



## Final Report

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## **I. Introduction**

The 58<sup>th</sup> International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication (EIPBN), 2014, was held at the Omni Shoreham Hotel in Washington, DC, May 27 to 30, 2014. The EIPBN Conference is recognized as the foremost international meeting dedicated to lithographic science and technology and its application to micro and nanofabrication techniques. The conference brought together 386 engineers and scientists from industries and universities from all over the world to discuss recent progress and future trends. Among the emerging technologies that are within the scope of EIPBN is Nanofabrication for Energy Sources along with nanofabrication for the realization of low power integrated circuits. Every year, EIPBN provides financial support for students to attend the conference. The 2014 Conference Chairman is Dr. Theodore Fedynyshyn of MIT Lincoln Labs and the Program Chairman is Dr. Karl K. Berggren of MIT. The Conference is organized and managed by a Steering Committee, which is incorporated in the state of New Jersey, and fully protected by liability insurance. In addition to the Conference Chair and Program Chair the members of the Steering Committee at the time of the conference were:

J. Todd Hastings, University of Kentucky  
Michael A. Guillorn, IBM  
John Hartley, College of Nanoscale Science and Engineering, Albany  
G. Patrick Watson, Princeton University  
Leonidas E. Ocola, Argonne National Laboratory  
Rebecca Cheung, University of Edinburgh  
Reginald C. Farrow, New Jersey Institute of Technology  
Michael Fritze, USC

Students are the lifeblood of the EIPBN conference, in that they both provide a fresh and exciting perspective, and also become the future scientists attending the conference in the future on a regular basis. Financial support provided for their travel came from a mixture of government agencies and corporate donors. The Department of Energy Office of Basic Energy Sciences provided \$5,000 to support student travel from US universities to participate at EIPBN 2014 through grant DE-SC0011789.

## **II. EIPBN 2014 Student Participation**

Student presentations are a vital part of the EIPBN Conference. They contain new, innovative approaches to the topics of the conference that are of great interest to the technical community at large. Furthermore, once the students graduate and launch their careers in the field, they become the regular attendees of the conference for years to come. If they become professors, they advise students in turn on projects that address future problems in the field of the conference, and the cycle continues. In this regard, maintaining strong student participation is a requirement for the long-term viability of the conference. Thanks to travel support from EIPBN in combination with a reasonable reduced hotel rate and conference registration rate for students, 105 students attended EIPBN 2014. Students were 27% of the conference attendance, which a healthy participation. Of those students that attended 43 received travel support from EIPBN through sponsors such as the DOE Office of Science. Most students were 1<sup>st</sup> authors on either an

oral or poster presentation. This is not surprising, since the time and expense for a student to attend the conference is usually justified only if a paper is to be presented. A small number of students were present as co-authors on a paper or poster. Some of these may have actually been presenters, as there was no formal comparison of the program and actual speaker / poster presenter.

This year, as in previous years, the students were offered discounted registration for the conference. The advance student registration rate was set to \$250, with the on-site student registration set to \$300 (compared to \$700 and \$750 for regular attendees). EIPBN negotiated an arrangement with the Omni Shoreham Hotel for a limited number (20) of rooms at the reduced rate of \$189.00 per night for students (compared to the \$209 regular conference rate).

#### *Student Financial Support*

As in years past, financial support for student travel was provided. The amount funded was chosen to correspond on average to the cost of an air ticket to Washington, D.C. to attend the conference. Some differential was made depending on the distance traveled. For students from the US / Canada, the average amount was \$475. For students from Europe and Asia, the amount was \$700. As part of the conditions for receiving funds, students were:

- 1) Required to register for the conference, and
- 2) Asked to volunteer for various tasks that may be available for students.

The tasks we usually ask students to perform at the conference are assisting the session chairs in managing their room, usually helping questioners be heard by running microphones to them. This year, we also used student support at the panel discussion, providing roving microphones to allow questions from the audience to be heard. Students are also asked to help at the set up time the physical posters, putting banners on the poster boards to identify the locations where individual posters are to be placed.

### **III. Awarding Student Funds**

A detailed process was used to decide which student should receive financial support. These steps were listed in detail on the conference website.

*Acceptance of Abstract:* First, it was required that students have their name on an accepted abstract to be considered for travel reimbursement. The decisions about student support were therefore made after the Program Chair had prepared the initial Program.

*Request by Professor:* Second, the student's Professor needed to send a request for financial support to either the Conference Chair or the Program Chair. Requests from students themselves were returned and the students asked to have their professor provide a request. All requests were forwarded to the Conference Chair for final disposition.

