



# Newsletter

October 2019

'Magnetic UFO', spikes generated by the instability of a ferrofluid with a strong magnetic field. Source.: Mina Aziziha (West Virginia University, USA.)

## Newsletter of the IEEE Magnetics Society

Volume 59 | Issue 4 | October 2019

Editor: Gareth Hatch



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## From the President

By **Pallavi Dhagat**, President of the IEEE Magnetics Society

In this article I'd like to share about our Society's budget planning process. Let me start by noting that our finances continue to be healthy as ever, which, of course, makes the budget planning smoother.



Our budget for the following year is drafted around the months of June and July, with help from financial analysts at the IEEE, who consider the historical trends in our income and spending to provide a first version of the document. Subsequently, the Finance Chair and the President together with the Committee Chairs review the budget to discuss any changes necessary in view of planned projects or operations for the upcoming year.

A key topic of discussion is on the allocation of surplus monies, if any, to fund new activities to benefit the membership at large. Over the years, the surplus has been used, for example, to support professional development and networking events at workshops and conferences, to provide child-care and student travel grants, and to subsidize conference registration fees. (If you will be at the MMM Conference later this November, do take note of and enjoy these benefits and initiatives!)

All proposed spending and the budget as a whole must be approved by vote of the Administrative Committee, prior to being effective. Regular reports, prepared by the IEEE finance support staff, allow us to monitor actual income and spending against the budget, and take corrective measures, if necessary. While not immune to unexpected events and circumstances—e.g. changes in government policies on visas or outbreak of diseases that can severely impact conference attendance and hence, finances—our Society has maintained a balanced and in recent times, a surplus budget, which has enabled many new initiatives to be introduced and sustained.

If you have thoughts and suggestions on new activities that the Society could consider in the future, please do not hesitate to email me. I would also encourage you to participate in the Society's annual meeting held at the INTERMAG conferences. This meeting is open to all members and will next be held in May 2020 at the INTERMAG conference in Montreal, Canada.

In closing, as always, I encourage you to consider volunteering for the Society, by getting involved in your local Chapter organization and serving on conference committees. Your engagement is vital to helping us continue to serve and grow our community!

Pallavi Dhagat can be contacted via email: [dhagat@ieee.org](mailto:dhagat@ieee.org).

## News from the IEEE Sensors Council

By Fabrice Labeau, President of the IEEE Sensors Council

The IEEE Sensors Council brings together 26 IEEE societies whose interests overlap with the general area of sensors.

Over 2019, the IEEE Sensors Council just held a very successful **IEEE INERTIAL** conference in Naples, Florida. The 6th edition of this symposium that its founder affectionately calls a "boutique" event, was again a tremendous success. The number of registrants clearly exceeded our predictions, to actually reach the capacity of the host hotel and conference space!

With the undeniable success of INERTIAL, the IEEE Sensors Council has also started another topical conference, called **IEEE FLEPS**, on flexible and printable sensors and systems, which was held in July in Glasgow.

The Sensors Council is also creating a new topical conference on Sensors Interfaces, to be held starting in 2020; this new event will be industry focused and will feature select invited presentations.

In terms of publications, I am happy to report that both the **IEEE Sensors Journal** and **IEEE Sensors Letters** are doing very well, with increased number of papers submitted and published, while maintaining a very thorough and selective review process. Thanks to the hard work of our editorial teams, both publications are also leaders among IEEE periodicals in terms of fast submission to publication, with median "sub-to-pub" times in the order of 7 weeks!

The other publication administered by the Council, the **IEEE Internet of Things Journal** is also quickly establishing itself as a major IEEE periodical, which will publish up to 7,000 pages this year, and whose articles are routinely among the most downloaded of all IEEE articles!

Finally, let me point out an important ongoing opportunity for all sensors people: the IEEE Sensors Council awards program, which recognizes technical or service achievements and are open to all qualified individuals in the sensor community; so please think about nominating deserving colleagues.

### New Senior Members

The following members of the IEEE Magnetics Society were recently elevated to the grade of Senior Member:

**August 2019:** John Butler, Ionna Giouroudi, Chi Wah Leung, Claudia Martis, Oleksandr Prokopenko, Carlo Ragusa, Peter Thoma, Kang Wang, Lang Zeng.

For more information on elevation to Senior Member, visit the [IEEE Senior Member Grade Web page](#).

# IEEE Magnetics Society Distinguished Lecturers for 2020

Submitted by Beth Stadler, Distinguished Lecturer Committee Chair

It is my pleasure to introduce the 2020 Distinguished Lecturers (DLs) on behalf of the IEEE Magnetics Society:

- Mathias Kläui (Johannes Gutenberg University Mainz, Germany);
- Bert Koopmans (Eindhoven University of Technology, The Netherlands);
- Tim Mewes (University of Alabama, USA); and
- Masashi Shiraishi (Kyoto University, Japan).

Speakers were chosen by committee on the basis of international reputation for excellence in their respective fields, speaking acumen, and widespread interest within the greater magnetics community of their proposed lecture topics.

Those in positions to organize and host DLs are encouraged to contact the DLs directly. Please be flexible in scheduling, so that they can have quality visits to many different places.

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## Antiferromagnetic Insulatronics: Spintronics without magnetic fields and moving electrons

Mathias Kläui

Johannes Gutenberg University Mainz, Germany

With information technology consuming a sizeable part of the total energy, 'GreenIT' information storage and computing technology will have a major impact to address societal challenges.

