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**GORDON RESEARCH CONFERENCES** *frontiers of science*

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**Nancy Ryan Gray, Ph.D.**

Director

**2008 GORDON RESEARCH CONFERENCE  
on ELECTRODEPOSITION**

**FINAL PROGRESS REPORT**

DEPARTMENT OF ENERGY  
GRANT NO. DE-FG02-08ER46500

The Gordon Research Conference on ELECTRODEPOSITION was held at Colby-Sawyer College, New London, New Hampshire, July 27- August 1, 2008. The Conference was well-attended with 122 participants (attendees list attached). The attendees represented the spectrum of endeavor in this field coming from academia, industry, and government laboratories, both U.S. and foreign scientists, senior researchers, young investigators, and students. Of the 122 attendees, 46 voluntarily responded to a general inquiry regarding ethnicity which appears on our registration forms. Of the 46 respondents, 21% were Minorities – 4% Hispanic, 15% Asian & 2% African American. Approximately 28% of the participants at the 2008 meeting were women.

In designing the formal speakers program, emphasis was placed on current unpublished research and discussion of the future target areas in this field. There was a conscious effort to stimulate lively discussion about the key issues in the field today. Time for formal presentations was limited in the interest of group discussions. In order that more scientists could communicate their most recent results, poster presentation time was scheduled. Attached is a copy of the formal schedule and speaker program and the poster program. In addition to these formal interactions, "free time" was scheduled to allow informal discussions. Such discussions are fostering new collaborations and joint efforts in the field.

Thank you for your support of this Conference. As you know, in the interest of promoting the presentation of unpublished and frontier-breaking research, Gordon Research Conferences does not permit publication of meeting proceedings. If you wish any further details, please feel free to contact me. Thank you.

Sincerely,  
*Thoman Moffat, PI & Conference Chairperson*  
NIST

# ELECTRODEPOSITION

July 27- August 1, 2008

Colby-Sawyer College

New London, NH

Chair:

**Thomas Moffat**

Vice Chair:

**Peter Searson**

Electrodeposition melds key aspects of electrochemistry and materials science. In the last decade the advent of a variety of remarkable in situ characterization methods combined with the ever expanding application of wet chemical processing in high end technological endeavors has transformed the nature of the field. The "old black magic" is giving way to the rigors of science as the electrodeposition process plays a central role in the fabrication of state-of-the-art ULSI and MEMS devices as well as being a key tool in the fabrication of novel materials and nanostructures.

This year the conference will consider several timely issues such as how electrodeposition can contribute to the effective production of energy conversion devices, ranging from solar collectors to fuel cell electrocatalysts. Likewise, the challenge of building contacts and interconnects for next generation electronics will be examined over length scales ranging from individual atoms or molecules to chip stacking. Electrochemical fabrication of magnetic materials and devices as well as composite materials will also be discussed. Nucleation and growth phenomena underlie all aspect of electrochemical deposition and this year's meeting will consider the effect of both adsorbates and stress state on morphological evolution during thin film growth. A variety of new measurement methods for studying the growing electrode/electrolyte interface will also be detailed. In addition to the scheduled talks a session of short talks on late breaking news will be held Wednesday evening. There will also be at least two lively poster sessions that are essential elements of the conference and to which all attendees are encouraged to contribute.

This will be 7th Electrodeposition GRC and based on past experience it is the premier "mixing bowl" where young investigators and international experts have an extended opportunity to interact in a fun and collegial atmosphere. The afternoons provide free time for discussions coupled with mountain hikes, lake trips, and/or lively soccer, volleyball or tennis matches! We anticipate having some funds available to help graduate students and postdoctoral associates attend the meeting. The attendance of this popular conference is limited so early registration is strongly advised.

