

# Newsletter

November 2022

## Newsletter of the IEEE Magnetics Society

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## From the President

by **Masahiro Yamaguchi**, President of the IEEE Magnetics Society

I am writing this article on my way back from Minneapolis, United States, where I joined the **67th Annual Conference on Magnetism and Magnetic Materials (MMM 2022)**. I was very happy to participate in a major international conference face-to-face for the first time since the COVID-19 pandemic. The number of in-person attendees was 671 as of November 3. My congratulations to **Yayoi Takamura**, MMM 2022 General Chair, and her team to have overcome numerous uncertainties and achieved a great success with a reasonable budget balance.



I take this opportunity to welcome new member of the Administrative Committee (AdCom): **Montserrat Rivas** (University of Oviedo) as our newly appointed Women in Magnetism (WiM) coordinator. I am looking forward to collaborating with her to meet the best interests of our members.

The elections for the positions of Secretary/Treasurer and President-elect of MagSoc for the 2023–24 term are completed. We welcome our new Secretary/Treasurer, **Sara Majetich**, and new President-Elect, **Ron Goldfarb**.

Our initiative on the **Magnetism in Ukraine** is working out very well. On behalf of the IEEE Magnetics Society, **the Science and Technology Center in Ukraine (STCU)** received 70 applications and identified 22 research projects to be funded in 2022. In all, 70 magnetics researchers will receive financial support, including 14 women and 14 students.

While the Society budget balance is quite healthy in 2022, the projected amount of money available from initiative and endowment funds for 2023 will be only two thirds that of 2022 due to a reduction in revenue from the Publications & Packaged Products distribution. This will constrain all the Society's budget items in 2023. In response to this, we examined the 2023 initiatives and their baseline budget earlier than usual, and the MagSoc AdCom approved the following initiatives at its November 2022 meeting: *Women In Magnetism Leadership Initiative*, *MagSoc Oral History Initiative*, *Students in Magnetism Initiative*, **Magnetism for Ukraine Initiative**, **Intermag 2023 Conference Initiative**, *Periodicals Promotion Initiative*, *Magnetism in Latin America Initiative*, and *Magnetism for Tomorrow's Chips Panel Initiative*. These activities are secured for 2023.

During my term as president in 2021-2022, we fully revised the Constitution and Bylaws of the IEEE Magnetics Society, and introduced new Operations Manuals. We launched a *Standard Subcommittee* under the Technical Committee, and a *Women in Magnetism Subcommittee* under the Membership Committee. We became an affiliate member of the IEEE Brain Technical community and joined the Task Force on Rebooting Computing (TFRC). The Magnetics Society is now an Associate Member of the **Commission on Magnetism (C9) of the International Union of Pure and Applied Physics (IUPAP)**.

Several new projects have started in the last two years, the **Oral history project, Students in Magnetism (SiM)**, and motors and electric machine seminar series. **Magnetism in Ukraine** could become a role-model for nonpolitical support of research in Ukraine within the IEEE. Society finance managed its expenses very well after exceptional losses due to canceled activities and their compensation from IEEE insurance throughout the COVID-19 pandemic. The "*IEEE Magnetics Society Diversity, Talent, and Innovation Fund*" was launched to support the Society's financial operation, using a portion of the insurance revenue.

We carefully watched the impact of the COVID-19 induced transition implemented for our major conferences with one conference run in fully virtual format (Intermag 2021) and two run in hybrid format (Joint MMM-Intermag 2022 and MMM 2022). The Conference Executive Committee (CEC) of the Society developed a "*Strategy for Future Major Conferences*" that recommends a combined conference format. **Intermag 2023** will employ this format. The Executive Committee (CEC) selected Rio de Janeiro, Brazil, as the Intermag 2024 venue, which will be the first time that Intermag will have taken place in Latin America; This has stimulated the Society's activities in South America and we welcome the **Brazilian Materials Research Society** as a new sister society. The 2022 AtC-AtG conference received more invited and contributed talks from Latin American countries.

*IEEE Magnetics Letters* was recognized for 'Short Submission-to-Publication Times' in the first quarter of 2022. First publications appeared in the IEEE Magnetics Society section in *IEEE Access*. We sponsored Local Mini-Summer Schools in 2022 (Asia-5, Europe-1, US-1). The Neil Smith Award for *Contributions to the Understanding of Magnetic Phenomena in Materials and Devices* is undergoing approval processes with the IEEE Technical Activities Board (TAB).

Roadmaps covering Spin-Orbit Torques, Magnetolectric Materials and Devices, and Spin-Wave

Computing were published in *IEEE Transactions on Magnetics*. Roadmaps on Permanent Magnetic Materials, Magnetic Nanoparticles – Part I: Standards & Part II: Applications, Critical Materials for Magnetic Technologies are in preparation. The second series of the Society's outreach videos from Asia are published on [IEEE.tv](#) and our [YouTube channel](#). Selected topics are spintronics, motors, and biomagnetics. A new chapter has been launched in Northern New Jersey. The [Society's website](#) has been fully renewed to be more attractive and interactive. The renewals of the Sister Society agreements is ongoing with the Magnetics Society of Japan and the European Magnetism Association.

I would like to thank all Society members for these accomplishments, particularly committee and board members and chairs in 2021-2022. My extensive thanks to [Molly Bartkowski](#), [Regina Mohr](#), and the Simply Vintage team who have supported the Society's operations very well. It has been an honor and an enriching experience for me to have served as the first President of the IEEE Magnetics Society resident in Asia. I would like to continue transferring my knowledge and experiences to the younger Society members particularly those living in Asia.

## “Magnetism for Ukraine 2022”

by Sara Majetich, Andrii Chumak and Valentyn Novosad,  
IEEE MagSoc "Magnetism in Ukraine 2022" team

**The Science and Technology Center in Ukraine (STCU)**, on behalf of the IEEE Magnetics Society, conducted a competition for scientists, engineers and students working in the field of magnetics. This competitive program offers individual grants of \$2,000 and group grants of \$10,000 for the period of one year. The aim of the program is to support the research and professional development of scientists, engineers and students working in the field of magnetics, with a focus on excellence, innovation and community growth.

The STCU has received 70 excellent applications and via a competitive selection process identified **22 research projects** that are to be funded in 2022. **70 magnetics researchers** will receive financial support, including **14 females** and **14 students**. Projects receiving support are based in Kyiv, Kharkiv, Sumy, Donetsk, and Dnipro.

The award is contingent upon the signature of contractual obligations and confirmation that all participants:

- Hold a permanent position (either full-time or part-

time) at a Ukrainian research institute or University;

- Reside in Ukraine for at least 50% of the time during the project implementation; for the group projects, all team members reside in Ukraine for at least 50% of the time during the project implementation.

The duration of the projects is 12 months. The final report must be submitted to the STCU within the last month of the project duration. Alternatively, the final report can be replaced by one or more peer-reviewed scientific publications with acknowledgement to this program. If the applicant is not already a member of the IEEE Magnetics Society, membership is expected to be acquired during the first month of the project. For group proposals, all team members are expected to become members of the Magnetics Society. Please send confirmation of membership by the required deadline to [Dr. Olga Saliuk, o.y.saliuk@gmail.com](mailto:Dr. Olga Saliuk, o.y.saliuk@gmail.com).

For more information, please contact [Elena Taberko](#), tel.: +38-044 490 7150; email: [elena.taberko@stcu.int](mailto:elena.taberko@stcu.int). A second call for proposals is tentatively expected in August 2023 and will be posted on the [STCU website](#). A link will be available on the IEEE Magnetics Society website.