Traditionally, magnetism has been the prime approach to non-volatile data storage and spintronics devices for memory and sensing have been realized. However so far, spintronics is linked inextricably to ferromagnets in metals entailing major disadvantages, such as ohmic losses during operation and unwanted interactions due to stray fields. A possible novel approach is to use antiferromagnets. While known for a long time, antiferromagnetically ordered systems have previously been considered, as expressed by Louis Néel in his Nobel Prize Lecture, to be "interesting but useless".

However, since antiferromagnets potentially promise faster operation, enhanced stability with respect to interfering magnetic fields and higher integration due to the absence of dipolar coupling, they could potentially become a game changer for new spintronic devices.

I will introduce the key operations of reading and writing the antiferromagnetic order to store and retrieve information and how to transport information using low loss spin currents.

Reading can be achieved in metallic as well as insulating antiferromagnetic heterostructures, using special magnetoresistance effects, and efficient switching of antiferromagnets has been demonstrated by spin orbit torques. Spin currents have been shown to carry information with unprecedented efficiency in the insulating antiferromagnet hematite, the main component of rust showing that very common materials can be used in unexpected ways!

**Mathias Kläui** is professor of physics at Johannes Gutenberg-University Mainz and adjunct professor at the Norwegian University of Science and Technology. He received his PhD at the University of Cambridge, after which he joined the IBM Research Labs in Zürich. Prof. Kläui was a junior group leader at the University of Konstanz and then became associate professor in a joint



appointment between the EPFL and the PSI in Switzerland before moving to Mainz. His research focuses on nanomagnetism and spin dynamics on the nanoscale in new materials. His research covers from blue sky fundamental science to applied projects with major industrial partners. Prof. Kläui has published more than 260 articles and given more than 200 invited talks. He is a Senior member of the IEEE and has been elected to the technical and administrative committees of the magnetics society. He is also a Fellow of the IOP and has been awarded a number of prizes and scholarships.

Contact details: visit [www.klaeui-lab.de](http://www.klaeui-lab.de).

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## Femto-magnetism meets spintronics: Towards integrated magneto-photonics

Bert Koopmans

Eindhoven University of Technology, The Netherlands

Novel schemes for optically controlling ferromagnetic order at a femtosecond time scale [1] receive great scientific interest. In the strongly non-equilibrium regime, it has become possible not only to quench magnetic order, but even to deterministically switch the magnetic state by a single femtosecond laser pulses. Moreover, it has been shown that pulsed laser excitation can induce spin currents over several tens of nanometers. This development triggered a merge of the fields of 'femto-magnetism' and spintronics – opening up a fascinating playground for novel physical phenomena. In this lecture I will discuss the underlying principles, but also envision their exploitation in THz magnonics and integrated spintronic-photonics memories.

After a brief review of the field, mechanisms for ultrafast loss of magnetic order upon fs laser heating [2] as well as all-optical switching will be explained. Next, different processes that give rise to laser-induced spin currents will be distinguished. In particular I will address experiments that have demonstrated laser-induced spin transfer torque on a free magnetic layer [3]. These fs spin currents are absorbed within a few nanometers, providing ideal conditions for exciting and exploring THz spin waves [4]. Finally, it will be argued that synthetic, layered ferrimagnets provide an ideal platform for combining fs optical control with advanced spintronic functionality. It will be shown how magnetic bits can be written 'on-the-fly' by fs laser pulses in a so-called magnetic racetrack, where they are immediately transported by a dc current [5].

Such schemes may lead to a novel class of integrated photonics, in which information is transferred back and forth between the photonic and magnetic domain without any intermediate electronic steps.

[1] E. E. Fullerton, H. A. Dürr, A. V. Kimel and B. Koopmans, Chapter VI "Interfacial effects in ultrafast magnetization dynamics", in F. Hellman, et al., "Interface-induced phenomena in magnetism", *Rev. Mod. Phys.* 89, 025006 (2017).

[2] B. Koopmans, G. Malinowski, F. Dalla Longa, D. Steiauf, M. Faehle, T. Roth, M. Cinchetti and M. Aeschlimann, "Explaining the paradoxical diversity of ultrafast laser-induced demagnetization", *Nature Materials* 9, 259 (2010).

[3] A. J. Schellekens, K. C. Kuiper, R. R. J. C. de Wit and B. Koopmans, "Ultrafast spin-transfer torque driven by femtosecond pulsed-laser excitation", *Nat. Commun.* 5, 4333 (2014).

[4] M. L. M. Laliu, R. Lavrijsen, R. A. Duine and B. Koopmans, "Investigating optically excited terahertz standing spin waves using noncollinear magnetic bilayers", *Phys. Rev. B* 99, 184439 (2019).

[5] M. L. M. Laliu, R. Lavrijsen, R. A. Duine and B. Koopmans, "Investigating optically excited terahertz standing spin waves using noncollinear magnetic bilayers", *Phys. Rev. B* 99, 184439 (2019).