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## Contributors

Army Research Office

Department Of Energy

IBM

Intel Corporation

International Society for Electrochemistry  
National Institutes Of Standards & Technology  
National Science Foundation  
Rohm and Haas Company  
The Electrochemical Society

## SUNDAY

- 2:00 pm - 11:00 pm Arrival and Check-in
- 6:00 pm Dinner
- 7:30 pm - 7:40 pm Welcome / Introductory Comments by GRC Site Staff
- 7:40 pm - 9:30 pm **Molecular Electronics**  
Discussion Leader: **Andy Gewirth** (University of Illinois, USA)
- 7:40 pm - 8:25 pm Keynote Lecture: **Dieter Kolb** (University of Ulm, Germany)  
"Making Contacts for Molecular Electronics"
- 8:25 pm - 8:35 pm Discussion
- 8:35 pm - 9:20 pm **Richard L. McCreery** (University of Alberta, Canada)  
"Building Functional Electronic Devices from Molecular Components"
- 9:20 pm - 9:30 pm Discussion

## MONDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **Nucleation and Growth I**  
Discussion Leader: **Olaf M. Magnussen** (University of Kiel, Germany)
- 9:00 am - 9:35 am **Stanko Brankovic** (University of Houston, USA)  
"Nucleation, Growth and Morphological Stability of Nobel Metal Nanostructures Produced by Surface Controlled Red-Ox Reactions"
- 9:35 am - 9:45 am Discussion
- 9:45 am - 10:20 am **Philip G. Collins** (University of California at Irvine, USA)  
"Electrochemistry at a single point: oxidation, reduction, deposition and catalysis on carbon nanotube point defects"
- 10:20 am - 10:30 am Discussion
- 10:30 am Coffee Break / Group Photo
- 11:00 am - 11:35 am **Jay Switzer** (Missouri University of Science and Technology, USA)  
"Epitaxial electrodeposition of ceramics-from electronic materials to chiral biomaterials"
- 11:35 am - 11:45 am Discussion
- 11:45 am - 12:20 pm **Marcel Rost** (Leiden University, Netherlands)  
"In situ real-time observation of polycrystalline thin film growth"
- 12:20 pm - 12:30 pm Discussion

12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session I
6:00 pm	Dinner
7:30 pm - 9:30 pm	<b>Nucleation and Growth II</b>
	Discussion Leader: <b>John Stickney</b> (University of Georgia, USA)
7:30 pm - 8:20 pm	<b>Philippe Allongue</b> (CNRS-Ecole Polytechnique, Palaiseau, France) "In situ studies of electrodeposited magnetic materials"
8:20 pm - 8:30 pm	Discussion
8:30 pm - 9:20 pm	<b>Rolf Schuster</b> (Universitat Karlsruhe, Germany) "Electrochemical Calorimetry"
9:20 pm - 9:30 pm	Discussion

## TUESDAY

7:30 am - 8:30 am	Breakfast
9:00 am - 12:30 pm	<b>Stress Effects</b>
	Discussion Leader: <b>Robert Cammarata</b> (Johns Hopkins University, USA)
9:00 am - 9:35 am	<b>Joerg Weissmueller</b> (Forschungszentrum Karlsruhe & Universitat des Saarlandes, Germany) "Nanoporous Electrodes as Functional Nanomaterials"
9:35 am - 9:45 am	Discussion
9:45 am - 10:20 am	<b>Cody Friesen</b> (Arizona State University, USA) "Fundamental aspects of surface stress evolution during electrodeposition"
10:20 am - 11:30 am	Discussion
10:30 am	Coffee Break
11:00 am - 11:35 am	<b>Eric Chason</b> (Brown University, USA) "Stress evolution in electrodeposited films"
11:35 am - 11:45 am	Discussion
11:45 am - 12:20 pm	<b>Sean Hearne</b> (Sandia National Laboratory, USA) "Electroplating additive affects on intrinsic stress generation mechanisms"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session II
6:00 pm	Dinner
7:30 pm - 9:30 pm	<b>Surfactant Effects on Electrodeposition</b>
	Discussion Leader: <b>Kyoung-Shin Choi</b> (Purdue University)
7:30 pm - 8:20 pm	<b>Constanze Donner</b> (Atotech Deutschland GmbH)

- 8:20 pm - 8:30 pm Discussion "The role of organic molecules in thin metal layer deposition"
- 8:30 pm - 9:20 pm **Jacek Lipkowski** (University of Guelph, Canada)  
"Potential controlled aggregation of surfactant molecules at electrode surfaces"
- 9:20 pm - 9:30 pm Discussion

