

# MIT/MTL Center for Graphene Devices and 2D Systems

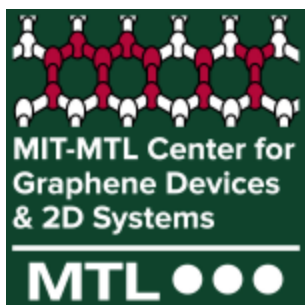
graphene.mit.edu Printed on July 17, 2024 using [Print My Blog](#)

## MIT-MTL Center for Graphene Devices & 2D Systems(MIT-CG) 2018 Review

By jbaylon

September 28, 2018

Categories: Uncategorized



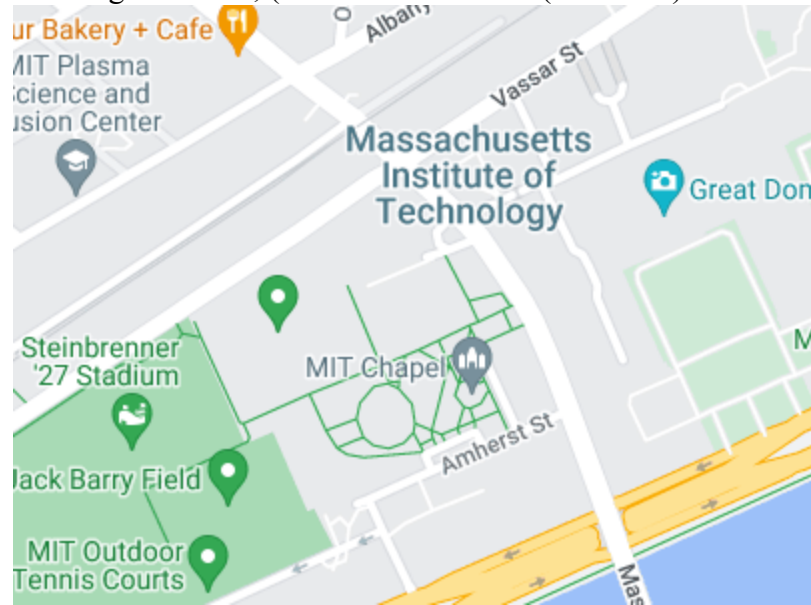
MIT faculty, students, staff and member companies are cordially invited to attend the 2018 review of the MIT-MTL Center for Graphene Devices & 2D Systems(MIT-CG). The review will be held at the Massachusetts Institute of Technology (MIT) on **Friday, November 2, 2018**

**Friday, November 2, 2018**

Massachusetts Institute of Technology (Stratton Student Center)

[84 Massachusetts Avenue, Cambridge, Massachusetts, USA](#)

Building W20-208, (Sala de Puerto Rico (W20-202) Second Floor



Agenda will compose of speakers from various faculty specializing in graphene and two dimensional systems \*Agenda is pending confirmation\*

### Registration

Registration is free to MIT faculty, students and affiliates. \*(Registration is required)\*

Registration is closed.

### Hotel Information

#### 2018 MIT Preferred Hotel Rates (\*click for details)

**Hotel Marlowe** 25 Edwin Land Boulevard, Cambridge, MA 02141

**Kendall Hotel** 350 Main Street, Cambridge, MA 02142

**Courtyard Marriott Cambridge** 777 Memorial Drive, Cambridge MA 02139

**Hyatt Regency Cambridge** 575 Memorial Drive, Cambridge, MA 02139

**Fairfield Inn Cambridge** 215 Monsignor O'Brien Highway, Cambridge, MA 02141

**Holiday Inn Express/Suites Cambridge** 250 Monsignor O'Brien Highway, Cambridge, MA 02141

### Venue address & Parking Information

Venue:

The best way to get from Boston Logan International Airport (BOS) to MIT is by taxi. The ride takes approximately 20 min. and costs ~\$25-40 from the airport.

Meeting location address is [84 Massachusetts Avenue, Cambridge, Massachusetts, USA](#)

The conference rooms is located on the 2nd floor in the Stratton Student Center (Building W20-202)

Parking:

**[Kendall Center Blue Garage](#)**

290 Binney St. Cambridge, MA 02142

**[Kendall Center Green Garage](#)**

90 Broadway St. Cambridge, MA 02142

**[Kendall Center Yellow Garage](#)**

77 Ames St. Cambridge, MA 02142

**[WebEx](#)**

Please contact Joseph Baylon via email: Joseph Baylon (jbaylon at mit dot edu) for this information.

**[Poster Presentation](#)**

We will have student/post doc best poster award ceremony after the final presentation. Three winners will be selected at the end of the review. (\$25, \$50, or \$100 Amazon gift cards.) \*\*You must be present to win. If you are not present, the winner runner up will get the prize.\*\*

**[Presentations](#)**

Presentations will be readily available immediately after the review to MIT faculty, students and industrial members of the center.

**[Questions?](#)**

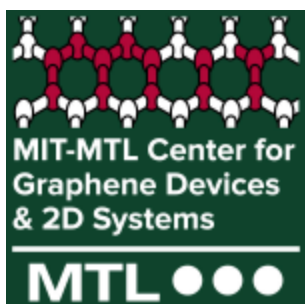
For any questions regarding this review, please contact Mr. Joseph Baylon (jbaylon at mit dot edu).

# 2017 MIT-MTL Center for Graphene Devices & 2D Systems Review

By jbaylon

October 2, 2017

Categories: Uncategorized



Member companies are cordially invited to attend the 2017 review of the MIT-MTL Center for Graphene Devices & 2D Systems (MIT-CG). The review will be held at the Massachusetts Institute of Technology (MIT) on Friday, October 27, 2017.

**Friday, October 27, 2017**

Massachusetts Institute of Technology

[50 Vassar Street, Cambridge, Massachusetts, USA](#)

Building 36, (RLE Allen/Haus Room) (36-428-462 combined)

## [Agenda](#)

[MIT-MTL Center of Graphene Devices & 2D Systems Agenda](#)

## [Registration](#)

Registration is free to MIT faculty, students and affiliates, but the registration is mandatory.

Please click [HERE](#) to register.

## [Hotel Information](#)

**Marriott Cambridge Kendall Square** 50 Broadway, Cambridge, MA 02142, ([map](#)) (Hotel details [here](#)) MIT code: **MT2** \$347 a night

**Residence Inn** 120 Broadway, Cambridge, MA 02142, ([map](#)) (Hotel details [here](#)) MIT code: **MT2** \$318 a night

**Kendall Hotel** 350 Main Street, Cambridge, MA 02142, ([map](#)) (Hotel details [here](#)) MIT code: **MIT** \$259 a night

**Courtyard Marriott Cambridge** 777 Memorial Drive, Cambridge MA 02139, ([map](#)) (Hotel details [here](#)) MIT code: **MIT** \$299 a night

**Hyatt Regency Cambridge** 575 Memorial Drive, Cambridge, MA 02139, ([map](#)) (Hotel details [here](#)) MIT code: **33395** \$295 a night

**Fairfield Inn Cambridge** 215 Monsignor O'Brien Highway, Cambridge, MA 02141, ([map](#)) (Hotel details [here](#)) MIT code: **MT2** \$249 a night

**Holiday Inn Express/Suites Cambridge** 250 Monsignor O'Brien Highway, Cambridge, MA 02141, ([map](#)) (Hotel details [here](#)) MIT code: **100216750** \$214 a night

### **Review address/Parking Information**

The best way to get from Boston Logan International Airport (BOS) to MIT is by taxi. The ride takes approximately 20 min. and costs ~\$25-40 from the airport.

Meeting location address is [50 Vassar Street, Cambridge, Massachusetts, USA](#)

The conference rooms is located on the 4th floor in the Research Laboratory of Electronics (RLE) headquarters office. (Building 36-428-462)

Below are parking lot information if you are interested.

### **Parking Information**

#### **Kendall Center Blue Garage**

290 Binney St. Cambridge, MA 02142

#### **Kendall Center Green Garage**

90 Broadway St. Cambridge, MA 02142

#### **Kendall Center Yellow Garage**

77 Ames St. Cambridge, MA 02142

### **Webex**

Please contact Joseph Baylon via email: [jbaylon@mit.edu](mailto:jbaylon@mit.edu) for this information.

### **Poster Presentation**

We will have student/post doc best poster award ceremony after the final presentation. Three winners will be selected at the end of the review. (\$25, \$50, or \$100 Amazon gift cards.) **\*\*Must be present to win.** To submit your group's poster, please click [here](#) for more information.

### **Presentations**

Presentations will be readily available immediately after the review to MIT faculty, students and industrial members of the center.

### **Questions?**

For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

# June 30, 2017 From Diamond to Graphene and Related Carbon Nanotechnology

By jbaylon

August 25, 2017

Categories: Uncategorized



**Friday, June 30, 2017**

**RLE Haus Room, 36-428**

**1:00–2:00PM**

**Visiting Scientist, MIT-MTL**

**Fellow, Distinguished Lecturer and President-elect of IEEE Nanotechnology Council**

**University Chair Professor of Institute of Microelectronics, National Cheng Kung University, Tainan City, Taiwan**

**Email: [tzengyo@mail.ncku.edu.tw](mailto:tzengyo@mail.ncku.edu.tw), [tzengyo@mit.edu](mailto:tzengyo@mit.edu)**

**Professor Yonhua (Tommy) Tzeng is the current faculty member and formerly served as the Vice President for Research and Development, Dean of College of Electrical Engineering and Computer Science, and Director of Center for Micro-Nano Science and Technology at the National Cheng Kung University (NCKU). Prior to joining NCKU, he served as an Associate Director of Alabama Micro/Nano Science and Technology Center and Alumni Chair Professor of Electrical and Computer Engineering at the Auburn University in Auburn, Alabama. Professor Tzeng's research includes more than thirty years of CVD diamond synthesis and applications. His research interest extends to graphene and nanoscale materials for innovative electronics, sensors, and energy storage devices.**

**Both diamond (sp<sup>3</sup>) and graphite (sp<sup>2</sup>) exhibit many useful physical and chemical properties desirable for scientific, technological and consumer applications. High-rate homoepitaxial diamond CVD and high-density heterogeneous diamond nucleation, when combined with**