## Request for Proposals for the 2026 IEEE International Magnetics Conference (INTERMAG)

Submitted by Rudi Schäfer,  
Conference Executive Committee Chair

The Conference Executive Committee (CEC) of IEEE Magnetics Society is asking for proposals for the 2026 InterMag Conference to be held in the Europe region.

InterMag is the flagship annual magnetics conference sponsored by the Magnetics Society. This is the premier conference on all aspects of pure and applied magnetism and is typically attended by approximately 1300-1500 established researchers and Ph.D. students in both engineering and physics from all over the world. This conference has been in existence for more than sixty years and since 2016 the approved stand-alone InterMag site rotation is Americas–Europe–Asia/Pacific. Every third year it is held together with the Conference on Magnetism and Magnetic Materials (MMM) in the USA as a Joint Conference. Recent host cities in Europe were Amsterdam (2002), Madrid (2008), Dresden (2014), Dublin (2017) and Lyon (2021, turned into fully virtual).

For further information, please get in contact with Rudi Schäfer (MagSoc CEC chair, [r.schaefer@ifw-dresden.de](mailto:r.schaefer@ifw-dresden.de)) and Stephane Mangin (CEC regional liaison for Europe, [stephane.mangin@univ-lorraine.fr](mailto:stephane.mangin@univ-lorraine.fr)).

About the cover

## A Personal View on Organizing a Conference in Challenging Times: The Joint MMM-Intermag 2022 Experience

by **Victorino Franco**,  
General Chair of Joint MMM-Intermag 2022 Conference

Back in 2017, attending conferences was a completely different experience from what we have faced since 2020. There were no face masks in the audience, we would not consider that some presentations would be given online, we would profusely greet our colleagues and friends after not meeting for a long time,... and sponsors and organizers of major conferences would not consider that there was a significant financial risk provided that the scientific program was of high quality. That paradigm changed almost overnight, and we have faced a completely different situation in recent years. We still hope that things will return to what we considered normal, and there is evidence for that trend, but some of the changes that we had to implement will remain for some time. This article is my personal point of view as a conference organizer in COVID times. A more detailed description of the data for the Joint MMM-Intermag 2022 is available at [AIP Advances 12, 060401 \(2022\)](#).

It was in 2017 that **Rudi Schäfer** nominated me to be the General Chair of the Joint MMM-Intermag 2022. I took it as a great honor and, at the same time, as a challenge because it would be the largest conference that I would have organized in that capacity. Soon after the MMM AdCom approved the nomination, I started appointing the chairs of the Management Committee of the Conference. I was looking for efficient colleagues with a broad distribution of scientific topics and geographic origins that were diverse enough so that all regions and research fields were properly represented. Gender balance occurred naturally, and I didn't have to force any selection based on it. None of us knew at that time that the conference would take place under circumstances completely different from what we thought we were signing up for.



Although conference organization starts as soon as you are appointed, the speed significantly increases by the time the meeting just before yours is going to take place. Being every three years, the Joint MMM-Intermag 2019 was still far enough, although I got very valuable advice from **Suzanne te Velthuis**, the General Chair for that conference, about what was expected for a normal Joint Conference workflow. That year, as *IEEE Magnetics Society Distinguished Lecturer*, I had the opportunity to visit some of the most relevant laboratories in the world. I was able to complete the list of appointees for the Management Committee. None of us knew what was eventually coming. Things started to change by the end of 2019. My last trip as a Distinguished Lecturer was to China for two weeks in December. I started hearing about a student who had a strange case of pneumonia that lasted for quite some time. Nothing was relevant at that time. I did attend other major conferences in USA until March 2020. Next up was InterMag 2020, for which I registered, and booked all flights and accommodation. Travel restrictions prevented it from happening. It was a clear case of *force majeure*, so all expenses were reimbursed to potential attendees. At that time, it was clear that conferences would not be the same for quite some time. The IEEE Magnetics Society set up a working group to plan future actions; we selected an online platform for delivering the coming conferences and MMM 2020 became virtual; there was no other choice. **Chris Marrows**, the General Chair, handled this transition in a very efficient way and the conference ran smoothly. InterMag 2021 was still far away from the COVID outbreak, so there were some initial discussions about whether it should take place exclusively online or with some 'hybrid' component. Finally, the wise and safe choice was to hold it virtually under the expert leadership of **Bernard Dieny**.

Approximately eight months before the Joint MMM-Intermag 2022 Conference, the situation had turned very uncertain. Although some restrictions were being



lifted, periodic waves of COVID infection spread throughout the world. Holding the conference entirely online would have been a mistake because all of us were already becoming tired of sitting in front of a computer watching videos; holding it entirely in-person was also not a realistic choice, because until much later in the year, every attendee traveling from abroad would have to obtain a special waiver to enter the United States on business. It was clear to me that we would need a combination of both modalities: those who wanted to attend from the safe comfort of their homes should be able to do it; those who wanted a more traditional conference experience, with in-person interaction with colleagues, should also have that opportunity. That's what I understood as "hybrid," even if some content would need to be asynchronous in the virtual realm. It is impossible to plan real-time events that suit the entire range of our attendees, who, at the same time, are geographically dispersed. Choosing that hybrid path meant that the management committee would be forced to live under constant uncertainty because regulations would be evolving dynamically during all of that preparation time. I was extremely fortunate with the whole committee, and I thank all of them for their flexibility and efficiency. In particular, the program co-chairs, **Matt Willard** and **Rie Umetsu**, the treasurer, **Chris Rea**, and the special events chair, **Hari Srikanth**, had to make constant adjustments to accommodate the situation, which changed almost every day. That was a massive task and a much larger workload than anyone could have anticipated.

The question that was very relevant for the organization

of the conference was related to the reason why someone would take all the hassle to travel to New Orleans and attend the conference in person when the scientific lectures would be available online. We felt it was connected to the possibility of having new activities on site and improved interpersonal interaction. Therefore, we dedicated our efforts to make the conference memorable for all those who were able to attend on-site. We organized new activities, like the first-ever **Magnetic Sensors Challenge**, in which teams of students would prepare a magnetics-related device with the kits that they received at the conference and submit a *TikTok* video showing the results. In addition to gaining more technical knowledge, this was a way to enhance networking among students. Videos were fun to watch and even some supervisors did not know that their students had such a talent for acting. As poster presentations were not feasible on-site due to safety issues, we gave attendees the opportunity to present their posters as short oral presentations on-site, which was also a success. In addition to the tutorial, which was conducted online, we added a new onsite session on **Current Trends in Magnetism**. To favor interaction among attendees, we provided food at many of the events, including coffee with beignets, a New Orleans specialty. We also provided a full meal for those attending the **Entrepreneurship in Magnetism** event,





*Current Trends in Magnetism, Joint MMM-Intermag 2022, New Orleans, USA*

which was an effective way to promote discussion.

Another factor that was very critical for us was the safety and peace of mind of the attendees and their families. Many of us haven't experienced that type of situation since the COVID outbreak, yet we asked people to travel to the US from abroad. Travel was different, and rules were changing nonstop. Therefore, in December 2021, Jiayan and I set off for a conference in Charlotte to rehearse how it was to travel internationally in those circumstances. We were among the very few overseas attendees. That conference confirmed my previous hunch that we needed a COVID testing site at the conference hotel if we did not want international travelers to be put through significant stress. So, we made arrangements to make that happen in New Orleans.

