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NEWSLETTER

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AUG 2025

Editor:
Jia Yan Law

FIELD, TEMPERATURE FIRST-ORDER REVERSAL CURVE MEASUREMENTS

DC MOMENT: MEASURED TWO WAYS

SPECIAL IN THIS ISSUE!
ARTICLES FROM
COMPANIES

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IN THIS ISSUE

Note from the Editor

This issue dives into the world of magnetic measurements and characterization, featuring invited articles from leading companies in the field.

We also bring you the latest Summer School report, plus something extra: heartfelt reflections from attendees; don't miss what they had to say to the organizers and Education Committee.

And in a metal-inspired theme, we explore unexpected magnetic "marvels"... like the components inside electric guitars that bring your favorite riffs to life.

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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, sister societies and other people in the area of applied magnetics.

Contributions are solicited from Society and sister society members, Officers & other volunteers, conference organizers, local chapters, and other individuals with relevant material. The Newsletter is published quarterly on the Society website.

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PITCH IN

Passionate about impactful ideas, educational content, or inspiring stories? Got an eye for what makes a great read? We're always on the lookout for powerful ideas, compelling voices, and fresh perspectives. Whether you're a seasoned writer or just passionate about your field, this is your invitation to get involved.

Write to us and come on board!

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Characterization is More Powerful When Correlated!

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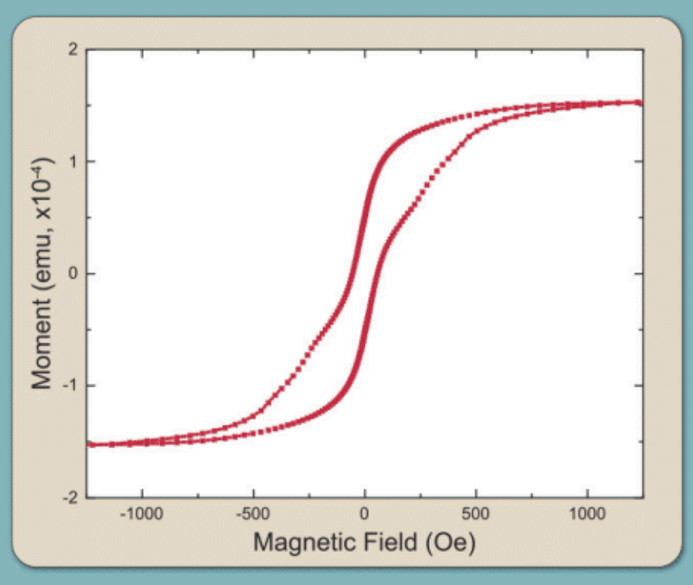

Major Hysteresis Loop:
Characterize the ensemble average

Temperature: 0.5 K–1000 K
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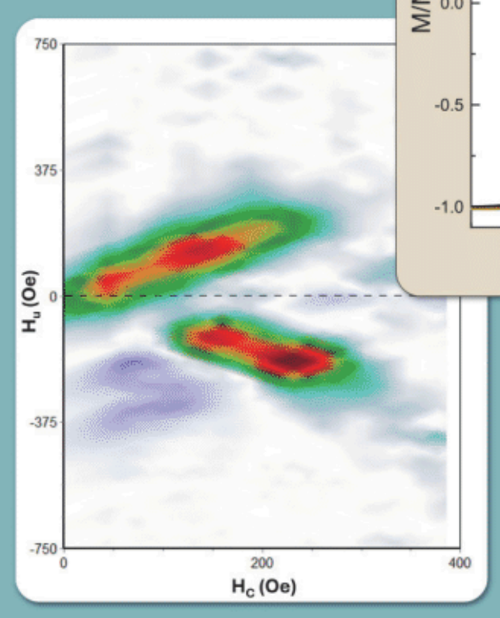