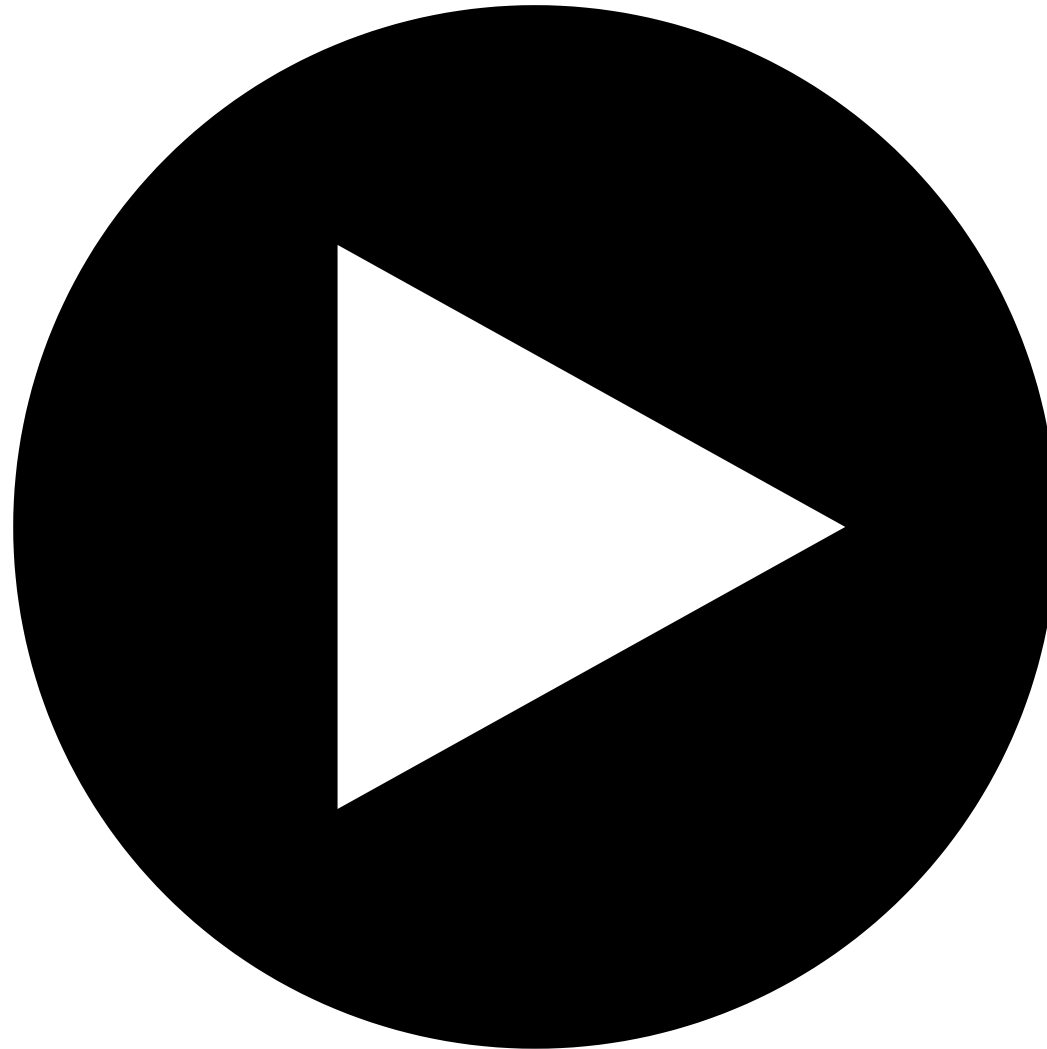
**smart grain-boundary engineering and doping techniques, have produced insulating and semiconductor single crystalline and polycrystalline diamonds ranging from individual 10-carat diamond crystals to table-top sized coatings of ultra-nano-crystalline diamond with 2-5 nm grain sizes.**

**Abstract:**

**Alternatively, 2-D atomically thin graphene, which is a derivative of diamond's cousin(graphite), possesses excellent electronic, optical, thermal, mechanical, and chemical properties due to its sp<sup>2</sup> carbon-carbon bonding without surface dangling bonds and unique electronic structures. Hybrid carbon nanostructures of diamond and graphene provide further opportunities of innovative applications. In this seminar, diamond and graphene related carbon technology will be reviewed with some examples of recent research results.**

**Video below:**





<https://youtube.com/watch?v=>

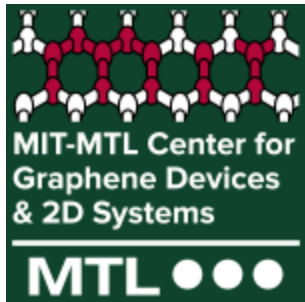


## Tuesday, April 4th, 2017: Seminar “Two Dimensional Nanosheets for Electron Device Applications”

By jbaylon

April 6, 2017

Categories: Seminar



### Two Dimensional Nanosheets for Electron Device Applications

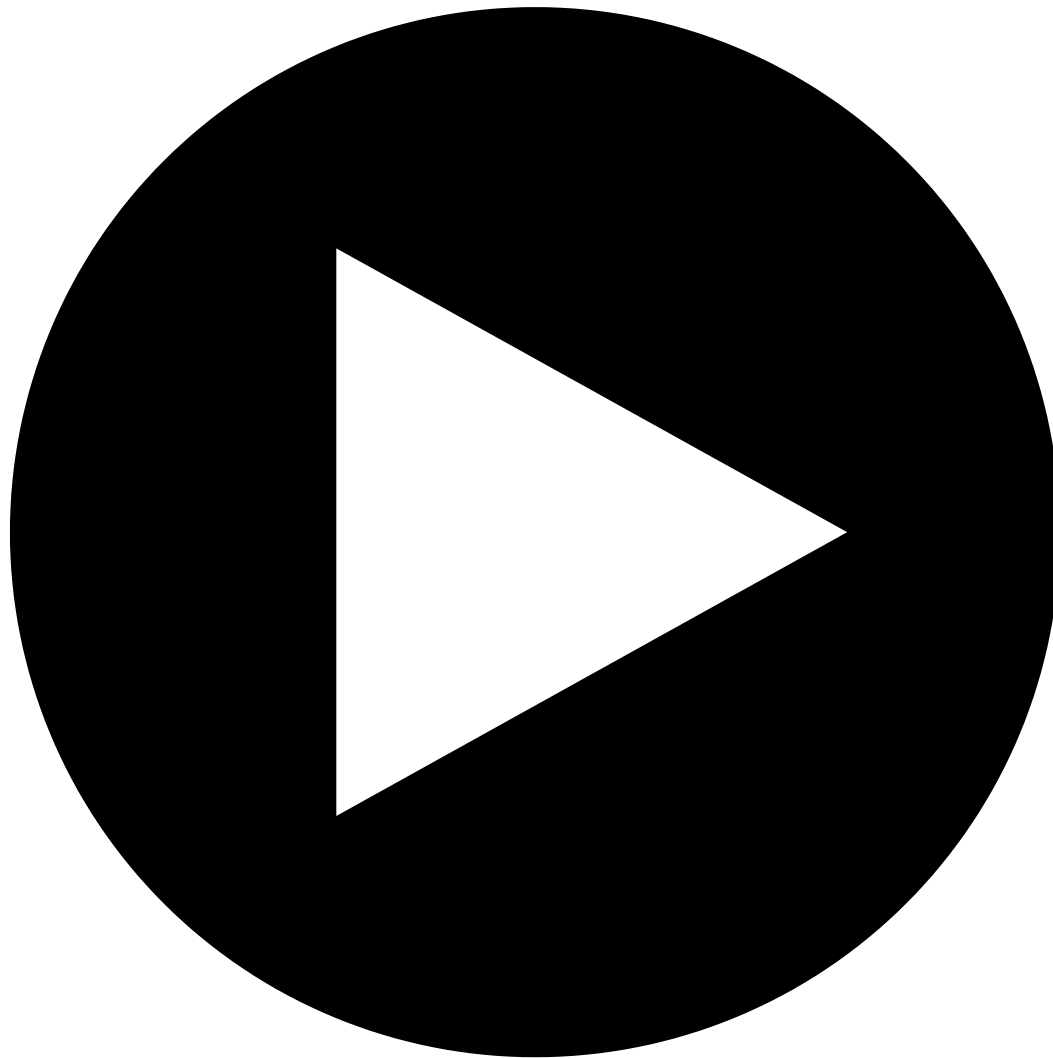
Speaker: Professor Seongil Im

Tuesday, April 4th, 2017




**Abstract:** Two-dimensional (2D) semiconductor materials with discrete bandgap have attracted much attention from many researchers owing to their interesting physical properties and potentials for future nanoscale electronics. Transition metal dichalcogenides (TMDs) and black phosphorus (BP) are those and many of field effect transistors (FETs) have reported using such 2D materials. My group has successfully fabricated 2D complementary (CMOS) logic inverters and van der Waals (vdW) junction PN diodes. This seminar will discuss and display three types of electron devices.

**Biography:** Prof. Seongil Im, is an Underwood Distinguished Professor in the Department of Physics at the Yonsei University in Seoul, Korea. He is a faculty member who is internationally recognized for his research accomplishments. His research expertise is device physics and detailed research subjects are Oxide and Organic Thin-Film Electronics, Field Effect Transistors, Nanowire and Nanosheet FETs, and Photon-probing to characterize device stabilities. He has published more than ~220 peer -review journal papers including Applied Physics Letters, Advanced Materials, Advanced Functional Materials, Small, Nano Letters, IEEE Electron Device Letters, etc.




<https://youtube.com/watch?v=oMbm9J2RGzE>

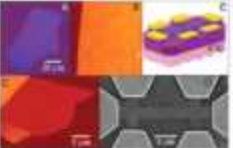
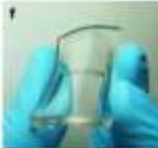
### Introduction



The most widely studied 2-D material  
Conical Dirac spectrum  
Energy states without a bandgap  
High mobility ( $< 100000\text{cm}^2/\text{Vs}$ )  
More conductive than copper  
Attractive optical phenomena



More Flexible than rubber  
Stretchable material  
Stronger than diamond  
Various forms (ribbon, tube, ball...)



K. S. Kim, Science 307, 69 (2009)    K. S. Novoselov et al. Science 306, 666 (2004)

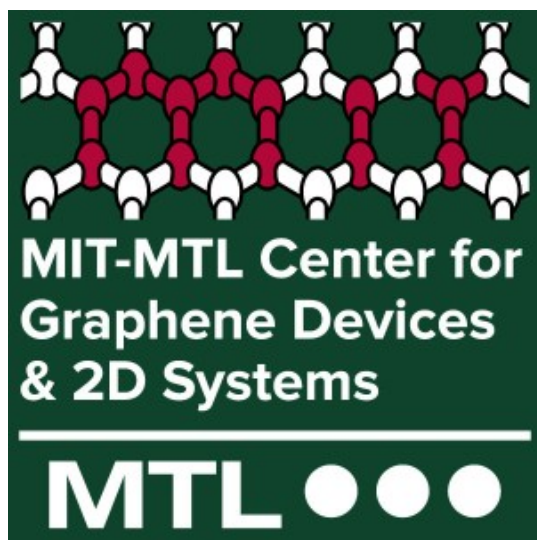
**Limitation of Graphene**  
Gapless Band Structure  $\rightarrow$  Unsuitable for switching devices

# 2016 MIT/MTL Center for Graphene & 2D Systems Annual Review

By jbaylon

December 2, 2016

Categories: Uncategorized



**Friday, November 4, 2016**

Massachusetts Institute of Technology

Click the links below to view their slides. Videos are also listed for your review if you wish to follow along with its slides.

