

Student Chapter Annual Report

December 2008

The University of New Mexico

SPIE Student Chapter

1313 Goddard, SE (MSC04 2710)

Albuquerque, NM 87106

USA

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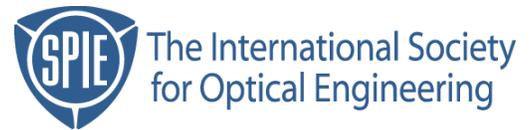
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Goals:

Our student chapter focuses on two main objectives: 1) Through the extended network of Student Chapter we aim to improve student member's academic ability, and open doors for our members to communicate with established professionals working in the fields of optics, photonics and related disciplines. 2) Outreach to community children, try to inspire our children to become the future Scientists.

Introduction about the chapter:

The SPIE student chapter of New Mexico has been constituted in August 2006 by 12 students and 4 student officers were elected in September 2006 and continued its activities till December 2007. In December 2007 new elections were performed were new officers were elected.



2008 officers:

President: Arezou Khoshakhlagh - karezou@unm.edu

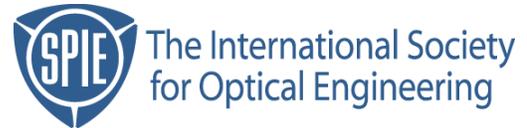
Vice President: Rajeev Shenoj - rshenoj@ece.unm.edu

Secretary: Stephen Myers - smyers@chtm.unm.edu

Treasurer: David Ramirez - davramir@unm.edu

Adviser:

Dr. Sanjay Krishna – skrishna@chtm.unm.edu



List of current members:

Name	Expires
Alexander Albrecht	31 December 2009
Jonathan Andrews	31 January 2009
Ajit Barve	30 September 2009
Arezou Khoshakhlagh	30 November 2009
Yan Li	31 March 2009
Stephen Myers	28 February 2009
Maya Narayanan Kutty	30 September 2009
Alex Raub	28 February 2009
Paul Schanwald	31 December 2009
Denis Seletskiy	30 April 2009
Rajeev Sheno	31 August 2009
Svyatoslav Smolev	31 January 2009
Nina Weisse-Bernstein	31 December 2008
Michael Zmuda	30 April 2009

Chapter activities:

1) SPIE and OSA BBQ:

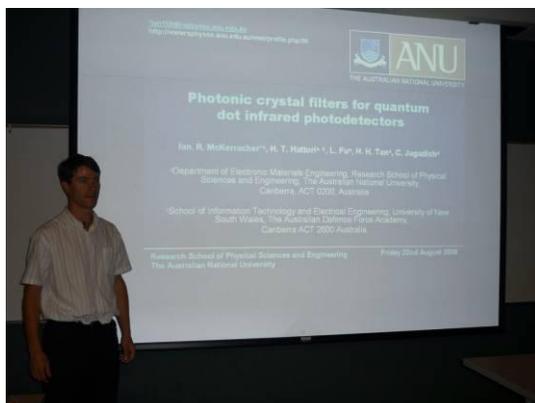
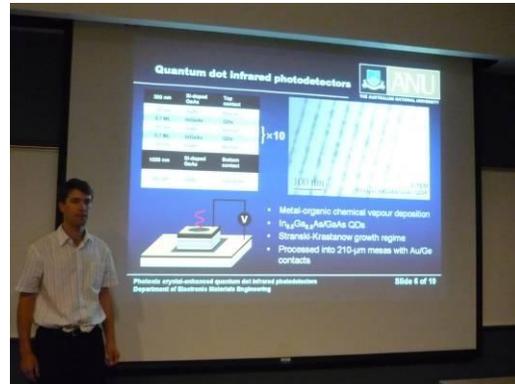
We organized a welcome BBQ party on Aug 28th for all new and returned UNM students, introduce the SPIE student chapter of UNM and the benefit of members to them, and try to increase chapter members.