As mentioned above, the only certainty that we had when planning the conference was that it was full of uncertainties. We expected around 400 attendees on-site, and that was the number of on-site registrations that we had a few weeks before the conference. Unfortunately, the *Omicron* variant outburst coincided with the moment when people had to finalize their travel plans. As a result, we lost a significant fraction of ~40% the on-site audience just one week before the event. We allowed people to change their registration to online and adapted the on-site program. The Program Co-chairs did a terrific job of keeping the sessions full and avoiding empty gaps in the schedule. Like modern production systems, we had to adapt a 'just-in-time supply chain' philosophy to all this reshuffling.

Many speakers made a significant personal effort to attend the conference on-site. I greatly appreciate that. A member of the committee, just one week before the conference, called me and, half-jokingly-half-seriously, asked me if we were really moving forward. Even I, when sitting on the plane to start the trip, looked at Jiayan and asked, "What are we doing? Will there be any other attendees at the conference site?" I am sure she was thinking the same thing, but we did not mention it to each other.

The conference started on the day it should, with the main hall full of people attending the **Current Trends in Magnetism** special event. People were happy to see each other after so long, speakers were enthusiastically presenting their talks. Groups at the bistros and receptions were larger than usual, with very lively conversation. We did it! We were all there! This was the path to normality. It made me especially proud that, after attendees from USA, the largest group at the on-site conference was from Spain.



*Members of the Club Español de Magnetismo at the Joint MMM-Intermag 2022*



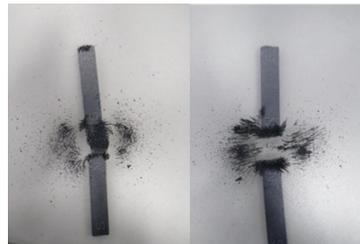
I received three gifts from friends during the Conference. I got a dedicated copy of ‘A Confederacy of Dunces’. This book takes place in New Orleans, but may be the reason for giving it to me was more related to the stubbornness of trying to run a conference in COVID times. I received a bottle of a special edition beer (which I will not mention to avoid unnecessary publicity). Even if I like good beer, and this was certainly the case, the name of the bottle was connected to the potential darkness we would feel if there was no one else but the committee at the conference. Probably this friend also had the same thoughts when boarding the plane. And finally, an intangible gift is the support of all committee members, volunteers, attendees, friends, and family. Seeing all of you happy made the effort worth it.

The conference is over and all final reports have been submitted. From the moment I was nominated until now, our lives have changed significantly, and we were forced to change our plans for the conference almost daily. Until now, no one has dared to ask me if I would have accepted the invitation to organize the conference if I had known that the circumstances were the ones we faced. I did ask that question to myself, and I am fully convinced that I would have stood up for the role without even blinking. It was a pleasure to work with the excellent team that I had on the Management Committee. It was really rewarding to see that attendees in New Orleans really enjoyed being there, interacting with other colleagues while discussing not only science but also life. In fact, I look forward to organizing another large conference, hopefully under more normal conditions, in the future. I have to add a note to my wife, in case she reads this: “Do not worry, darling, I will take some time to recover from the efforts we all made before jumping into the next one.”



## Helping Students Connect: Magnetics High School Project in Lebanon

by **Ernst Huijter**, Chair AP03/MTT17/MAG33 Joint Chapter, IEEE Lebanon



With the aim of developing an educational experience for high school students in Lebanon in order to familiarize them with the basics of magnetism and

major applications of magnetics, our joint AP/MTT/MAG chapter received a generous \$2,000 grant from the IEEE Magnetics Society. Materials for lab experiments were purchased and a manual was written in the framework of a final-year-project at City University in Tripoli, Lebanon.

The experiments, so defined, were tested during a demonstration at Iman High School, also in Tripoli, to a class of grade 11 students. The next step in the project was to allow students to do these experiments themselves in a lab. Arrangements were made with St Mary’s Orthodox College in Beirut, Lebanon, to conduct such lab experiments in 2019. But then severe economic troubles hit Lebanon, aggravated the year after by COVID-19 restrictions and plans were postponed till the first half of 2022.

With the help of three student volunteers, we conducted lab sessions for grade 11 and 12 students from February through June of 2022. The head of the school physics department indicated which of the nine experiments available would fit in with the curriculum during a certain class session. I kickstarted these sessions with an introduction to the IEEE, the Magnetics Society, and some foundations of magnetism. Students



## Lebanese Electromagnetics Day 2022

by **Ernst Huijjer**, Chair AP03/MTT17/MAG33 Joint Chapter, IEEE Lebanon

For the second time in a row our chapter held the Lebanese Electromagnetics Day. In 2021, COVID-19 forced us to have the event online, but thankfully 2022 allowed us to meet again in-person and we did so on June 16. In light of the dire economic situation in Lebanon, the event aims to support students at Lebanese universities doing projects related to magnetics and electromagnetics with cash prizes. We hope to continue running this event on an annual basis. In these very trying times, students competed with one another in three categories (UG, Masters, Ph.D.) by submitting digests; ultimately, seven students were invited to give a presentation. After a word of welcome by the chapter chair, the day started with a presentation and demonstration by American University of Beirut engineer Bassam Jadayel, member of Radio Amateurs Lebanon (RAL), a club with which our chapter has concluded a memorandum of understanding with the aim to organize common activities. The introduction to amateur radio was followed by RAL members passionately discussing their hobby. They have initiated and maintained contacts all around the world with like-minded hobbyists. Technological advancement into the digital domain (DMR) was described and the talk was concluded with a live demonstration.



Youssef Tawk, member of our chapter's executive committee and Associate Professor at AUB, had recently received a teaching award from the IEEE Antennas and Propagation Society. In a spirited presentation he explained his teaching methods and how they motivate and inspire students to appreciate



tested forces between pieces of different materials, like a metal, hard magnetic material, and soft magnetic material. Furthermore, they saw the response of a compass needle to an electric current and induced a voltage by inserting a magnet rapidly into a coil. They also felt the lifting force of an electromagnet, and a simple model revealed to them the concept of an electric motor.

Teachers at St Mary's, the student volunteers, and I enjoyed the clear enthusiasm of the students. In a feedback report the volunteers remarked:

*In the first experiment, students actually enjoyed testing the different magnets. They seemed intrigued by the lines of the magnetic field in the third part. The students visualized the attraction and repulsion forces much more clearly while using the transparent smooth sheet and the iron powder than while using the magnetic sheet.*

The head of the Physics department commented,



*“Throughout the experiments, junior and senior learners were actively engaged in posing questions, investigating, experimenting and reflecting on learning which is an integral component of*

*the learning process. It helped learners notice the connections between one context and another, between theory and the experience.”*

The pilot magnetism lab reached around 70 students of grade 11 (four Life Science sections and one General Science section) and 65 students of grade 12 (two Life Science sections and one General Science section).

In the future we plan to improve the set of experiments, recruit more university students as volunteers, and find more high schools to participate. Moreover, we would like to generate videos permitting students to preview or review experiments.

*The author acknowledges the grant awarded by the IEEE Magnetics Society, Dean Walid Kamali of City University and Ahmad Trad for writing the manual. The author would also like to thank American University of Beirut student volunteers Sabine Farhat, Sara Khalifeh, and Mohamad Abadi, and head of the Physics Department at St Mary's Orthodox College, Rima Timani for their tireless work and engagement.*

the beauty of electricity, magnetism, and electromagnetics.

In his talk, chapter chair Ernst Huijter documented the educational efforts of AUB student volunteers and St Mary's Orthodox College teaching staff in a pilot of conducting labs where high school students are introduced to the basics and applications of magnetism. This effort has been highlighted in another [news item](#) in this Newsletter. Oleg Seroff enlightened us about the efforts of Ericsson to limit the exposure to radiation in 5G systems.

