 Lecture introductions to posters (within 5 min/each)
- | | |
|---------|--------------------------|
| P-01 | Kristin A. Fletcher |
| P-02 | Elizabeth Morgan |
| P-03 | Ariel Lebrón-Paler |
| P-04-05 | Saisunee Liawrungrath |
| P-31 | Juwadee Shiowatana |
| P-25 | Pakawadee Sutthivaiyakit |
- 15.00-15.30 *BREAK & Poster Session*
- 15.30-17.30 Lecture introductions to posters (within 5 min/each)
- | | |
|---------|--------------------------|
| P-29 | Supalax Srijaranai |
| P-32 | Duangjai Nacapricha |
| P-39 | Proespichaya Kanatharana |
| P-16 | OrawanChailapakul |
| P-33 | Waret Veerasai |
| P-17 | Supot Hannongbua |
| P-18 | Thawatchai Tuntulani |
| P-34 | Teerakiat Kerdcharoen |
| P-38 | Adisorn Tuantranont |
| P-06-10 | Jaroon Jakmunee |
| P-19 | Wanchai De-Eknamkul |
| P-27-28 | Supa Hannongbua |

Friday 6 January 2006

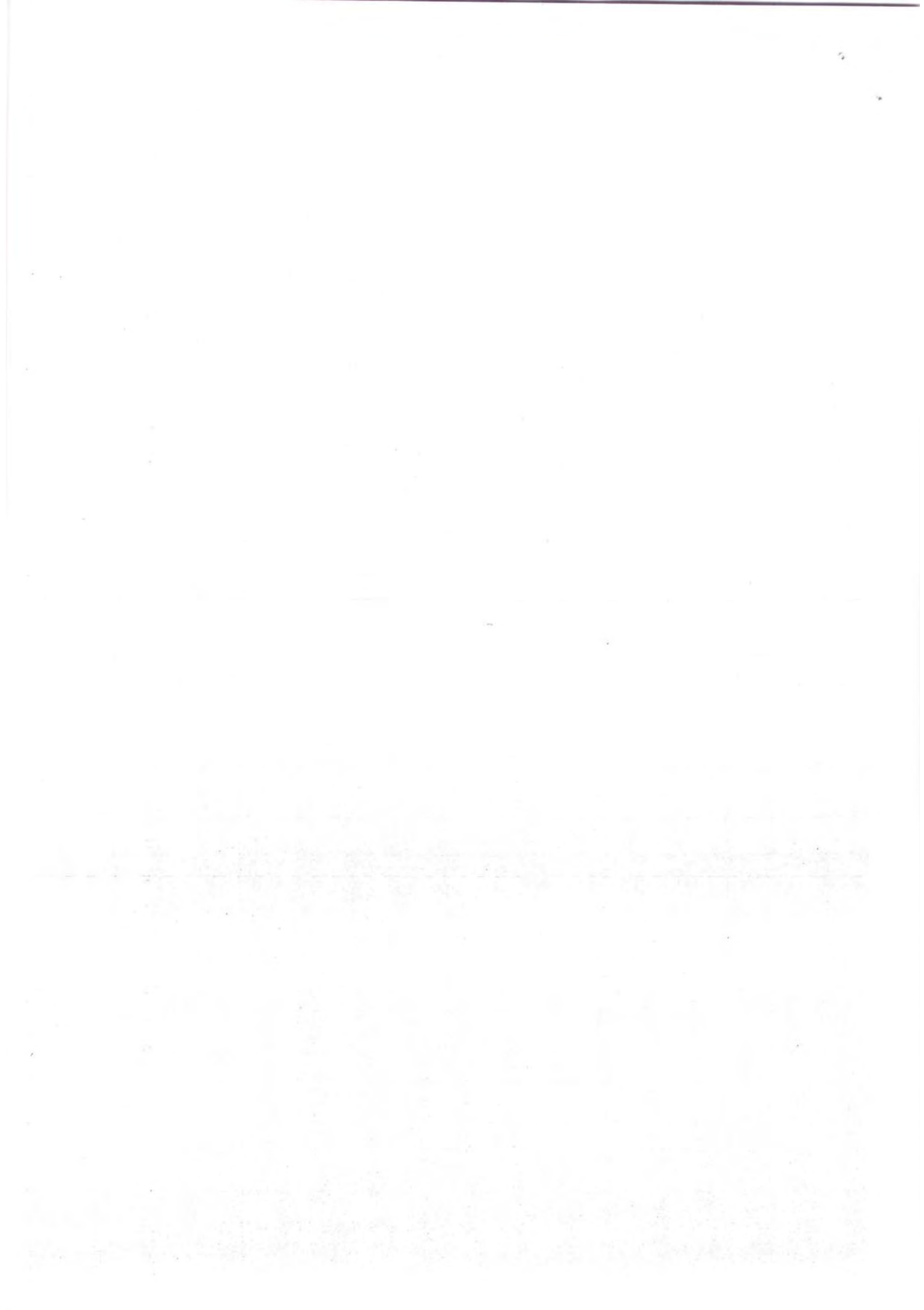
- 08.30-09.30 L-04 Perchlorate, Wherefrom, Wherein and What About it? (Purnendu K. (Sandy) Dasgupta), Texas Tech University
- 09.30-10.30 L-05 Nanoparticle-based Bioelectronic Detection of DNA and Proteins (Joseph Wang), Arizona State University
- 10.30-11.00 *BREAK & Poster*
- 11.00-12.30 Visit CMU & Research Laboratories
- 12.30-13.30 *LUNCH*
- 13.00-17.00 Excursion for US participants
- 13.30-15.00 Discussion for possibility in collaboration among Thai participants
- 15.00-15.30 *BREAK*
- 15.30-16.30 Discussion among Thai participants (continued)

Saturday 7 January 2006

- 08.30-09.30 L-06 Inorganic Nanocrystals: Synthesis and Biological Labeling (Y. Charles Cao), University of Florida
- 09.30-10.30 L-07 New directions for ion-selective electrodes: from non-equilibrium potentiometry to pulstrodes (Eric Bakker), Purdue University
- 10.30-11.00 *BREAK & Poster*
- 11.00-12.00 L-08 Complementary NMR and Fluorescence Assays in Drug Discovery and Toxicology (Daniel Sem), Marquette University
- 12.00-13.00 *LUNCH*
- 13.00-14.00 L-09 The Characterization of Solid-Liquid Interfaces using Emersion Vibrational Spectroscopies (Jeanne Pemberton), University of Arizona
- 14.00-15.00 L-10 Understanding Neurochemistry Neuron by Neuron: New Techniques to Study the Nanoenvironment in and around single cells (Jonathan Sweedler), University of Illinois
- 15.00-15.30 *BREAK & Poster Session*
- 15.30-16.30 Poster Session

Sunday 8 January 2006

- Round up Final Session : Chaired by Gary D Christian, Vichai Reutrakul , Vichai Boonsaeng , Wanchai De-Eknamkul and Kate Grudpan
- 08.30-09.00 Status of (Analytical)Chemical Science Research in Thailand (by Kate Grudpan/Jaroon Jakmunee/Gary D. Christian)
- 09.00-10.30 Round table discussion
- 10.30-11.00 *BREAK & Poster Session*
- 11.00-12.00 Round table discussion (continued) and Closing session
- 12.00-13.00 *LUNCH*
-



High-Speed Capillary Electrophoresis: A Versatile Tool for Bioanalysis

Robert T. Kennedy^{1,2}, Nicholas A. Cellar¹, Kendra Reid, Peilin Yang¹, Zechariah Sandlin¹, Emily E. Jameson¹, and Jill Venton¹

¹ *Department of Chemistry, University of Michigan, Ann Arbor, MI, USA*

² *Department of Pharmacology, University of Michigan, Ann Arbor, MI, USA*

Performing electrophoresis separations in capillaries allows much higher electric fields to be applied than in conventional gel electrophoresis, which in turn allows separations to be performed much more rapidly. High resolution separations in < 1 s can be performed with fields of 3,000 V/cm and appropriate instrumentation. Such fast separations allows the possibility of electrophoresis being used for chemical sensing, high-throughput analysis (as in drug screening), and for detection of short-lived species. The advent of microfabricated electrophoresis devices has allowed such fast separations to be incorporated into more complex systems. In this talk we will describe the use of fast electrophoresis to monitor hormone secretion from live cells, neurotransmitters in vivo, and the kinetics of biochemical reactions.

For the live cell studies, a microfabricated device shown in Figure 1 is developed that houses a single islet of Langerhans (insulin secreting cells of the pancreas). The islet is perfused with cell culture media and continuously sampled on-chip. The insulin released is measured using an electrophoresis-based immunoassay. The method should be generally applicable to other

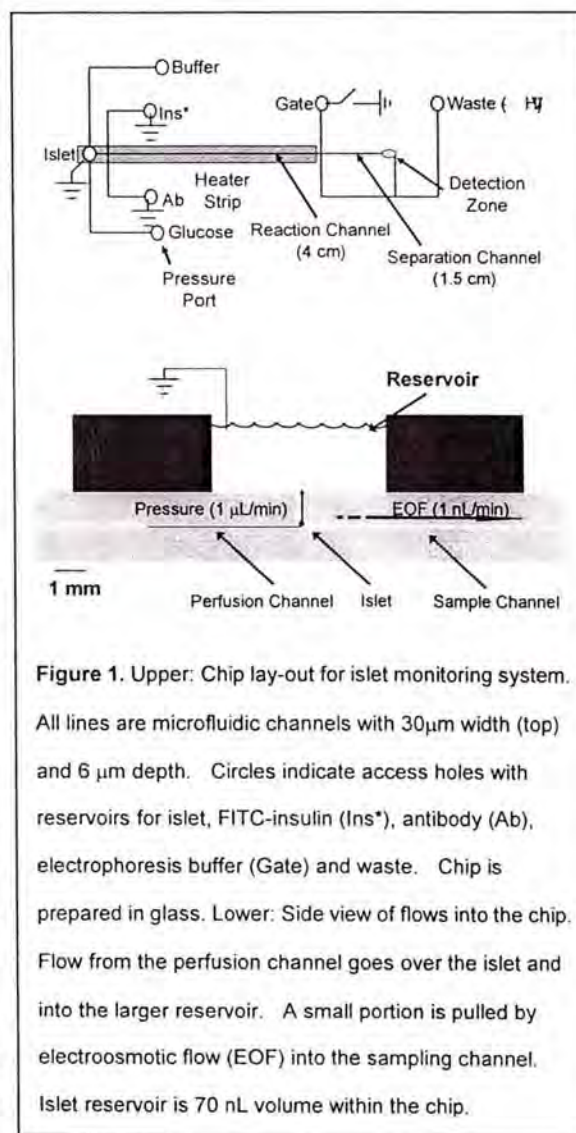


Figure 1. Upper: Chip lay-out for islet monitoring system. All lines are microfluidic channels with 30 μ m width (top) and 6 μ m depth. Circles indicate access holes with reservoirs for islet, FITC-insulin (Ins*), antibody (Ab), electrophoresis buffer (Gate) and waste. Chip is prepared in glass. Lower: Side view of flows into the chip. Flow from the perfusion channel goes over the islet and into the larger reservoir. A small portion is pulled by electroosmotic flow (EOF) into the sampling channel. Islet reservoir is 70 nL volume within the chip.

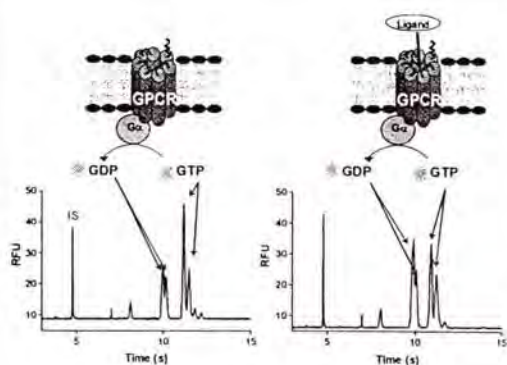


Figure 2. Schematic depicting the developed CE-based fluorescence assay for measuring receptor-mediated G protein GTPase activity. The cartoon illustrates the hydrolysis of BODIPY FL GTP (BGTP) to BODIPY FL GDP (BGDP) by heterotrimeric G proteins in a sample containing cell membranes with (right) and without (left) agonist. The electropherograms shows how the fluorescent product BGDP is separated from the substrate BGTP by capillary electrophoresis (CE), with more BGDP produced in samples containing agonist. Two peaks are observed for both BGTP and BGDP, due to inhomogenous labeling of the fluorescent GTP substrate on the 2' or 3' position of the ribose ring (see Supporting Information for the structure of BGTP).

cell types.

For neurotransmitter analysis, an *in vivo* sampling probe is coupled to on-line to a rapid CE measurement. The high temporal resolution allows rapid changes in behavior to be correlated with neurochemical changes enabling a new generation of psychological/neuroscience experimentation. This is an example of chemical sensing by rapid separations.

For biochemical kinetics measurements, two reactions are studied: G protein hydrolysis of GTP and cyclic-AMP formation by adenylyl cyclase. Both of these reactions utilize fluorescent nucleotides as substrate and continuous monitoring of the reaction mixture stream by serial injections onto a fast CE system allows changes in substrate, complex, and product to be determined. Michaelis-Menton kinetics can be measured. The method also allows activation of the proteins to be detected leading to the possibility of using the method as a drug screen. For example, in Figure 2, the conversion of fluorescently labeled GTP to

GDP can be detected by CE-LIF in samples that contain membranes with G protein coupled receptors. In the presence of a ligand that activates the receptor, this conversion is accelerated allowing active drugs to be detected.

Novel Separations Using Molecular Micelles in Micellar Electrokinetic Capillary Chromatography (MEKC) and Capillary Electrochromatography (CEC)

Isiah M. Warner

Department of Chemistry, Louisiana State University, Baton Rouge, LA 70803

Capillary Electrophoresis (CE) has become an important analytical tool for separation of charged analytes. In addition, the CE method when used in combination with a micellar pseudostationary phase offers a number of advantages for separation of neutral analytes. This latter approach has been termed micellar electrokinetic chromatography (MEKC) and has been evolving with the use of other pseudostationary phases for the last two decades. In our laboratory, we have employed polymeric surfactants (molecular micelles) for separation of chiral and achiral analytes using MEKC. Our studies have shown that these polymers are usually more suitable than conventional micelles in MEKC. We have also sought to understand the factors which contribute to effective enantiomeric separation by use of chiral polymeric surfactants. By careful attention to the parameters which contribute to chiral recognition, we have been able to develop a chiral polymeric surfactant reagent which is more than 70% effective for chiral recognition of 75 chiral drugs randomly pulled off the shelf. The great success of our reagents in MEKC has encouraged us to explore the utility of these phases in capillary electrochromatography (CEC). The CEC approach combines the separation ability of HPLC with the separation efficiency of CE. In this talk, we will focus on the use of molecular micelles as separation reagents in MEKC, CEC, and combined CEC/MEKC. The advantages and disadvantages of using these molecular micelles for CEC and MEKC separations will be compared and contrasted.

From Nanomaterials to Biological Systems: Analytical Chemistry in the Tucker Group at the University of Missouri

Sheryl A. Tucker

Department of Chemistry, University of Missouri-Columbia, Columbus, MO 65211

Research in the Tucker Group falls under one overarching theme—the analysis and characterization of novel macromolecular media and complex systems—with applications in chemical separations and sensing. For the last several years, the primary focus of this research program has been dendritic polymers, specifically poly(amidoamine), PAMAM, and poly(propyleneimine), PPI. Dendrimers are still a relatively new class of polymers that are monodisperse macromolecules with well-defined architectures and are referred to as unimolecular micelles. We have extensively studied their host-guest properties and generational dependencies, using spectrofluorometric probe techniques. Research results have spanned from reporting the novel intrinsic fluorescence of the PAMAM dendrimers, to being the first to sequester and characterize the PAMAM and PPI core regions, to the selective entrapment of target molecules from heterogeneous populations.

Recently, through collaboration with the Atwood Group in our Chemistry Department, we have moved into the characterization of self-assembling nanocapsules composed of C-alkyl-pyrogallol[4]arenes. They are formed through noncovalent hydrogen bonds between six pyrogallol[4]arene moieties and are capable of enclosing 1200-1500 Å³ of molecular space. Through encapsulation, the supramolecular nanocavities are designed for selective binding, separation and sensing of smaller molecules and ions, molecular transport and delivery, stabilization of reactive intermediates, and catalysis. Through the use of fluorescent reporter molecules, we have shown that these populated nanospheroids have an ordered inner phase and unique chemical environment. Single crystal X-ray crystallographic studies complemented the solution phase spectroscopic data.

The diversity of this research program is also enhanced through collaborations across disciplines. For example, we have been working with the Giuliano Group in Veterinary Medicine, to develop a spectroscopic method to validate of a novel photodynamic therapy (PDT) modality they use in treating equine squamous cell carcinoma. The unprecedented subcutaneous injection of a photosensitizing agent into the surgically excised tumor bed had shown favorable clinical results; however, scientific studies, to establish that the positive patient outcomes were due to local PDT, were needed. We investigated parameters such as the localization and resident-time of the drug in equine tissue. This project also has had to reconcile clinical needs and limitations with the types of control studies that experimental protocols demanded.

We have also tied two of our emphasis areas into a single project - enhanced separation of polycyclic aromatic hydrocarbons (PAHs). PAHs are an environmental concern because many are carcinogens/mutagens, and they remain difficult to separate due to the co-elution of structural and geometric isomers and the number and range

of compounds in a given sample. We have attempted to improve PAH reversed-phase HPLC separations through the use of secondary equilibria in the mobile phase. The introduction of either traditional surfactants or unimolecular micelle polymers in this phase, leads to improvements in the resolution and/or detection of this class of compounds. Moreover, such solvent systems are more environmentally friendly compared to usual mobile phase compositions.

The aforementioned Tucker Group projects are part of a collaborative research program, focusing on strengths in molecular spectroscopy and chemical separations. Furthermore, this academic program has a history of actively engaging in the development of human resources, particularly those from underrepresented groups.

Perchlorate, Wherefrom, Wherein and What About it?

Purnendu K. (Sandy) Dasgupta

*Department of Chemistry and Biochemistry, Texas Tech University,
Lubbock TX 79409-1061*

Perchlorate has been much in the American news media since the discovery of the significant contamination of the lower Colorado river with perchlorate seeping from the Las Vegas Wash, the source apparently being a single plant that manufactured ammonium perchlorate for use as Rocket fuel. Perchlorate, which was once regarded as a harmless, essentially nontoxic anion, may now be regulated at a maximum permissible level of a few parts per billion in drinking water. Perchlorate competes with iodide, which is essential for proper thyroid function in adults and for neural development in infants. There are two sodium iodide symporters in mammals, one is in the thyroid glands and the other is present in female mammary glands, the only means by which iodide is delivered to a breastfed infant. Much like most synthetic anion exchangers, perchlorate has much greater affinity for the symporter sites than iodide, effectively reducing iodide transport even at low perchlorate levels. There is naturally great concern about the presence of perchlorate in drinking water.

While the production of perchlorate as a fuel oxidizer may indeed be to blame for the contamination of the lower Colorado, easily measurable levels of perchlorate in groundwater in many places in the Texas panhandle, hundreds of miles away from any known perchlorate production facility, suggests that all perchlorate did not originate as rocket fuel. George Erickson of the USGS continued a noble tradition of trying to solve a century old puzzle and spent a lifetime figuring out how the Chilean Saltpeter deposits (which is mostly sodium nitrate but contains 0.1-0.2% perchlorate) originated. Based on isotopic evidence, his 1997 paper, published posthumously, concluded that the nitrate has atmospheric origin. With sufficient sensitivity brought about by collaboration with scientists at Iowa State, we can now see perchlorate everywhere, in rain, snow, even ice core samples from Greenland. Does perchlorate too naturally originate in the atmosphere?

We have done a US-wide study of dairy milk (FDA has now done theirs and come to the same conclusion) and human milk. The results of human milk studies are particularly of note and the relationship with iodide measured at the same time gives much food for thought.

This talk will discuss my personal involvement in the intensely politicized continuing perchlorate saga and its omnipresence and what it might mean for people in West Texas.

Nanoparticle-Based Bioelectronic Detection of DNA and Proteins

Joseph Wang

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The unique properties of nanoparticle-based materials, and the versatility of microspheres, in general, offer excellent prospects for the detection of DNA and proteins. This presentation will describe new multi-amplification/multi-tag particle-based bioelectronic assays based on a variety new biomaterial-nanoparticle assemblies. In particular, combining the catalytic enlargement of the metal-particle tags with the effective 'built-in' amplification of electrochemical stripping analysis, paved the way to remarkably low (fmol) detection limits. New platforms for carrying numerous redox tags, including carbon nanotubes and polystyrene beads, will be discussed in connection to ultrasensitive detection of proteins and nucleic acids. The high sensitivity of the new protocols was combined with an efficient magnetic separation. Such use of magnetic beads has been extremely useful for discriminating against unwanted constituents, including a large excess of co-existing mismatched and non-complementary oligomers, chromosomal DNA, RNA and proteins. TEM imaging has indicated that the DNA hybrid links the metal nanoparticles to the magnetic beads. No such aggregates were observed in the presence of noncomplementary or mismatched DNA. A new electrochemical coding bioassay, based on different inorganic-colloid (quantum dots) nanocrystal tracers, whose metal components yield well-resolved highly sensitive stripping voltammetric signals for the corresponding targets, will be described. The use of DNA recognition for designing nanoscale assemblies with tailored properties will also be discussed. Current efforts aimed at developing and transforming these protocols to high throughput microchip and multiwell platforms will be discussed.

Inorganic Nanocrystals: Synthesis and Biological Labeling

Y. Charles Cao

Department of Chemistry, University of Florida, Gainesville, FL 32611

Inorganic nanocrystals exhibit size- and shape-dependent properties that are of interest for applications ranging from biosensing and catalysis to optics and data storage. To date, the most successful and widely used nanocrystal synthesis relies on rapid precursor injection. However, it is difficult to scale up such a synthesis for making nanocrystals in large quantities. Herein we report a new synthesis of high-quality lanthanide-oxide and II-VI semiconductor nanocrystals. This new synthesis exhibits easily controllable nanocrystal growth kinetics. Therefore such a synthesis is very important for large-scale industrial preparation of these nanocrystals, where the rates of heating and cooling are limited. The as-prepared nanocrystals are highly dispersible in non-polar organic solvents, and simultaneously form superlattice structures via a self-organization process. After ligand exchange, these nanocrystals are dispersible in aqueous solutions. In addition, these nanocrystals are highly fluorescent, and exhibit higher stability against chemical and photo-oxidation, which is important to biological labeling applications.

New directions for ion-selective electrodes: from non-equilibrium potentiometry to pulstrodes

Eric Bakker

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The world of electrochemical sensors has traditionally been neatly divided between zero current potentiometry and dynamic electrochemistry, and ion-selective electrodes have belonged to the former group. A zero current readout principle has brought many advantages, such as independence of the signal on scaling laws and relatively robust behavior. In recent years, however, a number of important response characteristics have been improved by understanding kinetic non-ideal behavior. Indeed, unlike common textbook knowledge, operation at zero current does not necessarily mean that mass transport properties are negligible. In fact, the detection limits of polymeric membrane ion-selective electrodes have recently been improved by orders of magnitude compared to traditional values. On the other hand, many novel response principles have been discovered by departing from thermodynamic behavior, including the design of potentiometric sensors for polyionic analytes. This talk will explain how potentiometric sensors may be placed under instrumental control, by eliminating spontaneous extraction properties of the membrane and by galvanostatically driving ions into the sensing membrane. This results in ion sensors that have the same look and feel as their zero current potentiometry counterparts, with near-Nernstian response slopes and potentials that depend on the activity of the sample ions at higher concentrations. Since, however, the transport and extraction kinetics of the system are fully controlled, such devices are now reliable and useful where zero current potentiometry has traditionally failed. A range of promising applications will be discussed, including selectivity switching, reliable polyion sensing, and advances to probe surface recognition processes at such membranes.

Complementary NMR and Fluorescence Assays in Drug Discovery and Toxicology

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The goal of our research is to develop assays that facilitate the drug discovery process at the steps of: (a) Biomarker screening, (b) Lead discovery and (c) Lead optimization. The assays employ complementary use of NMR and fluorescence-based detection. Unique drug discovery tools being provided through the CPFM (Chemical Proteomics Facility at Marquette) include: NMR-based screening/lead optimization assays, complementary fluorescence assays, NMR and fluorescence reagents, and databases of drug fragments/building blocks.

(a) Biomarker screening. Oxidative stress, as manifested in altered levels of reduced thiols like glutathione, is correlated with various pathologies and toxic insults. But, there are no sensitive assays for detecting altered thiol levels *in vivo*, to assess this biomarker potential. We have developed a fluorescent dithiol reagent that appears to cross cell membranes, and permits detection of thiols *in vivo*.