2) SPIE talk:

We organized a talk on August 22, 2008 by Ian McKerracher from the Australian National University who is a PhD student in the Department of Electronic Materials Engineering at the ANU, working on quantum dot infrared photodetectors and impurity-free vacancy disordering. **The title of the talk was “Photonic Crystal Filters for**

Quantum Dot Infrared Photodetectors”: Quantum dot infrared photodetectors (QDIPs) exhibit a broadened photoresponse due to variations in the dot size, which is undesirable for multi-color detection. InGaAs/GaAs QDIPs were grown by metal-organic chemical vapor deposition and the photoresponse peak was around 6 μm , with a full width at half-maximum of just under 2 μm . Photonic crystal (PC) slabs can filter normally-incident light using Fano-like resonances. Using finite-difference time-domain simulations, PC dielectric filters were designed for integration with QDIPs to create narrowband detectors. The photoresponse can be tuned and the width decreased by up to 76%. Germanium and calcium fluoride layers were deposited by RF magnetron sputtering and PC arrays were etched into the germanium surface using conventional photolithography and plasma etching.



3) SPIE invited talk:

The invited speaker from the SPIE Visiting Lecturer Program, Dr. Sarath Gunapala gave us an invited lecture at November 17, 2008. Lecture title: **Quantum Structures for Infrared Detection**: There are many applications that require long wavelength, large, uniform, reproducible, low cost, stable, and radiation-hard infrared (IR) focal plane arrays (FPAs). For example, the absorption lines of many gas molecules, such as ozone, water, carbon monoxide, carbon dioxide, and nitrous oxide occur in the wavelength region from 3 to 15 micron. Thus, IR imaging systems that operate in the long wavelength IR (LWIR) region (8 - 15 micron) are required in many space borne applications such as monitoring the global atmospheric temperature profiles, relative humidity profiles, cloud characteristics, and the distribution of minor constituents in the atmosphere which are being planned for future NASA Earth and planetary remote sensing systems. Due to higher radiation hardness, lower 1/f noise, and larger array size the GaAs based Quantum Well Infrared Photodetector (QWIP) FPAs are very attractive for such space borne applications. Furthermore, we have exploited the artificial atomlike properties of epitaxially self-assembled quantum dots for the development of high operating temperature IR FPAs. Quantum dots are nanometer-scale islands that form spontaneously on a semiconductor substrate due to lattice mismatch. We have used molecular beam epitaxy technology to grow multi-layer dot-in-a-well (DWELL) devices by embedding InAs quantum dots in a InGaAs/GaAs QWIP structure. This hybrid quantum dot/quantum well device offers additional control in wavelength tuning via control of dot-size and/or quantum well sizes. In this presentation I will discuss the optimization of the detector design, material growth and processing that has culminated in realization of large format QWIP and QDIP FPAs, multi-band QWIP FPAs, portable and miniature LWIR cameras, holding forth great promise for myriad applications in 3-15 micron wavelength range in science, medicine, defense and industry.





4. Outreach:

1) In August 2008, Arezou Khoshakhlagh attended the SPIE officers workshop at San Diego where she took an optics outreach class along with the optics kit for outreach activities. The Kit was used for outreach activity for Kit Carson Middle school students located in Albuquerque, NM under supervision of Mr. Bob Zachary, rbzachary@flash.net. The goal was to teach basic optics concepts and motivate the students to continue education in science. The activity was performed by SPIE and OSA members. Middle school students also showed a lot of creativity and motivation on the experiments.





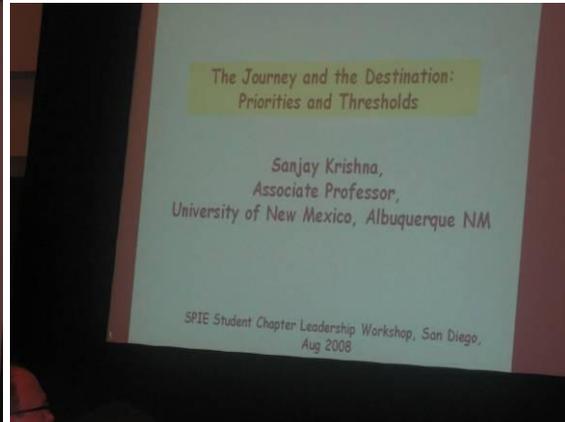
2) We successfully arranged a community outreach project on December 10, 2008. The West Mesa High School SPIE Chapter, located at Albuquerque, NM, has 10 high school SPIE student members with the average age of 17, and their adviser is Mr. Carmen DiGregorio, digregorio_car@aps.edu. We offered a lab tour for them at the Center of High Material Center (CHTM) at UNM. Rick Bradley, the CHTM manager, help us arrange it. High school members have a widow tour at the cleanroom, Laser Lab tour, and the Molecular Beam Epitaxy grow Lab tour.

Finally we introduced the college scholarship and member benefit of SPIE and how to join or start up a SPIE student chapter when they enter the college.