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## Third Joint Executive Meeting of the IEEE Magnetics Society Chapters in Japan and the Magnetics Society of Japan

by **Hideto Yanagihara** and **Masahiro Yamaguchi**

The IEEE Magnetics Society has six chapters in Japan; Fukuoka and Hiroshima, Japan Council (Tokyo), Kansai/Shikoku Joint Section, Nagoya, Sendai/Sapporo Joint Section, and Shin-Etsu Chapters. Since 2018, the Chapter chairs and the executive members of the **Magnetics Society of Japan (MSJ)** hold a joint meeting to contribute to a stronger relationship between the societies. The joint meeting is annually held during the Annual Conference on Magnetism in Japan, which is the flagship conference of the MSJ.

This year, **Hideto Yanagihara**, an Administrative Committee (AdCom) member of the Magnetics Society and a director of the **MSJ**, called for the third joint

meeting to an in-person format, after a two-years' break due to the COVID-19 pandemic. The meeting was held in the evening of September 6, 2022, during the 46th Annual Conference on MAGNETICS in Japan, held in Shinshu University, Nagano. The chairs and officers of the five chapters jointly met the representatives of the **MSJ**, including Satoshi Sugimoto, President of the MSJ. **Masahiro Yamaguchi**, President of the IEEE Magnetics Society joined this meeting as a guest.

There were discussions on (1) restarting joint invitations of Distinguished Lecturers (DLs) from Magnetics Society Chapters in Japan, (2) more integration of DL talks with Topical Symposia and Technical Meetings of the MSJ, (3) more nomination of MSJ members by IEEE Fellows and Magnetics Society AdCom members, and (4) the possibility of establishing a long-term mechanism in Japan to systematically recommend candidates for the titles and positions. Yamaguchi encouraged Japanese colleagues for more participation in the Around-the-Clock Around-the-Globe (AtC-AtG) conferences, new Students in Magnetism (SiM) events, and asked help for the success of Intermag 2023 to be held in Sendai, Japan.

During the Plenary Session for the Annual Conference on MAGNETICS in Japan, **Koki Takanashi**, General Co-Chair of Intermag 2023, introduced the outline of **Intermag 2023**, and **Masahiro Yamaguchi**, President of the IEEE Magnetics Society, introduced the activities of the **IEEE Magnetics Society** at the Plenary Session of the Annual Conference on MAGNETICS in Japan. We expect that more people will participate in conferences and society activities.



*Group photo of Third Joint Executive Meeting of the IEEE Magnetics Society Chapters in Japan and the Magnetics Society of Japan held in Momiji-Chaya (Maple Leaves Izakaya)*

# IEEE Magnetics Society at the International Conference on Electrical Machines (ICEM 2022)

Submitted by **Yacine Amara**, IEEE Magnetics Society Representative at ICEM2022 Conference



*The IEEE Magnetics Society booth at the Valencia Conference Center*

The **International Conference on Electrical Machines (ICEM)** is an influential and recognized international event, entirely devoted to electrical machines. Started in London in 1974, it is organized every two years. Since 2020, ICEM is officially registered as a non-profit organization (NPO).

The last **ICEM** was held in Valencia (Spain) during September 5-8, 2022 and had 492 participants, with 356 presented papers. It was co-chaired by Professors José A. Antonino-Daviu (Universitat Politècnica de València, Spain) and Gérard-André Capolino (Université de Picardie Jules Verne, France).

For this last event, the IEEE Magnetics Society was among the General Sponsors of the conference. The Society was represented at a booth, which was ideally located at the Valencia Conference Center, where the ICEM took place. During exchanges with the participants from academia and industry, promotion flyers of the society and the upcoming Intermag 2023 conference were distributed. This action was part of the "Magnetics

for Motors and Electric Machines" initiative, presented by Professor **Masahiro Yamaguchi** (President of the IEEE Magnetic Society), and voted by the Society Administrative Committee last April. This initiative is intended to deepen the relations between the Society and the well-established ICEM community.

The 2024 ICEM will take place in Torino, Italy (<https://icem.cc/coming-icems/>).

## Calorics 2022 in Cambridge

by **Xavier Moya** and **Neil Mathur**, organizers of Calorics 2022

Calorics 2022 was held on September 12-14, 2022, at the Møller Institute, on the site of Churchill College, Cambridge (UK). The three-day conference brought together over 45 participants coming from 14 countries, who enjoyed 30 invited talks that were divided into nine topics. A key aspect was for the community to meet up after the pandemic, so there were no online talks, thus freeing time for in-person interactions. On the second day, there was a conference dinner, which allowed participants to network and forge collaborations.

The conference covered all types of caloric materials, and ranged from fundamental aspects to applications of caloric materials in systems. Invited talks provided state-of-the-art research on multidisciplinary topics related to the physics, chemistry, materials science and engineering of caloric materials and devices, and brought together scientists and engineers from all caloric strands. For practical reasons, there were eight sessions, most of which mixed talks on materials and devices while focusing on just one type of caloric effect or multicaloric effects.

Positive feedback from a number of participants led to the announcement that the Calorics Conference should run biennially, with no change of location at least in the first instance.



*Participants at Calorics 2022*



TMAG 2022 conference picture. More pictures can be seen at [www.petaspin.com/tmag2022/gallery/](http://www.petaspin.com/tmag2022/gallery/)

## Trends in Magnetism 2022: A Conference in the Venetian Lagoon Islands

by **Vito Puliafito**, Politecnico di Bari, Italy

Trends in Magnetism 2022 (TMAG 2022) was held in Venice, Italy, at the Auditorium Santa Margherita, from September 4 to 9, 2022 ([www.tmag2022.it/](http://www.tmag2022.it/) [www.petaspin.com/tmag2022](http://www.petaspin.com/tmag2022)). It was the second edition in a series of international conferences initiated by the Petaspin Association, which started with TMAG 2020 in Cefalù (Italy).

TMAG 2022 was organized jointly by the Ca' Foscari University of Venice and Petaspin Association, in collaboration with Fondazione Università Ca' Foscari, Politecnico di Bari, Johannes Gutenberg University of Mainz and SPICE.

The two Chairs of the Conference were **Stefano Bonetti**, from the Ca' Foscari University, and **Vito Puliafito**, from the Politecnico di Bari. Together with **Jairo Sinova** from the JGU of Mainz, chair of the Program Committee, they welcomed more than 120 researchers, coming from 24 countries, including many European countries, USA, China, Japan, Korea, Brazil, Chile, Israel, Turkey and Algeria, and representing different areas of research in magnetism.

The main theme of TMAG 2022 was “Antiferromagnetism and Light” where the aim was to create a chance for the experts in these two broad fields to meet and move the scientific community forward. Besides the main theme, TMAG 2022 gave space to trending topics in all the areas of magnetism, including topological magnetism, spintronics for neuromorphic

and unconventional computing, and novel magnetic materials.

In the beautiful Auditorium Santa Margherita, TMAG 2022 started with an evening Nobel Lecture given by Prof. **Albert Fert**. The conference program had a structure similar to that of a Gordon Research Conference, with invited talks and ample time for discussion moderated by a leader in the field. Contributed participation was in the form of poster presentations with the invited speakers, discussion leaders, and Prof. Fert actively participating in the poster sessions. Overall, there were 4 keynote talks, 29 invited speakers, 70 posters. Five poster prizes were awarded, four presented by students and one by a senior researcher: Thomas Blank, from Radboud University (The Netherlands), Simone Cuccurullo, from Politecnico di Milano (Italy), Irina Dolgikh, from Radboud University (The Netherlands), Rodrigo Martín-Hernández, from the University of Salamanca (Spain), and, as senior researcher, Piotr Mazalski, from the University of Białystok (Poland).