**\*Please note, the slides and video are MIT proprietary, please do not forward these talks to anyone outside the Center. Thank you.**

8:30-9:00 “[Welcome remarks and roadmap](#)” (Prof. Tomás Palacios)

<https://youtu.be/T4II7IYZy8M?t=27s>

9:00-9:30 “[Recent progress in graphene-based layer transfer and wafer-scale epitaxial stacking of 2D materials](#)” (Prof. Jeehwan Kim)

<https://youtu.be/Hsz-Ti3qhLo?t=29s>

9:30-10:00 “[Transforming nanodevices to nanosystems](#)” (Prof. Max Shulaker)

<https://youtu.be/jJFkiRQkFcs>

10:00-10:30 “[Graphene as a Mother material for 2D layered systems Science and Technology](#)” (Prof. Millie Dresselhaus)

<https://youtu.be/WKp79T0sb7U?t=2m15s>

10:30-10:45 Morning Break /Poster session

10:45-11:15 “Electron-phonon coupling and ultrafast dynamics in 2D Heterostructures” Dr. Prineha Narang (Prof. Marin Soljacic’s group) **Pending**

11:15-11:45 “[Development in the synthesis and transfer 2D materials](#)” (Prof. Jing Kong)

<https://youtu.be/4ux3P08RCU4?t=5s>

11:45-12:15 “Synthesis and application of atomically thin membranes” Dr. Piran Kidambi (Prof. Rohit Karnik’s & Prof. John Hart’s group) **Pending**

12:15-13:30 Lunch /Poster Session

13:30-14:00 “[Quantum transport simulation and compact modeling of 2D materials](#)” Dr. Redwan Sajjad (Prof. Dimitri Antoniadis group)

<https://youtu.be/W6olstatTsg?t=21s>

14:00-14:30 “[FATE MURI, CIQM, and other large programs](#)” (Prof. Tomás Palacios)

<https://youtu.be/DHrlz4OsPFc>

14:30-15:00 “Light emitting diodes and photodetectors of 2D transition metal dichalcogenides: from visible to near infrared” Dr. Yaqing Bie (Prof. Pablo Jarillo-Herrero’s group) **Pending**

15:00-15:30 “[2D Materials for Precision Sensing and Quantum Information Processing](#)” (Prof. Dirk Englund) **(Audio only, no video) click link to follow with the audio video below!**

<https://youtu.be/cpdNBO6uaKY?t=13s>

15:30-15:45 Afternoon Break /Poster Session

15:45-16:00 “[Monolayer Valleytronic Materials](#)” Dr. Steven Vitale (Dr. Jakub Kedzierski’s group-Lincoln Laboratory)

<https://youtu.be/ywvxUg50Pmo?t=10s>

16:00-16:30 “[Covalent functionalization of carbon nanomaterials](#)” Dr. Maggie He (Prof. Timothy M. Swager’s group)

<https://youtu.be/0eYo81sEZ2Q?t=5s>

**QUESTIONS?**



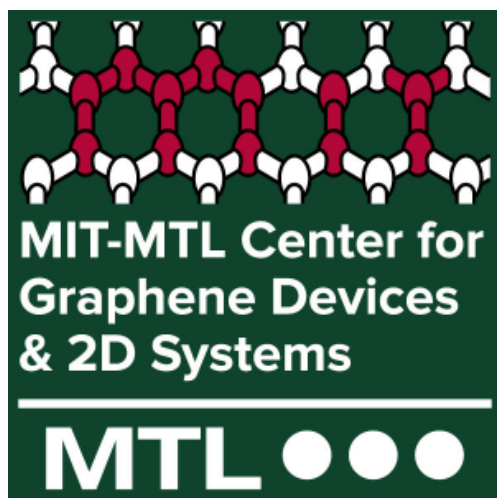
For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

## Poster Submission form

By jbaylon

October 17, 2016

Categories: Conference



If you wish to have the poster printed by EECS (best preferred), you must submit the PPT file by saving it to a PDF. Please attach the PDF by filling in the form below.

Please submit your poster no later than **4pm on MONDAY, October 23, 2017**

Creating your poster:

Use this ppt template only: [mit-mtl-graphene-poster-req-2017](#)

\*Either horizontal or verticle orientation is permitted

\*The poster should measure 36 inches x 48 inches to fit the display boards

\*Prepare your poster in PPT, then save it as a PDF. **\*\*NOTE: Save as "group's nameMIT\_pdf."**

\*Then upload the poster by filling out the submission form below.

If you have not submitted your poster by the deadline above, it is recommended that you choose a vendor such as FedEx Kinkos (at 600 Technology Square) or MIT CopyTech (11-004).

Please select a valid form

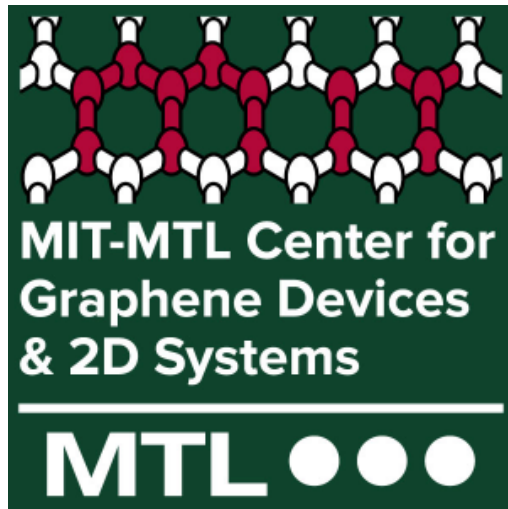


# 2016 Annual Review: MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG):

By jbaylon

October 17, 2016

Categories: Uncategorized



Welcome Members of the MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG):

We cordially invited you to attend the 2016 Review, which is being held at the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts (USA).

**Date: Friday, November 4, 2016, 8:00 AM EDT (Breakfast/Registration at 8:00 AM EDT)**

*Venue:* Massachusetts Institute of Technology ([MIT](#))

*Address:* 50 Vassar Street, Cambridge, Massachusetts (USA)

*Meeting Location :* Building 34, EECS Grier rooms 401A & B \*The exact directions to the meeting location is [here](#)

## [Registration](#)

**(click to register) Deadline: Friday, October 28th**

(MIT groups who wish to submit a poster, please click the link [here](#))

## **Hotel Information**

### **Residence Inn Boston/Cambridge and Marriott Boston/Cambridge**

**Residence Inn Boston Cambridge** (Registration link, please click [here](#) to reserve a room.)

**6 Cambridge Center, Cambridge, MA**

[Hotel added services](#)

**Ph: (617) 349-0700**

**Marriott Boston Cambridge** (Registration link, please click [here](#) to reserve a room.)

**Two Cambridge Center, 50 Broadway, Cambridge, MA**

[Hotel added services](#)

**Ph: (617) 494-6600**

To book with them directly, please go to **Residence Inn Boston/Cambridge**: [here](#), or **Marriott Boston/Cambridge**: [here](#)

As far as additional hotel options in the Boston/Cambridge, MA area, please find them [here](#).

## **Map/Directions to MIT**

The best way to get from the Boston Logan International Airport (BOS) to MIT is by taxi. The ride takes approximately 20 min. and the costs is somewhere around \$40.00 USD.

The parking in Boston and Cambridge is very limited and can be expensive.

[Link to campus map with location of Building 34](#)

## **Agenda**

The tentative schedule is expected to begin from 8AM to 5PM EDT, and registration and breakfast at 8AM) [Tentative Agenda](#)

## **Dinner**

Dinner will follow the evening of November 3rd. This dinner is restricted to the Center's PI's and the Industrial and Government members and will start at 6PM. Evoo Restaurant (New American Cuisine) is located at 350 3rd street, Cambridge, MA. Restaurant's website [here](#).

## **MIT/MTL WebEx**

If you cannot attend the Annual Review, you can join the meeting through WebEx by emailing Joseph Baylon at ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)) for the WebEx information.

## **Presentations**

After the meeting, the WebEx video along with the speakers presentation slides will become available on our Center's website as soon as it becomes available.

### **Questions?**

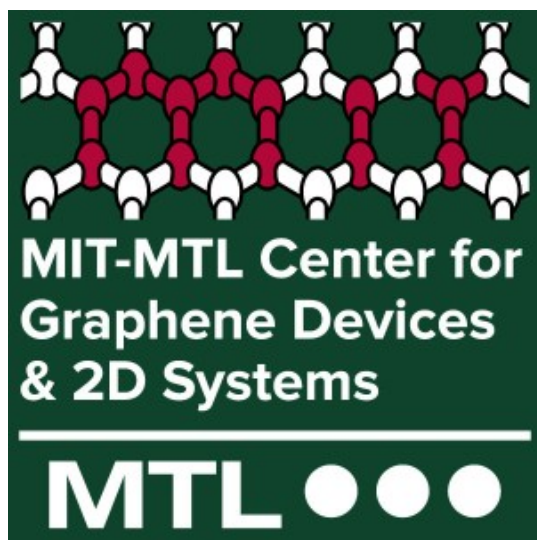
For any questions regarding the 2013 MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG) Annual Review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

# 2015 MIT-MTL Center for Graphene Devices & 2D Systems Annual Review

By jbaylon

September 21, 2015

Categories: Conference, Seminar



**Friday, October 23, 2015**

Massachusetts Institute of Technology

50 Vassar Street, Cambridge, Massachusetts, USA (see map [here](#))

Building 36, (RLE Allen/Haus Room) (36-428-36-462 combined)

Click the links below to download the PDF.

**\*Please note, the slides and video are MIT proprietary, please do not forward these talks to anyone outside the Center. Thank you.**

9:00-9:30 [Welcome and status of 2D Systems at MIT](#) Prof. Tomás Palacios

9:30-10:00

[Single-crystalline graphene and its application for semiconductor layer transfers](#) Prof. Jeehwan Kim

10:00-10:30 [Two dimensional materials and heterostructures through CVD synthesis](#) Prof. Jing Kong



10:45-11:15 [Quantum Science and Technology with Atomically-thin Materials](#) Prof. Pablo Jarillo-Herrero

11:15-11:45 [Single-Layer Nanoporous Graphene Membranes](#) Prof. Rohit Karnik

11:45-12:15 [More Possibilities for Layered Materials](#) Prof. Mildred Dresselhaus

14:15 -14:45 [Active 2D Material-based Nanophotonic Devices for Optical Interconnects](#) Prof. Dirk Englund

14:45- 15:15 [2D Transition Metal Dichalcogenides: Understanding Layer-Dependent Optoelectronic Properties and Vapor Synthesis](#) Mr. Ananth G. Rajan (Prof. Michael Strano's group)

15:15 – 15:45 [Toward Graphene Plasmon-Based Free-Electron IR to X-ray Sources](#) Dr. Ido Kaminer (Prof. Marin Soljacic's group)

16:00-16:30 [Structural design of 2D materials](#) Prof. Ju Li

16:30-17:00 [Growth and Preparation of 2D Nanostructures](#) (*slides only, no video*) Mr. Brent Keller (Prof. Jeffrey Grossman's Group)

### **QUESTIONS?**

For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

# The New Yorker: Feature Spotlight: Prof. Tomás Palacios

By jbaylon

December 19, 2014

Categories: News

## **Material Question: Graphene may be the most remarkable substance ever discovered. But what's it for?"**

By [John Colapinto](#) (Staff Writer with the New Yorker)



...Perhaps the most expansive thinker about the material's potential is Tomas Palacios, a Spanish scientist who runs the Center for Graphene Devices and 2D Systems, at M.I.T. Rather than using graphene to improve existing applications, as Tour's lab mostly does, Palacios is trying to build devices for a future world.

At thirty-six, Palacios has an undergraduate's reedy build and a gentle way of speaking that makes wildly ambitious notions seem plausible. As an electrical engineer, he aspires to "ubiquitous electronics," increasing "by a factor of one hundred" the number of electronic devices in our lives. From the perspective of his lab, the world would be greatly enhanced if every object, from windows to coffee cups, paper currency, and shoes, were embedded with energy harvesters, sensors, and light-emitting diodes, which allowed them to cheaply collect and transmit information. "Basically, everything around us will be able to convert itself into a display on demand," he told me, when I visited him recently. Palacios says that graphene could make all this possible; first, though, it must be integrated into those coffee cups and shoes... [Full article](#)

# MIT/ILP Institute Insider: Resource Spotlight: Prof. Tomas Palacios

By jbaylon

November 3, 2014

Categories: Uncategorized

## Extreme Materials and Ubiquitous Electronics

Tomás Palacios explores the application of novel materials in next-generation electronics to save energy and expand possibilities.