5) SPIE Student Chapter travel grant:

Arezou Khoshakhlagh attended SPIE officers workshop in August 2008 in San Diego where she got to interact with other officers from other student chapters and exchange ideas for the chapter management. In that meeting Dr. Sanjay Krishna, advisor of SPIE student chapter, who was the invited lecturer gave a lecture to students about how to achieve carrier goals.



6) New Officers:

We hold a pizza party December 19, 2008 to appreciate all the support from chapter members and hard work of chapter officers in 2008, and we re-elected 4 new officers for the term of 2009. In this meeting we also discussed all of the activities in the past year.

The 4 new chapter officers are:

2009 officers:

President: Stephen Myers - smyers@chtm.unm.edu

Vice President: Ajir Barve- ajit@chtm.unm.edu

Secretary: Maya Narayanan Kutty – maya.kutty@gmail.com

Treasurer: Freddie Santiago- [fredsan@unm.edu](mailto:freds@unm.edu)

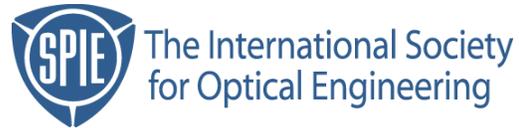
7) Future Activities

Collaboration with OSA student chapter:

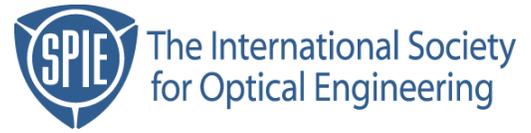
During 2008 years, SPIE student chapter worked closely to OSA student chapter at the University of New Mexico. The goal is to keep the close collaborations but still each chapter would have separate officers. Based on the 2008 meetings between the SPIE and OSA student chapters, the two chapters will host an optics conference in Albuquerque, NM in summer of 2009 which will include University of Colorado, University of New Mexico students.

SPIE talk:

In January 2009, Dr. Gregory Dente, from AFRL will give a talk on modeling of superlattices.



1. Chapter member, Rajeeve Shenoi, presented the paper “Low strain Quantum Dots in a Double Well Infrared Detectors”, SPIE, August 2008 hold at San Diego, Ca.
2. Chapter member, Rajeeve Shenoi, published the paper “Low strain Quantum Dots in a Double Well Infrared Detectors” in Infrared Space borne Remote Sensing and Instrumentation XVI SPIE 7082 SPIE 7082, 708207 (2008).
3. Chapter member, Arezou Khoshakhlagh, presented the paper “Optimization of InAs/GaSb Type-II Superlattice Interfaces for Long-Wave ($\sim 8 \mu\text{m}$) Infrared Detection” at IMBE, August 2008 hold at Vancouver, Canada.
4. Chapter member, Arezou Khoshakhlagh, submitted the paper “Optimization of InAs/GaSb Type-II Superlattice Interfaces for Long-Wave ($\sim 8 \mu\text{m}$) Infrared Detection” which has got accepted and will be published in April 2009, in Journal of Crystal Growth.
5. Chapter member, Ajit Barve, published the paper "Reduction in dark current using resonant tunneling barriers in quantum dots-in-a-well long wavelength infrared photodetector" in Applied Physics Letters 93, 131115 (2008).
6. Chapter member David Ramirez wrote a paper on: “Dependence of the Performance of Single Photon Avalanche Diodes on the Multiplication Region Width,”: David A. Ramirez, Majeed M. Hayat, and Mark A. Itzler, accepted for publication on Journal of Quantum Electronics.
7. Majeed M. Hayat, Graham J. Rees, David A. Ramirez, Mark A. Itzler, “Statistics of self-quenching time in single photon avalanche diodes,” IEEE Lasers and Electro-Optics Society, 2008. LEOS 2008. 21st Annual Meeting of the 9-13 Nov. 2008 Page(s):230 – 231.



Financial information:

Description	Date of transaction	Expenses	Deposit	Total
Initial Balance	December 2007			\$ 471.54
BBQ OSA Student chapter	September 2008	\$ 190.03		\$ 281.51
Student chapter funding	November 2008		\$ 700.00	\$ 981.51
SPIE talk	December 2008	\$ 11.38		\$ 970.13
Pizza party (invited talk)	December 2008	\$ 98.17		\$ 871.96
Pizza party (officer elections)		\$68.28		
Final Balance				\$ 803.68 **