## WEDNESDAY

- 7:30 am - 8:30 am Breakfast
- 9:00 am - 12:30 pm **Emerging Applications and Technical Opportunities**  
Discussion Leader: **Lili Deligianni** (IBM-Yorktown Heights, USA)
- 9:00 am - 9:35 am **Jon Reid** (Novellus, Inc., USA)  
"Through Silicon Vias: Challenges and Approaches"
- 9:35 am - 9:45 am Discussion
- 9:45 am - 10:20 am **Ingrid Shao** (IBM-Yorktown Heights, USA)  
"Electrodeposition of Phase Change Materials"
- 10:20 am - 10:30 am Discussion
- 10:30 am - 10:35 am **Business Item**  
(Call for Nominations for the next Vice Chair)
- 10:35 am Coffee Break
- 11:00 am - 11:35 am **Tom Ritzdorf** (Semitool, Inc., USA)  
"Issues in Electronic Packaging"
- 11:35 am - 11:45 am Discussion
- 11:45 am - 12:20 pm **Iris Nandhakumar** (University of Southampton, United Kingdom)  
"Electrodeposition of Thermoelectric Materials"
- 12:20 pm - 12:30 pm Discussion
- 12:30 pm Lunch
- 1:30 pm - 4:00 pm Free Time
- 4:00 pm - 6:00 pm Poster Session III
- 6:00 pm Dinner
- 7:30 pm - 9:30 pm **Late Breaking News**  
Discussion Leader: **Peter Searson** (Johns Hopkins University, USA)  
Ten Short Talks & Discussion

## THURSDAY

- 7:30 am - 8:30 am Breakfast
- 8:30 am - 9:00 am **Business Meeting**  
(Fill out Conference Evaluation Forms; Discuss future Site & Scheduling preferences; Election of the next Vice Chair)

9:00 am - 12:30 pm	<b>New Avenues</b>
	Discussion Leader: <b>Takayuki Homma</b> (Waseda University, Japan)
9:00 am - 9:35 am	<b>Robert A.W. Dryfe</b> (University of Manchester, United Kingdom) "Deposition at the liquid-liquid interface"
9:35 am - 9:45 am	Discussion
9:45 am - 10:20 am	<b>Jan Fransaer</b> (KU-Leuven, Belgium) "AFM study of the incorporation of particles during electrodeposition"
10:20 am - 10:30 am	Discussion
10:30 am	Coffee Break
11:00 am - 11:35 am	<b>Philip N. Bartlett</b> (University of Southampton, United Kingdom) "Electrodeposition from supercritical fluids"
11:35 am - 11:45 am	Discussion
11:45 am - 12:20 pm	<b>Mu Wang</b> (Nanjing University, China) "Self-organization of periodic nanostructures by electrodeposition"
12:20 pm - 12:30 pm	Discussion
12:30 pm	Lunch
1:30 pm - 4:00 pm	Free Time
4:00 pm - 6:00 pm	Poster Session IV
6:00 pm	Dinner
7:30 pm - 9:30 pm	<b>Materials for Solar Energy Conversion</b>
	Discussion Leader: <b>Giovanni Zangari</b> (University of Virginia, USA)
7:30 pm - 8:20 pm	<b>Daniel Lincot</b> (ENSCP, France) "Electrodeposition of semiconductors for photovoltaics"
8:20 pm - 8:30 pm	Discussion
8:30 pm - 9:20 pm	<b>Krishnan Rajeshwar</b> (University of Texas-Arlington, USA) "Electrodeposited Oxide Semiconductor Films for Solar Photovoltaic Applications: From Composites and Nanorods to Nanotubular Arrays"
9:20 pm - 9:30 pm	Discussion