(b) Lead discovery. We are developing the complementary use of NMR and fluorescence assays for two target classes commonly pursued in drug discovery efforts. Dehydrogenases. We have identified a privileged scaffold that is also fluorescent, and can be used as a universal assay for dehydrogenases as is, or tethered to another fragment to increase affinity for a specific dehydrogenase. Kinases. Drug targets being pursued are those involved in cell wall synthesis, especially for *Mycobacterium tuberculosis* and *Plasmodium falciparum*. Kinases are one of the most widely-pursued drug target classes, yet there is no universal and continuous kinase assay that operates in the preferred mode with signal increasing over time. We are developing a universal fluorescence-based assay for kinases by using ATP β S as a substrate.

(c.1) Lead optimization: potency. Once hits are identified and verified from primary screens, it is common to modify them to increase potency. For each of the above target classes, a ligand is being prepared that has a $^{13}\text{CH}_3$ group strategically placed. This label can be used to identify building blocks for fragment-based optimization of hits, in isotope filtered NMR experiments.

(c.2) Lead optimization: metabolism. Once potent leads are identified, it is common to screen for binding to a panel of cytochromes P450 (CYPs) using fluorescence-based activity assays. As a complement to these assays, we are developing NMR-based binding assays using $^{13}\text{CH}_3$ -labeled heme ligands. These assays can identify hits in a primary screen, and can provide structural information in a secondary screen.

In summary, we are developing: (1) A reagent/assay for detecting thiols *in vivo*, as an oxidative stress biomarker; (2) Universal fluorescence assays for infectious disease drug target classes: kinases & dehydrogenases; (3) Universal NMR binding/structural assays for kinases and dehydrogenases; (4) A universal NMR-based binding and structural assay for CYPs.

The Characterization of Solid-Liquid Interfaces using Emersion Vibrational Spectroscopies

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Recent efforts in this laboratory have focused on the development of a new approach to acquiring information about interfacial molecular structure at solid-liquid interfaces based on emersion, the controlled removal of an established interface at a solid surface from its native solution. The emersion process causes interfacial shear, resulting in the retention of thin layers of solution of nm-scale thickness on which optical spectroscopies can be performed. To date, this method has been successfully coupled with surface Raman and infrared spectroscopies, ellipsometry, and fluorescence spectroscopy to provide new information about the molecular details of interfacial structure in a wide range of chemical systems. In this seminar, models for the process that generates such thin layers will be discussed and details of the implementation of emersion Raman spectroscopy and emersion infrared reflectance-absorbance spectroscopy (IRRAS) will be presented. These tools have been applied to several model chemical systems based on bare and organically-modified metal and oxide surfaces in an effort to elucidate the fundamental molecular basis of surface wetting. Among the systems to be discussed will be those relevant in devices based on electrowetting and in reversed-phase liquid chromatography separations.

Understanding Neurochemistry Neuron by Neuron: New Techniques to Study the Nanoenvironment in and around single cells

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How does the brain work and how does it control behavior? Understanding the interactions of even relatively simple networks of neurons is hampered by a lack of knowledge of the full complement of neuroactive compounds used in most neuronal systems. Using matrix-assisted laser desorption/ionization (MALDI) time of flight (TOF) mass spectrometry (MS), neuropeptides can be identified in single cells and even in individual neuronal processes. Mass spectrometric imaging methods are described that can provide spatial "maps" of the neuropeptides found in simple invertebrate networks, as well as identify new neuropeptides. Using these techniques, hundreds of novel neuropeptides have been discovered and characterized in a range of simpler nervous systems including *Aplysia californica*, *Apis mellifera* and in several vertebrates.

What about classical neurotransmitters? As one example, the simultaneous detection and quantitation of serotonin and its metabolites at the level of individual neurons provide fundamental information of the neurochemical processes occurring in the central nervous system. A direct, quantitative and sensitive technique using nanoliter-volume sampling and capillary electrophoresis with wavelength-resolved laser-induced fluorescence detection has been developed to study the indolamines and related metabolites (such as tryptophan, tyrosine, 5-hydroxyindole acetic acid etc). We observe statistically significant changes in serotonin levels with the animal's hunger state in a single pair of neurons intricately involved with the feeding state of gastropod mollusks. The last example involves chiral measurements. In the nervous system of animals ranging from mollusks to mammals, D-amino acids are present. For example, D-Asp and D-Glu may be neurotransmitters and the biosynthesis of D-Asp has been observed in mammalian cells. In order to understand the functioning of D-Asp and D-Glu, we use small volume sampling and capillary electrophoresis with a combination of radionuclide detection, laser induced fluorescence detection and on-column absorbance detection. Using the invertebrate neuronal model system of *Aplysia californica*, we find that in specific identified neurons, the D-Asp levels represent up to 80% of the total Asp. In order to study the function of this molecule, we use single and subcellular characterization of the amino acids in the cell soma and neuronal processes, as well as its synthesis, transport and degradation. Our data to date supports a role of D-Asp in cell to cell signaling. These new analytical approaches are compared using a variety of well characterized neuronal networks from several neuronal model systems.

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TBA

Aptamers

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Aptamers are combinatorially selected oligonucleotides with high affinity for binding a particular target analyte, such as a protein or metabolite. Advantages of aptamers compared to other affinity binders include ease of production, modification, and manipulation, high stability, and reusability. Current investigations involve aptamer-modified surfaces for use in affinity Matrix-Assisted Laser Desorption-Ionization (MALDI) mass spectrometry and affinity capillary electrophoresis (CE). Studies of G-quartet forming aptamers including thrombin binding aptamer (TBA) and the insulin-linked polymorphic region (ILPR) will be presented. Successful capture of target proteins (thrombin and insulin) has been demonstrated. Capture of insulin-like growth factors by ILPR is the focus of recent work.

Rhamnolipid Biosurfactant for Heavy Metal Remediation: Sorption Studies at the Solid-Liquid Interface

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Rhamnolipid biosurfactant produced by the microorganism *Pseudomonas aeruginosa* can form metal complexes with traditional heavy metal contaminants in addition to exhibiting characteristic surfactant properties. The metal-binding properties of rhamnolipid could lead to enhanced heavy metal transport, but might also lead to alteration of mineral surface properties in the case of rhamnolipid or rhamnolipid-metal complex sorption. These processes have the potential to either facilitate or prevent heavy metal solubilization and/or removal from soil. Complete study of these systems at the solid-liquid and air-water interfaces is important in order to assess the feasibility of new, environmentally-compatible soil cleaning technologies. ATR-FTIR spectroscopy has been used in our studies to characterize rhamnolipid sorption to alumina in the presence and absence of lead(II) in solution. Insight about the sorption process on the charged surface and its implications will be presented and discussed.

Sequential Injection with Surfactant-Enhanced Absorption Spectrophotometric Determination of Zinc in Pharmaceutical Preparations Using 1-(2-pyridylazo)-2-Naphthol

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A Sequential injection (SI) spectrophotometric procedure for small amounts of zinc(II) using 1-(2-pyridylazo)-2-Naphthol(PAN) in a non-ionic surfactant, Triton X-100 medium was developed to avoid solvent extraction. It is based on the measurement of the pink Zinc(II)-PAN complex solubilized in the surfactant medium, pH 9.5 with an absorption maximum at 533 nm. Optimum conditions for determining zinc(II) were investigated to obtain the greatest sensitivity with minimum reagent consumption and waste release. A linear calibration graph over the range of 0.1-1.0 mg L⁻¹ was obtained with the regression equation $Y = 56.84x + 0.895$ with a correlation coefficient (r^2) of 0.9997. The method was very sensitive with the LOD (3σ) and the LOQ (10σ) of 0.02 and 0.06 mg L⁻¹, respectively. The RSD values for replicate determination ($n=10$) of 0.1 and 0.5 mg L⁻¹ Zn(II) were found to be 1.3 and 1.2 %, respectively. The proposed procedure has been satisfactorily applied to the determination of zinc(II) in commercial pharmaceutical preparations with a sample throughput 40 h⁻¹. Comparative determination of zinc(II) in the same sample solutions was carried out by atomic absorption spectrophotometry. Results obtained by both methods were in good agreement verified by student t-test at 95% confident level. Possible interfering cations and the method for elimination of interferences were also described.

Keyword: Sequential injection(SI), Spectrophotometric Detection, Zinc(II), 1-(2-pyridylazo)-2-Naphthol(PAN), Triton X-100, AAS

Computer Assisted Enhancement of Flow Injection (FI) Signal for Determining Manganese (II) based on Formaldioxime

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A double channel flow injection (FI) manifold with spectrophotometric detection incorporating with a computerized readout system was proposed for manganese(II) determination. A specially designed software was developed connect a spectrophotometer with a personal computer to replace an expensive chart recorder as a readout device for the fabricated FI manifold. The method is based on the reaction between manganese(II) and formaldioxime yielding a redish-colour product with the absorption maximum at 450 nm. The method involved injection of a 150 μl of standard or sample solution containing Mn(II) into a flowing system of 0.3 mol L⁻¹ formaldioxime in an ammonia buffer solution pH 9.0 which was then merged with another flowing stream containing masking agent (0.3 mol L⁻¹ EDTA as disodium salt) and 0.4% hydroxylamine hydrochloride(w/v). Optimum conditions for determining manganese(II) were investigated. Linear calibration graph over the ranges of 0.1-4.0 mg L⁻¹ Mn(II) and 0.1-0.5 mg L⁻¹ Mn(II) using a chart recorder and a computer as readout devices respectively. The detection limit (3σ) of 0.075 mg L⁻¹ and 0.059 mg L⁻¹ respectively were obtained. The RSD of 1.0 mg L⁻¹ Mn(II) was less than 2.0% (n=12) and the recovery of the added Mn(II) was grater than 99.0%. The proposed procedure with the computerized system has been applied to the determination of Mn(II) in natural waters with a sample throughput of 120 h⁻¹. A ten-fold enhancement of FI signal was obtained.

Keyword: Flow Injection(FI), Spectrophotometric Detection, Manganese(II), Formaldioxime

Development of Flow-based Analysis

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Our research group registers to be “Research Laboratory for Excellence in Development of Miniaturization in Flow Based Analysis” of the Faculty of Science and “Research Laboratory for Development of Analytical Instrumentation” of the Institute for Science and Technology Research and Development. Both affiliate to Chiang Mai University.

The researches of interest focus on development of analytical systems with flow-based techniques, including flow injection analysis(FIA), sequential injection analysis(SIA), FI/SI with bead injection, SI-Lab-on-valve, SI-Lab-at-valve and stopped flow. Miniaturization has been in progress. Cost-effectiveness is one of consideration aspects. Applications aim to local as well as international communities/ societies.

Some Developments on Microfluidics for Various Applications in Thailand

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The new developments in analytical science leading to analytical techniques that are precise, accurate, rapid and inexpensive are crucial to technologically advancing and sustainable society. Down scaling an analytical system into an assembly to integrate sample handling, i.e., sample introduction, pretreatment, separation and chemical reaction for detection with a sensor has been attempted. Flow-based analytical techniques can be used to manipulate sample and reagents in microfluidic system for automated sample processing either by continuous flow or programmable flow. This leads to development of various assemblies with microfluidics, micro-total analysis system (μ TAS) or Lab-on-Chip (LOC). The feature advantages are reduction of sample/reagents consumption, decreasing in analysis time with potential in “real time” analysis.

Development of Cost Effective Instruments and Techniques

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Our research group has designed and built some cost-effective instruments and apparatus, e.g., amperometer, potentiometer, stopped flow injection analyzer, microcontroller controlled pretreatment column and data acquisition system. Some new approaches on flow based analysis have been exploited, e.g., sequential injection(SI) with lab-at-valve, SI – lab-on-valve monosegmented flow titration, new stopped flow concept and hydrodynamic sequential injection analysis. The developed instruments and techniques have been applied to various local problems.

Some Aspects of Developments of Food and Pharmaceutical Analysis

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One of the directions of our research group concerns the developments of food and pharmaceutical analysis. Simple procedures for various applications have been investigated. The procedures are aimed as alternative to the standard methods. The procedures are useful both in remote and routine analysis. Examples of such investigations include Vitamin C assay (such as in fruit juice and pharmaceutical preparation samples), paracetamol assay, chromium picolinate assay in dietary supplement and the determination of tetracyclines in pharmaceutical preparations.

Applications of flow based analysis for low cost clinical screening

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Some flow based analysis techniques coupled with clinical screening methods have been developed. The main objective is to improve the performance of the existing clinical screening processes that are normally used in the hospitals in developing countries. Factors affecting performance include precision, analysis time, amount of sample and reagent used, ease of operation, analysis cost and safety for the operator. Works being done are listed as follows: flow injection-reduced volume anion exchange column for hemoglobin typing to screening for some types of thalassemia, flow injection-mini-immunoaffinity column for determination of condroitin sulphate proteoglycans to screen for ovarian cancer, sequential injection-ELISA bead based immunoassay and capillary immunoassay for determination of hyaluronic acid to screen for bone disease, sequential injection-lab-at-valve-bead immunoassay of condroitin sulphate epitope to screen for liver disease, flow injection-bead injection system for determination of bone alkaline phosphatase and hydrodynamic flow injection for osmotic fragility test.

Analytical Chromatography Research at Chiang Mai University, Thailand

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Following the installation of the first gas chromatograph of Chiang Mai University in the Chemistry Department in mid 1960's, analytical chromatography research at Chiang Mai University has been continually elevated. The department today is able to provide its staff and students with a range of chromatographic instruments for both teaching and research purposes. The scope of the analytical chromatography research has been expanded each year. Systematic optimization of various chromatographic parameters has been a common approach of the research group in carrying out projects aiming at more efficient separation and better detection of multi-component compounds. Successful projects with external funding include the following: sampling and analysis of acid deposition by ion chromatography, analysis for rice aroma constituents using gas chromatography, application of two-dimensional gas chromatography to the analysis of essential oils in natural samples, identification of volatile analytes in various samples using solid-phase microextraction coupled with gas chromatography-mass spectrometry, and liquid chromatography-mass spectrometry of a wide range of antioxidants and surfactants. Current analytical chromatography research is on the development of methods to be used in the analysis for certain hazardous air pollutants in airborne particulates, as part of the air pollution monitoring project funded by the Thailand Research Fund.

Biomedical Polymers Technology Unit Current Research

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The Biomedical Polymers Technology Unit (BPTU) is an interdisciplinary research group formed through the collaboration between polymer scientists in Chiang Mai University's (CMU's) Department of Chemistry and medical scientists in CMU's medical-based faculties. The BPTU is a designated Speciality Technology Unit of Thailand's National Metal and Materials Technology Center (MTEC).

Historically, the BPTU started out as a Polymer Research Group with a particular interest in the synthesis and characterisation of aliphatic polyesters. The main synthetic route was the ring-opening polymerisation (ROP) of cyclic esters (lactones and lactides). Since various members of this class of polymer are well-known to be biodegradable within the human body, this research has been expanded towards biomedical applications such as absorbable surgical sutures and nerve guides. At the same time, basic research still continues into the mechanisms of the ROP of cyclic esters with the aim of being able to synthesize more complex copolymers with controlled molecular architectures.

To complete its portfolio of main projects, the BPTU is also working to develop synthetic hydrogels for use in wound dressings. This is in response to an urgent need for this type of material in hospitals throughout Thailand. As with the biodegradable polyesters, the aim is to develop a cost-effective material which could be commercially produced at a price which Thai hospitals could afford.

Solvothermal Synthesis: Fabrication and Crystal Growth technique to Nanoparticles and New Hybrid Materials

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In broad terms, hydrothermal synthesis is one of a *chemie douce* process taking place in a liquid media above the boiling point and 1 bar, resulting in a crystallization of solids directly from solution by adept control of thermodynamic variables, such as temperature, pressure and composition. Here, the general strategies and examples in using the technique to prepare electroceramic nano-particles and novel inorganic-organic hybrid nano-structured materials are present. Factors influencing phase formation, particle size and morphology, such as feed stock chemical composition, solvent type, mineralizer, reaction pH, temperature and time are discussed.

Pt and PtRu-Supported Carbon Catalysts for Proton Exchanged Membrane Fuel Cell (PEMFC) and Direct Methanol Fuel Cell (DMFC)

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Pt and PtRu-supported carbon are the most promising electrocatalysts for PEMFC and DMFC now a day. High surface area particles which highly distributed in carbon supported are the significant properties controlling the catalytic activity of the cell. A variety of Pt and PtRu-supported carbon catalyst preparation methods will be introduced in this research. Two types of carbon supported powder were studied: Vulcan XC-72 and carbon nanotube. Pt and PtRu particle size and the size distribution were analyzed by Transmission Electron Microscopy Technique (TEM). X-ray Diffraction Technique (XRD) was used for phase identification.

Keywords: catalyst, Pt, Pt-Ru, preparation method, PEMFC, DMFC

Novel Chemometrics Approaches for Flow-Based Analysis

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Computational Simulation and Modeling Laboratory (CSML) is dedicated with the mission to serve as a center for modeling and simulation in education, research and development. Interdisciplinary research problems are principally focused in the lab, where interrelated issues in structural molecular biology, material sciences and chemometric method for analytical purposes are crucial. For the present work in cooperation with Prof. Kate Grudpan, Research Laboratory on Flow-based Analysis, Chiang Mai University under the Development of Micro- and Nano-scale Analysis Project by Flow-based Techniques: TRF senior researchers grants, novel chemometrics approaches were carried out for classification of gasoline trademarks from their dynamic interfacial pressure (DIP), and for simultaneous determination of chlorate and chlorite from flow injection-differential pulse voltammogram (FI-DPV) in agrochemical samples.

Applications of bare and modified diamond electrodes in electroanalysis

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Boron-doped diamond electrodes have been popularly used, particularly in the electroanalytical and electrochemical waste water treatment fields. Recently, we have demonstrated applications of diamond electrodes for the detection of several chemical species whose detection is complicated with conventional electrodes such as glassy carbon or metal electrodes. Here, we summarize our recent electroanalytical work on diamond electrodes for detection some important sulfur-containing compounds/drugs such as homocysteine. This work also exploits use of boron doped-diamond electrodes for the detection of inorganic compounds such as iodide. Moreover, we also emphasized the dependence of surface modification for the detection of tetracyclines. In addition, chromium (III) hexacyanoferrate (II) modified boron-doped diamond thin film electrode has been employed for determination of hydrogen peroxide. Both voltammetric results and amperometric detection in flow systems are presented. Uses of boron-doped diamond together with their electroanalytical applications are also discussed.

Center of Innovative Nanotechnology

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Nanoscience and nanotechnology is a novel concept that integrates knowledge from existing disciplines to create new knowledge and innovation. The collaboration of researchers in this “Nanopolymer” project focuses on specific objectives ranging from short term goals, such as a modification of nanomaterial properties, development of nanomaterial processing equipment and characterization technique improvement, to long term targets, which focus on a development of drug delivery system and modification of fabric and advanced textile. The project consists of 6 different sub-projects aiming at the following developments: (i) nanochitin-chitosan for delivery model of local anesthetics and zidovudine; (ii) fabric properties modification system using chemical vapor deposition process; (iii) organophilic modification of clay materials for the development of polypropylene nanocomposite fibers and packaging; (iv) monitoring and characterization of latex-protein binding on surface via SPR-SPFS technique; (v) prototype nanofiber spinning apparatus for uses in cosmetic, health, and medicinal applications; (vi) finishing of textiles with microcapsules or nanocapsules containing flame retardants..

Derivatives of Calix[4]arenes for Electrochemical Detections of Cations and Anions in Organic Solvents

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Three diamidoferrocene tetraalkylated calix[4]arenes (**L1**, **L2** and **L3**) have been synthesized. Elucidation of solution structures by various NMR techniques showed that **L1** and **L2** were in the equilibrium of cone and partial cone conformations while **L3** was in cone conformation. The ratio of cone to partial cone conformation was found to depend on solvents and temperature. Temperature dependent conformations of **L1** and **L2** were studied by variable ¹H NMR spectroscopy. In the solid state, X-ray crystallography showed that the stable conformations of **L1** and **L2** were partial cone and cone conformations, respectively. Binding abilities of **L1-L3** toward anions were investigated by ¹H-NMR titrations. Ligands **L1**, **L2** and **L3** were found to bind Y-shape anions such as carboxylate anions significantly better than H₂PO₄⁻ and Cl⁻. Electrochemical recognition of **L1-L3** toward cations and anions has been investigated by cyclic and square wave voltammetry. Upon electrochemically oxidized, binding enhancements of **L1-L3** toward anions were detected to a different extent.

Bis(calix[4]diquinones) **L4** and **L5** and double calix[4]diquinone **L6** have been synthesized from their corresponding double calix[4]arenes **4**, **5** and **6**, respectively. Compounds **4-6** have been prepared from one-pot and stepwise syntheses under high pressure. Complexation studies of ligands **L4**, **L5** and **L6** with alkali metal ions such as Li⁺, Na⁺, K⁺ and Cs⁺ were carried out by ¹H-NMR titrations. Receptors **L3** can selectively form 1:1 complexes with Na⁺. Ligand **L5** prefers to form 1:1 complexes with K⁺ and Cs⁺. Receptor **L6** retained the cone conformation of the calix[4]arene unit upon binding K⁺, but changed the conformation when complexing Li⁺ and Na⁺. Electrochemical studies using cyclic voltammetry and square wave voltammetry showed significant changing of voltammograms of **L4** and **L6** in the presence of alkali metal ions. Receptor **L6** showed the electrochemically-switched binding property towards Na⁺ and K⁺. Therefore, compounds **L3-L6** can possibly be used as alkali metal ion sensors.

TLC-Densitometric Analysis of Artemisinin for a Rapid Screening of High -Producing Plantlets of *Artemisia annua*

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Artemisinin is a sesquiterpene lactone containing a peroxide bridge present in the leave of *Artemisia annua* L. It has no UV or fluorescent chromophore in the molecule and thus makes complication in the analysis this compound. So far, the techniques available for the analysis of artemisinin include HPLC-UV detection connected with precolumn reaction, HPLC-electrochemical (EC) detection, gas chromatography, mass spectroscopy and the technique of HPLC-UV/EC. These techniques usually need either sophisticated equipment or complicated procedures for artemisinin analysis and, thus, have limitation for their applications in a screening program for high-artemisinin producing plants.

In this study, a simple TLC-densitometric technique was developed for rapid and accurate analysis of artemisinin in a large number of gamma-ray irradiated plantlets of *A. annua*. This new analytical method is based on the structural conversion of artemisinin on a silica gel plate by ammonia vapor to form a chromophore-containing compound that can be detected by UV-based TLC-densitometry. Structure elucidation of the ammonia treated artemisinin revealed suggested that the compound was 10-azadesoxyartemisinin which has its λ_{max} at 320 nm. For sample analysis, crude extracts various of *A. annua* mutants were subjected to artemisinin separation on a silica gel plate using a mobile phase hexane : ethylacetate : acetone, 16:1:1. After development the TLC plate was exposed with in a TLC tank ammonia vapor at 100°C for 2 hours before being scanned by TLC-densitometer using the wavelength of 320 nm. This TLC-densitometric system was quantitatively evaluated in terms of product stability, precision, accuracy, and calibration. Good linearity was obtained in the range of 0.01-0.12 μg . The technique appeared to be accurate and sensitive as compared with the complicated precolumn reaction-HPLC technique. Among 90 samples of gamma-ray irradiated plantlets tested, the artemisinin content appeared to be highly variable ranging from 0.02 to 3.34 % w/w of their dry weight of the crude extracts. These results prove that TLC can be a cheap and simple technique for the accurate screening of high-artemisinin producing plants.

The Effect of Gamma-Irradiation on In-Vitro Plasma Compatibility of Nanosuspension Formulation

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Nano suspension dosage form is an alternative for formulating the low solubility or insoluble drugs intended for intravenous administration. However, an appropriate sterilization process needs to be considered since traditional filtration method may not be applicable. In this study, lyophilized nano suspension formulation has been developed for an anticancer compound. Gamma irradiation has been performed for product sterilization. In-vitro plasma compatibility of the formulations before and after gamma irradiation process was evaluated under a condition mimic to intravenous injection. The objective of this experiment is to study the effect of gamma irradiation for sterilization on the in vitro plasma compatibility of cancer drug nano suspension formulation intended for intravenous infusion. The results show that, in most cases, the aggregation increases as a function of time at 37°C, but start decreasing after 10 minutes. Gamma irradiation for sterilization has no effect on the aggregation of nano suspension molecules after mixing with plasma.

ATR FT-IR Absorption Enhancement of a Thin Film under the Nano-confinement

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We introduce a simple yet very effective technique for infrared spectral acquisition of a nanometers-thin film with an enhanced spectral absorption. The absorption of the film of lower refractive index confined between media of greater refractive indices measured by attenuated total reflection Fourier transform infrared spectroscopy with a parallel-polarized radiation is greater than that of its bulk. As the thickness of the film decreased, the absorption with a parallel-polarized radiation increased while that with a perpendicular-polarized radiation decreased. The phenomena were explained based on the evanescent field variations under the nano-confinement. The theoretical calculations based on Fresnel equation indicate that the integration of the mean square evanescent field with the parallel-polarized radiation increases while that with the perpendicular-polarized radiation decreases as the separation of the high refractive index materials decreases. The phenomena were experimentally investigated and the results were in a very good agreement with the theoretical predictions.