**Bert Koopmans** is a Full Professor and Group leader of the group Physics of Nanostructures at the Department of Applied Physics of the Eindhoven University of Technology (TU/e). He obtained his PhD from the University of Groningen in 1993. After a postdoc at the Radboud University Nijmegen, he spent three years as a Humboldt Fellow at the Max-Planck Institute for Solid State Physics in Stuttgart. Prof. Koopmans' present research activities are in spintronics, nanomagnetism and ultrafast spin- & magnetization-dynamics. He participates in the TU/e Institute for Integrated Photonics, where he initiates research on integrated magneto-photonics, and is a member of the board of the Dutch NanoLabNL. His research is aimed to contribute to future energy-efficient and versatile information technology.



Contact: Bert Koopmans, Department of Applied Physics and Institute for Photonic Integration, Eindhoven University of Technology, P.O. Box 513, 5600 MB Eindhoven, The Netherlands; email: [b.koopmans@tue.nl](mailto:b.koopmans@tue.nl).

## Magnetization Dynamics and Damping

Tim Mewes

University of Alabama, USA

The dynamics and the damping of magnetization are of paramount importance to understand and predict the properties of magnetic materials used in a variety of applications. For example, spin-transfer torque magnetic random-access memory cells (STT-MRAM) are expected to switch fast, reliably, and with low power consumption, which requires low damping materials. New spintronic devices based on magnetic skyrmions, which also demand precise control of the magnetization dynamics, are another example. The Landau-Lifshitz-Gilbert equation of motion [1, 2] and extensions thereof [3] have been extremely successful in enabling predictions of the magnetization dynamics of materials both analytically and using micromagnetic simulations. Experimentally the magnetization dynamics can be elegantly probed in the frequency domain using ferromagnetic resonance (FMR). Recent progress in broadband ferromagnetic resonance techniques have provided valuable new insights in the magnetization dynamics and the damping mechanisms of magnetic materials.

In this lecture, I will introduce the fundamentals of magnetization dynamics and damping. I will discuss their importance for many applications, including hard drive read heads, spin-transfer torque magnetic random-access memories and new skyrmions based devices. I will talk about various mechanisms that can contribute to the damping of the magnetization in thin films including spin-orbit relaxation, spin pumping, and two-magnon scattering. The presentation will show how recent developments in broadband ferromagnetic resonance enable precise measurements of the dynamics and damping in thin magnetic films and multilayers especially when combined with angle and temperature dependent measurements [4]. This will include a discussion of the recently discovered anisotropic damping in exchange biased films [5, 6].

[1] T. L. Gilbert, "A Lagrangian formulation of the gyromagnetic equation of the magnetization fields (abstract only)," *Phys. Rev.*, vol. 100, p. 1243, (1955).

[2] T. L. Gilbert, "A phenomenological theory of damping in ferromagnetic materials," *IEEE Trans. Mag.*, vol. 40, no. 6, pp. 3443-3449, (2004).

[3] V. G. Bar'yakhtar and A. G. Danilevich, "Dissipation function of magnetic media," *Low Temperature Physics*, vol. 36, no. 4, pp. 303-309, (2010).

[4] B. Khodadadi, A. Rai, A. Sapkota et al., "Conductivity-Like Gilbert Damping due to Intraband Scattering in Epitaxial Iron," *arXiv preprint arXiv:1906.10326*, (2019).

[5] T. Mewes, R. L. Stamps, H. Lee et al., "Unidirectional Magnetization Relaxation in Exchange-Biased Films," *IEEE Magnetics Letters*, vol. 1, pp. 3500204-3500204, (2010).

[6] J. Beik Mohammadi, J. M. Jones, S. Paul et al., "Broadband ferromagnetic resonance characterization of anisotropies and relaxation in exchange-biased IrMn/CoFe bilayers," *Phys. Rev. B*, vol. 95, no. 6, p. 064414, 02/15/ (2017).

**Tim Mewes** received his undergraduate degree in physics in 1999 from the University of Kaiserslautern in Germany. He received his Ph.D. in physics from the same University in 2002. He subsequently was a postdoctoral researcher at Ohio State University. Prof. Mewes joined the University of Alabama in 2005, where he now works as a professor in the Department of Physics and Astronomy.



Prof. Mewes has published over 70 articles in peer-reviewed journals on topics including epitaxial growth of magnetic thin films, exchange bias, influence of ion irradiation on magnetic properties, magnetic resonance force microscopy, broadband ferromagnetic resonance, magnetization dynamics, damping, and micromagnetics.

During his undergraduate and graduate studies Prof. Mewes was a scholar of the German Academic Scholarship Foundation. In 2010 he received a National Science Foundation CAREER award for the investigation of the magnetization dynamics and damping in magnetic nanostructures. In 2011 he became a Visiting Fellow of the Center for Nanoscale Science and Technology at the National Institute for Standards and Technology in Gaithersburg, and in 2014 he received the IBM Faculty Award. Prof. Mewes currently chairs the Alabama chapter of the IEEE Magnetics Society. He chaired the 2016 IEEE International Conference of Microwave Magnetics in Tuscaloosa and has been active on program committees of several other international magnetism conferences. He is also a member of the American Physical Society.

Contact: Tim Mewes, Department of Physics and Astronomy, University of Alabama, Tuscaloosa, Alabama 35487, USA; email: [tmewes@ua.edu](mailto:tmewes@ua.edu).

