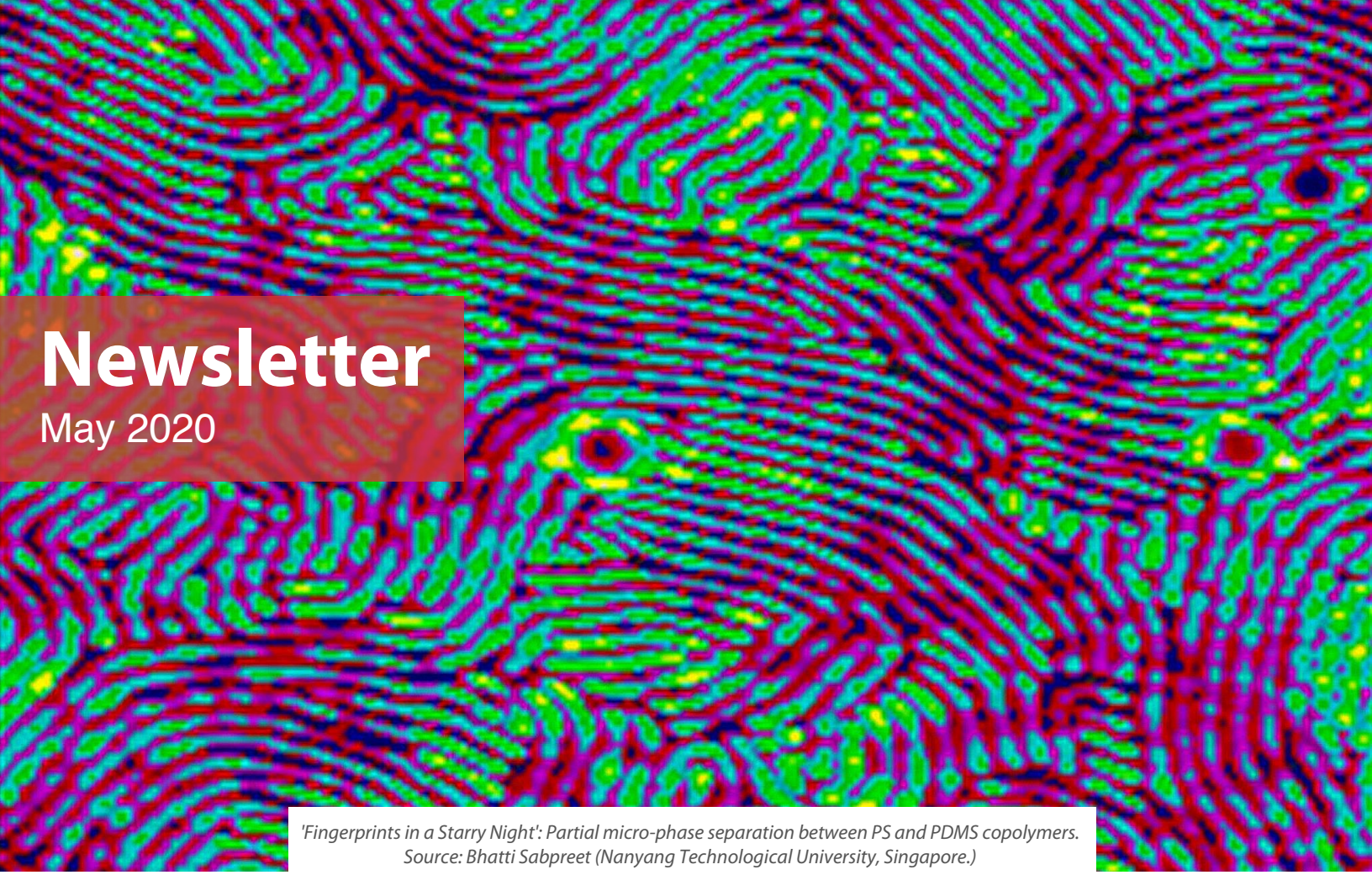

Newsletter

May 2020

'Fingerprints in a Starry Night': Partial micro-phase separation between PS and PDMS copolymers. Source: Bhatti Sabpreet (Nanyang Technological University, Singapore.)