Retention Factor and Retention Index of Homologous Series Compounds in Microemulsion Electrokinetic Chromatography Employing Suppressed Electroosmosis

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Retention factor (k) and retention index of homologous series compounds, such as alkylbenzenes, alkylarylketones, alkylbenzoates and alkylparabens, in microemulsion electrokinetic chromatography (MEEKC) employing suppressed electroosmosis were investigated. The MEEKC system used contained a phosphate buffer at pH 2.5, 1.1 v/v n -octane as oil, 100 to 200 mM sodium dodecyl sulfate (SDS) as surfactant and 890 mM 1-butanol as co-surfactant. A linear relationship between $\log k$ and the number of carbon (z) was obtained for homologous series compounds. Using alkylbenzenes as standard, the retention index of analytes can be determined. At given concentration of SDS, the linear relationships between $\log K_{ow}$ and $\log k$ for alkylbenzenes, was obtained, where K_{ow} is the n -octanol-water partition coefficient. In a wide range of SDS concentration from 100 to 200 mM, the predicted values of $\log K_{ow}$ obtained from MEEKC were insignificantly different and found to be in good agreement with literature values.

Organic Synthesis Research Unit

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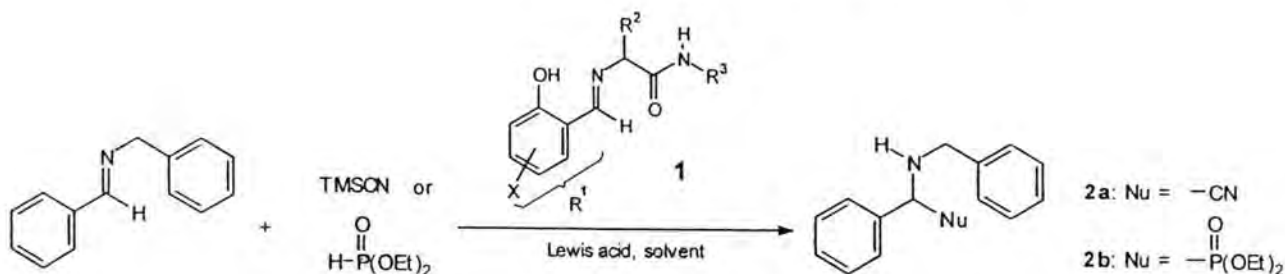
Organic synthesis is one of the most important fundamental disciplines in science. Over the years, vast majorities of naturally occurring and artificially designed molecules have been synthesized with attempts to match the complexity and sophistication provided by nature, and even beyond. The results have led to the advancement and extensive changes of the way we live. It is difficult to imagine anything organic that can be made without involving organic synthesis- pharmaceuticals, agrochemicals, cosmetics, catalysts, polymers, or advanced materials – to name just a few. The Organic Synthesis Research Unit was established with its main objective to develop new synthetic methodology and utilize existing chemistry to synthesize organic compounds with interesting biological activities and other desired advanced properties. Research areas may be divided into 3 main categories: **1) Development of new synthetic methodologies and synthesis of biologically active or theoretically interesting compounds** – this covers the synthesis of biologically active compounds; catalytic asymmetric synthesis and development of chiral catalysts; development of novel synthetic methodologies. **2) Chemistry of biopolymers and other materials** – the work focuses on chemical modification of chitin-chitosan and natural rubber; synthesis of bio-compatible polymers; modification and study of materials surface; controlled release of chemicals using polymers; inorganic-organic composite materials; flame-retarding polymers. **3) Molecular recognition and molecular devices** – this area includes the synthesis of calyx[4]arene derivatives as molecular devices; synthesis and properties of polymers carrying nucleobases; synthesis of polymers with electrical conductivity or interesting photochemical and photophysical phenomena; Separation of enantiomers by cyclodextrin derivatives. At present there are 10 faculty members and more than 40 undergraduate and graduate students working as part of the research unit.

Asymmetric nucleophilic addition to imines

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A series of novel salicylimine ligand **1**, constituted of salicylaldehyde, α -amino acid and chiral amine units, were synthesized. Initial screening on catalytic asymmetric Strecker as well as hydrophosphonylation of N-benzylidenebenzylamine in the presence of Lewis acid and the ligands were carried out. The degree of enantioselectivity was determined by ¹H NMR spectroscopy employing chiral solvating agents. The use of various Lewis acid-ligand **1** catalysts in a Strecker reaction resulted in the desired products in moderate to high yields. While the Ti-ligand complexes showed poor catalytic activities towards hydrophosphonylation of the imine, promising enantioselectivity was observed in the Strecker counterpart (up to 74 % ee).



An Overview of Research in Analytical Chemistry at Kasetsart University

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The research work focuses on method development for food safety and environmental analysis, and clean technology using various analytical techniques,i.e LC/tandem mass spectrometry, electrochemical technique and spectrometry.

The project on food safety involves method development for trace analysis of antibiotic residues and food additives in shrimps using high pressure liquid chromatography with UV, fluorescence and electrochemical detectors and analysis of trace elements in sea salt and to purify the sea salt by removing calcium,magnesium and sulphate.

The project on environment involves method development for pesticide analysis in ground water using LC/Tandem mass spectrometry, detector tube development for gas and metal analyses, and new spectrochemical methods for metal analysis and metal speciation.

The project on clean technology involves preparation and application of doped titanium dioxide using solar energy for waste treatment and superheated solvent extraction of chemical residues from environmental samples.

Novel Extraction Techniques Using High Pressure and Temperature Liquid

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In our research we have been trying to minimize organic extractant consumption by developing two techniques, superheated water extraction and pressurized liquid extraction. The fundamental of superheated water extraction was based on a decrease in polarity of water with temperature under high pressure, thus the pure water can be utilized to extract moderately polar organic compound. In pressurized liquid extraction approach an organic solvent is heated over its boiling point at elevated pressure. The high temperature and pressure provides several advantages, e.g. better penetration of the solvent into matrix, weakening the interaction between an analyte and the matrix and accelerating the extraction.

Our research group consists of 5 energetic postgraduates. A number of successful applications of superheated water produced from our laboratory are the extraction of pesticides from soil and environmental solid sample, volatile from lime and bergamot, and chemical constituents from *Zingiber cassumunar Roxb.* (Plai). Other related approaches are sorbent traps for superheated water extraction and derivatization for gas chromatography after using the technique.

TRF Targeted Basic Research

The Thailand Research Funds

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This newly initiated research grant is aimed at supporting the projects within the research programs or research consortia that have defined goals and are engaged in areas of basic research whose findings could be applied in formulating public policies, answering to social and economic needs, creating technologies and competitiveness for the country. The first of such programs is on "Medicinal Chemistry". The program's objectives are to discover new drugs, to foster the cooperative network of researchers in related fields, and to encourage the teams in working towards the common goals. In its starting phase, the program focuses on research on finding bioactive compounds from natural products, research related to the development of specific drugs, the syntheses of drugs whose patents have expired, and research according to the researchers' experience and interests which is highly innovative. Due to the different range of funding requested, all reviewed proposals are divided into the three following categories:

Category I: TRF Basic Research Grant (not exceeding three million baht per three years)

Category II: TRF Research Career Development Grant (not exceeding 1.2 million baht per three years)

Category III: TRF Grant for New Researcher (not exceeding 0.48 million baht per two years).

In the past two years, the Program has given support to many research projects in which some projects have already been carried out and published while some are still in the process of completion. In 2005, the Program has been extended to cover applications of bioactive compounds and Medicinal Herbs in Pharmaceutical, Nutraceutical and Agricultural Agents for Health and Food Safety which much effort has been made for initiation of cluster of knowledge in Thailand by strengthening collaboration between Thai and international scientists. In addition, the Program also initiate the start-up of novel research areas that are important such as drug delivery, nanoscience and nanotechnology and will have a direct impact on the success of the Program.

Moreover, two other programs of targeted basic research working on the same principles, ie., Production and Health of Aquatic Animals, Organic Agriculture have recently been announced and called for proposals. The emphasis is on the applications of modern biotechnological techniques in the production of safe food for domestic consumption as well as for export. In the near future Renewable Energy, Emerging Diseases, Stem Cells and Therapeutic Application, Rubber & Polymer Technology will be initiated. Interested researchers can request further information and submit concept paper (pre-proposal) to the TRF Academic research Division.

^1H , ^{13}C and ^{15}N -NMR Chemical Shift Calculations of Nevirapine in Different Solutions; A Quantum Chemical Calculations Approach

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NMR spectroscopy is commonly used to analyze compound structures but sometimes the interpretation of the spectra is difficult and has a limit of measurement due to the instrumentation limitations and low signal levels. The use of computational techniques allows to help for interpreting ambiguous experimental NMR spectra. In order to understand more in details on structural flexibility of the inhibitor in solutions, therefore, in this study, we performed ^1H , ^{13}C and ^{15}N -NMR chemical shift calculations of 11-cyclopropyl-5,11-dihydro-4-methyl-6H-dipyrido[3,2-b:2',3'-e][1,4]diazepin-6-one or nevirapine, one of the non-nucleoside HIV-1 reverse transcriptase (HIV-1 RT) inhibitors in different solvents; DMSO, chloroform, dichloromethane, ethanol and water. The starting geometry of nevirapine obtained from X-ray crystallographic data at 2.2 Å resolution of enzyme-inhibitor complex structure (1vrt.pdb) was optimized at B3LYP/6-31G** level. To investigate the geometry of nevirapine in solutions, the self-consistent reaction field (SCRF) method: integral equation formalism polarized continuum model (IEFPCM) was used. ^1H , ^{13}C and ^{15}N -NMR chemical shifts in solution model were calculated at B3LYP/6-311++G** level of theory using GIAO approach. Comparisons between experimental and calculated results were also considered, based on available DMSO and chloroform solvents. Correlations between experimentally determined chemical shifts and calculated data show a good agreement and confirm that the cyclopropyl ring plays an important role to determine the structure of nevirapine. The obtained results indicate that NMR chemical shift prediction is very useful and it can be compared to the experimental data. However, with the limitation of predicted model, some solvent model representation have been still under developed for improvement of higher accurate NMR chemical shift prediction. Because the rotation of the cyclopropyl ring plays an important role in the binding complex, investigating the structure of nevirapine can give more detail information about the three-dimensional structure. NMR spectroscopy is commonly used to analyze compound structures and usually measured from condensed-phase samples (solutions or powders) at ambient temperatures.

Some Development of Chromatographic Separation for Foods and Pharmaceutical Applications

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The research group has been active in exploring some novel packing materials for chiral chromatographic separation. The applications for such development are aimed for enantiomeric drugs. Some other investigations involve phenolic acids and antioxidants in foods, sugar, amino acids and carboxylic acids in raw sugar and cane juice for sugar cane industry.

Development of On-line Sample Preparation for Chromatographic Analysis

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Research interests focus on on-line sample preparation/preconcentration for chromatographic analysis, including high performance liquid chromatography (HPLC), ion chromatography (IC) and capillary electrophoresis (CE). The on-line sample pretreatment includes flow injection pre-column derivatization, sequential injection with lab-at-valve. Applications of such development would aimed for food, environmental and pharmaceutical samples are interested. New approaches for chromatographic separation using sequential injection chromatography (SIC) will be explored.

Dynamic approaches for study of bioavailability of metals and other elements in solid and food samples

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Determination of total element concentration in samples is generally used to indicate levels of element of interest in the samples. However, total concentration alone has limited use because elements can exist in different chemical forms and phases with varying availability. Degree of availability is often evaluated by techniques involving determination of forms or fractions that have been proved to be available. For example, sequential extraction using a series of extracting reagents of increasing strengths is usually employed to fractionate elements in solid materials into several groups of varying mobility. Fractionation by membrane dialysis to obtain a certain molecular size range with subsequent elemental determination is used to evaluate mineral bioavailability. These fractionation methods are widely used in a batch procedure based on equilibrium distribution. A batch procedure is tedious, time-consuming and cannot closely mimic the way a particular compound is leached in the environment or is absorbed in the body. These processes are dynamic rather than equilibrium. Dynamic approaches are therefore should be used. Under this basis, our group has firstly developed a dynamic continuous-flow sequential extraction system where fractionation of elements in a solid sample can be done in a stirred extraction chamber or in a microcolumn with sequential flow of extracting reagents. Another investigation has been on the development of a dynamic continuous-flow dialysis system for the study of in vitro mineral bioavailability. Various elemental detection systems, such as FAAS, GFAAS and inductively-coupled plasma mass spectrometry (ICP-MS) have been used, online or offline. Apart from the obvious advantages of simplicity, less risk of contamination and possibility for automation, the time-dependent kinetic information of the leaching or dialysing processes are also obtained. We have enjoyed the use of this information for many studies, such as evaluation of elemental-association, identification of contamination origin and degree of contamination, investigation of effect of food components on mineral bioavailability.

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'Flow Innovation-Research for Science and Technology' Laboratory

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From accumulative experience in flow-based analysis, we have just established a laboratory unit called 'First' laboratory. 'First' stands for 'Flow Innovation-Research for Science and Technology'. The laboratory is based at the Department of Chemistry, Faculty of Science, Mahidol University, Bangkok.

The group consists of active lecturers from 4 Thai Universities, which are Srinakharinwirot University, Ubon Rajathanee University, Burapha University and Mahidol University. Currently we have 1 Ph. D. researcher, 9 Ph. D. students, 9 M.Sc. students and 6 B. Sc. students. Our work have concentrated mainly on development of methods and small instruments for chemical analysis, using flow techniques (e.g., flow injection (FI), sequential injection (SI), all injection (AI)) and chromatographic techniques (e.g., high performance liquid chromatography (HPLC) and gas chromatography (GC)). We also head on for nanoanalysis such as lab-on-a-chip technique. You can find more details about us at the temporary website at http://www.geocities.com/firstlab_mahidol/.

A Challenge to Design Novel Catalysts for Electrochemical Energy Conversion and Sensors: Analytical Techniques

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The challenge on New and Renewable Energy Harvesting and Storage through Chemical Knowledge Bases and Nano-Technology for Sustainable Human Health and Environment is our research goal.

Interfacial Electrochemistry Research Group is a multidisciplinary research teams, under collaboration with MTEC, NECTEC, and MOSCT. Our work have oriented on both Physical and Analytical techniques for a challenge to design and characterize of novel catalysts for electrochemical energy conversion and sensors. From routine analytical techniques to fundamental concepts for better understanding the electrokinetic phenomena at Electrode/Electrolyte interfaces are concerned. On-going research activities are:

1. Development and applications of Electroanalytical techniques (DPV, SWV, CV, ChA) and Impedimetry (EIS) for Chemo- and Biosensor Design.
2. Preparation and characterization of Electrocatalysts and Composite electrodes for electrooxidation of small molecules for fuel cells (DMFC/PEMFC and SOFC)
3. PV- Energy Harvesting and Storage through Redox flow battery or Regenerative fuel cell (Optical transperence Electrode, Electrochemistry of multi-valence inorganic species)
4. Biogeochemical studies and Environmental inspector for extraordinary energy in Mekong River, nearby Thai-Laos border. (Real world chemistry of wetland area, Size based Analysis of waterborne, Trace gas monitoring and Depth profile studies)

You can find more details about us at scwvr@mahidol.ac.th

Introduction to Center of Nanoscience and Nanotechnology – Mahidol University

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In this lecture, we will introduce the research activities performed at the Center of Nanoscience and Nanotechnology of Mahidol University. The center was initiated in 2001 in order to allow trans-department and multi-disciplinary working environment for this emerging field. In the center, we are building up strength in 3 capabilities: (1) Nanoscale synthesis and manipulation (2) Nanoscale characterization and analysis and (3) Nanoscale modeling and design. Various research projects have been carried out since then in two directions: (1) Nanomaterials – focused on nanoparticles, nanocomposites and organic electronic materials (2) Nanodevices – focused on organic solar cells, organic light emitting devices, thin-film sensors and electronic nose. Recently, we are developing prototypes aiming to commercialization such as polymer-clay nanocomposites, conductive polymers (red-green-blue), surface plasmon resonance (SPR) biosensor for disease diagnosis and electronic nose instrument. The center owns a wide range of equipments which are utilized in-house and generously available for other Thai research groups, i.e. AFM, STM, XRD, DSC, SPR, LEEDS, LB trough, SIMS, PL, HPLC, GC.

Selected Publications

1. R. Traiphol, P. Sanguansat, T. Sriksirin, T. Kerdcharoen, T. Osotchan, "Spectroscopic Study of Solvent-induced Photophysical Change in Collapsed Coils of Isolated Chains of Conjugated Polymers", *Macromolecules*, accepted.
2. A. Udomvech, T. Kerdcharoen and T. Osotchan, "A DFT Study of Li/Li⁺ Adsorbed on Carbon Nanotube: Variation of Tubule Diameter and Length", *Chemical Physics Letters* 406 (2005) 161.
3. S. Aphiwattrakul, T. Sriksirin*, D. Triampo, R. Putiworant, S. Limpanart, T. Osotchan, W. Udomkichdech, "Role of the Cation-Exchange Capacity in the Formation of Polystyrene-Clay Nanocomposites by In Situ Intercalative Polymerization", *Journal of Applied Polymer Science* 95 (2005) 785.
4. Yodsoi Kanintronkul, Toemsak Sriksirin*, Chanan Angsuthanasombat and Teerakiat Kerdcharoen*, "Insertion behavior of the Bacillus thuringiensis Cry4Ba insecticidal protein into lipid monolayers", *Archive of Biochemistry and Biophysics* 442 (2005) 180.
5. J. H. Hodak, C. Downey, A. Pardi, D. J. Nesbitt, "Docking Dynamics of Isolated RNA Tertiary Contacts by Single Molecule Fluorescence Resonance Energy Transfer", *Proceeding of the National Academy of Science USA* 102 (2005) 10505.

Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry

Atitaya Siripinyanond and the Problem-Based Analytical Chemistry Research Group
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Field-flow fractionation (FFF) is a gentle size separation technique applicable to both macromolecules and particles. Separations by FFF are achieved within a flat open channel with a rectangular cross-section and triangular end pieces where the sample and carrier liquid enter and leave. With FFF, smaller particles or macromolecules leave the channel earlier than the larger species, owing to the higher diffusion coefficients of the former as compared to the latter. Inductively coupled plasma mass spectrometry (ICP-MS) is a sensitive analytical tool for multielement trace determination in the ppb (ng/g) or ppt (pg/g) ranges with isotopic information. Using ICP-MS as a sensitive element-specific detector after FFF separation provides information on elemental concentration across particle size distribution profile. Coupling FFF with ICP-MS offers the possibility of size-based elemental speciation.

Our research interests include applications of FFF-ICP-MS to various types of samples and development of FFF instrumentation. Various environmental samples were investigated including aquatic colloids, humic substances, and air particulate matters. Biological applications include proteins, food materials, and cosmetic products. Further, development of a low cost FFF instrumentation is currently underway.

NANO technology and Catalytic Science and Technology Laboratory (NANOCAST)

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The research in our research group is focused on the rational molecular structure design for catalysis and nanotechnology. The ongoing research projects include the synthesis of new ligands for small molecule activations and olefin polymerization, the relative stereochemistry determination of small molecules, conformational analysis of biomolecules, crystal engineering of magnesium complexes, the development of iron-supplements from local starch, and nanoparticle synthesis. At present, our group consists of 3 Ph.D. students, 8 M.Sc. students, and 3 B.Sc. students.

For further information, please visit our website at <http://mucc.mahidol.ac.th/~scess>.

Applications of Chromatographic Techniques in Clinical Research

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Chromatography is a widely used analytical technique for qualitative and quantitative analysis. Currently, the technique is applied extensively in pharmaceutical and biomedical areas ranging from drug-screening, quality assurance in the pharmaceutical industry, peptides and proteins purification, clinical pharmacology and forensic toxicology.

Previous work: the work was to study and develop analytical techniques especially chromatographic method for the separation and determination of iron and iron chelator (and its metabolite) in complex biological matrices (plasma, serum, urine). The work was directed towards the needs of academic, clinical, and government analysis for investigation of iron-overloaded disorders for Thalasemic patients in Thailand.

Future works: research interests in chromatographic analysis including theoretical aspects, detection methods and applications to foods, pharmaceuticals and biomedical sciences, and trace metal analysis. Microchip technology is also the topic of interest.

Microfluidic Systems for Lab-on-a-Chip Applications

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Nanobiotechnology raises fascinating possibilities for new analytical devices, Lab-on-a-Chip, for genomics, proteomics, and other biological applications. Applying MEMS (Micro-Electro-Mechanical Systems) or microsystem technology to the diversity of analytical problems has become an area of enormous interest, especially in connection with the development of microfluidic chips for clinical and forensic analysis. Lab-on-a-chip may include capable of sample preparation, integrated optics for excitation and detection of fluorescently labeled cells, cultivation of sorted cells, DNA amplification by polymerase chain reaction (PCR), or single cell enzymatic analysis. One advantage of miniaturization is sub-microliter consumption of reagents and sample. In addition, improved heat- and mass-transfer rates give faster reaction kinetics. Moreover, miniaturization enables integration of multiple analytical steps within a device, thus reducing the risk of carryover contamination. Hand-held lab-on-a-chip devices for point-of-care (POC) diagnostics are being developed. The developed device may offer the potential to analyze blood and other fluid samples extremely rapidly and inexpensively. It will have direct applications beyond the medical and clinical field, including homeland security, environment testing, and food safety.

A wide variety of polymeric materials have been widely used recently to construct micron-sized channels on a glass or silicon chip. In particular, polydimethylsiloxane (PDMS) has been used extensively, because it is robust, optically transparent, nonpolar, and impermeable to aqueous solutions and allows the easy, fast, and inexpensive fabrication of devices by using micromolding techniques. The microchannel was formed by complex 2-dimensional (2-D) patterned PDMS layers using microfabrication technique. The schematic of process flow used to create the 2-D patterned layers are shown in Fig. The master for each layer was fabricated using conventional photolithography technology. The layout was drawn using a computer-aided design program (L-Edit). Design was printed to form a transparent mask for contact photolithography to generate masters with a negative-tone UV photoresist (SU-8) on a silicon wafer. A curing agent and PDMS prepolymer (SYLGARD 184 Silicone Elastomer Kit, Dow Corning) was thoroughly mixed in a 1:10 weight ratio. The prepolymer mixture was degassed at 20-50 mtorr in a desiccator with a mechanical vacuum pump for 10 minutes to remove any air bubbles in the mixture. The prepolymer was poured onto the master to the height over the depth of designed channels. The master was cured for 3 hours at 100 degree C on a hot plate. After curing, the thin PDMS replicas were peeled off from the masters. Oxygen plasma treatment for PDMS surface activation was carried out using an oxygen plasma cleaner. Plasma-treated samples were immediately bonded with glass slides to form the closed micron-sized channels on the glass.

Trace Analysis and Biosensor Research at PSU

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Trace Analysis & Biosensor Research Unit

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The principal focus of Trace Analysis & Biosensor Research Unit at Prince of Songkla University is the development of techniques to selectively determine analytes. The unit has two main research areas chromatography and biosensor. The emphasis in chromatography is the development of sample preparations and methods to improve analytical performance for trace analysis of non-volatile and volatile contaminants/pollutants. Biosensor, an alternative to conventional analytical technique, combines biomolecular recognition with appropriate transducers to convert the concentration of the analyte in the sample into a detectable signal. Researches include biosensor construction, transducer development and immobilization techniques. Researches of the unit are aiming for application in clinical diagnosis, environmental pollutants detection, food analysis and process control.

Method development in flow-based techniques

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Previous research (M. Sc. and Ph. D./Royal Golden Jubilee Program, Thailand) has been focused on method development using flow-based techniques with different types of detection.

For previous works, the experience has lied mainly on iodine analysis in food urine and pharmaceutical samples. New method developments have been focused. Chemiluminescence and kinetic determination have been employed. Also use of membrane for technique of selective determination has been one of the experience.

Presently, my research works are carried out with 'First' Laboratory (First: Flow Innovation-Research for Science and Technology) of Asst. Prof. Duangjai Nacapricha (Mahidol University). Some work is partially a collaborative work with Prof. Kate Grudpan (Chiang Mai University). On going research is method development using micro-bore analysis (flow injection, sequential injection, all injection). Also, very narrow bore channel, such as use of the microchip technology, is also included.

Development of Greener Analytical Methods/Techniques in Pharmaceuticals

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The aim of this research group is to develop greener analytical method/technique in pharmaceuticals analysis by reducing and eliminating the use and generation of hazardous substances through all aspects of the chemical analysis lifecycle, for example, flow injection analysis (FIA), micellar liquid chromatography (MLC) and lab on a chip (LOC). Firstly, FIA was applied to determine procaine hydrochloride based on the reaction of cerium sulfate using surfactant to enhance sensitivity in colorimetry detection. In addition, FIA with pretreatment sample on line has been successful for the determination of total alcohol in beverage as an total analysis system with small reagent consumption and waste generation. Secondly, the possibility to increase advantage of guard column for use as an analytical column in separation binary and tertiary mixture of drugs or parabens has been studied in MLC. Finally, LOC has been designed and investigated. One of the successful design was a chip in microflow system that fixed light emitting diode and optical sensor at the lower and upper of the chip, respectively, which chip acted as micro reactor and micro flow-through-cell in the same unit.