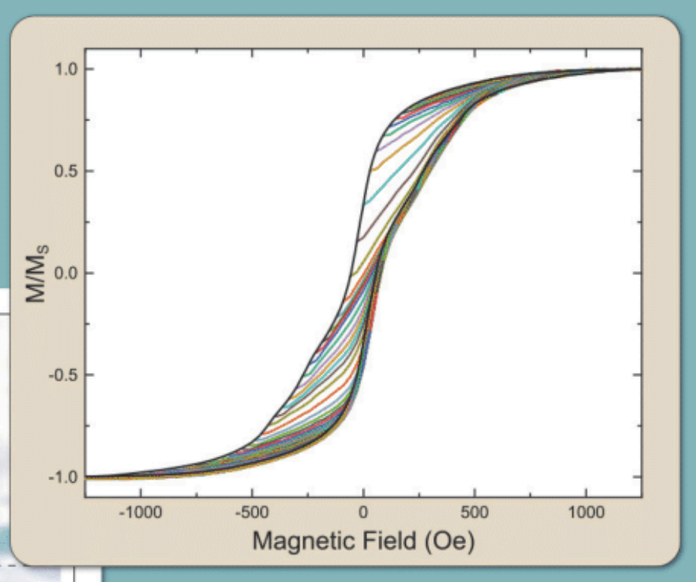

First Order Reversal Curves (FORCs) Analysis:
Quantitative fingerprint of the reversal mechanisms

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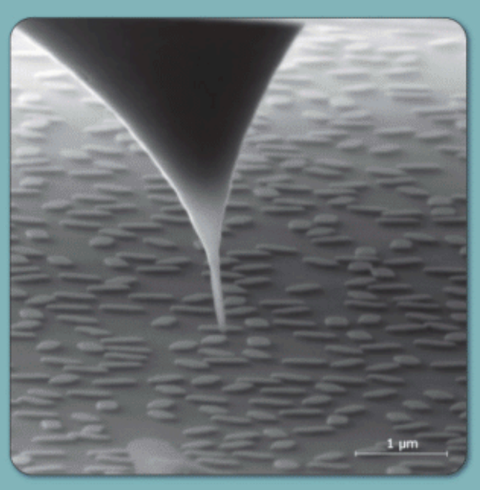
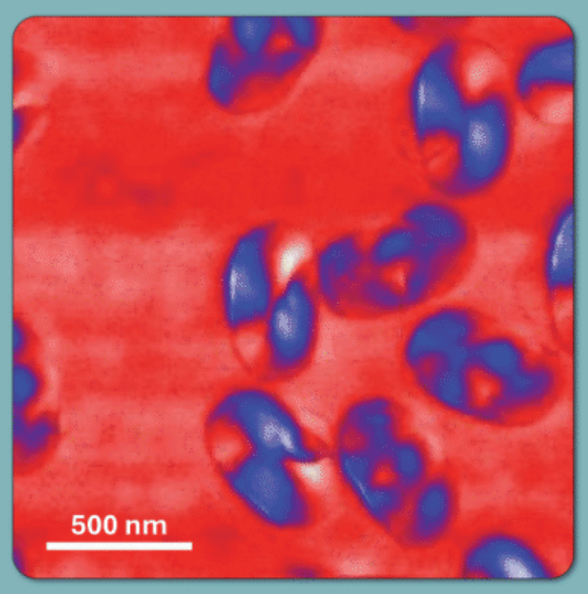


Magnetic Force Microscopy (MFM):
Remanent state domain imaging at the nanoscale





Temperature: 50 mK – 1000 K
Field: ± 9 T, ± 12 T, ± 14 T



Correlated Microscopy Platform
AFM with SEM + EDS

Sample provided by Dr. Jack Gartside, Imperial College London.