## FRIDAY

7:30 am - 8:30 am	Breakfast
9:00 am	Depart

**Electrodeposition (2008)**

Name	Organization	Participation	Status
ALLONGUE, PHILIPPE	ECOLE POLYTECHNIQUE	Speaker	Registered
ARGIRUSIS, CHRISTOS	TU CLAUSTHAL	Poster Presenter	Registered
BARTLETT, PHILIP N	UNIVERSITY OF SOUTHAMPTON	Speaker	Registered
BLIZNAKOV, STOYAN T	SUNY AT BINGHAMTON	Poster Presenter	Registered
BRAEMS, ISABELLE	ICMMO(LEMHE)	Attendee	Registered
BRANKOVIC, STANKO R	UNIVERSITY OF HOUSTON	Attendee	Registered
BRESE, NATE	ROHM AND HAAS ELECTRONIC MATERIALS	Attendee	Registered
BRUNNER, HEIKO H.	ATOTECH DEUTSCHLAND GMBH	Attendee	Registered
CAMACHO-ALANIS, FERNANDA	UNIVERSITY OF VIRGINIA	Poster Presenter	Registered
CAMMARATA, ROBERT C	JOHNS HOPKINS UNIVERSITY	Discussion Leader	Registered
CHAGNES, ALEXANDRE	ENSCP-LECA (UMR 7575)	Attendee	Registered
CHASON, ERIC	BROWN U	Speaker	Registered
CHATMAN, SHAWN M	MEMORIAL UNIVERSITY	Poster Presenter	Registered
CHEN, QINGYUN	COOKSON ELECTRONICS	Attendee	Registered
CHOI, KYOUNG-SHIN	PURDUE UNIVERSITY	Discussion Leader	Registered
CHOI, YONG	SUNMOON UNIVERSITY	Poster Presenter	Registered
COLLINS, PHILIP G	UNIVERSITY OF CALIFORNIA, IRVINE	Attendee	Registered
COOK, DAVID A	UNIVERSITY OF SOUTHAMPTON	Poster Presenter	Registered
DAMIAN, ALEXIS	ECOLE POLYTECHNIQUE	Poster Presenter	Registered
DIMITROV, NIKOLAY	BINGHAMTON UNIVERSITY - SUNY	Poster Presenter	Registered
DONNER, CONSTANZE	ATOTECH DEUTSCHLAND GMBH	Speaker	Registered
DRYFE, ROBERT A.W.	SCHOOL OF CHEMISTRY	Speaker	Registered
EKIZ, ELVAN H	ISTANBUL TECHNICAL UNIVERSITY	Attendee	Registered
EL BELGHITI, HANANE	LECA	Poster Presenter	Registered
EMNET, CHARLOTTE	BASF SE	Discussion Leader	Registered
FRANSAER, JAN L	KATHOLIEKE UNIVERSITEIT-LEUVEN	Speaker	Registered
FRIESEN, CODY	ARIZONA STATE UNIVERSITY	Speaker	Registered
FUKUNAKA, YASUHIRO	KYOTO UNIVERSITY	Poster Presenter	Registered
GEBREGZIABIHER, DANIEL K	UNIVERSITY OF GEORGIA	Poster Presenter	Registered
GEWIRTH, ANDREW A	UNIVERSITY OF ILLINOIS	Discussion Leader	Registered
GROSH, CAROLYNN D	UNIVERSITY OF WASHINGTON	Poster Presenter	Registered
GUDAVARTHY, RAKESH V	MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY	Poster Presenter	Registered
GUO, LIAN	JOHNS HOPKINS UNIVERSITY	Attendee	Registered
HANDWERKER, CAROL A	PURDUE UNIVERSITY	Attendee	Registered
HAUMESSER, PAUL-HENRI	CEA LETI MINATEC	Poster Presenter	Registered
HAYASE, MASANORI	TOKYO UNIVERSITY OF SCIENCE	Poster Presenter	Registered
HEARNE, SEAN J	SANDIA NATIONAL LABORATORY	Speaker	Registered
HERNANDEZ, EMIL A	THE PENNSYLVANIA STATE UNIVERSITY	Poster Presenter	Registered
HOMMA, TAKAYUKI	WASEDA UNIVERSITY	Discussion Leader	Registered
HUANG, QIANG	IBM TJ WATSON RESEARCH CENTER	Poster Presenter	Registered
HWANG, SUN MI	NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY	Poster Presenter	Registered
IZAKI, MASANOBU	TOYOHASHI UNIVERSITY OF TECHNOLOGY	Poster Presenter	Registered