Keywords : Green analytical chemistry, pharmaceuticals, Flow analysis, Micellar Liquid chromatography, Lab on a chip



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Research Interests

- Flow and sequential injection analysis and related techniques.
- Electroinjection analysis (EIA).

Education

- B.S. University of Oregon, 1959
- Ph.D. University of Maryland, 1964

Honors and Awards

- ACS Fisher Award in Analytical Chemistry
- ACS Division of Analytical Chemistry Award for Excellence in Teaching
- Fulbright-Hays Scholar, Belgium
- Medal of Honor, Universite Libre de Bruxelles
- Talanta Gold Medal
- Charles University Commemorative Medal
- Geoff Wilson Medal, Deakin University (inaugural recipient)
- Special Issue of *Electroanalysis* dedicated to GDC on the occasion of his 65th birthday (invited papers), 2002
- JAFIA Scientific Honor Award Medal, Japan Society for Analytical Chemistry
- Thailand Research Fund Senior Scholar Silver Award
- Honorary Doctorate Degree, Chiang Mai University
- Co-Editor-in Chief, *Talanta*
- Past Chair, Division of Analytical Chemistry, American Chemical Society

Representative Publications

"Characterization and Use of a Raman Liquid-Core Waveguide Sensor Using Preconcentration Principles," S. Tanikkul, J. Jakmunee, M. Rayanakron, K. Grudpan, B. J. Prenzen, L. W. Burgess, G. D. Christian, R. E. Synovec. *Talanta* **2003**, *59*, 809.

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"Sequential Injection Extraction for Sample Preparation," K. L. Peterson, B. K. Logan, G. D. Christian, J. Ruzicka. *Anal. Chim. Acta* **1997**, *337*, 99.



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Research Interests

- nanoscale analytical techniques and explore their use in the measurement of neurotransmitters and hormones both in vivo and at single cells.

Education

- University of Florida, Chemistry, B.S., 1984
- University of North Carolina-Chapel Hill, Chemistry, Ph.D., 1988
- University of North Carolina-Chapel Hill, Chemistry and Neurobiology, 1988-1991

Honors and Awards

- Presidential Faculty Fellowship
- ACS Findeis Award
- Benedetti-Pichler Award for Microchemical Chemistry
- Beckman Foundation Young Investigator
- NSF National Young Investigator
- Alfred P. Sloan Fellowship

Representative Publications

Gee, K.; Qian, W.J.; Kennedy, R.T. "A novel Zn^{2+} selective fluorophore and application to pancreatic beta-cells", *Journal of the American Chemical Society*, 2002, 124, 776-778.

Haskins, W.E.; Wang, Z.; Watson, C.J.; Rostand, R.R.; Witowski, S.R.; Powell, D.H.; Kennedy, R.T. "Capillary LC-MS² at the attomole level for monitoring and discovering endogenous peptides in vivo", *Analytical Chemistry*, 2001, 73, 5005-5014.

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Research Interests

- Fundamental studies in analytical chemistry as well as the development and application of new methods (chemical, instrumental and mathematical), for analytical measurements.
- The improvement of methodology for the analyses of complex systems.
- Environmental analyses.

Education

- B.S. Southern University, 1968
- Ph.D. University of Washington, 1977

Honors and Awards

- LSU Distinguished Faculty Award, 2000
- LSU Distinguished Faculty Award, 2000
- CASE Professor of the Year, 2000
- AAAS Lifetime Mentor Award, 2000
- Eastern Analytical Symposium Award for Achievements in Analytical Sciences, 2000
- Listed in 18th Edition of Who's Who in the World, 2000
- Award for Achievements in Analytical Sciences, 2000
- Eastern Analytical Symposium Award for Achievements in the Fields of Analytical Sciences, 2000
- Carnegie Foundation for the Advancement of Teaching/CASE Louisiana Professor of the Year, 2000
- Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring, 1997

- 2003 - Council for Chemical Research Diversity Award,
- 2003 - American Association for the Advancement of Science Fellow,
- 2002 - Howard Hughes Medical Institute Professors Award,
- 2003 - ACS Award for Encouraging Disadvantaged Students into Careers in the Chemical Sciences

Representative Publications

- J. Thibodeaux, E. Billiot and I.M. Warner. Enantiomeric Separations Using Poly (L-valine) and Poly (L-leucine) Surfactants. Investigation of Steric Factors Near the Chiral Center. *Journal of Chromatography A*, **2002**, 966(1-2), 179-186
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- E. Billiot and I.M. Warner. Examination of Structural Changes of Polymeric Amino Acid-Based Surfactants on Enantioselectivity: Effect of Amino Acid Order, Steric

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- J. Dey and I.M. Warner. The pH-Dependent Fluorescence Spectra of 9-Aminocamptothecin: Ground and Excited-State-Ionization Behavior in Aqueous Medium. *Journal of Photochemistry and Photobiology A*, **1998**, *116*, 27-37

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E.L. Roberts, S. Burguieres and I.M. Warner. Spectroscopic Studies of Indigo Carmine Dye in Organized Media . *Applied Spectroscopy*, **1998**, 52(10) , 1305-1313

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Research Interests

- Organized Media; Molecular Spectroscopy; Chemical Analysis; Analytical; Environmental

Education

- BS, Kent State University, 1990
- PhD, University of North Texas, 1994

Honors and Awards

- 2003 Quality Recognition Award, Girl Scouts of the USA, awarded to the Girl Scouts – Heart of Missouri Council for the “Magic of Chemistry” Program
- 2002 ChemLuminary Award, “Best Single Event in a Local Section Promoting Women in Chemistry”, American Chemical Society Women Chemists Committee, awarded to the University of Missouri Local ACS Section for November 2001 “Magic of Chemistry” Program
- 2002 Alliance Award, Girl Scouts – Heart of Missouri Council
- 2002 Woman of Distinction Award, Columbia Area Girl Scouts
- 2002 Wyvern Pin (blue), Alpha Chi Sigma recognition of outreach activities
- 1999 Cottrell Scholar Award, Research Corporation
- 1998 CAREER Award, National Science Foundation
- 1996 Young Alumni Achievement Award, Kent State University Alumni Association
- 1994 Iota Sigma Pi Anna Louise Hoffman Award for Outstanding Achievement in Graduate Research
- 1993 American Chemical Society Analytical Division Graduate Fellowship
- 1993 Tomas Hirschfeld Student Award, Federation of Analytical Chemistry and Spectroscopy Societies

- 1993 Association for Women in Science Predoctoral Award
- 1990 University of North Texas Doctoral Fellowship
- 1989 I. M. Kolthoff Enrichment Award, Analytical Division of the American Chemical Society
- 1989 Kent State University Undergraduate Award in Analytical Chemistry
- 1987 CRC Press Freshman Achievement Award
- 1986 Kent State University Alumni Reach for Excellence Scholarship
- 1986 Ohio Board of Regents Scholarship
- 1990 National Science Foundation Doctoral Fellowship

Representative Publications

C. Mao and S.A. Tucker. High Performance Liquid Chromatographic Separation of Polycyclic Aromatic Hydrocarbons Using Pyridinium Chloride as a Selective Fluorescence Quencher to Aid Detection. *J. Chromatogr. A* 2002, 966, 53.

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D.L. Richter-Egger, A. Tesfai and S.A. Tucker. Spectroscopic Investigations of Poly(Propyleneimine) Dendrimers Using the Solvatochromic Probe Phenol Blue and Comparisons to Poly(Amidoamine) Dendrimers. *Anal. Chem.* 2001, 73, 5743.

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D. A. Wade and S. A. Tucker. Spectrochemical Evaluation of Pyridinium Chloride as a Possible Selective Fluorescence Quenching Agent of Polycyclic Aromatic Hydrocarbons in Water and Neat Acetonitrile. *Talanta* 2000, 53, 571.

D.A. Wade, P.A. Torres and S.A. Tucker. Spectrochemical Investigations in Dendritic Media: Evaluation of Nitromethane as a Selective Fluorescence Quenching Agent in Aqueous Carboxylate-Terminated Polyamido Amine (PAMAM) Dendrimers. *Anal. Chim. Acta* 1999, **397**, 17.



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Research Interests

- Fluid flow in thin films, Thin film specific chemical sensors.
- Measurement of trace atmospheric species and atmospheric chemistry, Air Pollution Toxicology, Automated intelligent analyzers, Microscale analytical systems, Automated process analysis in the chemical industry, Novel approaches to ionic chromatography and electrophoresis.

Education

- 1977 Louisiana State University, Baton Rouge, Ph.D. in Analytical Chemistry with minors in Inorganic Chemistry and Electrical Engineering.
- 1976 Bell and Howell Diploma in Advanced Electronics, DeVry Institute of Technology, Chicago, IL.

Honors and Awards

- National Science Talent Search Scholar, Government of India, 1965-1968.
- Atomic Energy Commission of India Graduate Fellow in Chemistry, 1969-1970.
- Government of India Doctoral Research Fellow, 1972.
- Frank R. Blood Award for best annual publication, Society of Toxicology and Pharmacology, 1981.
- Institute Medal, Institute of Industrial Sciences, University of Tokyo, 1987.
- P. A. Traylor Creativity Award, Analytical Sciences, Dow Chemical Company, Midland, MI, 1989.
- Barney E. Rushing, Jr. 1990 Faculty Distinguished Research Award. Texas Tech University, Dads and Moms Association, 1991.

- A. Benedetti-Pichler Memorial Award for contributions to Microchemistry, American Microchemical Society, 1998.

Representative Publications

"Light at the End of the Tunnel: Recent Analytical Applications of Liquid Core Waveguides", Dallas, T.; Dasgupta, P.K. *TrAC: Trends Anal. Chem.* **2004**, 23, 385-392.

"Fast Durable Microfabricated Humidity Sensors", Kuban, P.; Berg, J.M.; Dasgupta, P.K. *Anal. Chem.* **2004**, 76, 2561-2567.

"Field Instrument for Simultaneous Large Dynamic Range Measurement of Atmospheric Hydrogen Sulfide, Methylmercaptan and Sulfur Dioxide", Toda, K.; Ohira, S.-I.; Tanaka, T.; Nishimura, T.; Dasgupta, P.K. *Environ. Sci. Technol.* **2004**, 38, 1529-1536.

"A Membrane Based Parallel Plate Denuder for the Collection and Removal of Soluble Atmospheric Gases", Takeuchi, M.; Li, J.; Morris, K.J.; Dasgupta, P.K. *Anal. Chem.* **2004**, 76, 1204-1210.

"Microfabrication and Characterization of Teflon AF Coated Liquid Core Waveguide Channels in Silicon", Datta, A.; Eom, I.-Y.; Dhar, A.; Kuban, P.; Manor, R.M.; Ahmad, I.; Gangopadhyay, S.; Dallas, T.; Holtz, M.; Temkin, H.; Dasgupta, P.K. *IEEE Sensors Journal* **2003**, 3, 788-795.



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Research Interests

- The development of microfluidic ("Lab-on-Chip") biochip devices, nanomaterials-based sensors, enzyme electrodes, DNA and proteins recognition and diagnostics, bioelectronics, nanobiotechnology, electrochemical sensing devices for environmental, security, and clinical monitoring, design of nanostructures, microfabrication and miniaturization, counterterrorism-detection, the development of new interfaces, sensor/recognition coatings, and remote sensing.

Education

- Ph.D., Technion, 1978

Honors and Awards

He was the recipient of the 1994 Heyrovsky Memorial Medal (of the Czech Republic) for his contributions to voltammetry, of the 1999 American Chemical Society Award for Analytical Instrumentation, and the ISI 'Citation Laureate' Award for being the Most Cited Scientist in Engineering in the World (during 1991-2001). He was awarded a Honorary Professor from National University (Cordoba, Argentina) in 2003. The Westhafer Award for Research (NMSU's highest academic award) was awarded to him in 1990. Between 2001 and 2004 he held the Manasse Chair and a Regent Professorship of NMSU. He was ranked as the most cited electrochemist in the world in 1995, and at the 17th place in the ISI's list of 'Most Cited

Researchers in Chemistry' for the 1992-2002 period. He is currently serving as the Chief-Editor of the international journal Electroanalysis and has been a member of the 12 other international journals.

Representative Publications

"Nanocrystal-based Bioelectronics Coding of SNP", G. Liu, T. Lee and J. Wang, *J. Am. Chem. Soc.*, 127(2005)38.

"Nanomaterial-based Electrochemical Biosensors", J. Wang, *Analyst*, 139(2005)421.

"On-Chip Integration of Enzyme and Immunoassays: Simultaneous Measurements of Insulin and Glucose", J. Wang, A. Ibez, and M. P. Chatrathi, *J. Am. Chem. Soc.*, 2003,125, 8444.

"Oxygen-Rich Carbon Paste Enzyme Electrodes for Operation in Oxygen-Deficient Solutions", J. Wang and F. Lu, *J. Am. Chem. Soc.*, 1998, 120, 1048.

"Real-Time Electrochemical Monitoring: Towards Green Analytical Chemistry", J. Wang, *Accounts for Chem. Res.* 35(2002) 811.

"DNA-based Amplified Bioelectronic Detection and Coding of Proteins," J. Wang, G. Liu, B. Munge, L. Lin and Q. Zhu, *Angew Chemie Int. Ed.*, 2004,43,2158.



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Research Interests

- Addressing the problems that are at the interface of nanochemistry and bio-analytical chemistry.
- Combinations of biological and material components with complementary properties will be developed as powerful tools for fabricating functional nanostructures and characterizing the biological world.
- nanocrystal synthesis, nanocrystal assembly, and nanocrystals for use as biological markers.

Education

- Ph.D., Jilin University, 1996

Honors and Awards

- Exemplary Graduate Advisor and Mentor in the NSF AGEP Program (2004)
- Collegiate Inventors Award (2003)

Representative Publications

"One-Pot Synthesis of High-Quality Zinc-Blende CdS Nanocrystals." Cao, Y. C.; Wang, J.J. *Am. Chem. Soc.* 2004, 126, 14336.

"Synthesis of Square Gadolinium-Oxid Nanoplates" Cao, Y. C. *J. Am. Chem. Soc.* 2004, 2004, 126, 7456.

"Raman Dye-Labeled Nanoparticle Probes for Proteins" Cao, Y. C.; Jin, R.; Nam, J.-M.; Thaxton, C. S.; Mirkin, C. A.; *J. Am. Chem. Soc.*, 2003, 125, 14676.

"Controlling Anisotropic Nanoparticle Growth Through Plasmon Excitation", Jin, R.;

Cao, Y. C.; Hao, E.; Mtraux, G. S.; Schatz, G. C.; Mirkin, C. A. *Nature*, 2003, 425, 478.

"Nanoparticles with Raman spectroscopic fingerprints for DNA and RNA detection", Cao, Y.C.; Jin, R.; Mirkin, C.A. *Science* 2002, 297, 1536.

"Photoinduced conversion of silver nanospheres to nanoprisms", Jin, R.; Cao, Y.; Mirkin, C.A.; Kelly, K.L.; Schatz, G.C.; Zheng, J.G. *Science* 2001, 294, 1901.

"DNA-modified core-shell Ag/Au nanoparticles", Cao, Y.; Jin, R.; Mirkin, C.A. *J. Am. Chem. Soc.* 2001, 123, 7961.

"Growth and properties of semiconductor core/shell nanocrystals with InAs cores", Cao, Y.; Banin, U. *J. Am. Chem. Soc.* 2000, 122, 9692.

"Synthesis and characterization of InAs/InP and InAs/CdSe core/shell nanocrystals", Cao, Y.; Banin, U. *Angew. Chem. Int. Ed.* 1999, 38, 3692.

"Identification of atomic-like electronic states in indium arsenide nanocrystal quantum dots", Banin, U.; Cao, Y.; Katz, D.; Millo, O. *Nature* 1999, 400, 542



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Research interests

- The understanding and development of electrochemical and optical sensor principles for clinical, bioanalytical and environmental applications.
- Currently, the principal directions include the study of trace level potentiometric sensors, pulsed chronopotentiometric sensors, and microsphere-based fluorescent detection principle

Education

- Diploma of Chemistry, 1989, Swiss Federal Institute of Technology (ETH) Zurich; Doctor of Natural Sciences, 1993, ETH Zurich; Postdoctoral Scholar, 1993-1995, The University of Michigan.

Honors and Awards

- Roche Prize for Sensor Technology, 2004
- Talanta Gold Medal
- Alumni Professor, Auburn University, 2001-2005
- Young Investigator Award, Society for Electroanalytical Chemistry, 2001

Representative Publications

Wygladacz, K.; Bakker, E., Imaging Fiber Microarray Fluorescent Ion Sensors Based on Bulk Optode Microspheres. *Anal. Chim. Acta* 2005, 532, 61-69.

Makarychev-Mikhailov, S.; Shvarev, A.; Bakker, E., Pulstrodes: Triple Pulse Control of Potentiometric Sensors. *J. Am. Chem. Soc.* 2004, 126, 10548-10549.

Qin, Y.; Bakker, E., Elimination of Dimer Formation in In(III) Porphyrin-Based Anion-Selective Membranes by Covalent Attachment of the Ionophore. *Anal. Chem.* 2004, 76, 4379-4386.



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Research Interests

- Biophysical characterization of the factors responsible for specificity in ligand-protein interactions, addressed in a proteome-wide manner.
- Applications include understanding and minimizing the toxic side effects of drugs as well as environmental toxins such as endocrine disruptors.
- Biophysical methods employed include enzymology, NMR (nuclear magnetic resonance) spectroscopy, fluorescence and chemo/bioinformatics.

Education

- B.S. degree, UW-Milwaukee, 1986
- Ph.D. degree, UW-Madison, 1990.

Representative Publications

Pellecchia, M., Huang, X., Meininger, D. and Sem, D.S. (2003) NMR-based drug design: applications to very large proteins. In "BioNMR in drug discovery" Zerbe O. Ed.

Kho, R, Baker, BL, Newman, JV, Jack, RM, Sem, DS, Villar, HO and Hansen, MR (2003) A Path from Primary Protein Sequence to Ligand Recognition Proteins: Structure, Function, and Genetics 50, 589-599.

Pellecchia, M., Sem, D.S. and Wuthrich, K. (2002) Nuclear Magnetic Resonance in Drug Discovery. Nature Reviews Drug Discovery. 1, 211-219.

Plesniak, L, Horiuchi, Y, Sem, DS, Meininger, D, Stiles, L, Shaffer, J, Jennings, PA and Adams, JA (2002) Probing the Nucleotide Binding Domain of the Osmoregulator EnvZ Using Fluorescent Nucleotide Derivatives Biochemistry 41, 13876-13882.

- Pellecchia, M., Meininger, D., Dong, Q., Chang, E., Jack, R. and Sem, D.S. (2002) NMR-based Structural Characterization of Large Protein-Ligand Complexes *J. Biom. NMR* 22, 165.
- Sem, D.S. and Pellecchia, M. (2001) NMR in the Acceleration of Drug Discovery. *Current Opinion in Drug Discovery and Development* 4, 479.
- Pellecchia, M., Meininger, D., Shen, A.L., Jack, R., Kasper, C.B. and Sem, D.S. (2001) SEA-TROSY (Solvent Exposed Amides with TROSY): A Method to Resolve the Problem of Spectral Overlap in Very Large Proteins. *J. Am. Chem. Soc.* 123, 4633.
- Jack, R., Sem, D.S., Yu, L. (2001) Real-time Structure-Based Drug Development. *Genetic and Engineering News*. 21, 34.
- Sem, D.S., Yu, L., Coutts, S.M. and Jack, R. (2001) Object-oriented Approach to Drug Design Enabled by NMR SOLVE: First Real-Time Structural Tool for Characterizing Protein-Ligand Interactions. *J. Cellular Biochemistry. Suppl.* 37, 99-105.
- Shen, A.L., Sem, D.S. and Kasper, C.B. (1999) Mechanistic Studies on the Reductive Half Reaction of NADPH Cytochrome P450 Oxidoreductase. *J. Biol. Chem.* 274, 5391.
- Sem, D.S., McNeeley, P. and Linnik, M. (1999) Antibody Affinities and Relative Titers in Polyclonal Populations *Arch. Biochem. Biophys.* 372, 62.
- Sem, D.S. and McNeeley, P. (1998) Steady State Enzyme Kinetic Fluorescence Polarization Assay Applied to Calpain II. *FEBS Letters* 443, 17.
- Sem, D.S., Baker, B.L., Victoria, E.J., Jones, D.S., Marquis, D., Yu, L., Parks, J., and Coutts, S.M. (1998) Structural Characterization and Optimization of Antibody-Selected Phage Library Mimotopes of an Antigen Associated with Autoimmune Recurrent Thrombosis. *Biochemistry* 37, 16081.
- Holmbeck, S.M.A., Foster, M.P., Casimiro, D.R., Sem, D.S., Dyson, H.J. and Wright, P.E. (1998) High Resolution Solution Structure of the Retinoid X Receptor DNA Binding Domain *J. Mol. Biol.* 281, 271.
- Sem, D.S., Casimiro, D.R., Kliewer, S.A., Provencal, J., Evans, R.M. and Wright, P.E. (1997) NMR Spectroscopic Studies of the DNA-Binding Domain of the Monomer-binding Nuclear Orphan Receptor, Human Estrogen Related Receptor-2. *J. Biol. Chem.* 272, 18038.



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Research Interests

- Analytical Science
- Materials Synthesis and Characterization
- Surface Science

Education

- Ph.D. 1981, University of North Carolina, Chapel Hill
- B.S. 1977, University of Delaware (Chemistry)
- B.A. 1977, University of Delaware (Biology)

Honors and Awards

- Award in Analytical Chemistry, 2004
- National Science Foundation Creativity Award, 1998
- University of Arizona College of Science Distinguished Teaching Award, 1996
- Iota Sigma Pi Agnes Faye Morgan Research Award, 1994
- National Science Foundation Creativity Award, 1990
- IBM Faculty Development Award, 1985

Representative Publications

A.M. Hawkrigde, J.E. Pemberton, *J. Am. Chem. Soc.*, 2003, 125, 624-625. "Model Aluminum-Poly(p-phenylenevinylene) Interfaces Studied by Surface Raman Spectroscopy."

- C.J. Orendorff, M.W. Ducey, J.E. Pemberton, L.C. Sander, *Anal. Chem.*, 2003, 75, 3360-3368. "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy. 3. Effects of Highly Ordering Solvents."
- C.J. Orendorff, M.W. Ducey, J.E. Pemberton, L.C. Sander, *Anal. Chem.*, 2003, 75, 3369-3375. "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy. 4. Effects of Model Aromatic Solutes and Bases."
- D.J. Tiani, J.E. Pemberton, *Langmuir*, 2003, 19, 6422-6429. "Emersion of 11-Mercapto-1-undecanol-Modified Ag Substrates from Aqueous and Nonaqueous Solvents: The Effect of Emersion Velocity on the Emerged Solvent Layer Thickness."
- S. P. Pasilis, J.E. Pemberton, *Inorg. Chem.*, 2003, 42, 0000. "Speciation and Coordination Chemistry of Uranyl(VI)-Citrate Complexes in Aqueous Solution."
- C.J. Orendorff, M.W. Ducey, J.E. Pemberton, *J. Phys. Chem. A*, 2002, 106, 6991-6998. "Quantitative Correlation of Raman Spectral Indicators in Determining Conformational Order in Alkyl Chains."
- M.W. Ducey, C.J. Orendorff, J.E. Pemberton, L.C. Sander, *Anal. Chem.*, 2002, 74, 5576-5584. "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy: 1. Effects of Temperature, Surface Coverage and Preparation Procedure."
- M.W. Ducey, C.J. Orendorff, J.E. Pemberton, L.C. Sander, *Anal. Chem.*, 2002, 74, 5585-5592. "Structure-Function Relationships in High-Density Octadecylsilane Stationary Phases by Raman Spectroscopy: 2. Effects of Common Mobile Phase Solvents."
- C.D. Zangmeister, J.A. Turner, J.E. Pemberton, *Geophys. Res. Lett.*, 2001, 28, 995-998. "Segregation of NaBr in NaBr/NaCl Crystals Grown from Aqueous Solutions: Implications for Sea Salt Surface Chemistry."
- J.W. Robertson, M. Cai, J.E. Pemberton, *Adv. Mater.*, 2001, 13, 662-667. "Perfectly Insulating Ultrathin Silica Films Formed by a Room Temperature Sol-Gel Process."
- C.D. Zangmeister, J.E. Pemberton, *J. Phys. Chem. A*, 2001, 105, 3788-3795. "Raman Spectroscopy of the NaCl + HNO₃ Reaction: NaNO₃ Growth and Effect of H₂O Exposure."
- M. Cai, J.E. Pemberton, *Fresenius' J. Anal. Chem.*, 2001, 369, 328-334. "Vibrational Spectroscopy of Dimethylchlorooctadecylsilane Covalently Bonded to Ultrathin Silica Films Immobilized on Ag Surfaces."
- D.K. Kambhampati, T.A.M. Jakob, J.W. Robertson, M. Cai, J.E. Pemberton, W. Knoll, *Langmuir*, 2001, 17, 1169-1175. "Surface Plasmon Resonance Studies of Polymer Brushes and DNA Hybridization Interactions on a Novel Silicon Oxide Sol-Gel Sensing Surface."