Newsletter of the IEEE Magnetics Society

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Editor: Gareth Hatch

In this Issue:

From the President

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

I write this article when our lives and daily routines have been disrupted by the pandemic. My thoughts, first and foremost, are for the health and safety of you and your families. I know normalcy will return and we, as friends and colleagues, will support each other and continue to push the frontiers of magnetism.

In the uncertainties and challenges presented by the virus, needless to say, we have had to make difficult but necessary decisions to safeguard the wellbeing of our members. These decisions have included cancelling the summer school scheduled for Taiwan in July, the International Conference on Microwave Magnetics (ICMM) in Beijing in June and the Intermag conference to be held in Montreal in May. The organizing committee for these events left no stone unturned in exploring alternative options but with growing business closures and travel restrictions it became evident that organizing these events this year was not going to be possible.

I sincerely thank the members of these committees—in particular, Ko Wei (Chair, Summer School 2020) and Brian Kirby (Chair, IEEE Magnetics Society Education Committee); Haiming Yu (Chair, ICMM 2020) and Cindi Dennis (General Chair, Intermag 2020) —for their extraordinary efforts and leadership under challenging circumstances. We are hopeful that normal times will return in the next few months and that conferences in the latter half of the year and early next year will be able to continue as scheduled. We will, naturally, prioritize the safety of our attendees in any decisions related to hosting these events.

Financially, we are fortunate that our Society has adequate funds to buffer any losses. We are also proactively taking measures to mitigate the impact to ensure continued operation of our planned activities in the current and next fiscal years.

Finally, I would like to end on a note of brightness and cheer by announcing the recipients of the Magnetics Society Achievement, Early Career and Distinguished Service Awards for this year: Dr. Chia-Ling Chien from the Johns Hopkins University is recognized with the Achievement Award for "*pioneering discoveries in magnetic materials, nanostructures, and spin phenomena; for training young researchers; and providing invaluable service to the community*."

The Early Career Award is made to Dr. Jean Anne Incorvia from The University of Texas at Austin for "*contributions to implementation of von Neumann and neuromorphic magnetic computing prototypes using spins in two-dimensional systems*."

Dr. Gareth Hatch of Strategic Materials Advisors Ltd. receives the Distinguished Service Award for "*a decade of outstanding service as Editor of the Magnetics Society Newsletter, and in particular for transforming it into a modern and engaging communications vehicle that is available through multiple channels.*" My heartiest congratulations to the awardees. We will look forward to recognizing them at the Intermag conference in Lyon, France next year.

My next update as Society President will follow this summer. As always, if you would like to reach out to me with feedback and suggestions for our Society do not hesitate to email me at dhagat@ieee.org. Please take care and stay safe,

*Pallavi Dhagat can be contacted via email: **dhagat@ieee.org**.*

Chia-Ling Chien Receives the 2020 Achievement Award

By Mark Stiles, NIST

Chia-Ling Chien would have been presented with the 2020 Achievement Award of the IEEE Magnetics Society at the INTERMAG conference in Montreal this year. This is the highest award bestowed by the IEEE Magnetics Society, given in recognition of exceptional technical accomplishments in the field of magnetics.

The citation for Prof. Chien's award reads: "*For pioneering discoveries in magnetic materials, nanostructures, and spin phenomena; for training young researchers; and providing invaluable service to the community.*"

Prof. Chien has been an innovator and discoverer of intricate physical properties of new magnetic materials and nanostructures. His sustained contributions over the past three decades have been broad as well as deep, impacting many areas of materials research and condensed matter physics, especially magnetism and superconductivity. These contributions have advanced the understanding of magnetic materials and spin dependent phenomena at the nanoscale, and have helped establish the foundation from which spintronics is now moving towards successful technological applications with potential for broad economic impact.

The subjects to which Prof. Chien has made important contributions include giant magnetoresistance in magnetic granular solids, nanowire arrays, quantum transport, exchange bias, Andreev reflection spectroscopy, Fe-based superconductors, superconducting proximity effects, spin-transfer torques, magnetic nanorings, voltage-controlled magnetism, magnetic skyrmions, spin Hall effect, spin caloritronics, spin-triplet superconductors, and antiferromagnet spintronics.