## Spins in Low-dimensional Materials Systems: Transport, Gate-control and Conversion

Masashi Shiraishi  
Kyoto University, Japan

Transport, control and conversion of spins in condensed matters have been pivotal concepts in spintronics. Spin transport is the most fundamental concept to realize spin-dependent phenomena, spin control mainly by gating enables

information switching using a spin degree of freedom, and spin conversion allows detection of spins, a dissipative physical quantity. Whilst bulk metallic and semiconducting systems have been to date major material stages to realize the aforementioned concepts, low-dimensional materials systems such as atomically-flat two-dimensional materials [1-3], two-dimensional electron gases formed at an interface of a heterostructure [4,5], topologically-protected Dirac surface states in topological insulators [6,7] and ultrathin films [8] are becoming attractive materials stages to pursue novel spintronic concepts and phenomena. I will introduce the attractiveness of these new materials systems, cover an overview of the central achievements, and focus on recent investigation to pioneer novel spintronic physics in the low-dimensional materials systems.

[1] B. Raes, S.O. Valenzuela et al., "Determination of the spin-lifetime anisotropy in graphene using oblique spin precession", *Nature Commun.* 7, 11444 (2016).

[2] S. Dushenko, M. Shiraishi et al., "Gate-tunable spin-charge conversion and the role of spin-orbit interaction in graphene", *Phys. Rev. Lett.* 116, 166102 (2016).

[3] A.W. Cummings, S. Roche et al., "Giant spin lifetime anisotropy in graphene induced by proximity effects", *Phys. Rev. Lett.* 119, 206601 (2017).

[4] R. Ohshima, M. Shiraishi et al., "Strong evidence for d-electron spin transport at room temperature at a LaAlO<sub>3</sub>/SrTiO<sub>3</sub> interface", *Nature Mater.* 16, 609 (2017).

[5] E. Lesne, M. Bibes et al., "Highly efficient and tunable spin-to-charge conversion through Rashba coupling at oxide interface", *Nature Mater.* 15, 1261 (2016).

[6] Y. Shiomi, E. Saitoh et al., "Spin-electricity conversion induced by spin injection into topological insulators", *Phys. Rev. Lett.* 113, 196601 (2014).

[7] Yuichiro Ando, M. Shiraishi et al., "Electrical detection of the spin polarization due to charge flow in the surface state of the topological insulator Bi<sub>1.5</sub>Sb<sub>0.5</sub>Te<sub>1.7</sub>Se<sub>1.3</sub>", *Nano Lett.* 14, 6226 (2014).

[8] S. Dushenko, M. Shiraishi et al., "Tunable inverse spin Hall effect in nanometer-thick platinum films by ionic gating", *Nature Commun.* 9, 3118 (2018).

**Masashi Shiraishi** received the B.S., M.S., and Ph.D. degrees from Kyoto University, Japan, in 1991, 1993 and 2003. He was a researcher in SONY Corporation Research Center (1993-2004), an associate professor (2004-2010) and a professor (2010-2013) at Graduate School of Engineering Science, Osaka University, Japan. Since 2013, he has been a professor at Department of Electronic Science and Engineering, Kyoto University, Japan. Prof. Shiraishi was a guest scientist of Max-Planck-Institut für Festkörperforschung (Stuttgart, 1997-1998), a guest professor of Uni. Regensburg (Germany, 2007) and a researcher of JST-PRESTO program (2007-2011).



Prof. Shiraishi has published over 150 technical articles in peer-reviewed journals, including book chapters and review articles, and has given more than 50 invited presentations at international conferences. He received Outstanding Research Award (Magnetic Society of Japan, 2013), Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (Prizes for Science and Technology, Research Category, 2017) and 36th Osaka Science Award (2018).

Contact: Masashi Shiraishi, Department of Electronic Science and Engineering, Kyoto University, Katsura, Nishikyo-ku, Kyoto, Japan; email: [shiraishi.masashi.4w@kyoto-u.ac.jp](mailto:shiraishi.masashi.4w@kyoto-u.ac.jp).

## Magnetics Textbook Author Search

A respected publisher is interested in revising and updating a classic textbook on magnetics. An ideal author would be academically inclined, have a broad background in fundamental and modern magnetism, have good writing skills, and be comfortable working in SI units.

Please send expressions of interest for this interesting assignment to Petru Andrei via [pandrei@fsu.edu](mailto:pandrei@fsu.edu) and Ron Goldfarb via [r.goldfarb@ieee.org](mailto:r.goldfarb@ieee.org).

## Report on the 2019 IEEE Magnetics Society Summer School

By Ravi L. Hadimani, Local Organizing Committee Co-Chair

During June 2-7, 2019, the IEEE Magnetics Society Summer School (MSS19) was held successfully in the USA at Virginia Commonwealth University (VCU) in Richmond, Virginia and at the National Institute of Science and Technology (NIST) in Gaithersburg, Maryland. A record 93 students participated, including 80 fully funded students, six partially funded students and seven student volunteers.

The MSS19 Program Chair was Brian Kirby, MSS19 Treasurer was Sara Majetich and Student Selection Committee Chair was Leszek Malkinski. The Local Organization Committee included Ravi Hadimani and Robert Shull as co-Chairs, Radhika Barua as local Treasurer and J. Atulasimha as Student Selection Representative.

The event featured presentations from all four Distinguished Lecturers—Victorino Franco, Justin Shaw, Hari Srikanth and Hyunsoo Yang. Talks were also given by seven other senior researchers in magnetics—Bernard Dieny, Ron Goldfarb, Chih-Huang Lai, Kyung-Jin Lee, Sara Majetich, Rudolf Schäfer and Bruce Terris.