Nearly everyone seems to carry a cell phone or tablet. But if Tomás Palacios's vision of the future of electronics comes to bear, it will be increasingly difficult to separate electronics from all the other structures and materials surrounding us. An electrical engineer by training, Palacios, MIT Associate Professor of Electrical Engineering and Computer Science, develops new materials to bring electronic devices to the next level and beyond. "We are always trying to mix materials, engineering and physics to create a prototype device that can get people excited about new applications and opportunities," he says. [Read More](#)

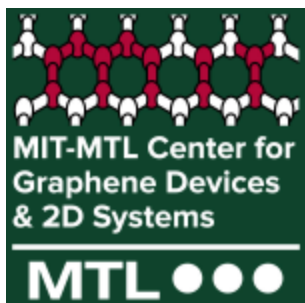
[Direct Link to Video](#)

## 2014 Annual Review (9/25/2014) Presentations & Videos

By jbaylon

September 25, 2014

Categories: News, Seminar



### 2014 MIT-MTL Center of Graphene Devices and 2D Systems Annual Review Meeting

***NOTE: Please remember that many of the results discussed during the review meeting are still unpublished. Therefore, we kindly ask to keep the information confidential and please do not distribute any of them. Thank you***

**Please click the links below to view each speaker's presentation, and the video of their talk.**

Thursday, September 25, 2014 Bldg. 36 – RLE Haus & Allen Rooms 428/462 (4th floor) – MIT (Cambridge, MA)

8:30-9:00 (Welcome and Status of 2D Systems at MIT) **Prof. Tomás Palacios** (click [PDF 1](#) [PDF 2](#)).

9:00-9:30 On-chip Graphene Optoelectronics **Prof. Dirk Englund** (click [PDF](#))

9:30-10:00 Spectroscopic Studies of Heavy Doping of Graphene **Prof. Mildred Dresselhaus** (click [PDF](#))

10:00-10:30 Plasmons in Graphene **Prof. Hrvoje Buljan (Prof. Marin Soljačić's group) (click [PDF](#))**

10:45-11:15 2D Metal-Organic Frameworks as Semiconductive Graphene Analogues Dr. Dennis Sheberla (Prof. Mircea Dincă's Group) (PDF) (**click [PDF](#)**)

11:15-11:45 Roll-to-Roll CVD Growth of Graphene Prof. John Hart (**PDF**) *Please email [ajhart@mit.edu](mailto:ajhart@mit.edu) for additional slides or the video*

11:45-12:15 Understanding the Layer Number Dependence of Graphene and MoS<sub>2</sub> Chemical and Optoelectronic Properties Prof. Michael Strano



(click [PDE](#))

12:15-13:45 Lunch/Poster Session (Album)

13:45-14:15 Understanding and Designing 2D Materials for Energy & Environmental Applications Mr. Priyank Kumar( Prof. Jeffrey Grossman's Group) (click [PDE](#))

14:15-14:45 Compact Model for Nanoscale Graphene Transistors Dr. Shaloo Rakheja: (Prof. Dimitri Antoniadis's Group) (**click [PDF](#)**)

14:45-15:15 Chemical Vapor Deposition Synthesis of Graphene and Related 2D Materials Prof. Jing Kong (**click [PDF](#)**)

15:15-15:45 Experimental Investigation of Mass Transport and Filtration Across Nanoporous Monolayer Graphene Membranes Prof. Rohit Karnik (**click [PDF](#)**)

16:00-16:30 Chargeless Currents in Graphene Superlattices Prof. Leonid Levitov (**click [PDF](#)**)

16:30-17:00 Transport and Optoelectronics in MoS2 and WSe2 Dr. Hugh Churchill (Prof. Pablo Jarillo Herrero's Group) (**click [PDF](#)**)

## Special Seminar (9.11.14): Prof. Jose Luis Pau (University Autonoma de Madrid, Spain)

By jbaylon

September 15, 2014

Categories: News, Seminar

**MIT-MTL Center for Graphene Devices & 2D Systems**

**Special Seminar**

**Dielectrophoretic assembly of nanowires and flakes of 2D materials for high-throughput fabrication of electronic devices**



*Professor José Luis Pau Vizcaíno  
(Universidad Autónoma de Madrid, Spain)*

Thursday, September 11, 2014

**Jackson room (38-466)**

1:00pm – 2:00pm

*Host: Prof. Tomás Palacios*

[PDF slides](#)

**Abstract:** Dielectrophoresis (DEP) is the movement of suspensoid particles relative to that of the solvent in non-uniform electric fields. The force induced in the particles can be used to attract them to specific sites defined by pairs of electrodes separated a few microns. The aim of this talk is to present our last results on the development of NW devices fabricated by DEP, with special focus on the conditions that allow the optimal trapping and orientation of NWs. Dielectrophoretic flow systems will be introduced as a means to integrate NWs on glass, silicon or PCB substrates. The use of those systems has led to the development of NW devices, including single NW photoconductors, n-p-n heterojunction photodiodes, and more recently, tunnel photodiodes. Preliminary experiments carried out to align flakes of graphene oxide will be also presented. Finally, the impact on the device performance of parameters such as surface charge density, NW size, and contact characteristics will be discussed.

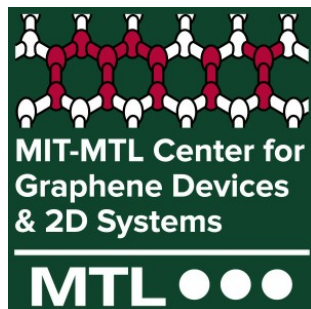
**Biography: Prof. José Luis Pau Vizcaíno** is an Assistant Professor of Electronics at Universidad Autónoma de Madrid (UAM). He received his BS degree from UAM in 1998 and his PhD degree from Universidad Politécnica de Madrid (UPM) in 2003. In 2008, he receives a Ramon y Cajal Fellowship Award from the Spanish Ministry of Education and Science to enroll the Applied Physics Department at UAM, becoming a permanent Faculty member in 2013. His current research interests include the processing of nanomaterials for the development of light detectors and sensors. He has over 80 peer-reviewed publications and an H-index of 17 (WoK). His works have been cited more than 800 times.

# 2014 Review MIT-MTL Center for Graphene Devices & 2D Systems Annual Review (September 25, 2014)

By jbaylon

July 18, 2014

Categories: Conference, Seminar



Member companies are cordially invited to attend the annual review of the MIT-MTL Center for Graphene Devices & 2D Systems. The review will be held at the Massachusetts Institute of Technology (MIT) on Thursday, September 25, 2014. The review will finish with a dinner on the evening of September 25th.

## Thursday, September 25, 2014

Massachusetts Institute of Technology

50 Vassar Street, Cambridge, Massachusetts, USA

Building 36, (RLE Adler/Haus Room) (36-428-36-462 combined)

## [Registration](#)

Registration is now closed.

## [Hotel Information](#)

A block of rooms for Sept. 24-25th meeting has been reserved at the following hotels: Cambridge Residence Inn and Boston Marriott Cambridge.

**Cambridge Residence Inn** (Hotel details [here](#)) **Boston Marriott Cambridge** (Hotel details [here](#)) MIT block/discount rates at both hotels are \$308 a night. The cut off date for the MIT discount rate is **Wednesday, August 27th**, so early registration is recommended.

## [Other Accommodations in the Boston/Cambridge Area](#)

## [Map](#)

The best way to get from Boston Logan International Airport (BOS) to MIT and the Marriott hotel is by taxi. The ride takes approximately 20 min. and costs ~\$25-40.

Parking in Boston and Cambridge is very limited and expensive.

[Link to campus map with location of Building 34](#)

[How to walk from Marriott hotel to meeting location.](#)

## [Agenda](#)

Click here for details: [Agenda 9.25.13](#)

Dinner will be available for Industry members and the center's faculty starting at 6:00pm at a local restaurant in Cambridge, MA. (More details will soon become available.)

## [Webex](#)

You can find information on how to join the meeting through Webex ( [link](#) is reserved for the members).

## [Presentations](#)

Presentations will be readily available immediately after the review.

## [Questions?](#)

For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

## 2014 Annual Review (WebEx link)

By jbaylon

July 18, 2014

Categories: Uncategorized

Topic: MIT/MTL Center for Graphene Devices & 2D Systems Annual Review

Date: Thursday, September 25, 2014

Time: 8:30 am, Eastern Daylight Time (New York, GMT-04:00)

Meeting Number: 641 015 073

Meeting Password: MITGraphene

---

To join the online meeting (Now from mobile devices!)

1. Go to <https://mit.webex.com/mit/j.php?MTID=m4ceb9735e974509bdcbaa8d6f1156cd2>
2. If requested, enter your name and email address.
3. If a password is required, enter the meeting password: MITGraphene
4. Click “Join”.
5. Follow the instructions that appear on your screen.

To view in other time zones or languages, please click the link:

<https://mit.webex.com/mit/j.php?MTID=m58babb258288a5bbf887dee4e33a0395>

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To join the audio conference only

To receive a call back, provide your phone number when you join the meeting, or call the number below and enter the access code.

US Toll Number: +1-617-324-0000

Access code:641 015 073

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For assistance

1. Go to <https://mit.webex.com/mit/mc>
2. On the left navigation bar, click “Support”.



You can contact me at:

[jbaylon@mit.edu](mailto:jbaylon@mit.edu)

1-617-2530987

To update this meeting to your calendar program (for example Microsoft Outlook), click this link:

<https://mit.webex.com/mit/j.php?MTID=m693f5e15187eafd31a623e666187ab51>

WebEx will automatically setup Meeting Manager for Windows the first time you join a meeting. To save time, you can setup prior to the meeting by clicking this link:

<https://mit.webex.com/mit/meetingcenter/mcsetup.php>

The playback of UCF (Universal Communications Format) rich media files requires appropriate players. To view this type of rich media files in the meeting, please check whether you have the players installed on your computer by going to <https://mit.webex.com/mit/systemdiagnosis.php>.

<http://www.mit.edu>

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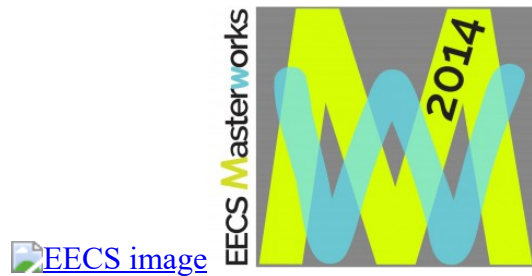
**IMPORTANT NOTICE:** This WebEx service includes a feature that allows audio and any documents and other materials exchanged or viewed during the session to be recorded. By joining this session, you automatically consent to such recordings. If you do not consent to the recording, discuss your concerns with the meeting host prior to the start of the recording or do not join the session. Please note that any such recordings may be subject to discovery in the event of litigation.