Prof. Chien's impact on the field of magnetism should not be judged just by his direct impact but also by the impact of the students and post-docs he has trained, of which 22 are faculty members all over the world. The quality of this training can be seen in their success. Since leaving John Hopkins, Prof. Chien's PhD students have published over 1400 papers and his post-docs (excluding former students) over 600 papers. Two of his students are IEEE Fellows and seven are APS Fellows. Prof. Chien was a Program co-Chairman and then General Chairman for the Magnetism and Magnetic Materials (MMM) Conference, and so were two of his former students.

Prof. Chien received his Doctorate in physics from Carnegie-Mellon University in Pittsburgh, Pennsylvania, USA in 1972. He joined the Physics faculty at the Johns Hopkins University in 1976, where he has been ever since. He is currently the Jacob L. Hain Professor in the Department of Physics & Astronomy.

Prof. Chien is a Fellow of the American Physical Society and of the American Association for the Advancement of Science. He is an honorary professor at Nanjing University, Lanzhou University, and Fudan University in China. He is the 2004 recipient of the David Adler Award of the American Physical Society, a 2005 Distinguished Lecturer of the IEEE Magnetics Society, the 2012 recipient of the AUMS (Asian Union of Magnetics Societies) Award, and the 2015 recipient of the International Union of Pure and Applied Physics (IUPAP) Magnetism Award and Néel Medal. He is also an academician of the Academia Sinica.

Call for Papers: Special Topic on Tunneling FETs for Energy-Efficient Computing & Information Processing

Forwarded by Ron Goldfarb, Publications Committee Chair

A call for papers has been issued by the *IEEE Journal on Exploratory Solid-State Computational Devices and Circuits* (JXCDC) for a special topic on "Tunneling FETs for Energy-Efficient Computing & Information Processing."

The tunneling field-effect transistor (T-FET) is considered a future transistor option due to its steep-slope prospects and the resulting advantages in operating at low supply voltage (V_{DD}).

This call for papers on tunneling FETs is for rapid publication of seminal results across the areas of T-FET materials, devices, and circuits for novel computation and information processing. Manuscripts with key insights into the advantages and challenges of specific T-FET device and material designs and circuit techniques are especially valued in order to guide the semiconductor industry and academia on a path toward more energy-efficient computing.

Sub-topics of interest include:

- N- and P-tunneling FET experimental transistors demonstrating high performance at low supply voltage;
- T-FET material and device design, including hetero-junction III-V materials, transition metal dichalcogenides, other two-dimensional materials and their hetero-junctions;
- T-FET circuits for energy efficient computing and information processing; and
- Energy-efficient computing and information processing with T-FET transistor circuits and architectures.

Important dates:

- **Submission deadline**: June 30 2020;
- **First notification**: 1 August 2020;
- **Revision submission**: 21 August 2020;
- **Final decision**: 30 September 2020; and
- **Publication online**: 1 December 2020.

All inquries for the JXCDC journal should be sent via email to **jxcdc@ieee.org**.

Magnetics Quiz

By Ron Goldfarb, Publications Committee Chair

A. Most magnetic materials are attracted to permanent magnets. Which type is repelled?

1. Antiferromagnets
2. Paramagnets
3. Diamagnets

B. Which of the following elements is not ferromagnetic at ambient temperature?

1. Nickel
2. Cobalt
3. Manganese

C. Do magnetic monopoles exist?

1. Yes
2. No

D. The magnetic lodestone, the first discovered magnetic mineral, is made of:

1. Magnetite
2. Samarium-cobalt
3. Neodymium-iron-boron

E. Which of the following people does not have a magnetic measurement unit named after him?

1. Tesla
2. Oersted
3. Helmholtz

New Senior Members

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

February 2020: Jingsheng Chen, Emilie Jue, Hans Nembach, Mustafa Pinarbasi and Dongwon Yun.

April 2020: Andreas Friedrich, Andrew Kent, and Yue Zhang.

For more information on elevation to Senior Member, visit the IEEE Senior Member Grade Web page.