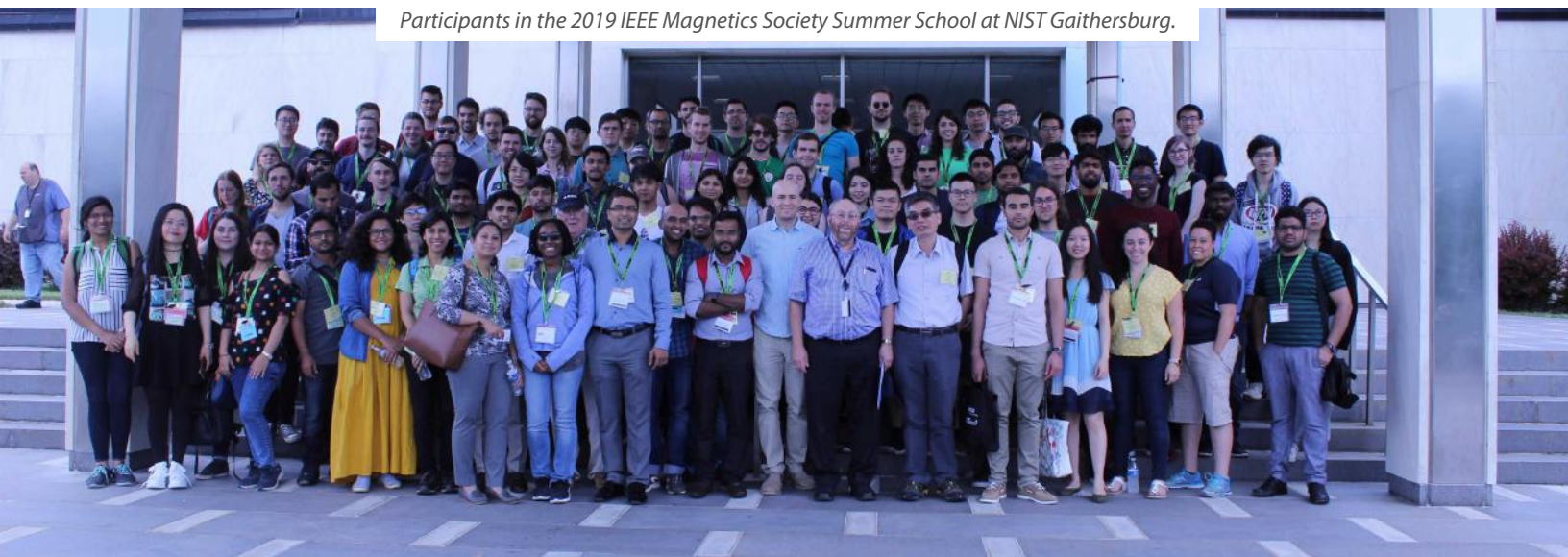
There were two panel discussions. The first was titled “Latest research in magnetism in industry and job prospectus for magnetics grad students in industry”, which included representatives from Ames National Laboratory, Homeland Security, NIST, National Science Foundation, Oakridge National Lab, the US Department of Energy and the US Naval Research Laboratory.

The second panel discussion was titled “Latest research in magnetism in industry and job prospectus for magnetics grad students in national labs and US federal agencies”, which included representatives from Bose Corp., Bruker Corp., Fish and Richardson Patent Law, Metamagnetics Inc., Northrop Grumman Corp., Quantum Design Inc. and Western Digital Corp.

In addition to the above participants there were 12 other faculty members and senior researchers who had volunteered to assist in judging the poster and project-presentation competitions and other logistics.

A banquet was organized at the Boathouse Restaurant on the bank of the James River. IEEE Magnetics Society President, Pallavi Dhagat and IEEE Richmond Section Chair Steve Kemp

Participants in the 2019 IEEE Magnetics Society Summer School at NIST Gaithersburg.





2019 IEEE Magnetics Society Summer School students visit the National Mall in Washington, DC.



addressed the banquet and thanked the students and speakers.

The students had an opportunity to visit NIST Gaithersburg and see many state-of-the-art and unique facilities. After the NIST visit, they visited the National Mall in Washington, D.C. During the NIST visit, students had an opportunity to hold the Nobel Medal awarded to Robert Shull's father Clifford G. Shull. Fig. 2 shows students visiting National Mall in Washington, DC.

Students also had an opportunity to observe a demonstration of magnetic-force microscopy by John Thornton from Bruker Inc.

MSS19 was concluded on the Friday evening with an award ceremony and closing remarks by Gary Tepper, Professor and Chair of the Department of Mechanical and Nuclear Engineering at VCU.

Since the end of the summer school, the MSS19 organizers have received extremely positive feedback from the students and speakers about the event.

Lectures slides, poster titles, attendee list and photo galleries can be found online at <https://egr.vcu.edu/ieee/mss19/>.

## Spain Chapter News

*By Alfredo García-Arribas, Spain Chapter President*

The IEEE Magnetics Society Spain Chapter will celebrate its annual meeting during October 17-18, 2019.

The meeting will be held in Pamplona, Spain and will be hosted by Cristina Gómez-Polo and her collaborators in the Institute for Advanced Material (InaMat), at the Public University of Navarra.