Participants also enjoyed a rich social program. The night visit to the Basilica of San Marco was the highlight



Stefano Bonetti, Albert Fert and Vito Puliafito during the social dinner

of the program, especially the moment when the church, submerged in darkness, was slowly illuminated to reveal the golden mosaics on the ceilings. A conference dinner took place on Wednesday, September 7<sup>th</sup> in Torcello, a small island of the Venetian lagoon where guests arrived by means of a boat transfer provided by the conference organization. Likewise, rowing classes in the Venetian channels during lunchtime turned out to be very successful. During the social dinner, the Past-President of IEEE Magnetics Society, **Pallavi Dhagat**, gave a speech about the Society and about diversity in science. That evening, the third edition of TMAG was also announced, which will be held in Rome in September 2023 ([www.petaspin.com/tmag2023](http://www.petaspin.com/tmag2023)).

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## The 2022 IEEE Around-the-Clock Around-the-Globe Magnetics Conference

by May Inn Sim, Jan Masell, Alberto de la Torre (Regional Chairs)

August 2022 marked another successful edition of the **IEEE Around-the-Clock Around-the-Globe Magnetics Conference (AtC-AtG)**. In line with the conference's trademark format of a fully virtual and non-stop 24 hours running experience, the third edition was organized by a group of highly motivated early career researchers from all corners of the globe meeting in different time zones around the clock. The overall conference experience was further boosted for one and all with the unyielding support from past year organizers and invaluable guidance from the Steering Committee, formed by senior members of the scientific community.

An assembly of 12 invited expert talks, 50 contributed talks, and 65 posters formed the exciting program, attracting more than 500 registrants. The **IEEE AtC-AtG 2022** remains a unique, diverse, inclusive, and equitable conference for all across the spectrum of identities, geographical locations, and lived experiences. We traveled virtually to research institutions around the world, spanning 23 different countries, with the strongest contributions from Spain and Argentina, with six contributed talks, and India having 18 posters presented.

Positive feedback from participants further acknowledged the efforts of the organizers in bridging the “*virtual engagement and communication barriers*”. In particular, multiple *Gather.town* sessions were incorporated into the program, wherein poster presentations, competitions, meet-the-invited-speaker sessions, and online multiplayer games were held.

These fun and interactive segments encouraged interactions and networking amongst participants and received commendations from many.

To bring the conference to fruition, the organizers worked tirelessly through many meetings and discussion sessions. Members of the organization committee regarded this opportunity as “a very enriching and formative experience within my graduate studies that has led to new worldwide friendships and collaborations.” Their involvement paved the way for additional personal development too, picking up and “honing managerial skills, communication skills, and many more”. With that said, we are proud to announce that we will soon begin our search for motivated individuals, both young postdocs and students, who are interested in being part of the organizing committee for the AtC-AtG 2023 conference - stay tuned!

We thank all the participants and committee members for their support and participation in making AtC-AtG 2022 as memorable as it was, and we welcome you to look forward to the next edition of AtC-AtG 2023. See you there!

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## The Steering Committee Chairs' view of the 2022 IEEE Around-the-Clock Around-the-Globe Magnetics Conference

by Hans Nembach (past Chair), Helmut Schultheiss (Chair) and Matthew Pufall (incoming Chair), AtC AtG Steering Committee

The third edition of the **IEEE Around-the-Clock Around-the-Globe Magnetics Conference (AtC-AtG)** was another great success, with 578 registered participants. As in the two previous years, the conference was only virtual and ran non-stop for 24 hours. It was organized by a group of highly motivated advanced students and early career researchers. They were supported by a team of last year's organizers and guided by the Steering Committee, which was formed by senior members of the community. They assembled an exciting conference program with contributed oral and poster sessions, with a total of 50 contributed talks and 65 posters. The presenters were from 23 different countries, with the strongest contribution from Spain and Argentina, both having 6 talks and India having 18 posters. In addition, the conference featured 12 invited talks and tutorials by senior experts from around the world, with a special emphasis on inviting a diverse group of experts, where the different regions are all well represented. We have received again very positive feedback from the organizers, who told us that they

learned a lot beyond just how to organize a conference but also, for example, how to efficiently lead a small team, how to distribute tasks and meet many tight deadlines.

Soon, we will start our search for motivated advanced students and young researchers, who are interested in organizing the 2023 AtC-AtG conference. Please stay tuned.

We strongly appreciate the financial support the AtC-AtG conference has received from the Education Committee and the Conference Executive Committee of the Magnetics Society.

## Search for the Next Incoming IEEE Around-the-Clock Around-the-Globe Steering Committee Chair

*Submitted by Hans Nembach (past Chair), Helmut Schultheiss (Chair) and Matthew Pufall (incoming Chair), AtC AtG Steering Committee*

The IEEE Around-the-Clock Around-the-Globe Magnetics Conference (AtC-AtG) is looking for a new incoming chair for the Steering Committee. This is a three-year appointment, where the incoming chair becomes familiar with the responsibilities to oversee the students and postdocs organizing the conference during the first year, takes charge as the chair during the second year and passes on the knowledge as past-chair during the third year. We expect the incoming chair to be a senior member of the magnetics community and that they be willing to interact and guide the organizing students, mostly through Slack. Please contact Hans Nembach ([nembach@ieee.org](mailto:nembach@ieee.org)) if you are interested or would like to apply for the position. The application deadline is **December 7, 2022**.

## IEEE Student Membership Discount

The IEEE Board of Directors has approved a discount of 50% on student member dues. Students may use the promotion code **FUTURE50** during the online check-out process for joining or renewing their IEEE memberships.

Students who recently joined or renewed at full price may write to the **IEEE Contact Center** to request a credit on future membership dues.

[Join Now](#)

## New Senior Members

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

**September 2022:** Graeme Bunce, Joseph Castagna, Jean-Pierre Ducreux, Dustin Gilbert, Cengiz Onbasli and Yutaka Sakurai.

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

## The IEEE Magnetics Society Standards Committee (MG/SC)

by **Philip Pong**, Chair of Standards Committee

The IEEE Magnetics Society has recently approved the formation of the Standards Committee (MG/SC) under its Technical Committee. The MG/SC is responsible for providing and developing core standards for the benefit of industry in magnetics and related areas. These standards help enable industry to advance technology forward at a rapid pace to deliver the finest products to consumers. The scopes covered by the MG/SC include, but are not limited to:

- Spintronics & recording
- Power, energy, machine, and environment
- Sensors, communications, instrumentation, and measurement
- Materials and phenomena
- Bio, interdisciplinary, and emerging topics

By working with the IEEE Standards Association (IEEE SA), IEEE MG/SC will be able to provide a globally open, inclusive, and transparent environment for market-relevant, voluntary consensus standardization and other industry consensus activities in the magnetics area.

The IEEE MG/SC had its kick-off meeting on October 27, 2022. During the kick-off meeting, the establishment of the MG/SC was announced and a platform for standards development in magnetics was created. A Technical Subcommittee is being set up for each of the above-mentioned technical areas. If you have expertise in any of these areas and are interested in participating in standards development, you are welcome to join the Technical Subcommittees. The Technical Subcommittees will oversee and coordinate the standards activities within their respective scopes. Please kindly contact Philip Pong, MG/SC Chair ([philip.pong@njit.edu](mailto:philip.pong@njit.edu)) or Malia Zaman, IEEE SA Program Manager ([m.zaman@ieee.org](mailto:m.zaman@ieee.org)) with your CV and indicate which Technical Subcommittees you are interested in joining.

