



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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	Hannongbua Supa	1. Mr.Andrew L. Olson Ms. Pornthip Boonsri			Olson, A. L., Yao, H., Saparpakorn, P., Hannongbua, S., Herdendorf, T.J., Mizioro, 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

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INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT
DIRECTORS(PI/PD) and co-PRINCAPAL INVESTIGATORS/co-
PROJECT DIRECTORS

**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)

☐ Hearing Impairment
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☐ Other
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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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List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Mark Arnold
Alan J. Bard
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REVIEWERS NOT TO INCLUDE:

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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 \$ 29,260	PROPOSED DURATION (1-80 MONTHS) 12 months	REQUESTED STARTING DATE 10/01/05	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
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 Chemistry		PI/PD POSTAL ADDRESS Box 351700				
PI/PD FAX NUMBER 206-685-3478		Seattle, WA 98195 United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address		
PI/PD NAME Gary D Christian	PhD	1964	206-543-1635	christian@chem.washington.edu		
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, 1153-1163 (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, 169-174 (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-Sauntry (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 Isotachopheresis*, 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 PI's 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. Whetstone (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, Ndalut, 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
AUG 11 1998			Initials - ORG

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,

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

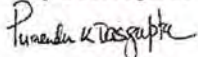
Box 41061
Lubbock, Texas 79409-1061
(806) 742-3067
Fax (806) 742-1289

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

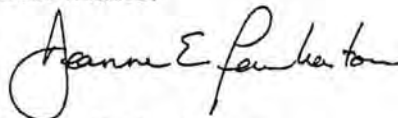
Dear Gary:

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. Sirirug 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

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