As has become traditional, the meeting has been scheduled together with the general assembly of our sister society **Club Español de Magnetismo** (CEMAG).

An exciting program has been organized for the two-day event.

In the afternoon of October 17, 2019 there will be a scientific session dedicated to young researchers, where Ph.D. students and post-doctoral researchers will present their work in a mixed oral and poster session. Over 20 participants will share their activities in a variety of research fields within magnetism.

A scientific session with three invited talks from senior researchers will take place in the morning of October 18, 2019:

- Hyunsoo Yang (National University of Singapore, 2019 Distinguished Lecturer): 'Spin-Orbit Technologies: From Magnetic Memory to Terahertz Generation';
- Arantxa Fraile Rodríguez (University of Barcelona): 'Tuning magnetic phenomena at the nanoscale by nanostructuring and proximity effects'; and
- José Rivas Rey (University of Santiago de Compostela, 2018 Salvador Velayos Prize winner): 'Nature-inspired nanostructured magnetic scaffolds for bone tissue engineering'.

The meeting will be complemented with the General



Poster Session at the 2019 IEEE Magnetics Society Summer School.

Assemblies of both the IEEE Magnetics Society Spain Chapter and CEMAG, together with a friendly joint lunch.

The organizers acknowledge the financial support of IEEE Magnetics Society and the IEEE Spain Section.

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## Seoul Chapter News

*By Jongill Hong, Seoul Chapter Chair*

The Seoul Chapter of the IEEE Magnetics Society held two invited lectures at Yonsei University in Seoul in early 2019.

In March 2019, Dr. C. M. Park (Tokyo Electron) reviewed the recent developments in perpendicular magnetic tunnel junctions.



*Dr. C. M. Park (Tokyo Electron) presents to members of the Seoul Chapter.*

In March 2019, Dr. S-H Yang (IBM Research) presented his recent work on chiral spintronics in magnetic nanowires.

The Seoul Chapter has been active in supporting seminars and invited talks and in encouraging IEEE member students to participate in chances to learn about emerging topics in magnetics in 2019.

The Seoul Chapter (MAG33) currently belongs to the Seoul Section, one of five IEEE Sections in Korea. Since there are not enough members to establish their own Chapters in the other Sections, Seoul Chapter has been the only IEEE Magnetics Society Chapter in Korea. Unfortunately, members belonging to other Sections have had difficulties in officially communicating with the Seoul Chapter and in participating in activities.

In April 2019, the Seoul Chapter submitted a petition to resolve such issues by changing the parent unit of the Chapter from the IEEE Seoul Section to the IEEE Korea Council. The IEEE MGA team provided a write-up for review by officers of the IEEE Seoul



*Dr. S-H Yang (IBM Research) presents to members of the Seoul Chapter.*

Section and the IEEE Korea Council for review.

In early October 2019, the Chapter received word that the proposed change had been accepted, and going forward, with the change in parent unit, the entity will now be referred to as the Korea Chapter of the IEEE MAGnetics Society.

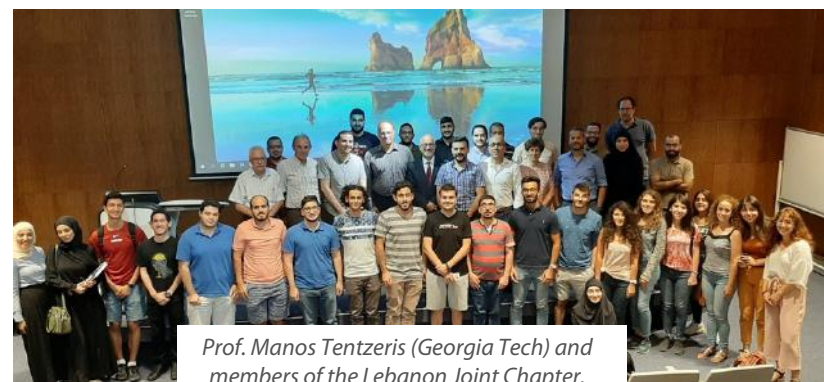
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## Lebanon Joint Chapter News

*By Walid Kamali, Lebanon AP/MTT/MAG Joint Chapter Chair*

This year the AP/MTT/MAG Lebanon Joint Chapter organized its Electromagnetics Week during September 5-11 2019. The week was an occasion for professionals and academics working in, studying or teaching electromagnetics, microwaves and antenna design in Lebanon, to meet, socialize and to discuss their activities.