J.E. Pemberton, M. Ho, C.J. Orendorff, M.W. Ducey, *J. Chromatogr. A*, 2001, 913, 243-252. "Raman Spectroscopy of Octadecylsilane Stationary Phase Conformational Order: Effect of Solvent."

C.D. Zangmeister, J.E. Pemberton, *J. Am. Chem. Soc.*, 2000, 122, 12289-12296. "Raman Spectroscopy and Atomic Force Microscopy of the Reaction of Sulfuric Acid with Sodium Chloride"

M.H. Schoenfisch, M. Ovadia, J.E. Pemberton, *J. Biomed. Mater. Res.*, 2000, 51, 209-215. "Covalent Surface Organochemical Modification of Noble Metal Electrodes for Cardiac Biomaterial Applications."

J. Gailer, G.N. George, I.J. Pickering, R.C. Prince, S.C. Ringwald, J.E. Pemberton, R.S. Glass, H.S. Younis, D.W. DeYoung, H.V. Aposhian, *J. Am. Chem. Soc.*, 2000, 122, 4637-4639. "A Metabolic Link Between Arsenite and Selenite: The Seleno-bis(S-glutathionyl) Arsinium Ion."



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Research Interests

- bioanalytical chemistry, and focus on developing new methods for assaying nanoliter volume samples, and applying these methods to study the distribution and dynamic release of neurotransmitters and neuropeptides from individual neurons.
- the roles that peptide hormones, neurotransmitters and neuromodulatory agents play in behavior, learning and memory.

Education

- B.S. degree , Chemistry from the University of California , Davis , 1983
- Ph.D., the University of Arizona , 1989.

Honors and Awards

- ACS Analytical Division Award in Chemical Instrumentation
- The Merck Prize
- Fellow, American Association for the Advancement of Science
- The Gill Prize in Instrumentation and Measurement Science
- Benedetti-Pichler Award in Microanalysis
- ACS Arthur Fideis Award for Young Analytical Scientists
- Packard Fellowship
- Alfred P. Sloan Fellowship
- Dreyfus Teacher-Scholar Award

Representative Publications

"Vitamin E Imaging and Localization in the Neuronal Membrane," Monroe EB, Jurchen JC, Lee J, Rubakhin SS, Sweedler JV., *J. Am. Chem. Soc.*, **127**, 12152-12153 (2005).

"Imaging Mass Spectrometry: Fundamentals and Applications to Drug Discovery," S. S. Rubakhin, J. C. Jurchen, E. B. Monroe, and J. V. Sweedler, *Drug Discovery Today*, **10**, 823-837 (2005).

"Monitoring Activity-dependent Peptide Release from the CNS Using Single-Bead Solid-Phase Extraction and MALDI TOF MS Detection," N. G. Hatcher, T. A. Richmond, S. S. Rubakhin, and J. V. Sweedler, *Analytical Chemistry*, **77**, 1580-1587 (2005).

"Nanocapillary Arrays Effect Mixing and Reaction in Multilayer Fluidic Structures," T. C. Kuo, H. K. Kim, D. M. Cannon, M. A. Shannon, J. V. Sweedler, and P. W. Bohn, *Angewandte Chemie-International Edition*, **43**, 1862-1865 (2004).

"Systemic Serotonin Sulfate in Opisthobranch Mollusks," J. N. Stuart, J. D. Ebaugh, A. L. Copes, N. G. Hatcher, R. Gillette, and J. V. Sweedler, *J. Neurochem.* **90**, 734-742 (2004).

"Engineering the Morphology and Electrophysiological Parameters of Cultured Neurons by Microfluidic Surface Patterning," E.V. Romanova, K.A. Fosser, S.S. Rubakhin, R.G. Nuzzo, and J.V. Sweedler, *FASEB J.* **18**, 1267-1269 (2004).

"The Chemistry of Thought: Neurotransmitters in the Brain," J.N. Stuart, A.B. Hummon and J.V. Sweedler, *Anal. Chem.* **76**, 121A-128A (2004).

Kristin A. Fletcher, Ph.D.

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Research Interests:

- Optical Spectroscopy
- Room-Temperature Ionic Liquids as Green Solvents
- Molecularly Organized Solvent Systems
- Capillary Electrophoresis Separations
- Chemical Sensing
- Environment-Related Chemicals and Processes
- Polycyclic Aromatic Compounds
- Photophysics of Polymers, Biomolecules, and Pharmaceuticals
- Chemical/Solution Thermodynamics
- Chemical Education

Education:

2000 – 2004	New Mexico Institute of Mining and Technology Socorro, New Mexico Research Supervisor: Siddharth Pandey	Ph.D. in Chemistry
1997 – 1998	University of North Carolina, Chapel Hill Chapel Hill, North Carolina	Research Assistant
1995 – 1997	University of North Texas Denton, Texas Research Supervisor: William E. Acree, Jr.	Masters of Science
1990 – 1995	University of North Texas, Denton, Texas Mathematics	Bachelor of Science: Bachelor of Arts: Chemistry

Selected Peer-Reviewed Research Publications:

“Detection of Homocysteine and Cysteine”, Weihua Wang, Oleksandr Russin, Xiangyang Xu, Kyu Kwang Kim, Jorge O. Escobedo, Sayo O. Fakayode, **Kristin A. Fletcher**, Mark Lowry, Corin M. Schowalter, Candace M. Lawrence, Frank R. Fronczek, Isiah M. Warner, Robert M. Strongin, *Journal of the American Chemical Society*, **127**, pp. 15949-15958 (2005).

"Influence of Polydispersity of Polymeric Surfactants on Enantioselectivity of Chiral Compounds in Micellar Electrokinetic Chromatography", Jepkoech Tarus, Rezik A. Agbaria, Kevin Morris, Simon Mwongela, Abdulqawi Numan, Linda Simuli Wabuye, **Kristin A. Fletcher**, Isiah M. Warner, *Langmuir*, **20**, pp. 6887-6895 (2004).

"Generation and pH Dependent Superquenching of Poly(amido) Carboxylate Dendrons Hosting a Single 'Focal Point' Pyrene", Siddharth Pandey, Rebecca A. Redden, **Kristin A. Fletcher**, Darryl Y. Sasaki, Angel E. Kaifer, Gary A. Baker, *Chemical Communications*, pp. 1318-1319 (2004).

"Correlation between the Fluorescent Response of Microfluidity Probes and the Water Content and Viscosity of Ionic Liquid + Water Mixtures", Siddharth Pandey, **Kristin A. Fletcher**, Sheila N. Baker, Gary A. Baker, *Analyst*, **129**, pp. 569-573 (2004).

"Surfactant Aggregation Within Room-Temperature Ionic Liquid 1-Ethyl-3-Methylimidazolium bis(trifluoromethylsulfonyl)imide", **Kristin A. Fletcher** and Siddharth Pandey, *Langmuir*, **20**, pp. 33-36 (2004).

"Solvatochromic Probe Behavior Within Ternary Room-Temperature Ionic Liquid bmimPF₆ + Ethanol + Water Solutions", **Kristin A. Fletcher** and Siddharth Pandey, *Journal of Physical Chemistry B*, **107**, 13532-13539 (2003).

"Selective Fluorescence Quenching of Polycyclic Aromatic Hydrocarbons by Nitromethane Within Room Temperature Ionic Liquid 1-Butyl-3-Methylimidazolium Hexafluorophosphate", **Kristin A. Fletcher**, Shubha Pandey, Isaiah K. Storey, Ashley E. Hendricks, Siddharth Pandey, *Analytica Chimica Acta*, **453**, pp. 89-96 (2002).

Reviews and Book Chapters:

"Capillary Electrochromatography using Polyelectrolyte Multilayer Coatings", Mary W. Kamande, **Kristin A. Fletcher**, Mark Lowry, and Isiah M. Warner, *Journal of Separation Science*, **28**, pp 710-718 (2005).

"Molecular Fluorescence, Phosphorescence, and Chemiluminescence Spectrometry", Aleeta M. Powe, **Kristin A. Fletcher**, Nadia N. St. Luce, Mark Lowry, Sharon Neal, Matthew E. McCarroll, Philip B. Oldham, Linda B. McGown, Isiah M. Warner, *Analytical Chemistry*, **76**, pp. 4614-4634 (2004).

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Research Interests

Environmental systems involve remediation of metal contaminants. Current explored areas include the use of bacterial produced metabolites such as rhamnolipid biosurfactants for bioremediation purposes. Rhamnolipid-metal speciation and adsorption at the solid-liquid and liquid-air interfaces at different environmental conditions will provide vital information about fate and transport of metal contaminants in soil.

Education and Awards

University of Arizona, Department of Chemistry, 2002-present

- National Science Foundation Graduate Fellowship - 2003-2006
- Graduate Minority Fellowship - 2001

University of Puerto Rico at Cayey, 1997-2001, B.A., Chemistry

- Graduated Magna Cum Laude
- Active member of Chemistry Club; 2nd Place 2001 Team Chemistry Competition

Publications

- Lebrón-Paler, A.; Becker, B.; Otto, W.; Larive, C.K.; Pemberton, J.E., Spectrochemical Determination of the Acid Dissociation Constant of the Biosurfactant Monorhamnolipid in Aqueous Solution. *Anal. Chem.* to be submitted.
- Lebrón-Paler, A.; Pemberton, J.E., Adsorption Behavior of Monorhamnolipid at γ -Alumina using ATR-FTIR. *Environ. Sci. Tech.*, in preparation.



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Research Interests

- Flow-based analysis, cost effective instrumentation/ analysis

Brief Education

- B.S. (Chemistry), Chiang Mai University, Thailand, 1974
- Ph.D. Liverpool John Moores University (Liverpool Polytechnic), England (Scholarship by Liverpool Education Authority), 1981
- Alexander von Humboldt Research Fellow at the Centre for Advanced Technological and Environmental Training, Karlsruhe Research Centre, Germany, 1991-92 and other post-doc fellow ships by DAAD in different periods
- The Royal Society (UK) visiting research fellow at Liverpool John Moores University, 1998

Honors and Awards

- Award for Outstanding Researcher of the Year in Chemical and Pharmaceutical Sciences, by The National Research Council of Thailand (NRCT)
- Award for Outstanding ex-student of Chiang Mai University Alumni Association
- Thailand Research Fund (TRF) Senior Research Scholar Award
- Award for Outstanding Scientist of the Year, by Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King
- "JAFIA Scientific Award" by The Japanese Association for Flow Injection Analysis (JAFIA), JAPAN
- "Thailand Outstanding Person in Science and Technology" by the Office of Thailand Uniqueness, The Office of the Prime Ministry
- Currently: Advisory Editorial Board: Talanta (Elsevier) J. Flow Injection Analysis (JAFIA); Associate Editor: Water Research (Elsevier); Formerly: Editorial Board-Laboratory Robotics and Automation (Wiley)

Representative Publications

- Tue-Ngeun O, Jakmunee J and Grudpan K (2005) A novel stopped flow injection-amperometric procedure for the determination of chlorate. *Talanta*, **68**(2),459-464.
- Burakham R, Lapanantnoppakhun S, Jakmunee J and Grudpan K (2005) Exploiting sequential injection analysis with lab-at-valve (LAV) approach for on-line liquid-liquid micro-extraction spectrophotometry. *Talanta*, **68**(2),416-421.
- Settheeworrit T, Hartwell SK, Lapanantnoppakhun S, Jakmunee J, Christian GD and Grudpan K (2005) Exploiting guava leaf extract as an alternative natural reagent for flow injection determination of iron. *Talanta*, **68**(2),262-267 .
- Tue-Ngeun O, Ellis P, McKelvie ID, Worsfold P, Jakmunee J and Grudpan K (2005) Determination of dissolved reactive phosphorus (DRP) and dissolved organic phosphorus (DOP) in natural waters by the use of rapid sequenced reagent injection flow analysis. *Talanta*, **66** (2), 453-460.
- Jakmunee J, Pathimapornlert L, Hartwell SK and Grudpan K (2005) Novel approach for mono-segmented flow micro-titration with sequential injection using a lab-on-valve system: a model study for the assay of acidity in fruit juices. *Analyst*, **130** (3), 299-303.
- Chantiwas R, Beckett R, Grudpan K (2005),Size-based speciation of iron in clay mineral particles by gravitational field-flow fractionation with electrothermal atomic absorption spectrometry, *Spectrochim Acta B*, **60**(1), 109-116.
- Hartwell S Kradtap, Srisawang B, Kongtawelert P, Jakmunee J and Grudpan K (2005) Sequential injection-ELISA based system for online determination of hyaluronan. *Talanta*, **66**(2), 521-527.
- Jakmunee, J, Patimapornlert L, Suteerapataranon S, Lenghor N, Grudpan K (2005) Sequential injection with lab-at-valve (LAV) approach for potentiometric determination of chloride. *Talanta*, **65**(3), 789-793.
- Chailapakul O, Amatongchai M, Wilairat P, Grudpan K, Nacapricha D (2004) Flow-injection determination of iodide ion in nuclear emergency tablets, using boron-doped diamond thin film electrode. *Talanta*, **64**(5), 1253-1258.
- Burakham R, Higuchi K, Oshima M, Grudpan K, Motomizu S (2004) Flow injection spectrophotometry coupled with a crushed barium sulfate reactor column for the determination of sulfate ion in water samples. *Talanta*, **64**(5), 1147-1150.
- Tanikkul S, Jakmunee J, Lapanantnoppakhun S, Rayanakorn M, Sooksamiti P, Synovec RE, Christian GD, Grudpan K (2004) Flow injection in-valve-mini-column pretreatment combined with ion chromatography for cadmium, lead and zinc determination. *Talanta*, **64**(5), 1241-1246.
- Grudpan K (2004) Some recent developments on cost-effective flow-based analysis. *Talanta*, **64**(5), 1084-1090.

Hartwell S, Kradtap, Grudpan K and Christian G D (2004) Bead injection with a simple flow-injection system: an economical alternative for trace analysis. *Trends in Analytical Chemistry*, **23**(9), 619-623.

Grudpan K (2003) Development of Cost-Performance Flow-based Chemical Analysis Systems. *Journal of Flow Injection Analysis*, **20** (2), 153.

Pattanapong A, Ruzicka J, Atallah R, Christian G D, Jakmunee J and Grudpan K (2003) Exploiting Sequential Injection Analysis with Bead Injection and Lab-On Valve for Determination of Lead Using Electrothermal Atomic Absorption Spectrometry. *Anal. Chim. Acta*, **499** (1-2), 167-72.

Lenghor N, Grudpan K, Jakmunee J, B. A. Staggemeier, W.W.C. Quigley, Bryan J. Prazen, Christian GD, Ruzicka J. and Synovec RE (2003) Sequential Injection Analysis with Dynamic Surface Tension Detection: High Throughput Analysis of the Interfacial Properties of Surface Active Samples. *Talanta*, **59**, 1153 – 63.

Ampan P, Lapanantnoppakhun S, Sooksamiti P, Jakmunee J, Hartwell SK, Jayasvati S, Christian GD and Grudpan K (2002) Determination of trace iron in beer using Flow Injection Systems with in-valve column and bead injection. *Talanta* **58**, 1327-34.

Nacapricha D, Maungkaew S, Ratanawimarnwong N, Shiowatana J and Grudpan K (2001) Continuous and Stopped Flow Injection for Catalytic Determination of Total Iodine in Urine. *Analyst* **126**, 121-6.

Grudpan K, Kamfoo K and Jakmunee J (1999) Flow Injection Spectrophotometric or Conductometric determination of Ascorbic Acid in a Vitamin C Tablet Using Permanganate or Ammonia. *Talanta* **49**, 1023-26.

Grudpan K, Jakmunee J and Sooksamiti P (1999) Flow Injection Dialysis for the Determination of Anions using Ion Chromatography. *Talanta* **49**, 215.

Grudpan K and Thanasarn T (1993) Overhead Projector Flow Injection Analysis. *Anal. Proc.* **30**, 10-3.

Sooksamiti P, Geckeis H and Grudpan K (1996) Determination of Lead in Soil Samples by In-valve Solid Phase Extraction Flow Injection Flame Atomic Absorption Spectrometry. *Analyst* **121**, 1413-17.

Grudpan K, Nacapricha D and Wattanakanjana Y (1991) Radiometric Detectors for Flow Injection Analysis. *Anal. Chim. Acta* **246**, 325-8.



Dr. Adisorn Tuantranont

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National Science and Technology Development Agency (NSTDA)
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Dr. Adisorn Tuantranont received the Ph.D. degree in electrical and computer engineering from University of Colorado at Boulder, Colorado, in 2001.

Since 2001, he joined National Electronic and Computer Technology Center (NECTEC) and established Nanoelectronics and MEMS laboratory. He is a pioneer in the research field of Micro-Electro-Mechanical Systems (MEMS) in Thailand. He has published approximately 50 journals and conference proceeding papers related to the MEMS, Optical MEMS, Microactuator, BioMEMS, Microfluidics, and Lab-on-a-chip fabrication and holds 5 patents. He is currently a member of the founding committee of National Nanotechnology Center (NANOTEC). He received a Young Technologist award in 2004 from Foundation the Promotion of Science and Technology under the Patronage of His Majesty the King and the best thesis award in 2005 from the National Research Council of Thailand.



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Research interest

- Trace Elements Determination by Atomic Spectrometry
- Size Characterization by Field-Flow Fractionation
- Elemental Speciation by Hyphenated Techniques

Education

- B.Sc. (Chemistry), 1994, Mahidol University, Bangkok, Thailand
- M.Sc. (Applied Analytical and Inorganic Chemistry), 1996, Mahidol University, Bangkok, Thailand (under the supervision of Associate Professor Juwadee Shiowatana)
- Ph.D. (Chemistry), 2002, University of Massachusetts at Amherst, U.S.A. (under the supervision of Professor Ramon M. Barnes)

Grants/ Awards

- Research Grant, September 1996 – August 1997, “Direct Electrothermal Atomic Absorption Spectrometric Determination of Heavy Metals in Seafood Samples by Slurry Introduction”, National Science and Technology Development Agency, Thailand
- Research Grant, July 2003 – June 2005, “Size Based Elemental Speciation of Airborne Particles by Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry”, The Thailand Research Fund
- Outstanding Poster Award, Flow Field-Flow Fractionation-Inductively Coupled Plasma-Mass Spectrometry (Flow FFF-ICP-MS) for Sediment Bound Trace Metal Characterization, A. Siripinyanond, R. Barnes, and D. Amarasiriwardena, TP 56, *2002 Winter Conference on Plasma Spectrochemistry*, Scottsdale, Arizona, Jan 6-12, 2002.

Publications (in scientific journals)

- K. Judprasong, M. Ornthai, A. Siripinyanond and J. Shiowatana, "A Continuous-Flow Dialysis System with Inductively Coupled Plasma Optical Emission Spectrometry for *in vitro* Estimation of Bioavailability", *J. Anal. Atom. Spectrom.*, 2005, **20**, 1191-1196.
- U. Kumtabtim, J. Shiowatana and A. Siripinyanond, "Sedimentation Field-Flow Fractionation-Inductively Coupled Plasma Optical Emission Spectrometry: Size-Based Elemental Speciation of Air Particulates", *J. Anal. Atom. Spectrom.*, 2005, **20**, 1185-1190.
- S. Saeseaw, J. Shiowatana and A. Siripinyanond, "Sedimentation Field-Flow Fractionation: Size Characterization of Food Materials", *Food Res. Int.*, 2005, **38**, 777-786.
- A. Siripinyanond, S. Worapanyanond and J. Shiowatana, "Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry: An Alternative Approach to Investigate Metal-Humic Substances Interaction", *Environ. Sci. Technol.*, 2005, **39**, 3295-3301.
- A. Siripinyanond and R. M. Barnes, "Flow Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry of Chemical Mechanical Polishing Slurries", *Spectrochim. Acta, Part B*, 2002, **57**, 1885-1896.
- A. Siripinyanond, D. Amarasiriwardena and R. M. Barnes, "Flow Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry for Sediment Bound Trace Metal Characterization", *J. Anal. Atom. Spectrom.*, 2002, **17**, 1055-1064.
- D. Amarasiriwardena, A. Siripinyanond and R. M. Barnes, "Trace Elemental Distribution in Soil and Compost-Derived Humic Acid Molecular Fractions and Colloidal Organic Matter in Municipal Wastewater by Flow Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry (Flow FFF-ICP-MS)", *J. Anal. At. Spectrom.*, 2001, **16**, 978-986.
- A. Al-Ammar, A. Siripinyanond and R. M. Barnes, "Simultaneous Sample Preconcentration and Matrix Removal Using Field-Flow Fractionation Coupled to Inductively Coupled Plasma Mass Spectrometry", *Spectrochim. Acta, Part B*, 2001, **56**, 1951-1962.
- J. Shiowatana, K. Benyatian and A. Siripinyanond, "Determination of Cd, Co, Hg, and Ni in Seawater After Enrichment on Activated Carbon by Slurry Sampling Electrothermal AAS", *Atom. Spectrosc.*, 2000, **21**, 179-186.
- J. Shiowatana, A. Siripinyanond, Waiyawat W and Nilmanee S, "Determination of Total Mercury in Natural Gas Liquid and Condensate by Carbon Adsorption and Slurry Sampling ETAAS", *Atom. Spectrosc.*, 1999, **20**, 224-229.
- A. Siripinyanond and R. M. Barnes, "Flow Field-Flow Fractionation-Inductively Coupled Plasma Mass Spectrometry and Metal Speciation in Proteins: A Feasibility Study", *J. Anal. Atom. Spectrom.*, 1999, **14**, 1527-1531.

J. Shiowatana and A. Siripinyanond, "Rapid Determination of Cd in Flour by Electrothermal AAS Using the Slurry Technique", *Atom. Spectrosc.*, 1996, **17**, 122-127.

Charter in a textbook

R. M. Barnes and A. Siripinyanond, in "Advances in Atomic Spectroscopy", J. Sneddon, ed., Elsevier, Amsterdam, 2002, Vol. 7, pp.179-235.



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Research interest

- Development of flow-based systems including microfluidics for chemical analysis.
- Method development for iodine analysis.
- Investigation and application of kinetic determination methods.
- Remote sensing system for chemical analysis
- Phosphorus in soil and sediments: studies of continuous extraction and analytical method development.

Educations

1987 B.Sc. (Hons), Prince of Songkla University, Songkla, Thailand
1989 M.Sc.* (Anal. Chem.), Chiang Mai University, Chiang Mai, Thailand
1993 Ph.D.* (Anal. Chem.), Liverpool John Moores University, Liverpool, UK

* sponsored by the Thai government under "The Development and Promotion of Science and Technology Talents Project (DPST)"

Awards

- **First prize for research presentation** in "1992 Young Researchers' Meeting" held at the University of Salford, Manchester by the Radiochemical Methods Group, Analytical Division, **Royal Society of Chemistry, UK.**
- Topic: "Trapping of Radioiodine on Charcoal: Particles, Precision and Performance"
- **Second prize for research presentation** in "1991 Young Scientists" held at UMIST
- Manchester by Analytical Division, **Royal Society of Chemistry, UK.**
- Topic: Impregnant in a Segment : KI in C by FIA"
- **Outstanding presentation in the first postdoctoral research presentation 2000**, organized by the **Thailand Research Fund (TRF).**

- **Medal and certificate for “2003 JAFIA Best Article Award”** from the paper entitled **“Simple flow injection system for colorimetric determination of iodate in iodized table salt, *Talanta*, 58, 1195-1201 (2002)”**. The award was given on the 6th November 2003 at Okayama University, Japan. This award is from The Japanese Association for Flow Injection Analysis (JAFIA), The Division of the Japanese Society for Analytical Chemistry
- **Outstanding Lecturer of the year 2005**, Faculty of Science, Mahidol University.

Selected of international publications

"Continuous and stopped flow injection for catalytic determination of total iodine in urine", **D. Nacapricha**, S. Muangkaew, N. Ratanawimarnwong, J. Shiowatana and K. Grudpan, *Analyst*, 126, 121-126(2001).

"A flow system for the determination of metal speciation in soil by sequential extraction", J. Shiowatana, N. Tantidanai, S. Nookabkeaw and **D. Nacapricha**, *Environ. Inter.*, 26, 381-387(2001).

"A novel continuous-flow sequential extraction procedure for metal speciation in solid", J. Shiowatana, N. Tantidanai, S. Nookabkaew and **D. Nacapricha**, *J. Environ. Qual.*, 30, 1195-1205(2001).