*Sorting:* At a predetermined cutoff date, the list of requests received up until that date were sorted using the average reviewer's scores for the abstracts. Abstracts receiving higher scores were ranked higher than those receiving lower scores. If there was a tie for a position in the ranking, the date of the Professor's request was also considered, with earlier requests given precedence over later requests.

*Granting:* The final cutoff was determined by the budget set for student support by the Conference Chair. For EIPBN 2014, awards were offered to 44 students. 43 students accepted the awards and attended the conference.

A variety of universities, countries, and topics were represented among the students receiving support. Students from 7 countries (including the US) and 20 universities were among the recipients of student travel financial support. We expect the dominance of US recipients reflects not the quality of abstracts, but the general lack of awareness of the program of financial support among overseas (and at some US) institutions. The students receiving EIPBN 2014 financial support are listed in Table I.

Name	Affiliation	Name	Affiliation
Willie Mae Reese	UC - Berkeley	Yujia Yang	MIT
Abhijeet Bagal	NC State	Faraz Najafi	MIT
Cheng Zhang	University of Michigan	Ke Du	Stevens Institute of Technology
Wei Ding	Princeton University	Stephanie Maruca	NJIT
Eric Mills	Princeton University	Shuang Pi	University of Massachusetts
Sunil Pandey	Princeton University	Can Li	University of Massachusetts
Ruoming Peng	Princeton University	Hao Jiang	University of Massachusetts, Amherst
Ji Qi	Princeton University	Peng Lin	University of Massachusetts
Yuxuan Wang	Princeton University	Abhijit Patil	University of Houston
Joong-Hee Min	NC State	Jeonghwan Kim	LSU
Xu Zhang	NC State	Ren Yan	Delft University of Techonology
Zhiteng Wang	NC State	Nanda Gaurav	TU Delft
Haogang Cai	Columbia University	Con Celal	University of Waterloo
Mikai Chen	University of Michigan	Bourke Levi	University of Otago
Junjun Ding	Stevens Institute of Technology	Alshammari Alanoud	University of Waterloo
Luozhou Li	MIT	Aydinoglu Ferhat	University of Waterloo
Hai Van	Florida State University	Dey Ripon	University of Waterloo
Sungjin Wi	University of Michigan	Yoshida Konomi	University of Tsukuba
Xinyu Zhao	Auburn University	Khan Arshad	University of Hong Kong
Sam Nicaise	MIT	Qu Tuo	University of Hong Kong
Vitor Manfrinato	MIT	Zhouyang Zhu	University of Hong Kong
Hyung Wan Do	MIT		

Table I: Students receiving EIPBN 2014 Student Travel Support.

#### Student Support Grants

Student support was provided from government and corporate sources as shown in Table II.

Sponsor	Contribution
SRC	\$5,000
Raith USA, Inc.	\$2,500
Argonne National Lab	\$2,500
Elionix	\$2,500
ORNL	\$3,500
Mentor Graphics	\$1,000
Tokyo Electron (TEL)	\$2,500
DOE	\$5,000
SEMTech Solutions	\$2,500
Total	\$27,000

Table II: Sponsors of EIPBN 2014 Student Travel Support.

DOE Office of Science funds were solicited by Prof. Reginald Farrow at the New Jersey Institute of Technology. NJIT dispersed the full granted funds to EIPBN 2014 and waived any facilities and administration costs.

#### IV. Peer-Reviewed Publications from EIPBN 2014

Extended abstracts of papers presented at the conference are available online: <http://eipbn.omnibooksonline.com/>. All participants that presented papers at the EIPBN 2014 Conference had the opportunity to submit journal articles to a special publication of the Journal of Vacuum Science and Technology B (JVSTB). JVSTB generally publishes those submitted articles that are accepted after peer review in the Nov/Dec issue of the same year as the conference. See JVSTB Vol. 30, No. 6 for the EIPBN 2013 published articles. At the time of this report there were 77 papers from the conference submitted for publication from the 2014 conference. The number that will be accepted for publication was not available for this report. Historically students are well represented in the papers published from EIPBN.

#### V. Conclusion

The 58<sup>th</sup> International Conference on Electron, Ion and Photon Beam Technology and Nanofabrication, 2014, held at the Omni Shoreham Hotel in Washington, DC, May 27 to 30, 2014 was a great success in large part because financial support allowed robust participation from students. The students gave oral and poster presentations of their research and many will publish peer-reviewed articles in a special conference issue of the Journal of Vacuum Science and Technology B. The Department of Energy Office of Basic Energy Sciences supported 13 students from US universities with a \$5,000 grant (DE-SC0011789). On behalf of the Steering Committee of EIPBN I would like to thank DoE for its support of student participation at this very worthwhile conference.

Reginald C. Farrow, Ph.D.