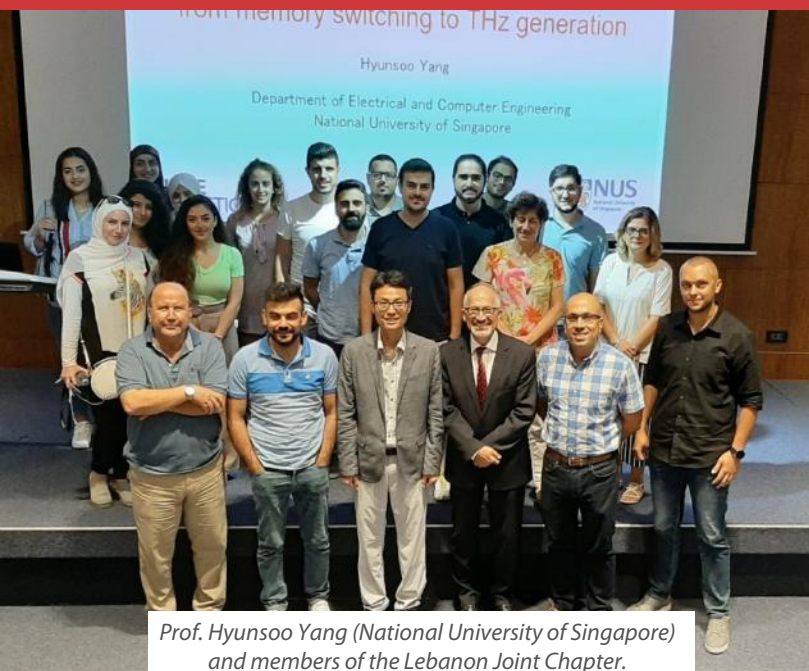
The American University of Beirut hosted two lectures. the first was given by Prof. Manos Tentzeris (Georgia Tech), titled: 'Inkjet-/3D-/4D-Printed Wireless Ultra-broadband Modules for IoT, SmartAg and Smart Cities Applications.'



*Prof. Manos Tentzeris (Georgia Tech) and members of the Lebanon Joint Chapter.*

The second lecture was given by 2019 Distinguished Lecturer Prof. Hyunsoo Yang (National University of Singapore), titled, 'Spin-Orbit Technologies: From Magnetic Memory to Terahertz Generation.'





*Prof. Hyunsoo Yang (National University of Singapore) and members of the Lebanon Joint Chapter.*

Both lectures had very good impact on the audience, especially the young engineering students.

## 5<sup>th</sup> Front Range Advanced Magnetics Symposium (FRAMS 2019)

*By Ezio Iacocca, Hans Nembach, Emilie Jué and Ron Goldfarb, FRAMS 2019 Co-Chairs*

Magnetism experts in the 'Front Range' region of the Rocky Mountains in Colorado and Wyoming, USA, met at the University of Colorado Boulder on August 15, 2019 for the fifth edition of the Front Range Advanced Magnetics Symposium (FRAMS 2019).

Started in 2015 at Colorado State University in Fort Collins, FRAMS has been held on a yearly basis in Laramie, Denver, Colorado Springs, and now Boulder. The 5th FRAMS was co-chaired by Ezio Iacocca (University of Colorado Boulder, now at



*Participants in the 5th Frontier Range Advanced Magnetics Symposium at University of Colorado Boulder.*

Northumbria University, U.K.), Hans Nembach and Emilie Jué (University of Colorado Boulder and NIST) and Ron Goldfarb (NIST).

FRAMS primarily aims to provide members of the magnetism community of the Front Range with networking opportunities and to give students a forum in which to present their work in a professional setting. In this edition, 52 students attended the symposium, comprising 60% of the total attendance. 13 talks were delivered by principal investigators from the participating institutions in four oral sessions, including a talk by 2019 IEEE Magnetics Society Distinguished Lecturer Justin Shaw.

The IEEE Magnetics Society sponsored four poster awards selected from the 46 poster presentations. We congratulate the winners: Christian Gentry (University of Colorado Boulder), Johnathon Davidson (University of Colorado, Colorado Springs), Gavin Hester (Colorado State University), and Wafa Aljuaid (University of Denver).

In addition, the IEEE Magnetics Society sponsored travel support for students, and the local chapters of the Magnetics Society sponsored a networking session. The breakfast and coffee breaks were supported by four generous industrial sponsors.

The 6th FRAMS symposium will be held at the Colorado School of Mines in Golden, Colorado, in the summer of 2020.

## 10<sup>th</sup> International Symposium on Metallic Multilayers (MML 2019)

*Submitted by José Luis F. Cuñado, MML 2019 Secretary*

During June 17-21, 2019 the 10<sup>th</sup> International Congress of Metallic Multilayers (MML 2019) was held in Madrid, Spain at the Campus of International Excellence UAM-CSIC in Cantoblanco, in the facilities of the IMDEA Nanoscience Institute and the Institute of Theoretical Physics (IFT).

The IMDEA Nanoscience Institute, in collaboration with the Autonomous University of Madrid (UAM) and the Complutense University of Madrid (UCM), organized the event, which was attended by more than 150 international scientists.

The Symposium was opened by Prof. Albert Fert, from Paris-Saclay University and the CNRS/Thales Physics Unit, and by Prof. Rodolfo Miranda, Professor of Condensed Matter Physics at UAM and Director of the IMDEA Nanoscience Institute.

In 2007, Prof. Fert received the Nobel Prize in Physics, together with Prof. Peter Grünberg, for the discovery in the 1990s of giant magneto-resistance (GMR), a phenomenon on which today's magnetic disk-based storage devices are based. GMR is an effect

whereby the electrical resistance of a thin multilayer structure varies, depending largely on an external magnetic field. The ongoing research in metallic multilayers has contributed decisively to important technological advances of the computer revolution. In December 1997, IBM released the first commercial device based on this effect.

The UAM Surface Physics laboratory led by Prof. Miranda also contributed significantly to the study of these multilayer systems. The IMDEA Nanoscience Institute, together with the UAM Surface Physics Laboratory, constitute a renowned international research center in this scientific area.

The MML 2019 Symposium was attended by international research figures from some of the most technologically advanced countries in this sector, including the USA, China, Japan, Korea, Singapore, Germany, the UK, Sweden, France and Italy.