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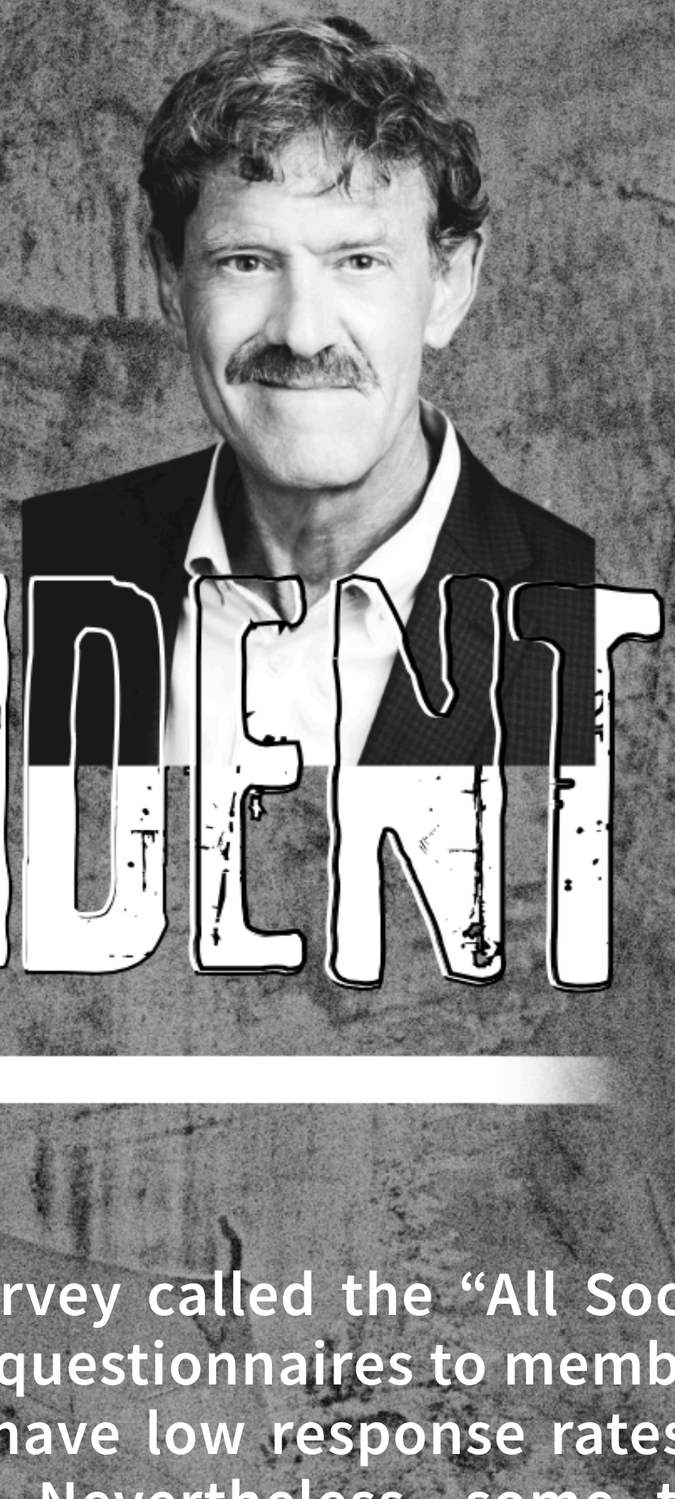
FROM THE PRESIDENT