## IEEE Magnetics Society Distinguished Lecturers for 2023

Submitted by **Beth Stadler**,  
Distinguished Lecturer Committee Chair

It is my pleasure to introduce the 2023 Distinguished Lecturers (DLs) on behalf of the IEEE Magnetics Society:

- Susana Cardoso de Freitas (Instituto de Engenharia de Sistemas e Computadores – Microsistemas e Nanotecnologias (INESC–MN) and Instituto Superior Técnico (IST) Lisboa, Portugal);
- J. Ping Liu (University of Texas at Arlington, USA);
- Yoichiro Tanaka (Tohoku University, Japan); and
- Manuel Vázquez (Institute of Materials Science of Madrid, CSIC, Spain).

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 either physically or virtually are encouraged to contact the DLs directly.

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### Magnetic Sensors: From Ultrathin Film Growth to Sensor Integration in Unexpected Systems

Susana Cardoso de Freitas  
*Instituto de Engenharia de Sistemas e Computadores – Microsistemas e Nanotecnologias (INESC–MN) and Instituto Superior Técnico (IST) Lisboa, Portugal*

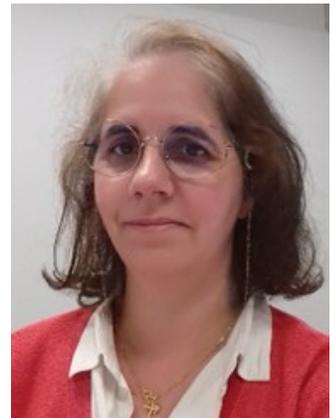
Nanoelectronics combines physical principles of materials with the impressive capability of engineering ultra-small devices at the nanoscale. Magnetic field sensors — in particular, magnetoresistive (MR) sensors — were driven by the technological push from computers and information storage in the early 1990s. Currently, they have a mature and broad level of implementation in the market, from automotive to biomedical domains. In this talk, I will first introduce key concepts in spintronics and highlight the physical mechanisms defining sensor performance and the figures of merit for the classification of outstanding MR sensors. The impressive technological progress in thin film preparation and characterization, combined with nano- and microfabrication tools, offer a large spectrum for device design. The materials discussed include several varieties of thin films: oxide films as tunneling

barriers, ultrathin amorphous and crystalline films, ultrathin textured layers with grain size control, magnetically soft layers, and antiferromagnetic films, all combined onto multilayer stacks, typically thinner than 60 nm in total. In addition, the noise mechanisms (the “killing factor” that limits MR sensor performance) will be discussed, and I will show successful strategies for improving the signal-to-noise ratio, which determines the ultimate field detectable by an MR sensor.

Examples where spintronic sensors are useful tools for precision sensing will be provided, including integration with microfluidics, optical, and micro-electromechanical micromachined actuators. Detection principles, sensor design, simulations, and experimental validation will be discussed for exciting applications where MR sensors bring added value over competing technologies. I will show how challenging applications have inspired creative solutions, requiring joint skills in physics, materials, electronics, and mechanical engineering. I hope that academics and engineers will be encouraged to propagate their expertise in magnetism to the young, talented people we see every day, and so promote innovation in future spintronic sensors.

#### **Susana Cardoso de Freitas**

*graduated in Technological Physics Engineering from the Instituto Superior Técnico (IST) Lisboa in 1996 and received the Ph.D. degree in Physics at the Universidade de Lisboa and INESC–MN in 2002. In 2002 she was a Co-Op Pre-Professional Engineer at the IBM T. J. Watson Research Center (USA), and then became a researcher at INESC–MN, where she is currently the co-leader of the Spintronics and Magnetic Biosensors Group. Since 2002 she has coordinated and participated as principal researcher in several European Union and national projects, with a strong collaboration with industry in advanced materials, sensors, and integrated systems. Her research focuses on optimizing magnetic materials and device architectures for robotics, biomedical, and industrial applications. As an Associate Professor in the Physics Department, Instituto Superior Técnico Lisboa, she is responsible for student coordination and advanced training in nanoelectronics, microfabrication, and spintronics, with a strong component of experimental learning in a clean room. She was appointed Coordinator for educational activities of the IEEE Portugal section in 2015. In 2018 she was selected*



as one of 109 Portuguese “Women in Science” by the Portuguese Ministry of Science and Technology (*Mulheres na Ciência*, 2nd edition, *Ciência Viva*, 2019). Since 2019 she has been a member of the “Ambassador for Innovation” group at IST. In 2019 she was elected Associate Member Delegate to the European Physics Society (EPS) Council and is a member of the General Council of the European Magnetism Association (EMA) for 2021-2023. She is a co-author of more than 300 articles, 25 book chapters, and five patents, and manages several technology-transfer contracts with industry worldwide related to MR sensors.

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### Magnetic Hardening in Low-Dimensional Ferromagnets

J. Ping Liu  
University of Texas at Arlington, USA

How “hard” (coercive) a ferromagnet can be has been a puzzle for a century. Seven decades ago, William Fuller Brown offered his famous theorem to correlate coercivity with the magnetocrystalline anisotropy fields in ferromagnetic materials. However, the experimental coercivity values have been far below the calculated levels given by the theorem, which is called Brown’s Coercivity Paradox. Researchers have attempted to solve the paradox with sustained efforts; however, the paradox remains unsolved, and coercivity still cannot be predicted and calculated quantitatively by modeling.

Progress has been made in the past 20 years in understanding coercivity mechanisms in nanoscale low-dimensional ferromagnets. In fact, ferromagnetism is a size-dependent physical phenomenon, as revealed by theoretical studies. However, nanoscale ferromagnetic samples with controllable size and shape have been available only in recent times. By adopting newly developed salt-matrix annealing, surfactant-assisted milling, and improved hydrothermal and chemical solution techniques, we used a bottom-up approach to produce nanostructured magnets and have successfully synthesized monodisperse ferromagnetic Fe-Pt, Fe-Co and Sm-Co nanoparticles and Co nanowires with extraordinary properties, which are strongly size- and shape-dependent. A study on size-dependent Curie temperature of the L1<sub>0</sub> ferromagnetic nanoparticles with sizes down to 2 nm has experimentally proved a finite-size effect. A systematic study of nanowires with

extremely high coercivity above their magnetocrystalline anisotropy fields has opened a door to the solution of Brown’s Paradox.

**J. Ping Liu** received the Ph.D. degree in Physics at the University of Amsterdam, The Netherlands. He is a Distinguished University Professor at the University of Texas at Arlington, USA. For the past four decades he has worked in research and development of permanent magnets and related magnetic materials in China, Europe, and the U.S. His recent research has been focused on hard magnetic nanoparticles, thin films, and bulk nanocomposites, as reported in his more than 320 peer-reviewed journal papers, review articles, and books, including *Nanoscale Magnetic Materials and Applications*, (Springer, 2009), *Skyrmions: Topological Structures, Properties, and Applications* (CRC Press, 2016), and *Permanent Magnets: The History and Future* (Science Press, 2020). He has supervised more than 50 graduate students and postdoctoral researchers. He is an elected Fellow of the American Physical Society and the IEEE. He received the Outstanding Achievement Award at the 25th International Workshop on Rare-Earth and Future Permanent Magnets and Their Applications in 2018.



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### Magnetic Data Storage Technology: From the Invention of Perpendicular Magnetic Recording to Social Integration

Yoichiro Tanaka  
Research Institute of Electrical Communication, Tohoku University, Japan

The digital world is producing nearly a hundred zetta-bytes of data per year and creating value for the quality of society. A huge amount of data is being stored, processed, transmitted, and then shared via large-scale networked data centers, which consist of millions of data storage systems filled with perpendicular magnetic recording (PMR) hard disk drives. PMR technology was invented by Shunichi Iwasaki in 1975, and the first commercial product was launched in 2005. Since then, data storage has become the ever-growing foundation

of the digital world and has led to data-driven innovations such as big-data artificial intelligence (AI) analytics, Internet of Things, medical science, and even black-hole visualization in astronomy.