## EECScon 2014 and Masterworks 2014 raise awareness of high-level student research

By jbaylon

May 30, 2014

Categories: Uncategorized



EECScon 2014 and Masterworks 2014 raise awareness of high-level student research

Two consecutive venues provide industry, faculty and student guests with full range and depth of research

Whether it is presented in a formal conference hall at the Kendall Marriott or accompanied with large servings of ice cream along the Charles M. Vest Student Street, research carried out by students in the MIT Department of Electrical Engineering and Computer Science (EECS) has gained a strong professional presence around MIT and beyond. This year, EECS decided to pair its cornerstone venues for showcasing student research — EECScon and Masterworks — in one afternoon (April 22), capturing a large and interested group of guests including fellow students, postdocs, research staff, faculty, and industry visitors ([Read More](#))

# Graphene and Graphene Heterostructures for Electronics: What is good? What is not?

By jbaylon

March 24, 2014

Categories: Uncategorized

## MIT-MTL Center for Graphene Devices & 2D Systems Special Seminar

### Graphene and Graphene Heterostructures for Electronics: What is good? What is not?

*Professor Gianluca Fiori*

*University of Pisa*

*Italy*

Monday, March 24, 2014

**RLE 36-462 (Allen Room)**

11:00AM-12:00PM

*Host: Prof. Tomás Palacios*

In this talk, we will provide an insight on the performance of graphene based devices by means of numerical simulations. In particular, we will focus on the perspectives of this new technology for electronic applications, outlining the most promising solutions, as well as those, which will never comply with Industry requirements. Attention will be posed on vertical and lateral heterostructures, as well as bilayer graphene based devices for both digital and analog applications.

**Dr. Gianluca Fiori** is an Assistant Professor at the University of Pisa. His main field of activity includes the development of models and codes for the simulation of CMOS transistors with ultra-short channel and innovative devices based on new architectures and new materials. In particular, at the beginning he focused his attention on quantum confinement, short channel effects and the random distribution of dopants in Silicon MOSFETs: part of

these models have been included into the commercial device simulator ATLAS, within a collaboration, in Autumn 2002, with Silvaco International, one of the worldwide leading developers and vendors of Technology Computer Aided Design (TCAD) software dedicated to Process and Device Simulation. Due to the increased interest in carbon electronics, Dr. Fiori has focused his attention on carbon based devices, through repeated research visits (in 2004, 2005 and 2008) at the Network for Computational Nanotechnology, at Purdue University, (IN-USA). Within these activities, he has developed codes based on semi-empirical tight binding Hamiltonians and the Non-Equilibrium Green's Function Formalism (NEGF). Dr. Fiori has recently released, under the BSD open-source license, the in-house developed code NanoTCAD ViDES (<http://vides.nanotcad.com>), which includes most of the physical models implemented during his research activity. More information available at <http://gianlucafiori.org>

# BACON+-CIQM

By jbaylon

March 21, 2014

Categories: Seminar, Uncategorized

This Center focuses the highly successful Boston Area CarBon Nanoscience Meetings (BACON) and Center for Integrated Quantum Materials(CIQM) and added topics on additional Quantum Materials to form BACON+ CIQM Meetings.

These monthly meetings bring together researchers in the Boston and Washington DC areas to discuss their recent work and exchange ideas about carbon nanotube, graphene, topological insulator, and diamond research in an informal setting. These meetings consists of two talks (typically by students or postdocs) along with lunch and a coffee break. The talks are open to everyone and will involve participant speakers from MIT, Harvard and Howard University. Visit the full BACON+ website [here](#)

**This seminar is posted here for the members of the MIT-MTL Center for Graphene Devices and 2D Systems. They should be treated in a confidential manner and should not be distributed outside the Center.**

## Meeting Schedule

Friday, April 25, 2014

12:00pm-1:30pm

### **BACON+ Meeting @ Howard**

Broadcast LIVE form the USA Science and Engineering Festival

*A Diamond Rainbow*

**Birgit Hausmann** (Loncar Group , Harvard) [PDF slides](#)

*Moire patterns in the world's thinnest cloth*

**Andrea Young** (Ashoori Group, MIT) [PDF slides](#)

***Sponsored by CIQM***

\*\*\*\*\*

Friday, March 21st, 2014  
12:00pm-1:30pm  
**BACON+ Meeting @ MIT**  
Speakers:

*Scanning Tunneling Spectroscopy and Imaging of Topological Kondo Insulators*  
**Yang He** (Hoffman Group, Harvard) [PDF slides](#)

*Electrically tunable interactions between graphene and optical emitters.*  
**Lucas Orona** (Jarillo-Herrero Group, MIT / Koppens Group, ICFO) [PDF slides](#)  
Location: MIT Duboc Seminar Room, [4-331](#) (Building 4, 3rd floor, room 331)  
**Sponsored by CIQM**

\*\*\*\*\*

Friday, February 14th, 2014

12:00pm-1:30pm

**BACON+ Meeting @ Harvard**

*Electrostatic Coupling Between the Surface States of a Topological Insulator*

**Valla Fatemi** (Jarillo-Herrero Group, MIT) [PDF slides](#)

*Excitonic properties of single-layer MoS<sub>2</sub>*

**Cosmi Yuxuan Lin** (Palacios Group, MIT) [PDF slides](#)

Location: Harvard, Maxwell Dworkin 119

*Sponsored by CIQM*

\*\*\*\*\*

Friday, Nov 22nd, 2013

12:00pm-1:30pm

**BACON+ Meeting @ MIT**

*Heteroepitaxial Growth of Diamond by Hot Filament Chemical Vapor Deposition*

**Bokani Mtengi** (Gary Harris Group, Howard University) [PDF slides](#)

*Induced Superconductivity in the Quantum Spin Hall Edge*

**Sean Hart** (Yacoby Group, Harvard) [PDF slides](#)

Location: MIT Duboc Seminar Room, [4-331](#) (Building 4, 3rd floor, room 331)



\*\*\*\*\*

Friday, Oct 18th, 2013

12:00pm-1:30pm

**BACON+ Meeting @ Harvard**

*Spin-filtered Edge States with an Electrically Tunable Gap in a Two-Dimensional Topological Crystalline Insulator*

**Tim Hsieh** (Fu Group, MIT) [PDF slides](#)

*Transport and Optoelectronics in Transition Metal Dichalcogenides*

**Hugh Churchill** (Jarillo-Herrero Group, MIT) [PDF slides](#)

Location: Harvard, Maxwell Dworkin G125 ([map](#))

\*\*\*\*\*

## 2-D Electronics with Transition Metal Dichalcogenides: Progress and Prospect

By jbaylon

February 6, 2014

Categories: Uncategorized



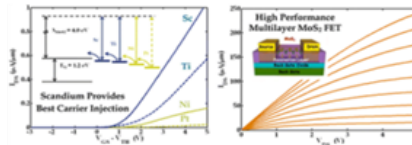
**Biography:** Dr. Das received his bachelor degree in Electronics and Telecommunication Engineering from Jadavpur University, India in 2003. He finished his Doctorate degree in the area of Micro and Nano Technology from the department of Electrical and Computer Engineering in May 2013 at Purdue University. His research focuses on exploring the device physics of low dimensional systems like nanotubes, nanowires, graphene and more recently the two dimensional layered Transition Metal Dichalcogenides for low power and high speed electronics applications.

**Abstract:** Low dimensional systems, by the virtue of their novel material properties and excellent electrostatic integrity, provide immense opportunities not only to explore fundamental physics but also to solve critical technological problems. One dimensional nanotubes, quasi one dimensional nanowires, two dimensional atomistically thin layered materials like graphene, hexagonal boron nitride and the more recently the rich family of transition metal di-chalcogenides (TMDs) comprising of  $\text{MoS}_2$ ,  $\text{WSe}_2$ ,  $\text{MoSe}_2$  and many more are prime examples of such low dimensional systems.

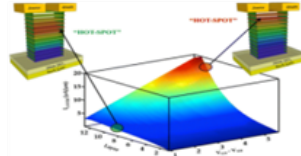
Cover Article  
S. Das, et al. *Rapid Research Letters* 7, 268-273, (2013).



Das, S. et al. *Nano letters*  
13 (1), 100-105 (2013).



Das, S. et al. *Nano letters*  
13 (7), 3396-3402 (2013).



In my talk I will first discuss how to connect these two dimensional ultra-thin TMDs to the “outside” world through ideal three dimensional metal contacts in order to capitalize on their ultimate potential. Then I will provide experimental evidences that strongly suggest the feasibility of aggressive channel length scaling of field effect transistors (FET) based on TMDs beyond the 10nm CMOS technology node. I will also demonstrate Schottky barrier tunneling phenomenon in back gated MoS<sub>2</sub> FETs and band to band tunneling phenomenon in partially top gated WSe<sub>2</sub> FETs, which will facilitate the implementation of TMDs for ultra-low power electronics. And finally I will show the effect of temperature, pressure, strain and light on the transport properties of the TMDs which can potentially shift the paradigm of conventional electronics.

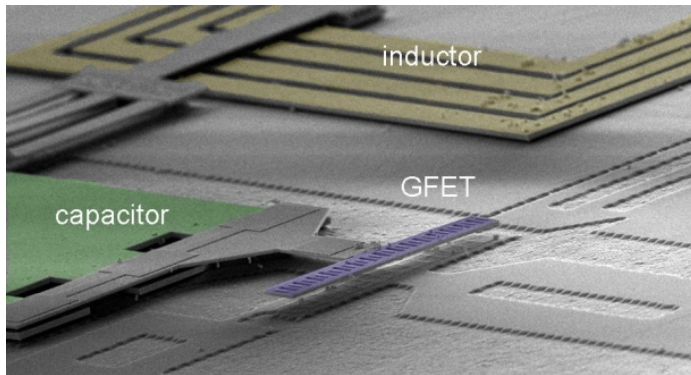
1. Center for Nanoscale Material, Argonne National Laboratory, Lemont, Illinois, 60439, USA
2. Birck Nanotechnology Center, Purdue University, West Lafayette, Indiana, 47907, USA

## IBM's graphene-based circuitry could boost wireless communications

By jbaylon

January 31, 2014

Categories: News



Researchers at Big Blue improved graphene-based radio receiver performance by attaching the fragile form of carbon material at the end of the chipmaking process. Read more from CNET: News [here](#)

# Development of Graphene-based RF Energy Harvesters on Paper

By jbaylon

December 21, 2013

Categories: News

## Development of Graphene-based RF Energy Harvesters on Paper



Faculty Advisor: Tomas Palacios

Mentor(s): Lili Yu

Contact e-mail: [tpalacios@mit.edu](mailto:tpalacios@mit.edu)

Research Area(s): Materials and Devices

In this project, we will use graphene and other two-dimensional materials to demonstrate RF energy harvesting devices on a flexible substrate such as PEN or paper. These devices will be one of the key components in a new generation of high performance and low cost sensors.

The main tasks of this project are:

1. Design and simulation of proposed RF energy harvesting device.
2. Transfer of graphene material to paper or PEN.
3. Fabrication of graphene devices at the Microsystems Technology Laboratories.
4. Characterization of the fabricated grapheneRF energy harvester.

[See more projects](#)

## MIT EECS Fall 2013 Award: Dr. Han Wang

By jbaylon

November 27, 2013

Categories: Uncategorized



November 18, 2013

Congratulations to Dr. Han Wang who received the Jin-Au Kong Doctoral Thesis Award (first prize) with the Electrical Engineering and Computer Science Department at the Massachusetts Institute of Technology(MIT).

### “Two-Dimensional Materials for Electronic Application”

The award was presented by Department Head of the EECS Department, Prof. Anantha Chandrakasan and Microsystems Technology Laboratories (MTL) Director, Prof. Jesus del Alamo, and supervisor Prof. Tomas Palacios, Associate Professor and Director of the MIT-MTL Center for Graphene Devices and 2D Systems.