JAYARAJU, NAGARAJAN	UNIVERSITY OF GEORGIA	Poster Presenter	Registered
KAVANAGH, KAREN L	SIMON FRASER UNIVERSITY	Attendee	Registered
KIM, HANA	NORTHEASTERN UNIVERSITY	Poster Presenter	Registered
KIM, YOUN-GUEN	UNIVERSITY OF GEORGIA	Poster Presenter	Registered
KITAYAPORN, SATHANA	UNIVERSITY OF WASHINGTON	Poster Presenter	Registered
KOLB, DIETER M	UNIVERSITY OF ULM	Attendee	Registered
KOO, HYO-CHOL	SEOUL NATIONAL UNIVERSITY	Poster Presenter	Registered
KUHN, ALEXANDER	UNIVERSITY BORDEAUX	Poster Presenter	Registered
KUMAR, SANTOSH	PURDUE UNIVERSITY	Poster Presenter	Registered
KUNG, SHENG-CHIN	UNIVERSITY OF CALIFORNIA, IRVINE	Poster Presenter	Registered
LAIR, VIRGINIE	ENSCP-PARIS6	Poster Presenter	Registered
LEE, CHI-WOO	KOREA UNIVESITY	Poster Presenter	Registered
LEE, JAE H	HONGIK UNIVERSITY	Poster Presenter	Registered
LEE, CHANG HWA	NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY	Poster Presenter	Registered
LIN, ERWIN S.	YORK UNIVERSITY	Poster Presenter	Registered
LINCOT, DANIEL	ECOLE NATIONALE SUPERIEURE DE CHIMIE DE PARIS	Speaker	Registered
LIPKOWSKI, JACEK	UNIVERSITY OF GUELPH	Speaker	Registered
LIU, YI	ROHM AND HAAS ELECTRONIC MATERIALS	Attendee	Registered
LUHN, OLE	KATHOLIEKE UNIVERSITEIT LEUVEN	Poster Presenter	Registered
MAGNUSSEN, OLAF	UNIVERSITAET KIEL	Discussion Leader	Registered
MAJUMDER, SARMITA	SIMON FRASER UNIVERSITY	Poster Presenter	Registered
MALLETT, JONATHAN J	UNIVERSITY OF VIRGINIA	Poster Presenter	Registered
MATSUSHIMA, HISAYOSHI	UNIVERSITAET KIEL	Attendee	Registered
MAURER, JOSEPH J	UNIVERSITY OF VIRGINIA	Poster Presenter	Registered
MCCREERY, RICHARD L	UNIVERSITY OF ALBERTA	Attendee	Registered
MOFFAT, THOMAS P	NIST	Chair	Registered
MORIN, SYLVIE	YORK UNIVERSITY	Attendee	Registered
MORRISSEY, RONALD J	TECHNIC, INCORPORATED	Attendee	Registered
MUNOZ, ANDRES GABRIEL	HELMHOLTZ-CENTRE FOR MATERIALS AND ENERGY	Poster Presenter	Registered
NAKANISHI, SHUJI	OSAKA UNIVERISTY	Poster Presenter	Registered
NANHAKUMAR, IRIS	UNIVERSITY OF SOUTHAMPTON	Speaker	Registered
NELSON, JEFFREY B	IONOGRAPHICS	Poster Presenter	Registered
NAZIMBETOVA, ZUKHRA I	ROHM AND HAAS ELECTRONIC MATERIALS	Attendee	Registered
OBRIEN, BRIGID F	JOHNS HOPKINS UNIVERSITY	Attendee	Registered
OU YANG, LIANG YUEH	NIST	Poster Presenter	Registered
PANECCASIO, VINCENT	ENTHONE INC.	Attendee	Registered
PEDIGO, AARON E	PURDUE UNIVERSITY	Poster Presenter	Registered
PENNER, REGINALD M	UNIVERSITY OF CALIFORNIA, IRVINE	Attendee	Registered
PERDJON-ABEL, MAGDALENA M	UNIVERSITY OF SOUTHAMPTON	Poster Presenter	Registered
PODLAHA, ELIZABETH	NORTHEASTERN UNIVERSITY	Poster Presenter	Registered
PODUSKA, KRISTIN M	MEMORIAL UNIVERSITY OF NEWFOUNDLAND	Poster Presenter	Registered
PURSWANI, JAYA M	RENSSELAER POLYTECHNIC INSTITUTE	Attendee	Registered
RAJESHWAR, KRISHNAN	UNIVERSITY OF TEXAS AT ARLINGTON	Speaker	Registered
REDDINGTON, ERIK	ROHM AND HAAS ELECTRONIC MATERIALS	Attendee	Registered
REID, JONATHAN	NOVELLUS	Speaker	Registered
RITZDORF, TOM	SEMITOOL INC.	Speaker	Registered