This lecture will discuss the essential magnetism needed to understand innovative PMR data storage technology and the origin of the high-density recording performance that has led current recording density growth. Storage performance stands on a stacked system foundation and the building blocks are, from its base, the physics of magnetism, three-dimensional material controls at the subnanometer scale, magnetic and electronic device design, storage device integration, and storage system architectures, together with nonvolatile memory to unleash the system's intrinsic performance. The development of new storage devices and systems requires a multiscale approach and the correct guiding principles to establish expected functions. As an extension of PMR research, the lecture will show the prospects for future storage technology and system architecture from the multiscale view of storage system development. New computational storage aiming at unifying computation power in data storage and brain-inspired systems, as well as the academic-industry relations to realize those systems, will also be introduced.



**Yoichiro Tanaka** is a professor in the Research Institute of Electrical Communication (RIEC) at Tohoku University. He received the bachelor's and master's degrees in Communications

Engineering and the Ph.D. degree in Electronic Engineering from Tohoku University, where he did his

thesis research on perpendicular magnetic recording physics and storage system integrations. He has worked in Toshiba's storage device business and in academia for over 30 years. He is devoted to the proof and development of PMR and helped realize the world's first PMR hard disk drive in 2005. His career includes the development of a giant magnetoresistive head, perpendicular granular thin film media, and, recently, new computational storage systems with integrated big-data analytics capability. He won Nikkei BP Technology Awards (1997, 2006), the Japan Magnetism Society Achievement Award (2006), and the Okochi Memorial Prize (2007). He is a senior member of the IEEE and a member of the Magnetism Society Administrative

Committee for a three-year term, 2022-2024. He is a fellow of the Magnetism Society of Japan (MSJ). He is currently serving as Secretary General for the International Magnetism Conference (Intermag 2023, Sendai).

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## **Cylindrical Micro- and Nanowires: From Curvature Effects on Magnetization to Sensing Applications**

Manuel Vázquez

*Institute of Materials Science of Madrid, , Consejo Superior de Investigaciones Científicas, Spain*

Research on curvature effects in magnetic nanostructures is attracting much interest as they offer novel alternatives to planar systems. In particular, the cylindrical geometry introduces significant singularities in the magnetic response of ferromagnetic wires just from their curvature, which primarily depends on their diameter, length, and aspect ratio. The main magnetic configurations include axial, transverse, and vortex (circular with a singularity at the axis). Micrometric-diameter amorphous wires with high magnetostriction re-magnetize through an ideal millimeter-long single domain wall propagating at kilometer-per-second speeds that results in a square hysteresis loop. Such bistable behavior and their magnetoelastic properties are the basis for various devices (e.g., stress and temperature sensors, electromagnetic shielding). On the other hand, ultrasoft non-magnetostrictive microwires are employed in very sensitive field sensors based on their giant magnetoimpedance effect or in flux-gate magnetometers.

Nanowires (20 nm to 400 nm in diameter) present an outstanding behavior where the crystalline structure plays a major role in competition with shape anisotropy. Cylindrical nanowires are considered as scaffolds for advanced three-dimensional nanoarchitectures exploiting intrinsic curvature that introduces significant differences from planar-based nanotechnologies. They are proposed for novel sensor devices and magnets, and their interconnecting arrays are considered for energy devices or brain-inspired computing. An ultimate goal is currently the investigation of the magnetization reversal modes in individual nanowires by advanced techniques, e.g., X-ray magnetic circular dichroism (XMCD) coupled to photoemission electron microscopy (PEEM), magnetic force microscopy (MFM), magneto-optical Kerr

effect (MOKE), electron holography, and micromagnetic simulations. They show axial, transverse, vortex, and more complex, exotic magnetic configurations and effects (e.g., magnetization ratchets, skyrmion tubes, helical vortices). The reversal nucleates at the nanowire ends involving singularities (e.g., Bloch-point walls) and at local transition regions (e.g., modulations in diameter and compositional modulations between segments of differently designed magnetic properties, such as ferromagnetic/ferromagnetic (FM/FM) or ferromagnetic/nonmagnetic (FM/NM). Individual nanowires are currently used or proposed for biomedical applications, such as cancer treatment, magnetic resonance imaging (MRI) contrast agents, or in composites for their antimicrobial activity.

activities, particularly those of the IEEE Magnetics Society: He founded the society's Spain Chapter in 2007, was chair of the InterMag Conference in 2008, and served as President in 2017-2018. He received the society's Distinguished Service Award in 2021. For the International Union of Pure and Applied Physics (IUPAP), he served as Secretary of the Magnetism Commission and as Program Chair of the International Conference on Magnetism (ICM) in 2015. He was one of the three co-founders of the Club Español de Magnetismo in 2002 and received its Salvador Velayos Award in 2016.

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## Students in Magnetism (SiM)

by May Inn Sim, María Salvador and Audre Lai



Greetings from the youngest chapter of the IEEE Magnetics Society!

Amidst the hustle and bustle of the year, July 2022 welcomed a new chapter of the IEEE Magnetics Society - **Students in Magnetism (SiM)** - a first of its kind in the society, devoted to young researchers and run by young researchers. Conceived by President-Elect **Atsufumi Hirohata**, the SiM chapter is led by **May Inn Sim** (National University of Singapore), **Ya-An (Audre) Lai** (Cornell University, USA), and **María Salvador** (University of Oviedo, Spain), to bring together the worldwide community of magnetism graduate students. The SiM chapter aims to form an inclusive space for members to grow in their graduate research journey through activities that may include invited talks, sharing sessions, networking sessions, reviewing experiences, and more. Members will also receive opportunities to make an impact on their communities through organizing outreach activities for the general public in order to publicize the ubiquity of magnetism in our daily lives. We hope that these events



**Manuel Vázquez** has been a Professor of Research in the Spanish Council for Research (CSIC) since 1996. He was responsible of many scientific and technological projects on the magnetism of nano- and microwires, and has supervised 35 Ph.D. students and numerous visiting scientists. He is coauthor of over 600 publications and 23 patents, and has contributed to several books, including as editor of *Magnetic Nano- and Microwires* (Elsevier, 2015 and 2020). After defending his Ph.D. at the Complutense University of Madrid, he was an Alexander von Humboldt postdoctoral fellow at the Max-Planck-Institute für Metallforschung and at the Technical University of Denmark, Lyngby, under a NATO research grant. He was the Head of Laboratory at the Institute of Applied Magnetism, IMA (1992-2000) and Manager of the Spanish Strategic Action on Nanoscience and Nanotechnology (2004-2009). He established the Group of Nanomagnetism and Magnetization Processes at ICMM/CSIC (2001). Prof. Vázquez has actively volunteered in international



SiM debut at MMM 2022 Conference, Minneapolis, USA

will motivate the younger generations to pursue a career in engineering and magnetism.

In this framework, **SiM** has launched an annual outreach program, MagnetiSiM (a combination of “Magnetism” and “SiM”) that strives to promote different applications of magnetism. This year’s edition, MagnetiSiM 2022, invites participants to learn about the phone magnetometers and the Earth’s magnetic field. About 300 years ago, British watchmaker George Graham was the first to note the rapid changes in magnetic field declination in a short time using three needles at his workshop in London. These variations in the magnetic field declination were likely to be the very first magnetic storm observation. Additionally, about 190 years ago, the German physicist and mathematician Carl Friedrich Gauss measured the intensity of the Earth’s magnetic field for the very first time.