*Prof. Rodolfo Miranda, Director of IMDEA Nanoscience Institute and Chair of MML 2019, during the opening session.*

potential applications in information technology, telecommunications, aerospace, energy, transportation, and even biomedical applications were also be discussed.

The event was closed by Prof. Ivan Schuller from the University of California, San Diego, USA who is also president of the Board of Trustees of the IMDEA Nanoscience Institute, with a conference on the present and future of neuromorphic computing.

The MML2019 Symposium was sponsored by the IEEE Magnetics Society and by companies including Zeiss, Specs, Lake Shore, Envico Magnetics, Angstrom and Antares.

## **Quantum Engineering: Magnetics Editors Wanted**

*By Ron Goldfarb, Publications Committee*

IEEE is expected to launch a new open-access journal early in 2020, *IEEE Transactions on Quantum Engineering*, subject to IEEE approval. The Magnetics Society would be a co-sponsor, subject to Administrative Committee approval of a memorandum of understanding.

In anticipation of the journal launch, manuscripts on quantum engineering are being accepted for review now, with a special



*Nobel laureate Prof. Albert Fert during the opening session of the MML2019 Symposium.*

The topics discussed during MML 2019 included the synthesis and functionalization of magnetic nanostructures, magnetization dynamics, spintronics, and quantum technologies, among others. The development of magneto-resistive devices and spin transistors that may have new



issue of *IEEE Transactions on Applied Superconductivity* serving as the designated back-up periodical if the new journal is not approved. All open-access fees will be waived for articles accepted in 2019 for publication in 2020.

Quantum engineering aspects of magnetism will be represented in the new journal (e.g., spin-wave solitons; qubits with long coherence times based on electron and nuclear spin degrees of freedom).

Members of the Magnetism Society who are interested in serving as journal editors or as potential authors are invited to contact me for more information via [r.goldfarb@ieee.org](mailto:r.goldfarb@ieee.org).

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## Two Special MRAM-Related Events at IEDM 2019 Organized by the IEEE Magnetism Society

*By Bernard Dieny, Publications Committee*

The IEEE International Electron Devices Meeting (IEDM) is the main annual conference of the IEEE Electron Devices Society and this year will be held during December 7-11, 2019, in San Francisco, California, USA.

Given the growing interest of the microelectronics industry in STT-MRAM, it is very important to strengthen the relationship between the microelectronics and magnetism communities since this technology requires specialized expertise in these two areas. For that reason, two special events related to MRAM technology are being organized around IEDM by the IEEE Magnetism Society.

The first is a special poster session on December 11, 2019 entirely dedicated to MRAM, including MRAM materials, phenomena, technology, testing; hybrid CMOS/MTJ technology and circuits; and spin logic. Similar MRAM poster sessions took place at IEDM 2016, IEDM 2017 and IEDM 2018, which were very successful, with more than 30 posters presented and very active cross-disciplinary discussions. This session is organized technically by the IEEE Magnetism Society and will be embedded in the IEDM 2019 conference. This event will be a great opportunity to bring together experts in magnetism and in microelectronics. It will appear as a special MRAM poster session in the IEDM program.

The second event is the 11<sup>th</sup> MRAM Global Innovation Forum which will take place in San Francisco on December 12, 2019. This is a one-day forum organized for the day following IEDM 2019 in the same hotel (Hilton Union Square). The Forum will consist of 10 invited talks from leading experts and a panel discussion.

## About the Newsletter

The purpose of the Newsletter of the IEEE Magnetism Society is to publicize activities, conferences, workshops and other information of interest to Society members and other people in the area of applied magnetism.

Contributions are solicited from Society members, Officers & other volunteers, conference organizers, local chapters, and other individuals with relevant material. The Newsletter is published quarterly on the Society webpage at: <http://www.ieeemagnetism.org>

Please send all contributions via email to the Newsletter Editor, Gareth Hatch, at: [g.p.hatch@ieee.org](mailto:g.p.hatch@ieee.org)

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Various MRAM related topics will be covered including STT-MRAM technology, memory and processor demonstrations, spin orbit torque MRAM, and the needs, challenges and potential of MRAM. The Forum was originally initiated by Samsung Semiconductor, and this Forum marks the eleventh edition of the series.

The Forum is entirely sponsored by Samsung Semiconductor. Registration to the Forum is free of charge, however the number of attendees is limited. To register for the Forum, please send an email to [incorvia@austin.utexas.edu](mailto:incorvia@austin.utexas.edu) with first name, last name, contact email and affiliation. A confirmation email will be sent to you. The deadline to register for the Forum is 8th November 2018.

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## Conference Calendar

*By Gareth Hatch, Newsletter Editor*

### **4<sup>th</sup> Ultrafast Magnetism Conference (UMC2019)**

14-18 October, 2019 - York, UK

### **Conference on Magnetism and Magnetic Materials (MMM 2019)**

4-8 November, 2019 - Las Vegas, Nevada, USA

### **Magnetism 2020**

11-12 February, 2020 - Orlando, Florida, USA

### **26<sup>th</sup> International Workshop on Rare Earth and Future Permanent Magnets and their Applications (REPM2020)**

24-27 August, 2020 - Baltimore, Maryland, USA

To list your conference in the Newsletter Conference Calendar, please contact the **Newsletter Editor**.