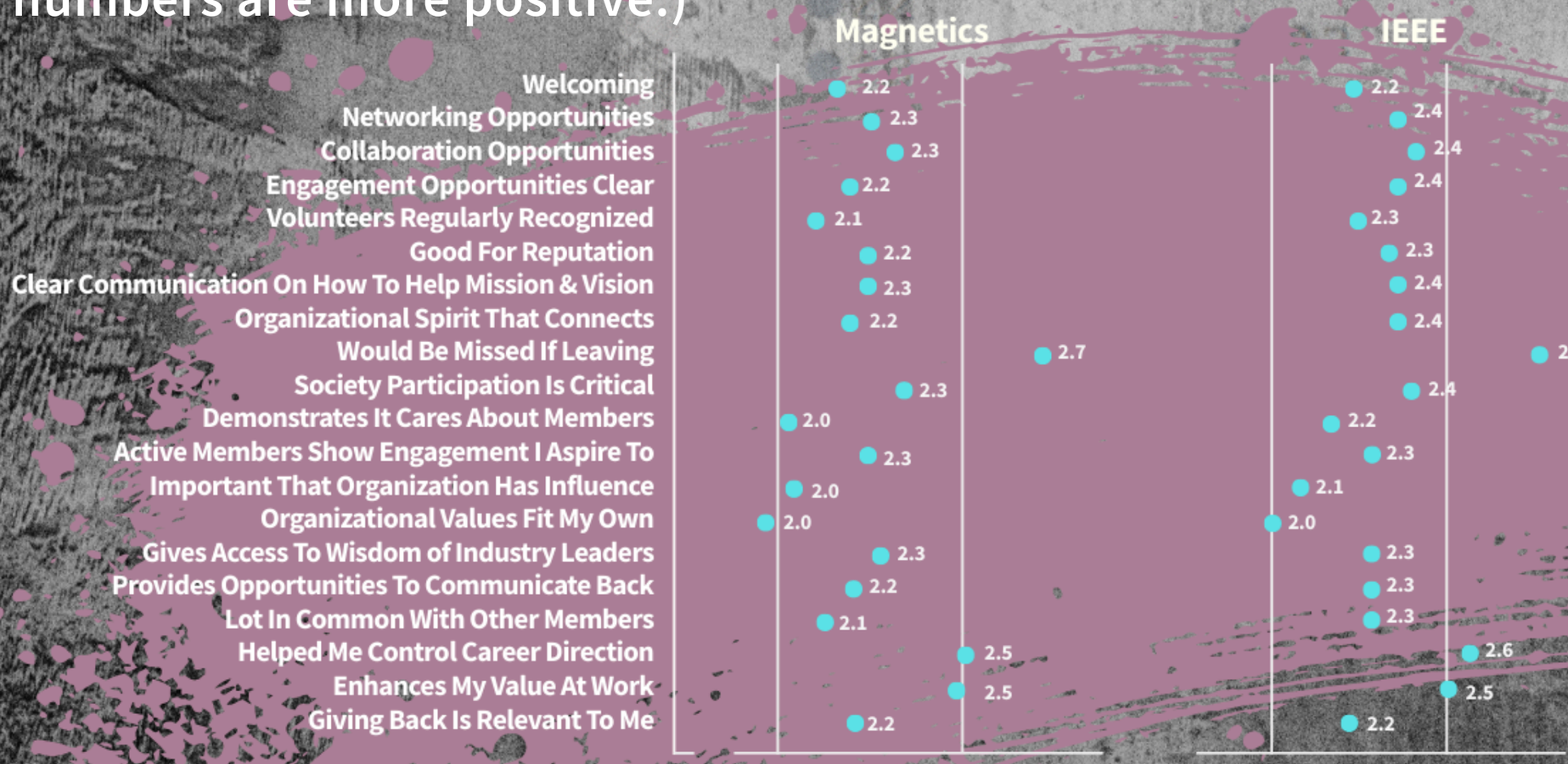
RON GOLDFARB

In 2024, IEEE conducted a survey called the “All Societies Research Project” by sending questionnaires to members of IEEE societies. Most surveys have low response rates, and this one was no exception. Nevertheless, some trends emerged.

IEEE societies as a whole had 14,105 respondents: 1,767 female, 11,548 male, 790 unknown. By comparison, the Magnetics Society had 312 respondents (10% of those polled): 27 female, 260 male, 27 unknown.

Overall, our members feel the same about the Magnetics Society as other IEEE members feel about their principal societies. However, Magnetics Society women and men value different society attributes, as I show further below.