## The Spanish Royal Academy of Engineering Award

By jbaylon

November 26, 2013

Categories: News



The Spanish Royal Academy of Engineering has awarded the “Agustin de Betancourt” award to Prof. Tomás Palacios. This award, the most prestigious given in Spain to an engineer less than 36 years old, recognizes Prof. Palacios’ work on nanotechnologies applied to high frequency electronic devices based on GaN and graphene. The award was presented by the Academy’s President, Prof. Elias Fereres, on November 26, 2013.

Prof. Palacios poses with Prof. Elias Fereres (left), President of the Spanish Royal Academy of Engineering, and Mr. Rafael del Pino (right), member of the MIT Corporation and CEO of Ferrovial.

Congratulations Tomás for yet another award in 2013!



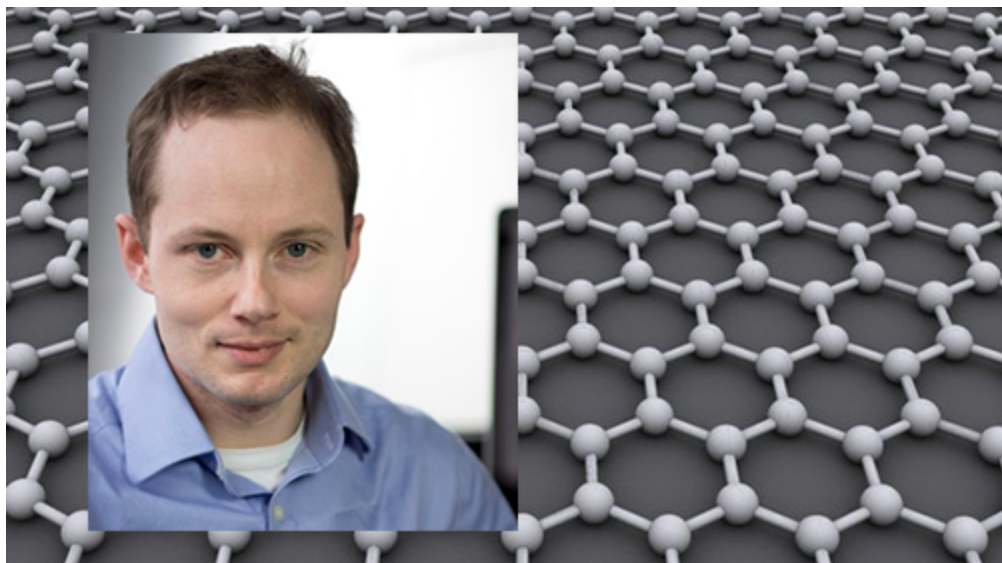
## Graphene: information at e-speed. Englund discusses

By jbaylon

November 21, 2013

Categories: News

## Graphene: information at e-speed. Englund discusses



“There’s a very strong need for that computer to turn electrical signals into optical signals very efficiently,” [Dirk Englund](#) the Jamieson Career Development Assistant Professor in the MIT Electrical Engineering and Computer Science Department explained to Marketplace Tech. Englund was approached to discuss his work in the Quantum Photonics Laboratory, where computer chips made of graphene and silicon are encouraging information to move near the speed of light.

Read more in the [Nov. 21, 2013, Marketplace Tech feature](#) titled “Graphene: OMG! The magic material that an elephant standing on a pencil couldn’t break.”

# 2013 MIT-MTL Center of Graphene Devices and 2D Systems Annual Review Presentations & Video

By jbaylon  
November 8, 2013  
Categories: News, Seminar



50 Vassar St., Cambridge, MA Bldg. 34, Room 401A&B (4<sup>th</sup> floor)

Friday, November 1, 2013

## AGENDA

***NOTE: Please remember that many of the results discussed during the review meeting are still unpublished. Therefore, we kindly ask to keep the information confidential and please do not distribute any of them. Thank you***

**Please click the links below to view each speaker's presentation, and the video of the conference is coming soon.**

8:45-9:30 Prof. Tomás Palacios: [Recent developments in graphene and MoS2 deviceter – Intro & 2nd Talk](#)

9:30-10:00 Prof. Markus Buehler: [Molecular mechanics of graphene and graphene- based materials](#)

10:00-10:30 Prof. Tim Swager: **Chemical Functionalization of Carbon Nanotubes and Graphenes**

10:30-11:00 Dr. Qing Hua Wang (Prof. Michael Strano's group): [The Use of Doping Trajectories in the Chemistry and Electronic Applications of Graphene and Other 2D Materials](#)

11:10-11:50 Prof. Jeff Grossman: **Functionalized Graphene for Energy and Water Applications \*\*Coming soon**

11:50-12:20 Dr. Shaloo Rakeja (Prof. Dimitri Antoniadis's group): [A unified charge-current compact model for ambipolar operation in quasi-ballistic graphene transistors](#)

13:00-13:30 Prof. Rohit Karnik: [Mass Transport Across Nanoporous Graphene Membranes](#)

13:30-14:00 Prof. Jing Kong: [Chemical Vapor Deposition synthesis of bilayer graphene](#)

14:00-14:30 Prof. Pablo Jarillo Herrero: [Quantum Transport and optoelectronics with 2D materials](#)

14:30-15:00 Prof. John Hart: **A Concentric Tube Reactor for Roll-to-Roll Manufacturing of 2D materials \*\*Coming soon**

15:15-15:45 Prof. Leonid Levitov: [Energy waves in graphene](#)

15:45-16:15 Mr. Ren Jye Shiue(Prof. Dirk Englung's group): [Chip-integrated graphene optoelectronics for light modulation and photodetection](#)

16:15-16:45 Prof. Tomas Palacios (Caucus and Feedback)

# 2013 MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG) Review

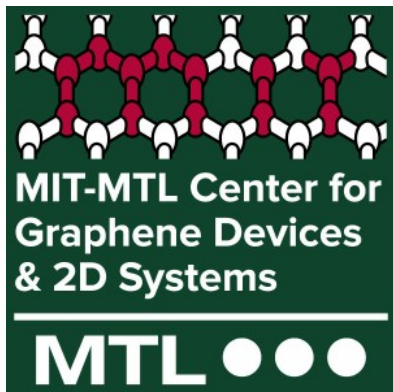
By jbaylon

August 27, 2013

Categories: Uncategorized

Slide 1

 [2012 Graphene Review Meeting](#) 



Welcome Members of the MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG):

You are cordially invited to attend the 2013 Review, which is being held at the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts (USA).

**Date: Friday, November 1, 2013, 9:00 AM EDT (Breakfast/Registration at 8:00 AM EDT)**

### **[November 1, 2013 \(Agenda\)](#)**

*Venue:* Massachusetts Institute of Technology ([MIT](#))

*Address:* 50 Vassar Street, Cambridge, Massachusetts (USA)

*Meeting Location :* Building 34, EECS Grier rooms 401A &B \*The exact directions to the meeting location is [here](#)

### **Registration**

Registration is now closed.

### **Hotel Information**

#### **Residence Inn Boston/Cambridge and Marriott Boston/Cambridge**

**Residence Inn Boston Cambridge** (Registration link, please click [here](#) to reserve a room.)

**6 Cambridge Center, Cambridge, MA**

[Hotel added services](#)

**Ph: (617) 349-0700**

**Marriott Boston Cambridge** (Registration link, please click [here](#) to reserve a room.)

**Two Cambridge Center, 50 Broadway, Cambridge, MA**

[Hotel added services](#)

**Ph: (617) 494-6600**

To book with them directly, please go to **Residence Inn Boston/Cambridge:** [here](#), or **Marriott Boston/Cambridge:** [here](#) (Note: The special MIT rate has expired as of October 10, 2013)

As far as additional hotel options in the Boston/Cambridge, MA area, please find them [here](#).

### **Map/Directions to MIT**

The best way to get from the Boston Logan International Airport (BOS) to MIT is by taxi. The ride takes approximately 20 min. and the costs is somewhere around \$40.00 USD.

The parking in Boston and Cambridge is very limited and can be expensive.

[Link to campus map with location of Building 34](#)

## **Agenda**

[November 1, 2013 \(Agenda\)](#) (The tentative schedule is expected to begin from 9AM to 4PM EDT, and registration and breakfast at 8AM) Breakfast and Lunch prepared by Bakers' Best Catering.

## **Dinner**

Dinner will follow the evening following the Annual Review. This dinner is restricted to the Center's PI's and the Industrial and Government members and will start at 6PM. Evoo Restaurant (New American Cuisine) is located at 350 3rd street, Cambridge, MA. Restaurant's website [here](#).

## **MIT/MTL WebEx**

If you cannot attend the Annual Review, you can join the meeting through WebEx by clicking [here](#) (\*Note, you must log in with your member username and password to view the WebEx information on our password protected website). Please email, Mr. Joseph Baylon at ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)) for the WebEx information, if you're interested.

## **Presentations**

After the meeting, the WebEx video along with the speakers presentation slides will become available on our Center's website as soon as it becomes available.

## **Questions?**

For any questions regarding the 2013 MIT-MTL Center for Graphene Devices and 2D Systems (MIT-CG) Annual Review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

## July 3, 2013: Tomas Palacios featured by MIT for exploring new materials in electronics

By jbaylon

July 5, 2013

Categories: News

July 3, 2013



Read about [Tomás Palacios](#), the Emmanuel E. Landsman Associate Professor of Electrical Engineering and Computer Science at MIT, where he is a principal investigator in the Microsystems Technology Laboratories (MTL) in the July 3, 2013 MIT News Office article by Larry Hardesty titled “High potential – Tomás Palacios investigates use of ‘extreme materials’ in electronics, which could reduce energy consumption and make computers far faster,” posted below in its entirety. [Read More](#)

## Dr. Han Wang: 2D Materials for Electronics Application

By jbaylon

July 5, 2013

Categories: Uncategorized

 [Han Wang](#)

Han Wang received the B.A. and M.Eng. degrees in electrical and information science, both with highest honors, from Cambridge University, England, in 2006 and 2007. He obtain his Ph.D. degree in Electrical Engineering and Computer Science at Massachusetts Institute of Technology in 2013. He is currently with the Nanoscale Science and Technology Group at IBM T. J. Watson Research Center in Yorktown Heights, NY. Mr. Wang has authored or coauthored more than 40 publications in distinguished journals and conferences and 1 patent. His work has been recognized with multiple awards including Roger A. Haken Best Paper Award in IEDM 2012, International Conference on Compound Semiconductor Manufacturing Technology (CS MANTECH) Best Student Paper Award 2010, Cambridge University Agilent Prize, and numerous fellowships.



## **U.K. to spend \$120 million on graphene institute**

By jbaylon

September 25, 2012

Categories: Uncategorized

LONDON – The U.K. government has said it will spend £70 million (about \$120 million) to fund a national institute of graphene research and commercialization activities, in Manchester, in the northwest of England.

[See More](#)

## Graphene, move over – meet Molybdenum Disulfide

By jbaylon

August 30, 2012

Categories: News, Uncategorized

As the wonders of graphene have become a part of the new electronics fabric of tomorrow's devices, the possibilities for use of other 2-D materials – like graphene just one atom thick – are being revealed. In particular, EECS graduate students Han Wang and Lili Yu working with Tomas Palacios, the Emmanuel E. Landsman Associate Professor of electrical engineering and computer science have discovered that molybdenum disulfide (MoS<sub>2</sub>) has properties that allow its successful application in a variety of electronic components. Their work, which follows on work by researchers at the Swiss university EPFL and work under Jing Kong the MIT ITT Career Development Associate Professor of Electrical Engineering, is reported in the journal Nano Letters. ([Read More](#))

## One-molecule-thick material has big advantages (MIT News)

By jbaylon

August 24, 2012

Categories: Uncategorized

### One-molecule-thick material has big advantages

Diagram shows the flat-sheet structure of the material used by the MIT team, molybdenum disulfide. Molybdenum atoms are shown in teal, and sulfur atoms in yellow.