In celebration of these anniversaries and the milestones in the Earth’s magnetic field measurement, SiM wants young students and the general public to explore our current magnetic sensor technology and to use one of the sensor available to measure the Earth’s magnetic field. Are you still thinking about where and how to

access a magnetic sensor? Chances are you already have one in your pocket and perhaps you are reading this newsletter on this device: your mobile phone. There are various sensors, including a magnetometer, on our mobile phones that can be used to conduct simple experiments. By downloading an app (Phyphox), you can access those sensors individually. SiM members have developed three activities to guide students to learn phone magnetometer applications and the Earth’s field measurement. The activity instructions can be found on our **webpage**. We encourage readers to go there, see how to do it, and share your value to complete our interactive map. You stand to win prizes with your submissions!

First glimpses of **SiM**’s gradual debut to the community were spotted by attendees at the recent **MMM 2022 in Minneapolis, USA**, with a kick-off event to promote SiM and engage student attendees to join in. Coupled with an additional networking game, the event saw over a hundred participants and SiM’s exclusive goodies and T-shirts were completely swept away.

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# Teaching and Communicating Magnetism

*by Martin Lonsky, Institute of Physics, Goethe University Frankfurt, Germany*

Nowadays, the majority of people are likely to encounter magnetism in their everyday lives, be it by simply seeing the magnets on their refrigerator door, using magnetized screwdrivers, navigating with a compass, swiping a credit card, undergoing a magnetic resonance imaging scan, or saving an image file on their computer's magnetic hard drive. Of course, in the IEEE Magnetics Society, we have a much closer and more professional relationship with the world of magnetism, for instance, by conducting fundamental research or driving the evolution of magnetism-based technologies. This places us in an optimal situation for teaching and communication outreach in the field of magnetism!

It is not uncommon that very early on during their time in elementary school, students learn about the attraction and repulsion of bar-shaped magnets, usually in a playful way. Children learn that such magnets are usually divided into two sections, which are painted red and blue, representing the north and south poles, respectively. Different "colors" attract; the same "colors" repel. Sometimes, horseshoe magnets are occasionally introduced and shown to exhibit a particularly strong magnetic field between their poles. In any case, horseshoe magnets have clearly become the most widely recognized symbol for magnets and are often identified as such even by the youngest kids.

At a later time, usually in secondary school, students are able to understand the origin and direction of magnetic fields. In particular, they learn about Oersted's law and how electric current produces a magnetic field. Students can understand how a time-varying magnetic field induces an electromotive force by studying Faraday's law and electromagnetic induction. In addition, they explore how magnetic fields influence the motion of charge, specifically via the Lorentz force, which is the fundamental cause of the Hall effect. In essence, the aforementioned topics constitute a basic education in magnetism that most people receive.

Clearly, this basic magnetism education is lacking, and the subject would merit more attention, especially with regard to the vast number of magnetic-based applications in science and technology. Apart from that, it is worth considering how to improve the presentation of magnetism in textbooks and the classroom. For instance, education researchers may object to the introduction of magnetic poles while claiming that this

is only a model and magnetic charges do not exist. However, numerous studies have shown that simply mentioning common mistakes is not effective at all. Instead, the student's misconception persists. Another common misconception about magnetic fields is the belief that a magnet exerts a force on a static charge.

Rather than relying on the instructor to demonstrate the failure of the model, letting the students experience it themselves (e.g., through conducting experiments or numerical simulations) to resolve these problems. As well as this, cooperative learning can be more effective than traditional chalk and board talks and teacher demonstrations.

Misconceptions persist even at university level. For instance, students often fail to identify the source of magnetic fields and tend to confuse magnetic force and field. We need to make it clear to students that electric fields are created by charges at rest, while magnetic fields occur due to charges in motion. In addition, many students believe that field lines are real. They need to comprehend that humans use imagination and simplification to describe complex natural phenomena. A final example is given by the confusion related to physical quantities, such as the magnetic flux density  $B$  and the magnetic field strength  $H$ , which are frequently both referred to as "magnetic field". This ambiguity bewilders students, teachers, and even scientists in the field of magnetism. Here, people from physics, engineering, and other fields ought to come together and achieve consistency in the naming of magnetic quantities as well as their units. The IEEE Magnetics Society can take a leading role in this discussion. As a matter of fact, units can often help students understand the meaning of their respective physical quantities.

All in all, we can further promote magnetism teaching and extend people's interest in magnetism! Taking appropriate steps to address misconceptions about magnetism is one step closer to an improved understanding. In addition, we could advocate for more timely magnetism content, such as magnetic recording and sensing technology, in the curriculum of high school science classes, which could help students understand the importance of magnetism early on in the curriculum. We are seeking for articles the IEEE Magnetics Society Newsletter from inspired MagSoc members about teaching and communicating magnetism as an ongoing effort to reach out to students, instructors at different levels, and the general public. You can get in touch with me through [mlonsky@physik.uni-frankfurt.de](mailto:mlonsky@physik.uni-frankfurt.de).

## From the Editor

by **Jia Yan Law**, Editor of the Newsletter of IEEE Magnetics Society



It gives me great pleasure to welcome you to the first edition of the Newsletter of the IEEE Magnetics Society, for which I serve as editor.

First of all, I want to thank **Gareth Hatch**, the previous editor of the Newsletter, for his outstanding job overseeing it over the years. *Gareth, you've*

*made it challenging to push for a new era in the MagSoc Newsletter! My sincere thanks go out to you as well for all your help during the transition of the editorship.*

Following the good tradition that I intend to continue, some new implementations will be made to broaden the newsletter's readership: to senior and young scientists, students and instructors, members, and those who are not yet members! Among these are sections on "Teaching and Communicating Magnetism," "Students in Magnetism," and etc. From the next issues, technical topics will be included, such as "Power, Energy, Machines, and Environment", "Materials: Applications, Supply Chain Issues, Processing and Recycling", "Spintronics, Recording, Fundamental Phenomena", "Spotlights on Research Groups and Projects", etc., to provide overviews of current trends or perspectives within each member's research area. A student-written section will be incorporated, along with cover articles that feature the "artists" behind *Magnetism as Art Showcase, Magnetic Sensors Challenge*, etc.

I'm looking forward to working with you all to increase readership by including topics that will relate to different career stages!

## 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

## Conference Calendar

by **Jia Yan Law**, Editor of the Newsletter of IEEE Magnetics Society

### 4<sup>th</sup> International Conference IEEE Advances in Magnetism (AIM2023)

January 15-18, 2023 - Moena, Italy.

### Magnetic Frontiers: Quantum Technology (Magnetic Frontiers 2023)

April 19-22, 2023 - Orlando, Florida, USA.

### INTERMAG 2023

May 15-19, 2023 - Sendai, Japan.

### 24<sup>th</sup> International Conference on the Computation of Electromagnetic Fields (COMPUMAG 2023)

May 22-26, 2023 - Kyoto, Japan.

### Physics of Magnetism 2023 (PM '23)

June 26-30, 2023 - Poznań, Poland.

### 2023 IEEE Magnetics Society Summer School

July 16-21, 2023 - Bari, Italy.

(Application deadline: November 30, 2022)

### 68th Annual Conference on Magnetism and Magnetic Materials (MMM 2023)

October 30 - November 3, 2023 - Dallas, USA.

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

Society webpage at:

<http://www.ieemagnetics.org>

Please send all contributions via email to the Newsletter Editor, Jia Yan Law, at: [jylaw@ieee.org](mailto:jylaw@ieee.org)

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