F. The Earth's magnetic field contributes to which of these celestial phenomena?

1. Aurora Australis
2. Ball lightning
3. Double rainbows

G. The Earth's magnetic field originates from

1. Magnetized iron, like a giant bar magnet, in the center of the Earth
2. Electrically conducting molten iron that forms an electrical circuit

H. The Earth's north magnetic pole is actually a magnetic south pole.

1. True
2. False

I. In the movie, "The Martian," the hero, who is stranded on Mars, did not use a magnetic compass to navigate his rover vehicle. Why?

1. The compass would have pointed to the Earth's magnetic north pole.
2. Mars has no global magnetic field.
3. He was located at the Martian north magnetic pole.

J. We know that the Earth's north magnetic pole is not exactly at the geographic North Pole. In which geopolitical state would a magnetic compass needle point to the geographic North Pole? In other words, at which longitude are the north magnetic pole and the north geographic pole aligned (zero magnetic declination)?

1. California, USA
2. Hawaii, USA
3. Kamchatka, Russia

(Answers on Page 4.)

Call for Nominations

By Manuel Vázquez, Nominations Committee Chair Chair

With this message I would like to remind all members of the IEEE Magnetics Society that the Nominations Committee is currently accepting nominations for positions on the Society's Administrative Committee (AdCom).

These nominations are used each year to select one third of the 24 elected members of the AdCom, the main forum in which the most important activities of the Society are discussed and subsequent votes are taken.

By nominating people suitable to represent your interests on the AdCom, you contribute to promoting broad diversity in terms of gender, geography and academia/industry balance in the Society's decision-making.

The deadline for nominations is **July 15, 2020**. Further information can be found at the Society Web site at **www.ieeemagnetics.org**.

Jean Anne Incorvia Receives the 2020 Early Career Award

Submitted by Masahiro Yamaguchi, Early Career Award Subcommittee Chair

The newly established Early Career Award was presented for the fourth time in 2020. The IEEE Magnetics Society has established this award in order to better support researchers in the early period of their carrier. The award is given to an individual, nominated no more than five years after the completion of his or her PhD, and who has already shown outstanding scientific or technical achievements which are significantly beyond the average performance of a person at that career level.

The Early Career Award consists of a cash award of US$1500, a travel award of US$500 and life membership in the Society.

This year's Early Career Award recipient is Jean Anne Incorvia (The University of Texas at Austin, USA). Dr. Incorvia received her bachelor's degree in physics from UC Berkeley in 2008, and her Ph.D. in 2015 from Harvard University cross-registered at MIT, where her thesis advisors were Prof. Marc A. Baldo and Prof. Caroline A. Ross. Her thesis was titled "Nanoscale Magnetic Materials for Energy-Efficient Spin Based Transistors."

From August 2015 to July 2017, Dr. Incorvia worked at Stanford University as a post-doctoral fellow with Prof. Philip Wong as supervisor. Since August 2017, she has extended her career in the Department of Electrical and Computer Engineering at The University of Texas at Austin.

Dr. Incorvia has significantly advanced the use of magnetic-material-based devices for

computation. She showed experimentally that bit information can be propagated among three devices to build a shift-register circuit. She also showed that the output of one device could switch two devices, which is an important property of logic devices towards "fanout" and had been lacking in magnetic-based designs.

Until Dr. Incorvia's work, there was little implementation of magnetic logic devices that satisfy universal computation in a single device and is concatenable to build circuits. She presented these results at the International Electron Devices Meeting (IEDM) in 2015, the leading microelectronics conference. She has become a leader in three-terminal magnetic tunnel-junction-based devices, and continued to actively publish on nanoscale memory and logic devices.

Dr. Incorvia extended her expertise on three-terminal magnetic tunnel junctions to neuromorphic computing. With colleague Dr. Friedman, she has designed devices to capture advanced biological functions necessary for energy-efficient computation, including leaky integrate-and-fire neurons with inherent lateral inhibition and synapses that perform spike-timing-dependent plasticity. In particular, the use of magnetic stray-field interactions to provide lateral inhibition between artificial neurons uses what is usually a detriment to traditional magnetic memory as a benefit for neuromorphic computing.