"A reverse-flow injection analysis method for the determination of dissolved oxygen in fresh and marine waters", S. Muangkaew, I. D. McKelvie, M. R. Grace, M. Rayanakorn, K. Grudpan, J. Jakmunee and **D. Nacapricha**, *Talanta*, 58, 1285-1291 (2002).

"Simple flow injection system for colorimetric determination of iodate in iodized salt", N. Choengchan, K. Uraisin, K. Choden, W. Veerasai, K. Grudpan and **D. Nacapricha**, *Talanta*, 58, 1195-1201(2002).

"Sequential extraction of phosphorus in soil and sediment using a continuous-flow system", W. Tiyaongpatana, P. Pongsakul, J. Shiowatana and **D. Nacapricha**, *Talanta*, 62(2004)765-771.

J. Shiowatana, N. Tantidanai, S. Nookarbkaew, R. Chomchoei, **D. Nacapricha** and P. Pongsakul "Development of a continuous-flow sequential extraction", *Soil and Fertilizer*. 25, 2-19 (2003), (in Thai).

"Use of pseudo-first order kinetics in flow injection for determination of trace inorganic iodine", N. Choengchan, K. Lukkanakul, N. Ratanawimarnwong, W. Waiyawat, P. Wilairat and **D. Nacapricha**, *Anal. Chim. Acta.*, 499, (2003)115-122.

"Simple and selective method for determination of iodide in pharmaceutical products by flow injection using iodine-starch reaction", **D. Nacapricha**, K. Uraisin, N. Ratanawimarnwong and K. Grudpan, *Anal. Bioanal. Chem.*, 378(2004) 816-821.

"Flow-injection determination of iodide ion in nuclear emergency tablets, using boron-doped diamond thin film electrode", O. Chailapakul, M. Amatongchai, P. Wilairat,

K. Grudpan and **D. Nacapricha**, *Talanta*, 64(2004)1253-1258.

“Determination of iodide by detection of iodine using gas-diffusion flow injection” and chemiluminescence N. Ratanawimarnwong, N. Amornthammarong^a, N. Choengchan, P. Chaisuwan, M. Amatatongchai, P. Wilairat, I.D. McKelvie, and **D. Nacapricha**, *Talanta*, 65(2005) 756-761.

“Determination of trace amounts of bromide by flow injection/stopped-flow detection technique using kinetic-spectrometric method”, K. Uraisin, **D. Nacapricha**, S. Lapanantnoppakhun, K. Grudpan and S. Motomizu, *Talanta*, 68(2005)274-280.

“Method development based on all injection analysis for determination of phosphorus in soil and sediment extracts” N. Amornthammarong, P. Anujaravat, K. Sereenonchai, P. Chaisuwan, P. Sastranurak, P. Wilairat and **D. Nacapricha**, *Talanta*, . 68(2005)480-487.



Dr. Ekasith Somsook

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Research interests

- Metallocene-based polymerization catalysis
- Nitrogen fixation
- Applications of NMR in chemistry and biology
- Metal-based drugs

Education

- **Ph.D. (Chemistry)**, August 2001, University of Wisconsin-Madison, U.S.A. **Mentor:** Prof. Clark R. Landis.
Dissertation: NMR-Based Solution Structures and Mechanisms of Metallocene Olefin Polymerization Catalysis.
- **B.Sc. (Chemistry) (First Class Honors)**, March 1994, Mahidol University, Bangkok, Thailand.

Honors/Affiliations

- Prof. Tab Nilaniti Outstanding Undergraduate Chemistry Student with Highest GPA Award (1994).
- Outstanding Undergraduate Chemistry Student with Highest GPA from Faculty of Science, Mahidol University, Bangkok, Thailand (1994).
- Outstanding Chemistry Student with Highest GPAX among 2nd and 3rd-Year Students from Faculty of Science, Mahidol University, Bangkok, Thailand (1992).
- Prof. Tab Nilaniti Outstanding 1st-Year Undergraduate Student with Highest GPA Award (1991).
- Outstanding Science and Mathematics Student of Thailand (1990 and 1991).
- Member of the Thai national team (1990) at the 22nd International Chemistry Olympiad in Paris, France. .
- The Development and Promotion of Science and Technology talent project scholar (1987-2001), Thailand.

Publications

- Kimmich, B. F. M.; **Somsook, E.**; Landis, C. R. "Oxidative Addition of Dihydrogen to [Ir(1,5-cyclooctadiene)(bisphosphine)]BF₄ complexes," *J. Am. Chem. Soc.* **1998**, *120*, 10115-10125.
- Landis, C. R.; Sawyer, R. A.; **Somsook, E.** "Synthesis and Characterization of a Chiral, Aza-15-Crown-5-Functionalized Ferrocenyldiphosphine Ligand for Asymmetric Catalysis," *Organometallics* **2000**, *19*, 994-1002.
- Liu, Z.; **Somsook, E.**; Landis, C.R. "A ²H-Labeling Scheme for Active Site Counts in Metallocene-Catalyzed Alkene Polymerization," *J. Am. Chem. Soc.* **2001**, *123*, 2915-2916.
- Liu, Z.; **Somsook, E.**; White, C. B.; Rosaaen, K. A.; Landis, C. R. "Kinetics of Initiation, Propagation, and Termination for the [(*rac*-C₂H₄(1-indenyl)₂)ZrMe][MeB(C₆F₅)₃]-Catalyzed Polymerization of 1-Hexene," *J. Am. Chem. Soc.* **2001**, *123*, 11193-11207.
- Somsook, E.**; Rujeeratanavorapan, V.; Pisitsak, P.; Suriyarak, S.; Prabpai, S.; Kongsaree, P.; Pohmakotr, M. "Crystal Structure of Hexaaquamagnesium(II) bis(hydrogen *cis*-9,10-dihydro-9,10-ethanoanthracene-11,12-dicarboxylate) dihydrate," *Z. Kristallogr. NCS* **2004**, *219*, 319-320.
- Somsook, E.**; Hinsin, D.; Buakhrong, P.; Teanchai, R.; Mophan, N.; Pohmakotr, M.; Shiowatana, J. "Interactions between iron(III) and sucrose, dextran, or starch in complexes" *Carbohydr. Polym.* **2005**, *61*, 281-287.
- Thammakan, N.; **Somsook, E.** "Synthesis and thermal decomposition of cadmium dithiocarbamate complexes" *Mater. Lett.* accepted.



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Research Interests

- Development of cost-effective instrumentation of flow based analysis and electroanalysis.
- Analytical method development based on flow based and electroanalysis for solving various local problems of Thailand.

Education

- B.S., Prince of Songkhla University, 1990
- Ph.D., Chiang Mai University, 1997

Honors and Awards

- Award for Outstanding Young Scientist of the Year 2003, by Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King

Representative Publications

Hartwell, S. K.; Srisawang, B.; Kongtawelert, P.; Jakmunee, J.; Grudpan, K. *Talanta* **2005**, *66*, 521-27.

Hartwell, S. K.; Boonmalai, A.; Jayasvati, S.; Lapanantnoppakhun, S.; Jakmunee, J.; Grudpan, K. *Analytical Sciences* **2005**, *21*, 437-39.

Jakmunee, J.; Pathimapornlert, L.; Hartwell, S. K.; Grudpan, K. *Analyst* **2005**, *130*, 299-303.

Lenghor, N.; Staggemeier, B. A.; Hamad, M. L.; Udnan, Y.; Tanikkul, S.; Jakmunee, J.; Grudpan, K.; Prazen, B. J.; Synovec, R. E. *Talanta* **2005**, *65*, 722-29.

Tue-Ngeun, O.; Ellis, P.; McKelvie, I. D.; Worsfold, P.; Jakmunee, J.; Grudpan, K. *Talanta* **2005**, *66*, 453-60.

- Udnan, Y.; McKelvie, I. D.; Grace, M. R.; Jakmunee, J.; Grudpan, K. *Talanta* **2005**, *66*, 461-66.
- Burakham, R.; Duangthong, S.; Patimapornlert, L.; Lenghor, N.; Kasiwad, S.; Srivichai, L.; Lapanantnoppakhun, S.; Jakmunee, J.; Grudpan, K. *Analytical Sciences* **2004**, *20*, 837-40.
- Tanikkul, S.; Jakmunee, J.; Lapanantnoppakhun, S.; Rayanakorn, M.; Sooksamiti, P.; Synovec, R. E.; Christian, G. D.; Grudpan, K. *Talanta* **2004**, *64*, 1241-46.
- Udnan, Y.; Jakmunee, J.; Jayasavati, S.; Christian, G. D.; Synovec, R. E.; Grudpan, K. *Talanta* **2004**, *64*, 1237-40.
- Ampan, P.; Ruzicka, J.; Atallah, R.; Christian, G. D.; Jakmunee, J.; Grudpan, K. *Analytica Chimica Acta* **2003**, *499*, 167-72.
- Grudpan, K.; Worakijcharoenchai, N.; Sooksamiti, P.; Jakmunee, J.; Christian, G. D. *Indian Journal of Chemistry Section A-Inorganic Bio-Inorganic Physical Theoretical & Analytical Chemistry* **2003**, *42*, 2939-44.
- Jakmunee, J.; Udnan, Y.; Morrison, R.; Beckett, R.; McKinnon, I.; Grudpan, K. *Analytical Sciences* **2003**, *19*, 1495-98.
- Lenghor, N.; Grudpan, K.; Jakmunee, J.; Staggemeier, B. A.; Quigley, W. W. C.; Prazen, B. J.; Christian, G. D.; Ruzicka, J.; Synovec, R. E. *Talanta* **2003**, *59*, 1153-63.
- Srisawang, B.; Kongtawelert, P.; Hartwell, S. K.; Jakmunee, J.; Grudpan, K. *Talanta* **2003**, *60*, 1163-70.
- Tanikkul, S.; Jakmunee, J.; Rayanakorn, M.; Grudpan, K.; Marquardt, B. J.; Gross, G. M.; Prazen, B. J.; Burgess, L. W.; Christian, G. D.; Synovec, R. E. *Talanta* **2003**, *59*, 809-16.
- Ampan, P.; Lapanantnoppakhun, S.; Sooksamiti, P.; Jakmunee, J.; Hartwell, S. K.; Jayasvati, S.; Christian, G. D.; Grudpan, K. *Talanta* **2002**, *58*, 1327-34.
- Chantiwas, R.; Beckett, R.; Jakmunee, J.; McKelvie, I. D.; Grudpan, K. *Talanta* **2002**, *58*, 1375-83.
- Grudpan, K.; Ampan, P.; Udnan, Y.; Jayasvati, S.; Lapanantnoppakhun, S.; Jakmunee, J.; Christian, G. D.; Ruzicka, J. *Talanta* **2002**, *58*, 1319-26.
- Jitmanee, K.; Hartwell, S. K.; Jakmunee, J.; Jayasvasti, S.; Ruzicka, J.; Grudpan, K. *Talanta* **2002**, *57*, 187-92.
- Lenghor, N.; Jakmunee, J.; Vilen, M.; Sara, R.; Christian, G. D.; Grudpan, K. *Talanta* **2002**, *58*, 1139-44.
- Muangkaew, S.; McKelvie, I. D.; Grace, M. R.; Rayanakorn, M.; Grudpan, K.; Jakmunee, J.; Nacapricha, D. *Talanta* **2002**, *58*, 1285-91.

Suteerapataranon, S.; Jakmunee, J.; Vaneesorn, Y.; Grudpan, K. *Talanta* **2002**, 58, 1235-42.

Tipparat, P.; Lapanantnoppakhun, S.; Jakmunee, J.; Grudpan, K. *Journal of Pharmaceutical and Biomedical Analysis* **2002**, 30, 105-12.

Jakmunee, J.; Grudpan, K. *Analytica Chimica Acta* **2001**, 438, 299-304.

Tipparat, P.; Lapanantnoppakhun, S.; Jakmunee, J.; Grudpan, K. *Talanta* **2001**, 53, 1199-204.



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Research interest

- Analytical atomic spectroscopy, environmental analytical chemistry

Educations

- B.Eng (1973), Tokyo Institute of Technology, Japan (Mombusho Scholarship)
- M.Sc. (1975), Tokyo Institute of Technology, Japan (Mombusho Scholarship)
- Ph.D. (1986) (Analytical Chemistry), University of New South Wales, Australia (Columbo Plan scholarship).

Recent research grants awarded as principle investigator

Source	Research topic	Year
Petroleum Authority of Thailand	Development of determination method for mercury in natural gas liquid	1998-1999
Thailand Research Fund (TRF)	Development of novel continuous-flow sequential extraction for speciation of heavy metals in solid	1999-2003
UNICEF research grant	Develop a low-cost field test kit for arsenic at low levels	2000
National Science and Technology Development Agency(NSTDA)	Production of rice flour reference material for quality control of determination of trace metals	2000-2001
UNICEF research grant	Develop a low-cost test kit for arsenic	2002
Pollution Control Department	Develop field test kits for environmental testing	2002-2003
UNICEF research grant	Develop a low-cost test kit for water quality monitoring	2004
Pollution Control Department	Develop field test kits for environmental monitoring	2004
Thailand Research Fund (TRF)	Development and application of continuous systems for study of bioavailability of minerals and heavy metals	2004-2007

Recent International Publications

D.Nacapricha, S. Muangkaew, N. Ratanawimarnwong, **J. Shiowatana** and K. Grudpan, "Continuous and stopped flow injection for catalytic determination of total iodine in urine", *The Analyst*, **126**, 121-126 (2001).

D.Nacapricha, N. Ratanawimarnwong, S. Suwannachot, P. Wilairat, **J. Shiowatana** and K. Grudpan, "Kinetic determination of iodine in urine using stopped-flow injection for catalytic determination of total iodine in urine", *Analytical Sciences*, **17** Supplement, 133-136 (2001).

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J. Shiowatana, N.Tantidanai, S. Nookarbkaew and D.Nacapricha "A novel continuous-flow sequential extraction procedure for metal speciation in solid materials", *J. Environ.Qual.*, **30**, 1195-1205 (2001).

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D.Hinsin, L.Pdungsap and **J. Shiowatana** "Continuous-flow extraction system for elemental association study: a case of synthetic metal-doped iron hydroxide", *Talanta*, **58**, 1365-1373 (2002).

R. Chomchoei, **J. Shiowatana** and P. Pongsakul "A continuous-flow system for reduction of metal readsorption during sequential extraction of soil", *Anal. Chim.Acta.* **472**, 147-159 (2002).

C. W. Gray, R. G. McLaren and **J. Shiowatana** "The determination of labile cadmium in some biosolids-amended soils by isotope dilution plasma mass spectrometry", *Aust. J. Soil Res.* **41**, 589-597 (2003).

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Shitangkoon A, Yanchinda J, **Shiowatana J**. "Thermodynamic study on the gas chromatographic separation of the enantiomers of aromatic alcohols using heptakis(2,3-di-O-methyl-6-O-tert-butyl-6-O-dimethylsilyl)- β -cyclodextrin as a stationary phase" *J. Chromatography A* 1049: 223-226 (2004).

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Chomchoei R, Miro M, Hansen EH, **Shiowatana J** , " Sequential injection system incorporating a micro-extraction column for automatic fractionation of metal ions in solid samples. Comparison of the extraction profiles when employing uni, bi, and multi-bi-directional flow plus stopped-flow sequential extraction modes" *Anal.Chim.Acta*, 536: 183-190 (2005).

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Janya Buanuam, Juwadee Shiowatana and Pichit Pongsakul, Fractionation and elemental association of Zn Cd and Pb in soils contaminated by Zn minings using a continuous-flow sequential extraction, **J. Environ. Monitoring**, 7(7): 778-784 (2005).

Namfon Tongtavee, Juwadee Shiowatana, Ron McLaren and Colin Gray, Assessment of lead availability in contaminated soils using isotope dilution techniques, **Sc. Total Environ.**, 348: 244-256 (2005).

Namfon Tongtavee, Juwadee Shiowatana and Ron McLaren, Fractionation of lead in soils affected by smelter activities using a continuous-flow sequential extraction system, **Intern J Environ Anal Chem**, 85(8): 567-583 (2005).

Juwadee Shiowatana, Wutthika Kitthikhun, Upsorn Sottimai, Jeerawan Promchan, Kanokwan Kunajiraporn, Dynamic continuous-flow dialysis method for in vitro simulation of gastrointestinal digestion to predict mineral bioavailability of food, **Talanta**, in press.

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Kanchit Judprasong, Mathuros Ornthai, Atitaya Siripinyanond and Juwadee Shiowatana, A continuous-flow dialysis system with online inductively coupled plasma optical emission spectrometric detections for in vitro estimation of bioavailability, **J.Anal Atom.Spectrom.**,20(11): 1191-1196 (2005).

Patents

- Thailand, Device and method for field testing of arsenic, pending
- Thailand, Gas trapping device for gas detection, pending

Products

- Arsenic field test kit for water at low level detection
- Field test kits for water quality monitoring



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Research Interests

- Optimization of chromatographic parameters for analytical applications
- Applications of modern chromatography-mass spectrometry

Educational Background

- | | |
|------|---|
| 1966 | High School Diploma, Eisenhower High School, Rialto, California, U.S.A. |
| 1967 | Upper Secondary Education Certificate, The Prince Royal's College, Chiang Mai, Thailand |
| 1972 | B.S. (Chemistry), Chiang Mai University, Chiang Mai, Thailand |
| 1975 | M.Sc. (Analytical Chemistry), University of Salford, U.K. |
| 1980 | Ph.D. (Chemistry), University of Wales Swansea, U.K. |

Selected publications

- R. Karnka, M. Rayanakorn*, S. Watanesk and Y. Vaneesorn, "Optimization of High Performance Liquid Chromatographic Parameters for the Determination of Capsaicinoid Compounds Using the Simplex Method", *Anal. Sci.*, 18 (2002)1.
- S. Muangkaew, I. D. McKelvie, M. R. Grace, M. Rayanakorn, K. Grudpan, J. Jakmunee and D. Nacapracha, "A Reverse-Flow Injection Analysis Method for the Determination of Dissolved Oxygen in Fresh and Marine Waters", *Talanta*, 58 (2002) 1285.
- S. Tanikkul, J. Jakmunee, M. Rayanakorn, K. Grudpan, B.J. Marquardt, G.M. Gross, B. Prazewn, L.W. Burgess, G.D. Christian, R.E. Synovec, "Characterization and Use of a Raman Liquid-Core Waveguide Sensor Using Preconcentration Principles", *Talanta*, 59 (2003) 809.

K. Kuppathayanant, M. Rayanakorn, S. Wongpornchai, T. Prapamontol, R'L' Deming, "Enhanced Sensitivity and Selectivity in the Detection of Polycyclic Aromatic Hydrocarbons Using Sequential Simplex Optimization, the Addition of an Organic Modifier and Wavelength Programming", *Talanta*, 61 (2003) 879.

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Sunanta Wangkarn, Phimpha Soisungnoen, Mongkon Rayanakorn and Kate Grudpan "Determination of Linear Alkylbenzene Sulfonates in Water Samples by Liquid Chromatography–UV Detection and Confirmation by Liquid Chromatography–Mass Spectrometry" *Talanta*, 58, (2005), 686.



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Research interest

- Development of electrochemical methods
- Diamond Sensor
- Chemical and Biosensor
- Lab on chip

Education

- 1994 Ph.D. (Analytical Chemistry), The University of New Mexico, U.S.A
- 1985 M.Sc. (Analytical Chemistry), Chulalongkorn University, Thailand
- 1981 B.Sc. (Chemistry), Mahidol University, Thailand

Scholarship and Awards:

- Rachadapiset award
- ทุนวิจัยหลังปริญญาเอก
- ทุนพัฒนานักวิจัย (เมธีวิจัย สกว.)

Selected publications:

Treetepvijit, S.; Chuanuwatanakul, S.; Einaga Y.; Sato, R and Chailapakul, O
Electroanalysis of tetracycline using nickel-implanted boron-doped diamond thin film electrode applied to flow injection system *Analytical Sciences*, **2005**, *21*, 531.

Kanokporn, B.; Chuanuwatanakul, S.; Wangfuengkanagul, N and Chailapakul, O.;
Electroanalysis of lincomycin using boron-doped diamond thin film electrode applied to flow injection system *Sensors and Actuators B: Chemical*, **2005**, *108*, 627.

Charoenraks, T.; Chuanuwatanakul, S.; Honda, K.; Yamaguchi, Y.; and Chailapakul, O.; Analysis of Tetracycline Antibiotics Using HPLC with Pulsed Amperometric Detection *Analytical Sciences*, **2005**, *21*, 241.

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Sukwattanasinitt, M.; Nantalaksakul, A.; Potisatityuenyong, A.; Tuntulani, T.; Chailapakul, O. and Praphairakait, N. "An electrochemical sensor from a soluble polymeric Ni-salen complex." *Chemistry of Materials* **2003**, *15*(23), 4337-4339.

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Tomapatanaget, B.; Tuntulani, T. and Chailapakul, O. "Calix 4 arenes containing ferrocene amide as carboxylate anion receptors and sensors." *Organic Letters* **2003**, *5*(9), 1539-1542.

Chailapakul, O.; Siangproh, W.; Sarada, B.V.; Terashima, C.; Rao, T.N.; Tryk, D.A. and Fujishima, A. "The electrochemical oxidation of homocysteine at boron-doped diamond electrodes with application to HPLC amperometric detection." *Analyst* **2002**, *127*(9), 1164-1168.

Wangfuengkanagul, N. and Chailapakul, O. "Electrochemical analysis of D-penicillamine using a boron-doped diamond thin film electrode applied to flow injection system." *Talanta* **2002**, *58*(6), 1213-1219.

Wangfuengkanagul, N. and Chailapakul, O. "Electrochemical analysis of acetaminophen using a boron-doped diamond thin film electrode applied to flow injection system." *J of Pharm and Bio* **2002**, 28(5), 841-847.

Chailapakul, O.; Aksharanandana, P.; Frelink, T.; Einaga, Y. and Fujishima, A. "The electrooxidation of sulfur-containing compounds at boron-doped diamond electrode." *Sensors and Actuators B-Chemical* **2001**, 80(3), 193-201.



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Education

B.Sc. (1972) [Chemistry], Chulalongkorn University, Bangkok

M.Sc. (1974) [Physical Chemistry], Chulalongkorn University, Bangkok

Ph.D. (1980) [Analytical Chemistry], The Queen's University of Belfast, N-Ireland.

Post-Doctoral Training (1982-1984), Alexander von Humboldt Fellow, Paderborn University, Federal Republic of Germany

Fellowship/Grants/Awards:

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| 1982 - 1984 | Alexander von Humboldt Stiftung |
| 1982-84 | Alexander von Humboldt Stiftung |
| 1990 | Alexander von Humboldt Stiftung |
| 1997 | University Development Program, Ministry of University Affairs |
| 1998 | Alexander von Humboldt Stiftung Kasetsart University Research and Development |
| 1989 | Outstanding Scientific Research Award in 27 th Kasetsart University Conference, Bangkok, Thailand. |
| 2002 | Kasetsart University Research and Development |

Selected publications

Confirmatory determination of organochlorine pesticides in surface waters using LC/APCI/Tandem mass spectrometry, S. Chusaksri, S. Sutthivaiyakit and P. Sutthivaiyakit, *Anal. Bioanal. Chem.*, *in press*.

LC-MS/MS Method for the Confirmatory Determination of Aromatic Amines and Its Application in Textile Analysis, P. Sutthivaiyakit, S. Achatz, J. Lintelmann, T. Aungpradit, R. Chanwirat, S. Chumanee and A. Kettrup, *Anal Bioanal Chem*, **381**, 268-276(2005)

Constituents of The Leaves of *Macaranga tanarius*", Phommart, P. Sutthivaiyakit, N. Chimnoi, S. Ruchirawat, and S. Sutthivaiyakit *J. Nat. Prod*, **68**, 927-930.,(2005).

A novel 29-*nor*-3,4-*seco*-friedelane triterpene and a new guaiane sesquiterpene from the roots of *Phyllanthus oxyphyllus*" S. Sutthivaiyakit, N. Na Nakorn, W. Kraus and P. Sutthivaiyakit " *Tetrahedron* , **59**, 9991, (2003).

Diterpenylated and prenylated flavonoids from *Macaranga denticulata*, S. Sutthivaiyakit, S. Unganont, P. Sutthivaiyakit, A. Suksamran, *Tetrahedron* **58**, 3619(2002).

Sulphur Dioxide Indicator Tube Using Copper (II) Complex of 1-[5'-nitro-2'-Thiazolyl]azo]-2-naphthol, P. Sutthivaiyakit and N. Nittitham, *Fresenius Envir. Bull* **9**, 152 (2000).

Book:

"Quantitative Chemical Analysis" and "Compleximetric Titration" Pakawadee Sutthivaiyakit in (14 pages) "Quantitative Chemical Analysis Laboratory", Chemistry Department, Kasetsart University, 1999 [in Thai].