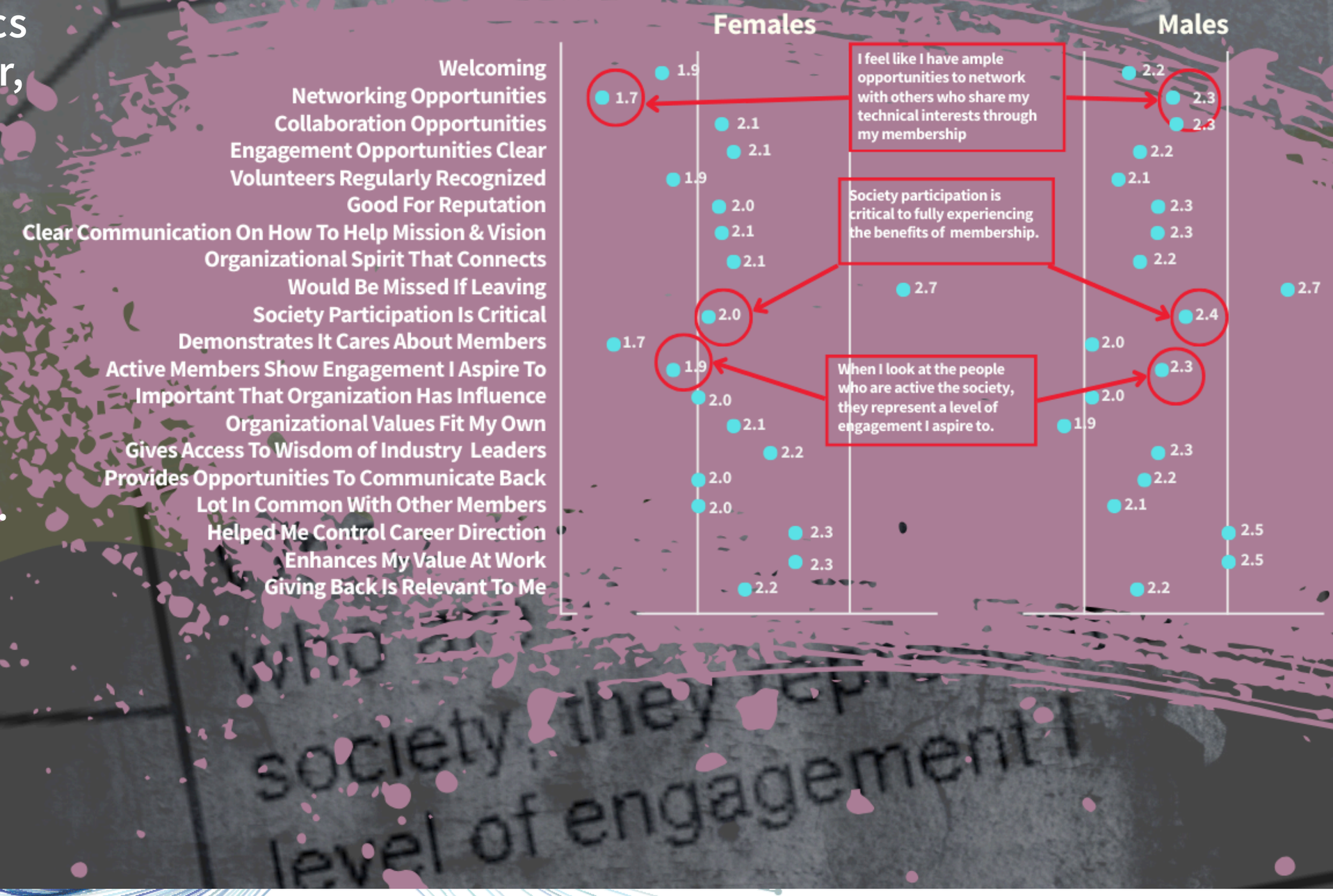
The “member experience” of respondents illustrates the averageness of how members characterize the Magnetics Society compared to members of all IEEE societies. (Responses range from 1 to 4, where smaller numbers are more positive.)



If one breaks down the right “IEEE” column, there are no significant differences between women and men for IEEE societies as a whole.



For the Magnetics Society, however, there are some differences. I highlight three areas of significant difference and give the full, expanded questions asked.



