Institute for Complex Adaptive Matter
ICAM Newsletter. October 2018.

Dear Colleagues,

We're delighted to send you the latest ICAM newsletter. These are exciting times for ICAM: the outlook is good, and much is happening that we want to share with you. We are coming off a summer of great research activity, including many wonderful workshops, schools and science exchanges. Our science exchange program QuantEmX is entering its third year, and has played a key role in many recent discoveries. Here are the contents in this Newsletter:

- Annual Meeting: Jan 14-16 2019
- New Website
- Recent workshops and Schools
- QuantEmX
- Visit to the National Science Foundation
- Meet our New Staff

Annual Meeting Hsinchu City, Taiwan

Save the date! We hope that each ICAM node can send a representative to the 2019 annual meeting of ICAM-I2CAM, to be held in Hsinchu, Taiwan 14-16 January 2019. This exciting meeting on the Pacific Rim, at a beautiful time of the year, will bring together the global ICAM community, combining important policy meetings of the steering

committees with Frontier Plenary Symposia in Soft, Biological and Quantum matter.

The final plenary session of the annual meeting will open a three day " Frontiers in Quantum Matter Workshop" , 16-18 January, 2018. co-hosted by ICAM, the NCTS and Institute of Physics, Academic Sinica. Details of the full set of invited talks, and the registration page will be available on the website shortly.

New ICAM-I2CAM Website

ICAM has a new website! The old website served us for more than 10 years, and needed to be completely re-written to bring it up to modern web-standards. This considerable task was carried out by the very talented UC Davis Students Shrimathi Vetri and Courtney Jeung. The transformation of the website was seamlessly completed in early September. Please visit the new website (icam-i2cam.org) and encourage your colleagues to register their membership. Registration is required to apply for ICAM workshops and QuantEmX fellowships.

We will also be asking you to help us update the information about your node in the near future.

News from Workshops and Schools

In the past year, ICAM has held more than 20 workshops and schools, across the full range of emergent phenomena, from Active Colloids with Order (Phoenix, Arizona, 1-3 April), the Interface between mechanics and physics (Cargese I2CAM summer school 7-17th August) , Fundamentals of quantum materials (School on quantum materials, U. Maryland, 9-15 January

2018) to Transport and Chaos in Condensed Matter and Holography (Workshop, Nordita, Stockholm, Aug 20-Sept 14).

One highlight of our summer activities are the annual I2CAM summer school in Cargese. Together with the Institute d'Etudes Scientifique de Cargese, ICAM cohosts an annual school which rotates between Soft, Biological and Quantum Matter. Cargese is a small fishing village on the west coast of Corsica, France. The outstanding facilities of the IES site, and its location make this a very inspiring place to learn physics.

This year's ICAM-Cargese school, "MEPHISTO", an intriguing acronym for MEchanics and Physics of STretchable Objects was organized by Jasna Brujic(NYU), Michael Falk (Johns Hopkins) and Laurent Ponson (Sorbonne University). The school brought together 65 students and 20 faculty from across the world to study the latest developments at the interface between physics and mechanics of materials. The informal style of the school, with old-fashioned chalk and blackboard lectures, interspersed with corner-table experiments, was greatly appreciated by students. The school also had a public lecture, given by Benoit Roman and Frederic Lechenault on the tearing and mechanics of paper and fabrics. The students and organizers greatly enjoyed the program, and also the beautiful setting and the excellent food and swimming and hiking during time-off. Next year's Cargese summer school, co-organized by Fabrice Bert, Mark Oliver Goerbig and Rajiv Singh will be on Frustrated Magnetism. Watch out for the first announcement later this Fall.

This year also featured ICAM's first co-hosted workshop with Nordita, in Stockholm, entiled "Bounding Transport and Chaos in Condensed Matter and Holography", organized by Blaise Gouteraux(Stockholm University), Sean Hartnoll (Stanford), Erez Berg (Chicago) and Larus Thorlacius (Stockholm University) . This four-week workshop (Aug 20 –Sept 14) brought together experimentalists and theorists working in string theory and condensed matter theory to discuss the application of holographic methods, born in particle physics, to the hydrodynamics of chaos and transport in materials. The topics covered in the meeting ranged from transport in strongly correlated metals to information scrambling in condensed matter and holographic conformal field theory. Much of the discussion revolved around the new, intriguing set of ideas of fundamental bounds on relaxation rates in quantum mechanics and the role such bounds may be playing in the physics of "strange metals"

Please visit https://www.icam-i2cam.org/our-workshops to see a full list of future ICAM workshops. The next workshop application deadline is September 28th.