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Research interest

- Biosensors
- Biocurrents: The role of bioelectricity in plant development

Education

- B.Sc. (Physics), 1978, University of Waikato, Hamilton, New Zealand
- M.Sc. (Physics (Biophysics)) (First Class Honours), 1980, University of Waikato, Hamilton, New Zealand (under the supervision of Dr Robert A. Sherlock)
- D.Phil. (Physics (Biophysics)), 1985, University of Waikato, Hamilton, New Zealand (under the supervision of Dr Robert A. Sherlock)

Awards

- Taguchi Prize for Outstanding Research Achievements by a Young Scientist in the Field of Biotechnology. Awarded by the Foundation for the Promotion of Biotechnology (FPB) in Thailand (TAGUCHI FUND), 1998.
- Faculty of Science Outstanding Lecturer in Research, 2003.
- Prince of Songkla University Exemplary Lecturer in Research, 2003.
- Faculty of Science Outstanding Lecturer in Teaching, 2005.

Selected publications

S. Suwansa-ard, P. Kanatharana, P. Asawatreratanakul, C. Limsakul, B. Wongkittisuksa and **P. Thavarungkul**, Semi disposable reactor biosensors for detecting carbamate pesticides in water. *Biosensors and Bioelectronics*, 2005, **21**, 445-454.

J. Jantra, H. Zilouei, J. Liu, B. Guieysse, **P. Thavarungkul**, P. Kanatharana and B. Mattiasson, Microbial biosensor for the analysis of 2,4-dichlorophenol. *Analytical Letters*, 2005, **38**, 1071-1083.

C. Thammakhet, **P. Thavarungkul**, R. Brukh, S. Mitra and P. Kanatharana, Microtrap modulated flame ionization detector for on-line monitoring of methane. *Journal of Chromatography A*, 2005, **1072**, 243-248.

W. Limbut, **P. Thavarungkul**, P. Kanatharana, P. Asawatratanakul, C. Limsakul and B. Wongkittisuksa, Comparative study of controlled pore glass, silica gel and Poraver[®] for the immobilization of urease to determine urea in a flow injection conductimetric biosensor system. *Biosensors and Bioelectronics*, 2004, **19**, 813-821.

P. Thavarungkul, C. Muangdit and K. Sunbhanich, Ionic currents associated with primary root growth of sunflower seedlings and the effect of external pH. *ScienceAsia*, 2003, **29**, 265-274.



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Research interests

Formulation Development

Develop the injectable formulation for:
Eplerenone Solution for Intravenous Injection (Anti-hypertensive agent).
Parecoxib Suspension for Sustained-Release Intramuscular Injection (Cox-II Inhibitor).
A-2 Peptides Solution for Intravenous Injection (Anticancer Agent).
SU-5416 Suspension/Solution for Intramuscular Injection (Anticancer Agent).

Analytical

Evaluating the aggregation state, stability and solubility of Polyene Macrolides, using UV/VIS, Fluorescence spectrophotometry, and High performance liquid chromatography (HPLC).

Evaluated the dissolution (USP dissolution apparatus) and stability (HPLC) of anti-seizure formulations.

Evaluated the chemical stability of liposomal formulations of Topotecan and intravitreal injections of ganciclovir using UV/VIS and HPLC.

Have expertise on Gel and paper Chromatography, Gel electrophoresis, Ultrafiltration, Ultracentrifugation, Transmission electron microscopy, Circular dichroism, and Coulter counter.

Pharmacokinetics

Evaluated the distribution of Polyene Macrolides in blood components, as well as their toxicity, half-life, organ distribution and disposition in rats.

Responsible Care and Use of Laboratory Animals course and was certified, University of Wisconsin-Madison.

Intravenous Administration Plasma compatibility study of SU-5416 (anticancer drug) NanoCrystal Colloidal Suspension.

Evaluation of serum albumin utilization in in-patient at Payathai 2 hospital.

Computer Completed Information Systems course, Chulalongkorn University.
Advanced training from Abbott Laboratories, covering a variety of computer programs, word processing, spreadsheet, data analysis, and statistics on a variety of operating systems.

Others Tablet and capsule manufacturing, dissolution apparatus, familiar with cGMP, Sterile techniques and biological techniques including cell culture, and protein purification.

Education

1995 to 2001 Ph.D. in Pharmaceutical Sciences, University of Wisconsin-Madison, USA.
1993 to 1995 Doctor of Pharmacy (Pharm.D.), University of Illinois-Chicago, USA.
1986 to 1992 B.S. in Pharmacy, Chulalongkorn University, Bangkok, Thailand (Honors).

Patent

P. Aramwit and H. Qi, Storage Stable Eplerenone Formulation, Pub. App. No. 20040072797, United States of America.

Award and Recognition

- Article and Abstract Selection Committee, AAPS Organization for Pharmaceutical Research Journal and Pharm Sci Journal, 2000-2001.
- Research Grant from Pharmacia-Upjohn Corporation, Kalamazoo, MI, USA, June 2000-September 2001.
- Research Assistantship, Graduated School Department, University of Wisconsin-Madison, Madison, Wisconsin, USA June 1997-October 2000.
- National Institute of Health (NIH) with Dr. Glen S. Kwon, University of Wisconsin-Madison, Madison, Wisconsin, USA June 1999-August 2000.
- Vilas Professional Development Fellowship, Graduate Student Council, University of Wisconsin-Madison, Madison, Wisconsin, USA May 1999.
- Scholarship from Kinetana Inc, Edmonton, Alberta, Canada, 1998.

- Travel Grant from Controlled Release Society, Inc. for the 25th International Symposium on Controlled Release of Bioactive Materials, Las Vegas, Nevada, USA June 1998.
- Teaching Assistantship, Graduated School Department, University of Wisconsin-Madison, Madison, Wisconsin, USA September 1995-May 1997.
- Scholarship in Clinical Pharmacy from Thai Government, Bangkok, Thailand, 1993.
- Scholarship in Immunology from the Government of Pharmaceutical Organization (GPO), Bangkok Thailand, 1993.
- Academic Honor from Chulalongkorn University, Bangkok, Thailand, 1992.

Selected publications

Book

A. Hemajudha, P. Aramwit. Vertigo-Dizziness, 2002. Printing Place, Bangkok, Thailand.

T. Wattanavijitkul, P. Aramwit. Medical Internet Handbook, 2004. Printing Place, Bangkok, Thailand

Selected articles

P. Aramwit, X. Liu, X. Cong, L. Lam and Y. Cao, Biospecific Antibodies as Emerging Pharmaceuticals for Tumor Immunotherapy, *Drugs of the Future*. 2005 Oct 30(10).

P. Aramwit and N. Kasettratrat, Evaluation of Serum Albumin Utilization in Inpatient at a Private Hospital in Bangkok, *Yakugaku Zasshi*. 2004 Sep 124(9): 631-634.

P. Aramwit and S. Assawawitoontip, Evaluation of Patient Counseling on Blood Pressure Control of Out-Patients with Hypertension at Chulalongkorn Hospital, *J. Med. Assoc. Thai* . 2003 Jun 86 Suppl 2: S 496-500.



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Research interest

- Ultra-trace and Trace Analysis
- Develop of the Sensors for medical, industries and environmental application.

Educations

- B. Sc. (Chemistry), 1971, Chulalongkorn University, Thailand
- M.S. (Analytical Chemistry), 1973, Saint Joseph's University, Philadelphia, Pennsylvania, U.S.A.
- Ph.D.(Analytical Chemistry), 1982, Villanova University, Villanova, Pennsylvania, U.S.A.

Award

- Faculty of Science, Prince of Songkla University Exemplary Lecturer in Research, 2002.

Selected publications

Chongdee Thammakhet, Panote Thavarungkul, Roman Brukh, Somenath Mitra and **Proespichaya Kanatharana** (2005). Microtrap Modulated Flame Ionization Detector for On-Line Monitoring of Methane. *J. Chromatography A*, 1072, 243-248.

Siriwan Suwansa-ard, **Proespichaya Kanatharana**, Punnee Asawatreratanakul, Chusak Limsakula, d, Booncharoen Wongkittisuksaa, d, Panote Thavarungkul, (2005). Semi disposable reactor biosensors for detecting carbamate pesticides in water. *Biosensors and Bioelectronics*, 21, 445-454.

Jongjit Jantra, Hamid Zilouei, Jing Liu, Benoit Guieysse, Panote Thavarungkul, **Proespichaya Kanatharana** and Bo Mattiasson (2005). Microbial Biosensor for the analysis of 2, 4-dichlorophenol. *Analytical Letters*, 38 (7), 1071-1084.

Chiraporn Chaibundit, Panita Sumanatrakul, Supaporn Chinchew, **Proespichaya Kanatharana**, Carin E. Tattershall, Colin Booth and Xue-Feng Yuan (2005). Associate properties of diblock copolymer of ethylene oxide and 1,2-butylene oxide: E₁₇B₁₂ in aqueous solution. *J. Colloid and Interface Science*, 283, 544-554.

Limbut W, Thavarungkul P, **Kanatharana P**, Asawatreratanakul P, Limsakul C and Wongkittisuksa B. (2004). Comparative study of controlled pore glass, silica gel and Poraver^R for immobilization of urease to determine urea in a flow injection conductimetric biosensors system. *Biosensors and Bioelectronics*, 19, 813 – 821.

Textbook

- **Kanatharana, P.** (1983). Gas Chromatographic Analysis In Soil Chemistry Chromatographic Analysis of Environment, 2nd., Edition, Grob, R.L., Editor Marcel Dekker, Inc., New York.
- **Kanatharana, P.** (1984). Course Notes :Gas Liquid Chromatography. Thai Unique Co., Bangkok, Thailand.
- **Kanatharana, P.** (1983). Theory of Gas Chromatography. Odean Store Printing Ltd., Bangkok, Thailand (in Thai).
- **Kanatharana P**, Matsubara T (eds.) (1998). DIWPA (Diveristas Western Pacific and Asia): 3rd. International Field Biology, Thailand.



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Research interest

- Analytical Chemistry (electroanalytical chemistry , separation techniques etc.)
- Automated analysis (especially flow injection analysis, FIA, SIA)
- Development of novel low-cost instrumentation.
- Environmental /analysis.
- Pharmaceutical analysis.
- Instrumentation with specially designed automated systems.
- Intelligence analytical tools.
- Lab-on-a-chip.
- Natural product chemistry.
- Chemical / biosensors.
- New ceramics.

Education

- B.S. [Chemistry], Chiang Mai University, Chiang Mai, Thailand
- M.Sc.[Analytical Chemistry], The University of Birmingham, U.K.
- Ph.D.[Analytical Chemistry], The University of Birmingham, U.K.
- Post-Doctoral Training at The University of London, U.K.
- Post-Doctoral Training at The University of Tasmania, Australia.

Selected International Publications

C. Thongpoon, S. Liawruangrath, B. Liawruangrath, R. Alan Wheatley, A. Townshend, "Flow Injection Chemiluminescence Determination of Cephalosporins in Pharmaceutical Perparations using Tris (2,2'-bipyridyl) ruthenium (II)- Potassium permanganate system" *Anal. Chim.Acta.* 553, 2005, 123.

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- N. Pisutthanan, **S. Liawruangrath**, B. Liawruangrath, J.B. Bremner, "Composition and Antituberculosis Activity of the Volatile Oil of *Heliotropium indicum* Linn. Growing in Phitsanulok Thailand", *Flavor and Fragrance Journal*, 2006 (accepted).
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Research interests

- Fourier Transform Infrared Spectroscopy
- Surface Plasmon Resonance and Surface Plasmon Fluorescence Spectroscopy
- Computer Programming on Optical Theory for Solving Spectroscopic Problems

Educations

- **Ph.D. (Polymer Science and Engineering, 1996)** Case Western Reserve University, USA
- **M.Eng. (Polymer Technology, 1992)** Chulalongkorn University, THAILAND
- **B.Sc. (Chemistry, 1989)** Chulalongkorn University, THAILAND

Professional Experience and Training

2005 - Present: Associate Professor, Chulalongkorn University
 2000 - 2005: Assistant Professor, Chulalongkorn University
 1998 - 2000: Lecturer, Chulalongkorn University
 2003 - 2004: Alexander von Humboldt Research Fellow at Max-Planck-Institut für Polymerforschung, Mainz, Germany
 1997 - 1998: Researcher, Thailand Institute for Science and Technology Research
 1996 - 1997: Postdoctoral Research Fellow, University of Essen, Germany
 1996: Postdoctoral Research Fellow, Case Western Reserve University, USA

Scholarship and Research Awards:

2006: **Innovation Awards**
 the National Research Council of Thailand
 2005: **Research Award in Chemistry and Pharmacy**
 the National Research Council of Thailand
 2005: **Outstanding Research Awards**
 Chulalongkorn University
 2005: **Innovation Awards**
 the National Research Council of Thailand

2005 - 2008:	TRF Basic Research Grant the Thailand Research Fund
2003 - 2004:	Alexander von Humboldt Research Fellow Alexander von Humboldt Foundation, Germany
2002 - 2005:	TRF Research Career Development Grant the Thailand Research Fund
2000:	Research Award in Chemistry and Pharmacy the National Research Council of Thailand
1999:	1999 Young Scientist Awards Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King
1999:	Science and Technology Research Awards Thailand Toray Science Foundation

Book

S. Ekgasit and H. Ishida, *Depth Profiling by ATR In: Handbook of Vibrational Spectroscopy*, Chalmers, J. M and Griffiths, P. R., Eds., (John Wiley & Sons, 2001), pp. 1508-1520.

Selected publications

S. Ekgasit and A. Padermshoke, *Optical Contact in ATR FT-IR Spectroscopy*, Appl. Spectrosc. **55**, 1352 (2001).

J. Vongsvivut, S. V. Shilov, **S. Ekgasit**, and M. S. Braiman, *Symmetrically-Tapered < 30- μ m-thick Quasi Planar Ge Waveguides as Chemical Sensors for Microanalysis*, Appl. Spectrosc. **56**, 1552 (2002).

S. Ekgasit, C. Thammacharoen, and W. Knoll, *SPR Based on Evanescent Field Treatment*, Anal. Chem. **76**, 561 (2004).

S. Ekgasit, C. Thammacharoen, F. Yu, and W. Knoll, *Evanescent Field in Surface Plasmon and Surface-Plasmon Field-Enhanced Spectroscopies*, Anal. Chem. **76**, 2210 (2004).

S. Ekgasit, G. Stengel, and W. Knoll, *Concentration of Dye-Labeled Nucleotides Incorporated into DNA Determined by SPR-SPFS Biosensor*, Anal. Chem. **76**, 4747 (2004).

J. Vongsvivut, Shilov, **S. Ekgasit**, and M. S. Braiman, *Characterization of <30 μ m-thick Symmetrical Tapered Ge Waveguides with Synchrotron IR Radiation*, Appl. Spectrosc. **58**, 143 (2004).

A. Padermshoke, Y. Katsumoto, H. Sato, **S. Ekgasit**, I. Noda, and Y. Ozaki, *Surface Melting and Crystallization Behavior of Polyhydroxyalkanoates Studied by Attenuated Total Reflection Infrared Spectroscopy*, Polymer **45**(19), 6547 (2004).

A. Padermshoke, H. Sato, Y. Katsumoto, **S. Ekgasit**, I. Noda, and Y. Ozaki, *Crystallization Behavior of Poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) Studied by 2D IR Correlation Spectroscopy*, Polymer **45**(21), 7159 (2004).

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- S. Ekgasit** and P. Thongnopkun, *Transflectance Spectra of faceted Diamonds Acquired by Infrared Microscopy*, *Appl. Spectrosc.* **59**, 1160-1165 (2005).
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Research Interest:

- Developments of Food and Pharmaceutical Analysis by Flow-based Techniques

Education:

- Ph.D. (Chemistry), Chiang Mai University, Thailand, 2001

Research Grants:

- The Postgraduate Education and Research Program in Chemistry (PERCH), 2003-2004
- The Commission on Higher Education (CHE), 2004-2006

Publications:

Tipprat, P., Lapanantnoppakhun, S., Jakmunee, J. and Grudpan, K., Determination of Ethanol in Liquor by Near-infrared Spectrophotometry with flow injection. *Talanta*, 53 (2001) 1199.

Tipprat, P., Lapanantnoppakhun, S., Jakmunee, J. and Grudpan, K., Determination of Diphenhydramine Hydrochloride in Pharmaceutical Preparations by Flow Injection Spectrophotometry, *J. Pharm. Biomed.*, 30 (2002) 105.

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Grudpan, K., Ampan, P., Udnan, Y., Jayasvati, S., Lapanantnoppakhun, S., Jakmunee, J., Christian, G.D., and Ruzicka, J., Stopped-flow Injection Simultaneous Determination of Phosphate and Silicate Using Molybdenum Blue, *Talanta*, 58 (2002) 1319.

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Burakhum, R., Lapanantnoppakhun, S., Jakmunee, J., and Grudpan, K., Exploiting Sequential Injection Analysis with Lab-at-valve (LAV) Approach for On-line Liquid-liquid Micro-extraction Spectrophotometry, *Talanta*, 68 (2005) 416.

Lapanantnoppakhun, S., Kasuwas, S., Ganranoo, L., Jakunee, J., and Grudpan, K., Simple Spectrophotometric Flow Injection System with an In-valve Minicolumn for the Enhancement in the Determination of Chromium(III) using EDTA, *Analytical. Sci.*, Inpress.



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Research Interests

- Application of combined chromatography (gas chromatography: GC, liquid chromatography: HPLC and supercritical fluid chromatography: SFC) / mass spectrometry (MS) to studies of some natural products.

Education

- Ph.D., Cardiff University, UK. 1990

Awards

- KAWAKUCHI AWARD : KU-JICA, Kasetsart University, 1995

Selected Publications

Wongpornchai, S., Dumri, K., Jongkaewwattana, S. and Siri, B. Effects of Drying Methods and Storage Time on the Aroma and Milling Quality of Rice (*Oryza sativa* L.) cv. Khao Dawk Mali 105, *Food Chem.*, 2004, 87(3), 407-414.

Gangopadhyay, G., Bandyopadhyay, T., Modak, B.K., Wongpornchai, S. and Mukherjee, K.K. Micropropagation of Indian pandan (*Pandanus amaryllifolius* Roxb.), a rich source of 2-acetyl-1-pyrroline, *Cur. Sci.*, 2004, 87(11), 1589-1592.

Wongpornchai, S., Sriseadka, T. and Choonvisase, S., Identification and Quantitation of the Rice Aroma Compound, 2-Acetyl-1-pyrroline, in Bread Flowers (*Vallaris glabra* Ktze), *J. Agric. Food Chem.*, 2003, 51, 457-462.

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aromatic hydrocarbons using sequential simplex optimization, the addition of an organic modifier and wavelength programming, *Talanta*, 2003, 61, 879-888.

Mahatheeranont, S., Keawsa-ard, S. and Dumri, K., Quantification of the Rice Aroma Compound, 2-Acetyl-1-pyrroline, in Uncooked Khao Dawk Mali 105 Brown Rice, *J. Agric. Food Chem.*, 2001, 49, 773-779.



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Research Interest

- Molecular Modeling
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- Computational Chemistry

Education

- Dr. rer. nat. (Physical Chemistry), University of Innsbruck

Selected Publications

S. Kongsuk, T. Kerdcharoen and S. Hannongbua*, "Monte Carlo Simulation of Potassium Ion Embedded 18-crown-6 in Water: Effect of the Cation to the Hydration Structure", submitted to *Journal of Molecular Graphics and Modeling*, (2005) in press.

S. Suramitr, T. Kerdcharoen, T. Srihirin and Supa Hannongbua*, "Quantum Chemical Calculations on Electronic Structures and Electronic Properties of Conductive Polymers.: The Alkoxy Derivatives of Poly(para-phenylenevinylene)", *Synthetic Metals* 155 (2005) 27.

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- T. Aree, T. Kerdcharoen* and S. Hannongbua, "Charge Transfer, Polarizability and Stability of Li-C60 complexes", *Chemical Physics Letters*, 285 (1998) 221.
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Research Interests

- Environmental analytical chemistry : spectroscopy and chromatography
- Trace metal analysis using solid chelating phase extraction
- Capillary electrophoresis

Education

1975-1979	Khon Kaen University, Thailand B.Sc.Hons. (Chemistry)
1979-1982	Chulalongkorn University, Thailand M.Sc. (Analytical Chemistry)
1986-1990	University College Cork, Ireland Ph.D. (Analytical Chemistry)

Scholarships

1979-1981	University Development Commission Scholarship, Thailand
1986-1999	Teaching Assistantship, University College Cork, Ireland
1999 (3 months)	Visiting scientist, University College Cork, Ireland

Selected publications

Srijaranai, S., Chanpaka, S., Kukusamude, C. and Grudpan, K. (2005)
Flow-injection in-line complexation for ion-pair reversed phase high performance liquid chromatography of some metal-4-(2-pyridylazo) resorcinol chelates, *Talanta* (in press)

Srijaranai, S., Siriengkawut, W., Srijaranai, S., Ruksakulpiwat, C and Deming, R. L. (2004) Effect of bound copper(II) on the LC separation of selected phenols using an aminophosphonic acid silica stationary phase, *Analytical Letters*. 37, 2577-2594.

Healy, L.O., Owens, V.P., O'Mahony, T., Srijaranai, S., Holmes, J.D., Glennon, J.D., Fischer, G., Albert, K. (2003) Supercritical fluid generated stationary phases for

liquid chromatography and capillary electrochromatography. *Analytical Chemistry* **75**, 5860-5869.

Srijaranai, S., Burakham, R., Khammeng, T. and Deming, R.L. (2002) Use of the simplex method to optimize the mobile phase for the micellar chromatographic separation of inorganic anions, *Analytical and Bioanalytical Chemistry* **374**, 145-147.

Srijaranai, S., Burakham, R., Deming, R.L., Khammeng, T. (2002) Simplex optimization of ion-pair reversed-phase high performance liquid chromatographic analysis of some heavy metals, *Talanta* , **56**, 655-661.

Glennon, J.D., O'Connor, K., Srijaranai, S., Manley, K., Harris, S.J., McKerverey, M.A. (1993) Enhanced chromatographic selectivity for sodium (1+) ions on a calixarene-bonded silica phase, *Analytical Letters* **26** (1), 153-62.



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Research interests

- Analytical chemistry
- Flow injection analysis
- Immunoassay

Education background

1993	B.S. Hons (Chemistry) Chiang Mai University, Chiang Mai, Thailand
1996	M.S. (Analytical Chemistry) University of Massachusetts at Amherst, Massachusetts, USA
2000	Ph.D. (Analytical Chemistry) University of Cincinnati, Ohio, USA

Awards and grants

1989-2000	scholarship from Institution for Promotion of teaching Science and Technology (IPST), Bangkok, Thailand to study in colleges both in Thailand and in the USA
1998-2000	teaching assistantship at the Chemistry Dept., University of Cincinnati
August 2001	two years research grant from PERCH 265,000 Baht "Development of FI-BI system"
September 2001	join three years research grant from TRF (Dr. Kate Grudpan) 158,933 Baht / year (co-with Dr. Prachya Kongtawelert, Biochemistry Dept., Medical school CMU) "Flow based technique in clinical application"
July 2002	two years research grant from TRF and CHE 480,000 Baht "Development of FIA/SIA for bead based immunoassay"
October 2003	one year research grant for small project from Chemistry Dept. Chiang Mai Univ. 40,000 Baht "Study and evaluation of the method to covalently link antibodies or antigens onto the capillary surface via a spacer arm"

January 2005	Outstanding research output award from TRF and CHE research grant (golden medal)
February 2005	The best poster presentation for small research project undergraduate level "Development of flow injection technique for study of rupture rate of red blood cell", undergraduate presentation day, Feb 11, 2005, Faculty of Science, Chiang Mai University
February 2005	one year research grant for small project from Chemistry Dept. Chiang Mai Univ. 40,000 Baht "Development of flow injection technique for study of rupture rate of red blood cell"

Selected publications

Development of Small Volume Bead Assay for Ovalbumin, Shoba Purushothama, Supaporn Kradtap, Brian Halsall, and William Heineman, *Analyst*, 2001, **126**, 337-341.

"Bugbead" an Artificial Microorganisms Model Used as a Harmless Simulant for Pathogenic Microorganisms, Supaporn kradtap, Ajith Wijayawardhana, Kevin Schlueter, William Heineman and Brian Halsall , *Analytica Chimica Acta*, 2001, **444**, 13-21.

A Simple Flow Injection System with Bead Injection for Trace Iron Determination, K. Jitmanee, S. Kradtap Hartwell, J. Jakmunee, S. Jayasvasti, J. Ruzicka, K. Grudpan, *Talanta*, 2002, **57**, 187-192.

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Review on Screening and Analysis Techniques for Hemoglobinopathies and Thalassemia, Supaporn Kradtap Hartwell, Boonraksa Srisawang, Prachya Kongtawelert, Torpong Sanguansermisri, Gary D. Christian, Kate Grudpan, *Talanta*, accepted.