Recently Dr. Incorvia has also made a major contribution to map the spin and valley Hall effect in monolayer WSe_2, a new two-dimensional transition-metal dichalcogenide. She focused on moving from optical excitation of the spin valleys to electrical control to further the field towards device applications of this new behavior. Dr. Incorvia presented an invited talk on this work at the 2018 ICM and the 2019 Joint MMM/INTERMAG Conference. She continues to make significant contributions to bridging magnetism and electronics.

Dr. Incorvia has been actively serving on the IEEE Magnetics Society as a Nanotechnology Council Representative in AdCom and on committees for recent MMM and Intermag conferences.

The citation for the Early Career Award reads: "For contributions to implementation of von Neumann and neuromorphic magnetic computing prototypes using spins in two-dimensional systems." Dr. Incorvia is the first female recipient of the Early Career Award."

Magnetics Quiz Answers

By Ron Goldfarb, Publications Committee Chair

(Quiz questions on Page 3).

A. (3) Diamagnets.

B. (3) Manganese, which is antiferromagnetic.

C. (2) No evidence has been found, unlike electric monopoles, which are negative and positive charges.

D. (1) Magnetite, also known as Fe_3O_4, iron oxide.

E. (3) Helmholtz.

F. (1) Aurora Australis, also known as the Southern Lights. The Aurora Borealis (Northern Lights) is better known.

G. (2), which refers to the Earth's dynamo, is correct.

H. (1) True. "The convention in early compasses was to call the end of the needle pointing to the Earth's north magnetic pole the 'north pole' (or 'north-seeking pole') and the other end the 'south pole' … . Because opposite poles attract, this definition means that the Earth's north magnetic pole is actually a magnetic south pole and the Earth's south magnetic pole is a magnetic north pole." [Wikipedia]

I. (2) is correct. Mars has only local magnetic fields (and no north magnetic pole).

J. According to **NOAA**, "based on the current WMM model, the 2020 location of the north magnetic pole is 86.50°N and 164.04°E." That longitude intersects Kamchatka, Russia, so (3) is correct. The north magnetic pole moves over time. In 2015, (2) Hawaii was correct. In 2006, (1) California was correct. With regard to latitude, since 1859, the north magnetic pole has been moving closer and closer to the north geographic pole. At 86.50°N, it is only 3.50° from the north geographic pole

IEEE Transactions on Quantum Engineering

Submitted by Ron Goldfarb, Publications Committee Chair

As previously announced, IEEE has approved a new, all-electronic, open-access journal, *IEEE Transactions on Quantum Engineering* (TQE). There is no limit to the number of pages per article. The Magnetics Society is a co-sponsor.

The editor-in-chief is Erik DeBenedictis, formerly of Sandia National Laboratories, USA. Associate editors for magnetics are Peng Li (Auburn University) and Serkay Ölmez (Seagate Technology). Manuscripts may be submitted at **https://mc.manuscriptcentral.com/tqe-ieee**.

TQE publishes various articles based on the engineering applications of quantum phenomena, including quantum computation, information, communication, software, hardware, devices, and metrology. The open-access fee is being waiverd through 30 June 2020. See **https://tqe.ieee.org** for more information.

Request for Cover Image Submissions

*By **Gareth Hatch**, Newsletter Editor*

On the cover of previous editions of the Newsletter we have featured images from the art-related competitions at the Intermag and MMM conferences. Given the conference cancellations this year, I would like to invite image submissions directly from IEEE Magnetics Society members, to potentially feature on the cover of future editions.

Please send your high-resolution image submissions to me at **g.p.hatch@ieee.org** with a caption or title for the image, a brief technical description, the name of the creator of the image, and their organization or affiliation.

While I can't guarantee that every image submitted will be used, I look forward to receiving your submissions for consideration.

Conference Calendar

*By **Gareth Hatch**, Newsletter Editor*

The Covid-19 pandemic has meant that numerous conferences and other events have been postponed or cancelled. As a result, the Conference Calendar will be updated in the next edition of the Newsletter when there will hopefully be a clearer picture of the new schedule for these and other events.

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

About the Newsletter

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

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.ieeemagnetics.org

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