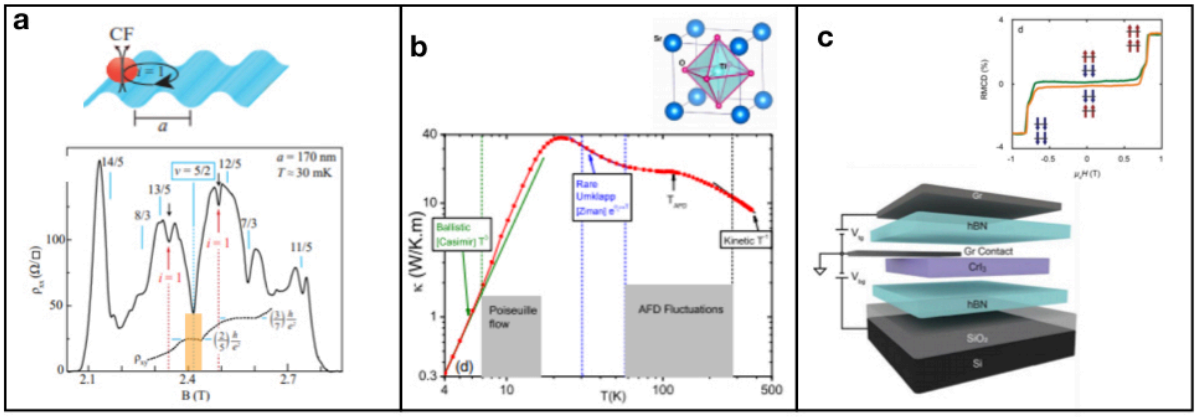
Visit to the NSF

At the end of October ICAM, represented by Laura Greene (NHMFL & Florida State U), Ka Yee Lee (U. Chicago), Johnpierre Paglione (U. Maryland), Piers Coleman(ICAM co-director, Rutgers) and Rajiv Singh (ICAM co-director, Davis) , plan to visit the National Science Foundation in Washington. At our meetings, we hope to explore new ways for funding ICAM's various activities, especially our research exchanges, workshops and our international activities. We will report on this visit in the near future.

QuantEmX

QuantEmX is a science-exchange program designed to foster new collaborations that further our understanding of emergent quantum phenomena in novel materials. QuantEmX is funded by the Betty and Gordon Moore foundation, to allow science exchanges by members of ICAM and the **EPiQS** (Emergent Phenomena in Quantum Systems) network of the Moore Foundation. **QuantEmX** science exchanges last up to eight weeks, and allow researchers to pursue a collaborative science exchange project. Senior and junior scientists can travel for short or long term from one lab to another to collaborate with each other, to learn new experimental techniques, for theory collaboration, as well as to take advantage of specialized equipment at places like the National High Magnetic Field Lab in Tallahassee Florida and other National Labs. (For more information see https://www.icam-i2cam.org/quantemx.)

Now in its third year, QuantEmX has funded more than 50 science exchanges since its inception in 2016. These have resulted in several publications in high profile journals including Physical Review Letters, Nano Letters, Nature Nanotechnology, Physical Review X and Science. A recent QuantEmX supported entitled `**Quantum Oscillations of an electrical resistivity in an insulator**' published in 'Science', by the group of Lu Li (U. Michigan) uncovered possible evidence a Fermi surface in Kondo Insulating $YbB_{12}$. Another high-profile paper, entitled `**Electrical control of 2D magnetism in bilayer CrI_3'** from the group of Pablo Jarillo-Herrero at MIT recently appeared in Nature Nanotechnology. A few examples of the research performed under QuantEmX exchanges is shown below:



(a) observation of Composite Fermions at $\nu = \frac{5}{2}$ (Shayegan group, Princeton), (b) thermal transport in strontium titanate (Behina group, EPSCI, Paris) and (c) electrical control of 2D magnetism in bilayer CrI_3 (Jarillo-Herrero group, MIT), parts of research done under the QuantemX travel exchanges.

Meet our NEW Staff

ICAM is proud to introduce its new staff, Suki LaForga, Keith Anglin and Roxanne Vidales (see below). Keith Anglin (center)is our staff supervisor and contracts and grants supervisor for ICAM. Roxanne Vidales(right) is our account manager and coordinates ICAM Workshops. Suki LaForga (left) is our Branch Contribution Coordinator, processes the QuantEmX applications and travel reimbursements. They look forward to working with you in the coming months.