Image courtesy of Wang et al.

The discovery of graphene, a material just one atom thick and possessing exceptional strength and other novel properties, started an avalanche of research around its use for everything from electronics to optics to structural materials. But new research suggests that was just the beginning: A whole family of two-dimensional materials may open up even broader possibilities for applications that could change many aspects of modern life.

[Read More](#)

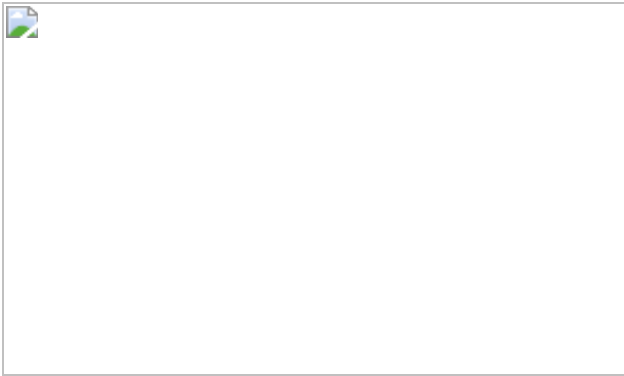
## A new approach to water desalination

By tpalacios

July 2, 2012

Categories: Paper

MIT researchers are using graphene layers to create a new kind of filtration material that can be far more efficient and possibly less expensive than existing desalination systems. The details of this new technology are explained in a recent paper in the journal NanoLetters [here](#). (The paper is also available in the password protected part of our website for our members).



Graphic: *David Cohen-Tanugi*

## 2012 MTL MIT Graphene Review Meeting Presentations

By jbaylon

April 30, 2012

Categories: Uncategorized

To view the presentations, please login your username and password and then [click here](#).

# 2012 MIT MTL Graphene Review Final Presentations & Attendees

By jbaylon

April 30, 2012

Categories: Review, Uncategorized

## MIT MTL Graphene Center

### Review Meeting

50 Vassar St., Bldg. 34, Room 401 (4<sup>th</sup> floor)

Cambridge, March 23<sup>rd</sup>, 2012

### AGENDA

***NOTE: Please remember that many of the results discussed during the review meeting are still unpublished. Therefore, please do not distribute them. Thank you.***

8:00-9:00 Registration and Breakfast

9:00-9:15 Prof. Tomás Palacios: [Welcoming Remarks](#)

9:15-9:45 Prof. Jing Kong: [Fabrication of graphene and related 2D materials](#)

9:45-10:15 Qing Hua Wang(Strano's Group): [Graphene chemistry](#)

10:15-10:45 Prof. Jeffrey C. Grossman: [Understanding and design of graphene-based materials for applications in energy conversion and storage](#)

10:45-11:05 Coffee break

11:05-11:15 Justin Song(Levitov's Group): [Hot charge carriers and optoelectronics in graphene](#)

11:15-11:30 Rahul Nandkishore(Levitov's Group): [Spontaneously ordered electronic states in graphene](#) Nature Physics <http://www.nature.com/nphys/journal/v8/n2/index.html>

11:30-12:00 Zhao Qin(Buehler's Group): [Molecular modeling of graphene structure, self-assembly and mechanics](#)

12:00-13:30 Lunch and Poster Session

13:30-14:00 Prof. Pablo Jarillo-Herrero: [Graphene Optoelectronics](#)

14:00-14:15 Sungjae Ha and Allen Hsu(Chandrakasan's and Palacios's Group): [Hybrid graphene-CMOS circuits](#)

14:15-14:45 Prof. Tomás Palacios: [Graphene chemical sensors, MoS<sub>2</sub>, and other materials](#)

14:45-15:05 Prof. Rohit Karnik: [Measuring molecular and ionic transport through graphene membranes](#)

15:05-15:25 Coffee break

15:25-16:30 Round Table: [Defining a road-map for graphene research and applications](#)

16:30-16:45 Caucus and feedback

## ATTENDEE LIST

You can find the [2012 Graphene Review List of Attendees](#). In [this](#) Picasa page, you can find some of the pictures taken during the event, courtesy of Valerie DiNardo.

# MIT MTL Graphene Center Review 2012

By jbaylon

February 13, 2012

Categories: Uncategorized

The members of the MIT Center for Graphene Devices and Systems are cordially invited to attend the forthcoming Center's review. The review will be held at the Massachusetts Institute of Technology (MIT) on March 23rd, 2012. The review will start with a dinner on the evening of March 22nd at the [The Blue Room](#) (additional details below).

*Date:* Friday, March 23rd, 2012

*Venue:* Massachusetts Institute of Technology  
50 Vassar Street, Building 34, Room 401 (for directions, please click [here](#))

## Registration

Online registration is required to attend the meeting. You can register [here](#). The registration will be open until **March 20th, 2012**, however early registration is strongly encouraged to help the organization of the workshop.

## Hotel Information

A block of rooms is being held at the The Kendall Hotel at the Engine 7 Firehouse at the special rate \$209 per night (March 22nd ) -Special Government rates is available on a first come basis. Total cost includes a full American Breakfast Buffet daily, high speed Internet access (wired and WiFi), pass to nearby fitness center, a hosted wine hour (Mon-Thurs) and local calls.

This hotel is near the MIT campus and less than 10 minutes walk from the Meeting venue. Please use the following hotel link to make your room reservation: [Kendall Hotel](#) at the Engine 7 Firehouse. For reservations, go to [www.kendallhotel.com](http://www.kendallhotel.com) – book a room – reservation wizard – type in dates – under promotional code type in MIT or GOV (for Government, ID's are required at check in and to receive the discount, you must be a federal government employee) **Space is limited so reserve a room today.**

To make a reservation by telephone call 1(866)556-1300 or 1(617)577-1300 and use the reservation code: MIT or GOV(for government employees only).

You can find additional options for hotel accommodation in the Boston/Cambridge area [here](#)

## Map



The best way to get from Boston Logan International Airport (BOS) to MIT and the Kendall Hotel is by taxi. The ride takes approximately 20 min. and costs ~\$25-40.

Parking in Boston and Cambridge is very limited and expensive.

[Link to campus map with location of Building 34](#)

[How to walk from Kendall hotel to meeting location.](#)

## **Agenda**

[MIT Graphene Review agenda.FINAL](#)

On March 22nd, the evening before the meeting, there will be a dinner starting at 6 pm at [The Blue Room](#) (One Kendall Square, Cambridge). \*\*The dinner is restricted to the Center's PI's and Industrial and Government members. The restaurant is within walking distance (8 min) from the MIT campus and the Kendall Hotel. You can find directions [here](#).

## **Webex**

You can find information on how to join the meeting through Webex [here](#) (the link requires access to the member-only section of this website).

## **Presentations**

After the meeting, you will be able to find all presentations here.

## **Questions?**

For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

# Samsung's world first graphene pilot factory

By tpalacios

December 25, 2011

Categories: News

Samsung Techwin (Samsung Techwin) has built a pilot line capable of producing large quantities of graphene. By actively investing in Korean companies for mass production of graphene is the next generation of materials, aiming to secure a future advantage.

Samsung Techwin, the month in graphene workshop held at the COEX in Samsung-dong, pilot production line for alternative graphene transparent electrodes 250 × 350 mm wide touch screen panel (for example production line) and 20 completed the construction revealed.

Using CVD, graphene materials were synthesized using the copper foil. The company started production after testing this month, next year plans to publish a 500 × 600 mm pilot line width of the area four times. The company will then proceed with the introduction of roll to roll process increased productivity.

Samsung Techwin has succeeded in fabricating large-area graphene films in collaboration with the 30-inch class Sungkyunkwan University, has been attracting attention worldwide. After the synthesis of graphene, this polyester (PE) films deposited on, the transparent electrode can be used in the film. Samsung Techwin is, RT (Rapid Thermal) – reduced to 300 for 40 minutes prior to the synthesis of graphene time to take advantage of CVD, also successfully be reduced to one-seventh.

Transparent electrode material is the main market for touchscreen smartphones has grown 22% annually in 2013, is expected to expand to 1 trillion won. Until now, the market accounted for most of the transparent electrode film ITO, flexible displays in that it uses rare metals has been pointed out the problem.

When using the graphene transparent electrodes, can be thinner than the transparent touch panel. The display can also be applied in turn, can also be increased by 20 to 30 percent of the display brightness.

Josunmin a senior researcher at Samsung Techwin is “Japanese companies and the U.S., and the CNT, has been actively developing new materials for transparent electrodes, such as nanowires silver ink” and “Graphene looking for a material of the transparent electrode is also Samsung Techwin invested in,” he said.

15 million won if successful pilot line running Samsung Techwin (about 105 million yen) 100,000 won more expensive transparent electrode film (about 7000 yen) is expected to be less able. This price level such as mobile phones, which can be applied to various fields.

In addition to Samsung Techwin, POSCO, chemical LG, N-Barotech, Dongjin (eastward) are challenging to mass production and graphene Semichem. Dongjin Semichem, the ink coating and printing process for graphene, POSCO is the low cost production technology of graphene, LG Chem, is looking for ways to apply to the display and rechargeable battery. Graphene also important patents, but more research is actively occupying the second place followed by South Korea to the United States.

Honbyonfui professor at Seoul National University, “Graphene is only characteristic not only good, great benefits in terms of resources because indium is a scarce resource that can substitute,” and “Korean companies are applying graphene to actively develop production technology have entered,” he said.

# Seminar: Electrical Interfacing of Cells with Graphene Field Effect Transistors

By jbaylon

December 1, 2011

Categories: Seminar

Jose A. Garrido

Walter Schottky Institut

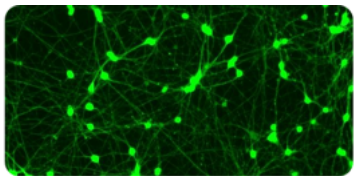
Technische Universität München, Germany

**When: Friday, December 2, 2011**

**Where: Grier Room A, 34-401A**

**Time: 10:00AM-11:00AM**

*The seminar was recorded and can be found [here](#).*



The development of the future generation of neuroprostheses will require the advancement of novel solid-state sensors with a further improvement in the signal detection capability, a superior stability in biological environments, and a more suitable compatibility with living tissue. Due to the maturity of Si technology, Si-based MOSFETs have been extensively used in previous decades for these applications. However, several disadvantages associated to this technology have motivated the search for more suitable materials. In this respect, the outstanding electronic and electrochemical performance of graphene holds great potential.

In this talk, I will discuss our work towards the development of a graphene-based platform for applications in bioelectronics. In particular, I will report on arrays of graphene solution-gated field effect transistors (G-SGFETs) which can enable an electrical synapse with electrogenic cells. Graphene SGFETs will be assessed based on their sensitivity and low-frequency noise performance. After discussing the biocompatibility of graphene, the ability of graphene SGFETs to transduce the electrical activity of living cells will be discussed.