ROST, MARCEL	LEIDEN UNIVERSITY	Speaker	Registered
ROUYA, ERIC	UNIVERSITY OF VIRGINIA MSE DEPT	Poster Presenter	Registered
ROY, JEROME	EUROPEAN SYNCHROTRON RADIATION FACILITY	Poster Presenter	Registered
SALVAREZZA, ROBERTO C	INIFTA-CONICET	Poster Presenter	Registered
SCHILARDI, PATRICIA L	INIFTA- UNLP - CONICET	Poster Presenter	Registered
SCHUSTER, ROLF	UNIVERSITY OF KARLSRUHE	Speaker	Registered
SCHWARTZ, DANIEL	UNIVERSITY OF WASHINGTON	Attendee	Registered
SCHWARZACHER, WALTHER	UNIVERSITY OF BRISTOL	Attendee	Registered
SEARSON, PETER	JOHNS HOPKINS UNIVERSITY	Vice Chair	Registered
SHALYT, EUGENE	ECI TECHNOLOGY	Poster Presenter	Registered
SHAO, INGRID	IBM T.J. WATSON RESEARCH CENTER	Poster Presenter	Registered
SHAO, WENBO	UNIVERSITY OF VIRGINIA	Poster Presenter	Registered
SHERIDAN, LEAH B	UNIVERSITY OF GEORGIA	Poster Presenter	Registered
SHIN, JAE W	BROWN UNIVERSITY	Poster Presenter	Registered
SMETANIN, MAXIM	INSTITUT FUR NANOTECHNOLOGIE	Poster Presenter	Registered
SPRAY, RYAN	PURDUE UNIVERSITY	Poster Presenter	Registered
STAFFORD, GERY R	NIST	Poster Presenter	Registered
STEINMILLER, ELLEN M. P.	PURDUE UNIVERSITY	Poster Presenter	Registered
STICKNEY, JOHN L	THE UNIVERSITY OF GEORGIA	Discussion Leader	Registered
SUAZO, DAMARIS	UNIVERSITY OF PUERTO RICO-RIO PIEDRAS CAMPUS	Poster Presenter	Registered
SWITZER, JAY A	MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY	Speaker	Registered
TALBOT, JAN B	UCSD	Attendee	Registered
TALEB, ABDELHAFED	PIERRE ET MARIE CURIE UNIVERSITY, LABO LECA	Poster Presenter	Registered
THIEMIG, DENNY	TECHNISCHE UNIVERSITÄT DRESDEN	Poster Presenter	Registered
VALDES, MATIAS MH	INTEMA	Poster Presenter	Registered
VASILJEVIC, NATASA	UNIVERSITY OF BRISTOL	Poster Presenter	Registered
VELLEUER, JONATHAN	UNIVERSITY OF BRISTOL	Poster Presenter	Registered
WALKER, AMY V	WASHINGTON UNIVERSITY IN ST. LOUIS	Poster Presenter	Registered
WANG, MU	NAJING UNIVERSITY, CHINA	Speaker	Registered
WEISSMUELLER, JOERG	KARLSRUHE INSTITUTE OF TECHNOLOGY	Speaker	Registered
XU, XIAOMI	UNIVERSITY OF PITTSBURGH	Poster Presenter	Registered
YORK, SARA A	UNIVERSITY OF WASHINGTON	Poster Presenter	Registered
ZANGARI, GIOVANNI	UNIVERSITY OF VIRGINIA	Discussion Leader	Registered
ZHAO, CHUAN	MONASH UNIVERSITY	Poster Presenter	Registered