Bead Injection with Simple Flow Injection System, an Economical Alternative for Trace Analysis, S. Kradtap Hartwell, G.D. Christian, K. Grudpan, *Trends in Analytical Chemistry*, 2004, **23** (9), 619-623.

Sequential Injection-ELISA Based System for On-line Determination of Hyaluronan, Supaporn Kradtap Hartwell, Boonraksa Srisawang, Prachya Kongtawelert, Jaroon Jakmunee, Kate Grudpan, *Talanta*, , 2005, **66**, 521-527.

Mono-segmented Flow Micro-titration with Sequential Injection Using Lab-on-

Valve: A Model Study on Assay of Acidity in Fruit Juices, Jaroon Jakmunee, Lop Patimapornlert, Supaporn Kradtap Hartwell, Kate Grudpan, *Analyst*, 2005, **130**, 99-303.

A Simple Bead Injection-Flow Injection System for Determination of Copper, Supaporn Kradtap Hartwell, Apichart Boonmalai, Subhachai Jayasvati, Somchai Lapanantnoppakhun, Jaroon Jakmunee, Kate Grudpan, *Anal. Sci.*, May 2005, **21**, 437-439.

Exploiting Guava Leaf Extract as an Alternative Natural Reagent for Flow Injection Determination of Iron, *Talanta*, 2005, **68**, 262-267.



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Education

- 1981 B.Sc.(Chemistry), Khon-Kaen University, Khon-kaen, Thailand
- 1983 M.Sc.(Physical Chemistry), Mahidol University, Bangkok, Thailand
- 1985 Ph.D.(Computational Chemistry), Innsbruck University, Austria

Award/Honor

- 1989-1990 Junior Outstanding Research Award
(Faculty of Science, Chulalongkorn University).
- 1990 Outstanding Research Project
(Chulalongkorn University)
- 1991 Outstanding Research Project
(National Research Council of Thailand)
- 1992 Young Scientist Award
(Foundation for the Promotion of Science and
Technology under the Patronage of his Majesty the King).
- 1998 Outstanding Research Project
(Chulalongkorn University)
- 1999 1998 TWAS Prize for Young Scientists in Thailand
(Third World Academy of Science)
- 2001 The National Award for the Distinguished Researcher in the Field of
Physical Science and Mathematics
(National Research Council of Thailand)
- 2003 2003 Outstanding Scientist
(Foundation for the Promotion of Science and
Technology under the Patronage of his Majesty the King).
- 2003 The TRF Senior Scholarship
(The Thailand Research Fund)
- 2003 Most Cited TRF-Research Publication Award in the Field of

Selected publication

Loisruangsin, A., Fritzsche, S. and Hannongbua, S. "Newly developed ab initio Fitted Potentials for Molecular Dynamics Simulations of *n*-Pentane in the Zeolite Silicalite-1", *Chem. Phys. Lett.* **390**, 485 (2004).

Muangsin, N., Prajuabsook, M., Chimsook, P., Chantarasiri, N., Siraleartmukul, K., Chaichit, N., and Hannongbua, S. "Structure determination of diclofenac in a diclofenac-containing chitosan matrix using conventional X-ray powder diffraction data", *J. Appl. Cryst.* **37**, 288 (2004).

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- Kongsuk S., Kerdcharoen, T. and **Hannongbua, S.** "The hydration Structure of 18-crown-6/K⁺ Complex as Studied by Monte Carlo Simulation Using *Ab-initio* Fitted Potential", *J. Mol. Graph. Mod. Accepted* (2005)
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- Aruksakunwong, O., Wittayanarakul, K., Sompornpisut, P., Lee, V. S., Parasuk, V. and **Hannongbua, S.** "Structure and Dynamic Properties of Different Protonated states of Mutant HIV-1 Protease Complexed with the Saquinavir Inhibitor Studied by Molecular Dynamic Simulations" *JMGM . submitted* (2005)
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- Muangsin N., Prajaubsook M., Siritaedmukul K., Chaichit N. and **Hannongbua S.**, "Accurate Molecular Structure Determination using Conventional X-ray Powder Diffraction data of Small Organic Molecule in Polymer Mixture", *J. Struct. Chem., submitted*.
- Laohpongspaisan, J., Wijitkosoom, A., Pinitglang, S. Parasuk, V. and **Hannongbua, S.** "Quantum Chemical Calculations on the Structure and Binding of Water Molecules in the HIV-1 Protease (PR) Enzyme", *J. Chem. Inf. Com. Sci, submitted*.
- Wijitkosoom, A., Tonmunpuean, S., Hannongbua, S. And Truong, T. N. "Full-length HIV-1 Integrase: Structure and Molecular Dynamics Simulations", *submitted*.
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- Aruksakunwong, O., Sompornpisut, P., Wolschann, P. And Hannongbua, S. :Computational Studies of the Primary Resistance of Mutant HIV-1 Protease

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Panich, N., Hannongbua, S. And Sun, Y. “Structure, Hardness and Adhesion Studies of Multilayer Ti/TiB₂ Coatings on Hight Speed Steel” submitted(2005)



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Research & Career Path

- | | |
|---|-------|
| • DFG Postdoctoral Fellow, Technical University of Munich | 1999- |
| 2000 | |
| • Cherry L. Emerson Fellow, Emory University, USA | 2001 |
| • Thailand Outstanding Young Scientist Award | 2001 |
| • DFG Visiting Fellow | 2001 |
| • Thailand Toray Science & Technology Research Fellow | 2005 |

Education

University or equivalent Name and place	Years attended from to	Degrees
Chulalongkorn University, THAILAND	1986 1989	B.Sc. (Chemistry)
Chulalongkorn University, THAILAND	1990 1991	M.Sc. (Physical Chemistry)
University of Innsbruck, AUSTRIA	1992 1995	Dr.rer.nat (Physical Chemistry)

Selected publications

M. Kiselev, S. Noskov, Y. Puhovski, T. Kerdcharoen and S. Hannongbua, "The Study of Hydrophobic Hydration in Supercritical Water-Ammonia Mixture", *Journal of Molecular Graphics and Modeling* 19 (2001) 412.

S. Krishtal, M. Kiselev, Y. Puhovski, T. Kerdcharoen, S. Hannongbua and K. Heinzinger, "The Study of Hydrogen Bonds Network in Sub- and Supercritical Water by Molecular Dynamics Simulation", *Zeitschrift fuer Naturforschung* 56a (2001) 579.

T. Kerdcharoen and K. Morokuma, "ONIOM-XS: An Extension of ONIOM Method for Molecular Simulation in Condensed Phase", *Chemical Physics Letters* 355 (2002) 257.

T. Kerdcharoen, U. Birkenheuer, S. Krueger, A. Woitersky and N. Roesch, "Implementation of a QM/MM Approach in the Parallel Density Functional Program ParaGauss and Applications to Copper Thiolate Clusters", *Theoretical Chemistry Accounts* 109 (2003) 285.

S. Kongsuk, T. Kerdcharoen and S. Hannongbua, "How Many Water Molecules in the Hydration Shell of 18-crown-6? Monte Carlo Simulations Based on Ab Initio Derived Potential Energy Surface", *Journal of Physical Chemistry B* 107 (2003) 4175.

T. Kerdcharoen and K. Morokuma, "Combined QM/MM Simulation of Ca^{2+} /Ammonia Solution based on ONIOM-XS Method: Octahedral Coordination and Implication to Biology", *Journal of Chemical Physics* 118 (2003) 8856.

M. Kiselev, D. Ivlev, Y. Puhovski and T. Kerdcharoen, "Preferential Solvation and Elasticity of the Hydrogen Bonds Network in Tertiary Butyl Alcohol-Water Mixture", *Chemical Physics Letters* 379 (2003) 581.

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P. Wutticharoenmongkol, P. Supaphol, T. Sriksirin, T. Kerdcharoen and T. Osotchan, "Electrospinning of Polystyrene/Poly(2-Methoxy-5-(2'-Ethylhexyloxy)-1,4-Phenylene Vinylene) Blends", *Journal of Polymer Science B* 43 (2005) 1881.

Y. Kanintrunkul, T. Sriksirin, C. Angsuthanasombat and T. Kerdcharoen, "Insertion behavior of the Bacillus thuringiensis Cry4Ba insecticidal protein into lipid monolayers", *Archive of Biochemistry and Biophysics* 442 (2005) 180.

S. Suramitr, T. Kerdcharoen, T. Sriksirin and S. Hannongbua, "Electronic Properties of Alkoxy Derivatives of Poly(para-phenylenevinylene), Investigated by Time Dependent Density Functional Theory Calculations", *Synthetic Metals* 155 (2005) 27.

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S. Krongsuk, T. Kerdcharoen and S. Hannongbua*, " The Hydration Structure of 18-crown-6/K⁺ Complex as Studied by Monte Carlo Simulation Using Ab Initio Potential", submitted to *Journal of Molecular Graphics and Modeling*, in press.

In Progress:

T. Udommaneethanakit, T. Kerdcharoen, S. Hannongbua, V. Parasuk, T. Osotchan and T. Srihirin, "Photoisomerization of 4-(4'-Hydroxyphenylazo) Nitrobenzene: Kinetics and Theoretical Studies", submitted.

C. Suwattanasophon, M. Kiselev, T. Taveecharoenkool, C. Angsuthanasombat, T. Kerdcharoen, "Molecular Dynamics Simulations of the Bacillus thuringiensis Cry4Ba Mosquito-Larvicidal Protein: Implications for Pore Formation", submitted.

A. Tongraar*, T. Kerdcharoen and S. Hannongbua, "Simulations of liquid ammonia based on combined quantum mechanical/molecular mechanical (QM/MM) approach", submitted.

S. Krongsuk, T. Kerdcharoen*, A. Borodin and M. Kiselev, "Concentration effects of porphyrine monolayer at the air-water interface as studied by molecular dynamics simulations", submitted.

R. Traiphol*, T. Srihirin, T. Kerdcharoen, T. Osotchan, N. Scharnagl, R. Willumeit, "Local pi-pi Interaction Control Dynamics of Phenyl Ring Rotation in Conjugated Polymer in Solution", submitted.



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Qualifications

- February 1989 B.Eng. Mining Engineering, Chiang Mai University, Thailand
- August 1995 Ph.D. Chemistry, Texas A&M University, U.S.A.
- May-August 1996 Postdoctoral Fellow with Prof. Jean-Marie Lehn, Université Louis Pasteur, Strasbourg, France.

Honors and Distinctions

- 2002, Science and Technology Awards, Thailand Toray Science Foundation
- 1998, Young Scientist Award, Foundation for the Promotion of Science and Technology under the Patronage of His Majesty the King
- 1998, Professor Fund Award, Faculty of Science, Chulalongkorn university

Selected publications

Tuntulani, T.; Tumcharern, G.; Ruangpornvisuti, V. "Recognition Studies of a Pyridine-Pendant Calix[4]arene with Neutral Molecules: Effects of Non-Covalent Interactions on Supramolecular Structures and Stabilities" *J. Inclu. Phenom.* **2001**, 39, 47-53.

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Suksai, C.; Tuntulani, T. "Chromogenic Anion Sensors" *Top. Curr. Chem.* **2005**, *255*, 163-198.

Harding, D. J.; Adams, H.; Tuntulani, T. "B-N Bond Cleavage by Cobalt(II) in Acetato(3,5-diphenylpyrazole)[tris(3,5-diphenylpyrazolyl)borato]Cobalt(II)" *Acta Cryst.* **2005**, *C61*, m301-m303.

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Morakot, N.; Tomapatanaget, B.; Aeungmaitripirom, W.; Ngeon-tae, V. "Synthesis and Fluorescence Sensing Properties of Calix[4]arenes Containing Fluorophores" *Supramol. Chem.* **2005** in press.



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Research interests

- Fundamental studies in capillary electrophoresis, especially in chiral separation and microemulsion electrokinetic chromatography
- Methodology and applications of capillary electrophoresis for analyses of food, pharmaceuticals, natural products, herbal medicines, and agricultural chemicals
- Microchip electrophoresis

Education

- B.Sc. (Chemistry), Chulalongkorn University, Thailand, 1992
- M.Sc. (Petrochemistry), Chulalongkorn University, Thailand, 1995
- Ph.D. (Analytical Chemistry), University of York, UK, 2001

Representative Publications

T. Nhujak, W. Saisuwan, M. Srisa-art, A. Petsom "Microemulsion electrokinetic chromatography for separation and analysis of curcuminoids in turmeric samples" *Journal of Separation Science*, 2006, Accepted.

T. Nhujak, C. Sastravaha, C. Palanuvej, and A. Petsom "Chiral separation in capillary electrophoresis using dual cyclodextrins: Theoretical models of electrophoretic mobility difference and separation selectivity" *Electrophoresis*, 26 (2005), 3814-3823.

T. Nhujak, M. Srisa-art, K. Kalampakorn, V. Tolieng, and A. Petsom "Determination of gibberellic acid in fermentation broth and commercial products by micellar electrokinetic chromatography" *Journal of Agricultural and Food Chemistry*, 53 (2005), 1884-1889.

T. Nhujak and D.M. Goodall "Comparison of binding of tetraphenylphosphate and tetraphenylborate ions to cyclodextrins studies by capillary electrophoresis" *Electrophoresis*. 22 (2001), 117-212.

T. Nhujak and D.M. Goodall "Trace analysis of β -cyclodextrin in a sample of β -cyclodextrin by capillary electrophoresis" *Journal of Chromatography A*. 970 (2001), 313-320.



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Major Research Interests

- Biosynthesis and production of secondary products in plants and in cell cultures
- Detection, purification and characterization of biosynthetic enzymes of active constituents in plants
- Quantitative analysis of active constituents in herbs and species by HPLC, GC and GC-MS
- Standardization and Specification of herbs and spices

Educations

- B.Sc. (Biochemistry) 1974-1978, Chulalongkorn University, Bangkok, Thailand
- M.Sc. (Biochemistry) 1978-1980, Mahidol University, Bangkok, Thailand
- Ph.D. (Plant Biochemistry) 1982-1987, University of Guelph, Guelph, Canada
- Post doc. with Prof. M.H. Zenk 1989-1990, University of Munich, Munich, Germany (Alexander von Humboldt Research fellow)

Honors and Awards

- Distinguished Ph.D. thesis entitled "Rosmarinic Acid Production and Biosynthesis in *Anchusa officinalis* Cell Cultures (Advisor : Brian E. Ellis), University of Guelph, 1987
- Ontario Graduate Scholarship 1982-1987
- Alexander von Humboldt Post-doc. Fellowship, 1989-1990
- JSPS-UNESCO Visiting Scientist (University of Tokyo), 1994
- The Thailand Research Fund Research Scholar, 1995-1997 and 1999-present

Selected publications

- **PATENTS**

De-Eknamkul W. and P. Tansakul. Geranylgeraniol-18-hydroxylase from *Croton sublyratus* US patent no. 5, 879, 916, March 9, 1999

De-Eknamkul W. and P. Tansakul. Production of an Anti-Peptic Ulcer Plaunotol by an Enzymatic Reaction. Thai Patent no. 9858, September 15, 2000

- **ORIGINAL RESEARCH REPORTS**

De-Eknamkul, W. and C. Thongruang. Possibility of *Pueraria mirifica* to affect breast enlargement. J. Pharm. Sci., 25, 1-9 (2001).

Samappito, S., J.E. Page, Jurgen S., W. De-Eknamkul and T.M. Kutchan. Molecular characterization of root-specific chalcone synthases from *Cassia alata*. Planta, 216, 64-71(2002).

Samappito, S., J.E. Page, Jurgen S., W. De-Eknamkul and T.M. Kutchan. Aromatic and pyrone polyketides synthesized by a stilbene synthase from *Rheum tataricum*. Phytochemistry, 62, 313-323 (2003).

De-Eknamkul, W. and B. Potduang. Biosynthesis of β -sitosterol and stigmasterol in *Croton sublyratus* proceeds via a mixed origin of isoprene units. Phytochemistry, 62, 389-398 (2003).

Wungsintaweekul, J. and De-Eknamkul, W. Biosynthesis of plaunotol in *Croton stellatopilosus* proceeds via the deoxyxylulose phosphate pathway. Tetrahedron Letters, 46, 2125-2128 (2005).

Monthakantirat, O., De-Eknamkul, W., Umehara, K., Yoshinaga, Y. Miyase, T., Warashina, T. and Noguchi, H. Phenolic Constituents of the Rhizomes of the Thai Medicinal Plant *Belamcanda chinensis* with Proliferative Activity for Two Breast Cancer Cell Lines. J. Nat. Prod. 68, 361-364 (2005).

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Key qualifications

Dr. Waret Veerasai (WV) is a senior lecturer in physical, inorganic and analytical chemistry at Mahidol University, with 30 years experience. Particularly relevant is his service during 1975 - 2005 as the task leader in both physical and analytical aspects of electrochemistry. His major interests are related to the fundamental understanding on the charge transfer processes in redox flow systems and phenomena at modified electrode/electrolyte interfaces, which can be applied for novel sensors, electrochemical energy storage and fuel cell systems.

In 1989-1990, **WV** was a postdoctoral research fellow in the laboratories of Prof. A. Aramata and Prof. M. Ichikawa at Research center for Catalysis, Hokkaido University. **WV** contributed both on preparation and characterizations of the electrodes in collaborations with Prof. Enyo (EC/MS) and Prof. Toyoshima (STM&XPS).

WV involved as a scientific consultant for the redox flow system on "Baan Thai High Tech. project", the complete demonstration solar house with fish farm and water treatment system. The novel Vanadium Redox flow cell, as "Chemo-electricity storage" and several electrochemical sensors were established in this project.

In recent year, **WV** and his students (4 Ph.D. and 6-8 M.Sc.) at Mahidol University have focused on two research areas: (i) Size-based analysis of water borne particles and (ii) Interfacial electrochemistry, especially on electrochemistry at nano-level on electro-catalysts for sensors, electrochemical energy storage and alternative energy sources.

Educations

- **Post-Doctoral Research fellow**, "Electrocatalysts design and electrode surface Characterization", at Research Center for Catalysis, Hokkaido University, Japan, 1988-1989
- **Dr.rer.nat.** (Physical Inorganic Chemistry), University of Innsbruck, Austria, 1981
- **M.Sc.** (Physical Chemistry), Mahidol University, Thailand, 1975
- **B.Sc.Hons.** (Chemistry), Chiangmai University, Thailand, 1973

Professional Affiliations

Dr. Waret Veerasai had served as an executive committee of the Chemical Society of Thailand, and Chemical Division of the Science Society of Thailand for more than ten years.

He is a scientific reviewer for several projects, related to electrochemistry those were submitted for TRF or MTEC research funds, and also as a scientific reviewer of Science Asia Journal and of some university journals, in the field related to physical chemistry and electrochemistry

He is a permanent member of the Science Society of Thailand, the Society of Toxicology, a member of Thai Fuel Cell Research Group, an also as a member of PES user group at National Synchrotron Research Center.

Some selected publications

“Electrocatalytic effects of Tin and Ruthenium on modified platinum electrodes for Electro_oxidation of methanol” **W. Veerasai**, P. Amornpitaosuk and T. Ratana (preparing for publications)

“Sol-Emulsion-Gel preparation and characterization for ZrO_2 and V/ZrO_2 ”, **W. Veerasai** and T. Ratana (preparing for publications)

“Electrochemical conversion of Oxovanadium in acidic media” **W. Veerasai** and T. Kanyanee (preparing for publications)

“Production and Certification of In-house Rice Flour Reference Material”; Wipharat Chuachud, Juwadee Shiowatana, Niorn Chukanchanapituk, **Waret Veerasai**, Scott Willie and James Walker McLaren. Science Asia 28(2002) 351-358.

"Simple flow injection system for colorimetric determination of iodate in iodized salt", N. Choengchan, K. Uraisin, K. Choden, **W. Veerasai**, K. Grudpan and D. Nacapricha, *Talanta*, 58, 1195-1201(2002).

“Sensitivity Enhancement of Differential Pulse Polarographic technique by Simplex Optimization method” Buabarn Poonperm, **Waret Veerasai** and Prapin Wilairat, Chiang Mai J. Sci. 2000; 27(2):71-81.



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Selected publications

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กำลังมหาวิทยาลัยเชียงใหม่

ที่ 3605 /2548

เรื่อง แต่งตั้งคณะกรรมการจัดประชุม Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists

ตามที่ มหาวิทยาลัยเชียงใหม่ โดยคณะวิทยาศาสตร์ ได้กำหนดจัดประชุมเชิงปฏิบัติการ Interfaces of Analytical Sciences: Workshop of U.S. and Thai Analytical Scientists ระหว่างวันที่ 4-8 มกราคม 2549 โดยมีวัตถุประสงค์เพื่อให้เกิดการร่วมมือทางวิชาการของนักวิทยาศาสตร์ไทยทั่วประเทศทางวิทยาศาสตร์การวิเคราะห์และแขนงวิชาที่เกี่ยวข้องกับกลุ่มนักวิทยาศาสตร์ชั้นนำของสหรัฐอเมริกา โดยได้รับการสนับสนุนจากสำนักงานคณะกรรมการการอุดมศึกษา(สกอ.) สำนักงานกองทุนสนับสนุนการวิจัย(สกว.) และโครงการพัฒนาบัณฑิตศึกษาและการวิจัยทางเคมี(PERCH) National Science Foundation (NSF) สหรัฐอเมริกานั้น

เพื่อให้การดำเนินการจัดประชุมดังกล่าว เป็นไปอย่างเรียบร้อย อาศัยความในมาตรา 18 และ 21(1) แห่งพระราชบัญญัติ มหาวิทยาลัยเชียงใหม่ พ.ศ. 2530 จึงเห็นสมควรแต่งตั้งคณะกรรมการฝ่ายต่างๆเพื่อรับผิดชอบการจัดประชุมฯ ดังนี้

คณะกรรมการอำนวยการ

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| 1. เลขาธิการสำนักงานคณะกรรมการการอุดมศึกษา
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| 7. นายสมบัติ คงวิทยา | กรรมการ |
| 8. นายสราวุธ สมนาม | กรรมการ |

หน้าที่ จัดเตรียมสถานที่ สิ่งอำนวยความสะดวกในการประชุม จัดยานพาหนะสำหรับวิทยากรและผู้เข้าร่วมประชุมและอื่น ๆ ที่เกี่ยวข้อง

5. ฝ่ายต้อนรับเพื่อเยี่ยมชมห้องวิจัยภาควิชาเคมี

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| 1. ผู้ช่วยศาสตราจารย์ ดร.มงคล ราชะนาคร | ประธานกรรมการ |
| 2. รองศาสตราจารย์ ดร.เกรียงศักดิ์ ไชยโรจน์ | กรรมการ |
| 3. ผู้ช่วยศาสตราจารย์ ดร.สุกัญญา วงศ์พรชัย | กรรมการ |
| 4. ผู้ช่วยศาสตราจารย์ ดร.หทัยชนก เนียมทรัพย์ | กรรมการ |
| 5. ผู้ช่วยศาสตราจารย์ ดร.อภิรักษ์ รุจิวัตร์ | กรรมการ |
| 6. ผู้ช่วยศาสตราจารย์ ดร.สุภาภรณ์ ทรัพย์ | กรรมการ |
| 7. อาจารย์ ดร.สุนันทา ว่างนาค | กรรมการ |
| 8. อาจารย์ ดร.ฐปณีย์ สาครศรี | กรรมการ |
| 9. อาจารย์ ดร.วินิตา บุญโยคม | กรรมการ |

หน้าที่ ให้การต้อนรับ ให้ข้อมูล สิ่งอำนวยความสะดวกในการเยี่ยมชมห้องวิจัยอื่น ๆ และอื่นๆที่เกี่ยวข้อง

6. ฝ่ายประสานงานทั่วไป

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|------------------------------------|---------------|
| 1. รองศาสตราจารย์ ดร.นิกร มังกรทอง | ประธานกรรมการ |
| 2. ดร.สมชัย ลาภอนันต์พคุณ | กรรมการ |

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| 3. นางสาวทิพวรรณ ตระการศิรินนท์ | กรรมการ |
| 4. อาจารย์ ดร.จรูญ จักรมณี | กรรมการ |
| 5. นางสาวจิราวรรณ อุปนันท์ | กรรมการ |
| 6. นางสาวรัชฎา วงศ์สุวรรณ | กรรมการ |
| 7. นางสาวปรศนีย์ สนิพิมลบูรณ์ | กรรมการ |

หน้าที่ คัดต่อประสานงานในการจัดประชุมโดยทั่วไป ประสานงาน/อำนวยความสะดวกแก่วิทยากรและผู้ร่วมประชุม และ อื่น ๆ ที่เกี่ยวข้อง

ทั้งนี้ ตั้งแต่บัดนี้เป็นต้นไป

ลง ณ วันที่ ๑ ธันวาคม พ.ศ. 2548



(รองศาสตราจารย์ ดร.จิตต์ อุมมานราชชน)
รองอธิการบดีฝ่ายพิเศษสัมพันธ์
รักษาราชการแทนอธิการบดีมหาวิทยาลัยเชียงใหม่