JOSE A. GARRIDO received a PhD degree in engineering from the Technical University of Madrid in 2000. From 2001 to 2004, he was a Postdoc at the Walter Schottky Institut, Technische Universität München (TUM). He obtained his habilitation in experimental physics in 2010. Since 2011, Jose A. Garrido holds a privat dozent position at the Physics Department of the TUM. Among others, his current scientific interests include the use of carbon-based functional materials, such as diamond, graphene, and organic semiconductors for applications in biosensing and bioelectronics.

## BACON meeting@MIT, Friday, November 18th 2011

By undefined

November 16, 2011

Categories: Uncategorized

Dear Carbon Enthusiasts,

The next BACON meeting will be this Friday at MIT. This month there will be only one talk since afterwards is the ONR MURI review. As always food and drinks will be served beforehand.

Friday, November 18th 2011

12:00pm-12:45pm

**BACON Meeting @ MIT**

Speakers:

*Chemical imprint lithography on graphene: Controlling the substrate influence on electron transfer reactions*

**Qing Hua Wang** (Strano Group, MIT)

Location: [MIT,3-442](#)

*Sponsored by MIT CMSE*

The BACON monthly meetings bring together researchers in the Boston area to discuss their recent work and exchange ideas about carbon nanotube and graphene research in an informal setting. Each meeting consists of two talks (typically by students or postdocs) along with lunch and a coffee break. The talks are open to everyone and involve participant speakers from MIT, Harvard and Boston University.

<http://web.mit.edu/physics/cmxc/bacon/>

## Palacios wins PECASE award

By tpalacios

October 30, 2011

Categories: Awards, News

Tomas Palacios, the Emmanuel E. Landsman Associate Professor of Electrical Engineering and Computer Science and director of the MIT Center for Graphene Devices and Systems.

The White House [announced on Monday](#) that Tomas Palacios, the Emmanuel E. Landsman Associate Professor of Electrical Engineering and Computer Science and director of the MIT Center for Graphene Devices and Systems, was among the 94 young researchers awarded the 2011 Presidential Early Career Awards for Scientists and Engineers (PECASE), the highest honor bestowed by the U.S. government on science and engineering professionals in the early stages of their independent research careers.

The awards, established by President Bill Clinton in 1996, are coordinated by the Office of Science and Technology Policy within the Executive Office of the President. Sixteen Federal departments and agencies join together annually to nominate the most meritorious scientists and engineers. Awardees are selected for their pursuit of innovative research at the frontiers of science and technology and their commitment to community service as demonstrated through scientific leadership, public education or community outreach.

“It is a tremendous honor to have been selected for the PECASE award,” Palacios said. “It would have not been possible without the hard work and dedication of my students, and the support of my colleagues at MIT. This is an amazing place and I am humbled to be able to represent it in this award. I would also like to thank my sponsors at ONR, DARPA, ARL, DOE, ARPA-E, MARCO, NSF and other organizations and companies for supporting my research and helping us to push the limits of electronics.”

## Jarillo's and Levitov's groups demonstrate unusual thermoelectric response in graphene

By undefined

October 12, 2011

Categories: News, Paper

In research that has just been published in the journal *Science*, MIT researchers found that shining light on a sheet of graphene, treated so that it had two regions with different electrical properties, creates a temperature difference that, in turn, generates a current. Graphene heats inconsistently when illuminated by a laser, Jarillo-Herrero and his colleagues found.

Such differential heating has been observed before, but only under very special circumstances: either at ultralow temperatures (measured in thousandths of a degree above absolute zero), or when materials are blasted with intense energy from a high-power laser. This response in graphene, by contrast, occurs across a broad range of temperatures all the way up to room temperature, and with light no more intense than ordinary sunlight.

The research suggests graphene could be a very effective material for collecting solar energy, Jarillo-Herrero says, because it responds to a broad range of wavelengths; typical photovoltaic materials are limited to specific frequencies, or colors, of light. But more research will be needed, he says, adding, "It is still unclear if it could be used for efficient energy generation. It's too early to tell."

Philip Kim, an associate professor of physics at Columbia University who was not involved in this research, says the work represents "extremely important progress toward optoelectric and energy-harvesting applications" based on graphene. He adds that because of this team's work, "we now have better understanding of photo-generated hot electrons in graphene, excited by light."

The research was supported by the Air Force Office of Scientific Research, along with grants from the National Science Foundation and the Packard Foundation.

<http://www.sciencemag.org/content/early/2011/10/05/science.1211384>



# European Graphene Flagship Workshop

By undefined

September 23, 2011

Categories: Conference, News, Seminar

The European Union is currently evaluating the possibility of starting a 1 billion euro program on graphene. To define this potential program, a workshop will be held in Madrid (Spain) on **October 18th, 2011** (Registration Deadline: October 11th, 2011). This workshop aims at presenting the current state of the art and the opportunities of graphene-based materials/devices and related structures for future emerging technologies in the field of Information and Communication Technologies. Focus will be made on identifying the directions of promising innovation and disruptive technologies, including flexible electronics and transparent conductors, high frequency devices, digital logic, spintronics, nanoelectromechanical devices, ultimate sensors and bio-related applications. Challenges in the fields of ultimate microelectronics, energy dissipation and thermal management, advanced composites for aeronautics, and large scale graphene production and device integration will be discussed. All the information about the European Graphene Flagship program and the registration for the planning workshop can be found here:

<http://www.graphene-flagship.eu/GF/GFW.php>

## Slides from Kick-off Meeting

By tpalacios

August 13, 2011

Categories: Conference, Review, Seminar

The Kick-off meeting of the MIT/MTL Center for Graphene Devices and Systems was held on July 28th, 2011 at MIT. It was an exciting event, where more than 70 researchers from MIT, industry and the government met to discuss about the future of graphene and its more immediate applications.

The slides used by the different speakers during the kick-off meeting are available online [here](#). In that page, you can also find the attendee list. You have to login in to your Center's account to have access to this information.

## Webex information for Kick-off meeting

By tpalacios  
July 18, 2011  
Categories: Review

The information below provides instructions to setup webex for the kick-off meeting of the MIT/MTL Graphene Center:

Topic: Graphene Center – Kick-off Meeting  
Date: Thursday, July 28, 2011  
Time: 10:55 am, Eastern Daylight Time (New York, GMT-04:00)  
Meeting Number: 644 058 534  
Meeting Password: graphene

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To join the online meeting (Now from mobile devices!)

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1. Go to <https://mitweb.webex.com/mitweb/e.php?AT=MI&EventID=144902487&UID=0&PW=NNzFhODEwZjkw&RT=MiMxMQ%3D%3D>
2. If requested, enter your name and email address.
3. If a password is required, enter the meeting password: graphene
4. Click “Join”.
5. Follow the instructions that appear on your screen.

To view in other time zones or languages, please click the link:

<https://mitweb.webex.com/mitweb/e.php?AT=MI&EventID=144902487&UID=0&PW=NNzFhODEwZjkw&ORT=MiMxMQ%3D%3D>

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To join the audio conference only

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To receive a call back, provide your phone number when you join the meeting, or call the number below and enter the access code.

Call-in toll-free number (US/Canada): 1-866-699-3239

Call-in toll number (US/Canada): 1-408-792-6300

Global call-in numbers: <https://mitweb.webex.com/mitweb/globalcallin.php?serviceType=MC&ED=144902487&tollFree=1>

Toll-free dialing restrictions: [http://www.webex.com/pdf/tollfree\\_restrictions.pdf](http://www.webex.com/pdf/tollfree_restrictions.pdf)

Access code:644 058 534

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For assistance

- 
1. Go to <https://mitweb.webex.com/mitweb/mc>
  2. On the left navigation bar, click “Support”.

You can contact me at:

[tpalacios@mit.edu](mailto:tpalacios@mit.edu)

1-617-324

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# Kick-off Meeting of the MIT-MTL Center for Graphene Devices

By tpalacios

May 29, 2011

Categories: News, Review

Member companies are cordially invited to attend the kick-off meeting of the MIT-MTL Center for Graphene Devices and Systems. The review will be held at the Massachusetts Institute of Technology (MIT) on July 28th, 2011. The review will finish with a dinner in the evening of July 28th.

*Date:* July 28th, 2011

*Venue:* Massachusetts Institute of Technology

50 Vassar Street, Building 34, Room 401 (for directions, please click [here](#))

## Registration

Online registration is required to attend the meeting. You can register [here](#). The registration will be open until July 27, 2011, however early registration is strongly encouraged to help the organization of the workshop.

## Hotel Information

A block of rooms is being held at the Boston Marriott Cambridge Hotel at the special rate \$199 per night (July 27th – July 29th ). This hotel is near the MIT campus and less than 10 minutes walk from the Meeting venue.

Please, use the following hotel link to make your room reservation: [Boston Marriott Cambridge](#)

This link (and the special rate) will only be available until July 15th.

To make a reservation by telephone call 1(800)228-9290 or 1(617)494-6600 and use the reservation code: MIT Graphene Center (or “gragraa” if done through the website).

## [Other Accommodations in the Boston/Cambridge Area](#)

## Map

The best way to get from Boston Logan International Airport (BOS) to MIT and the Marriott hotel is by taxi. The ride takes approximately 20 min. and costs ~\$25-40.

Parking in Boston and Cambridge is very limited and expensive.

## [Link to campus map with location of Building 34](#)

## [How to walk from Marriott hotel to meeting location.](#)

## Agenda

You can find the agenda for the meeting [here](#).

On July 28th, after the meeting, there will be a dinner starting at 6 pm at [Legal Sea Foods](#) (5 Cambridge Center, Main st., Cambridge). The restaurant is within walking distance (5 min) from the MIT campus and the Marriott Hotel. You can find directions [here](#).

## Webex

You can find information on how to join the meeting through Webex [here](#) (the link requires registration).

## Presentations

After the meeting, you will be able to find all presentations here.

## Questions?

For any questions regarding this review, please contact Mr. Joseph Baylon ([jbaylon@mit.edu](mailto:jbaylon@mit.edu)).

# Graphene: The Road to Applications

By tpalacios

April 18, 2011

Categories: Conference, News

Graphene has become a major research topic in physical sciences in recent years and has many potential applications. However, realizing this promise will require translating academic graphene research to industry, where many practical roadblocks will need to be overcome before a clear advantage can be established over other technologies. This meeting, organized by the journal Nature, will focus on those applications of graphene that are most likely to reach the market within the next 5-10 years or sooner, and strategies to overcome the roadblocks along the way.

Prof. Tomas Palacios has been invited to speak at the Conference and to share with the Conference's attendees the vision of the MIT Graphene Center for future applications of graphene.

You can find all the information about the meeting [here](#).

# Graphene Week 2011

By tpalacios

April 17, 2011

Categories: Conference, News

The [Graphene Week 2011 conference](#) will be devoted to the science and technology of graphene, advances in its growth and chemical processing, manufacturing graphene-based devices and studies of electronic transport, investigation of physical properties using ARPES, STM and AFM, emerging applications of this new material. It will also address studies of optical properties of graphene and their applications in optoelectronics, graphene manufacturing by mechanical and chemical exfoliation, synthesis on SiC, and growth on metals and semiconductors.



## **BACON Meeting @ MIT – 4/8/2011**

By tpalacios

April 8, 2011

Categories: News, Seminar

Friday, April 8 2011 12:00pm-1:30pm

Talks:

Bilayer and Trilayer Graphene Solutions

Chih-Jen Shih (Blankschtein Group and Strano Group, MIT)

Gate defined quantum dots in suspended bilayer graphene

Monica Allen (Yacoby Group, Harvard)

Location: MIT Duboc Seminar Room, 4-331 (Building 4, 3rd floor, room 331)