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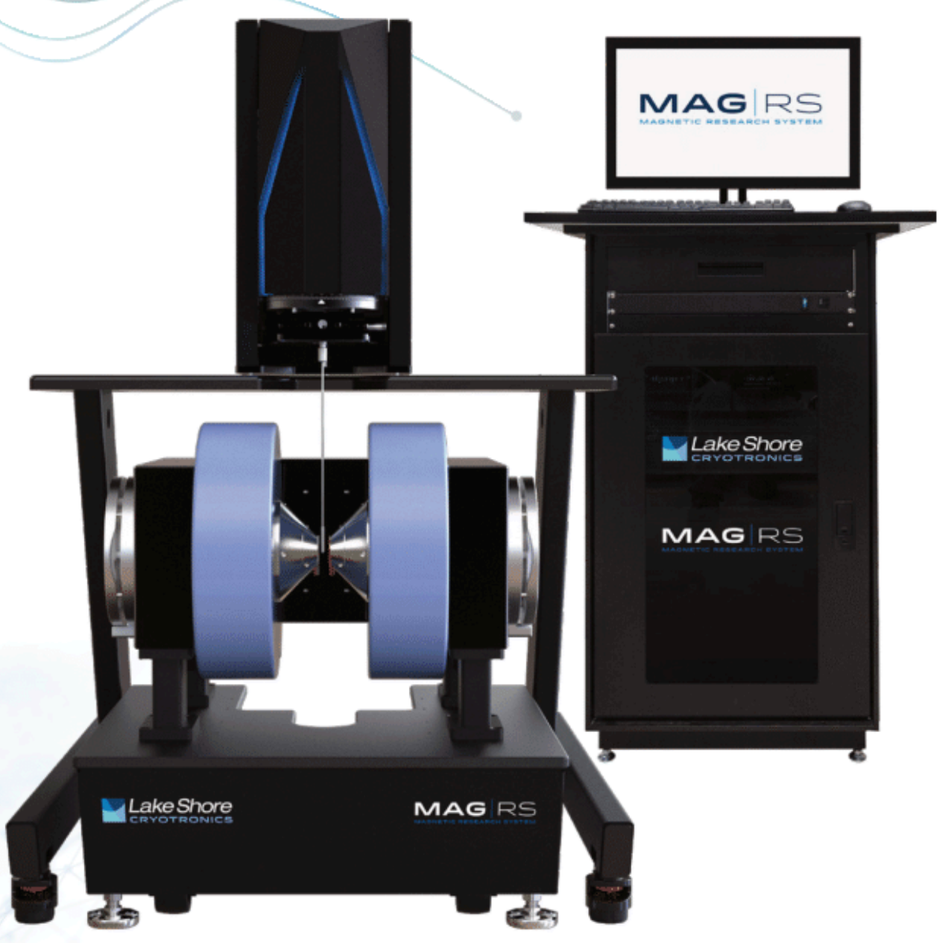


MAG|RS
MAGNETIC RESEARCH SYSTEM

Here are the reasons society members gave in response to the question, “Which of the following reasons best describe why you continue to maintain your membership? Please select all that apply.”

	Magnetics	IEEE
Remain technically current	57.3%	64.3%
Obtain publications	53.0%	57.3%
Networking with others who share my professional interests	49.0%	42.2%
Continuing education	32.8%	41.7%
Enhance career opportunities	32.0%	30.0%
Reduced registration fee at conferences	39.9%	29.5%
Enhance stature within the profession	31.6%	27.1%
Volunteering	30.0%	27.0%
Local chapter activities	32.4%	25.1%
Give back to the world community	26.5%	25.1%
Support my industry	20.2%	24.2%
Discounts on professional and personal services	17.0%	19.6%
Participate in standards development	16.6%	16.7%
Participate in public policy	7.1%	10.3%
Because my employer pays for it	10.3%	9.6%
Student branch activities	3.2%	5.9%
Participate in student contests	2.0%	5.1%
Others	0.8%	3.7%
None of the above	1.6%	1.2%

If one breaks down the right “IEEE” column, women and men responded somewhat differently when pondering their reasons for maintaining society memberships.

	Females	Males
Remain technically current	57.9%	65.9%
Obtain publications	50.5%	58.7%
Networking with others who share my professional interests	53.8%	40.6%
Continuing education	39.8%	42.5%
Enhance career opportunities	48.8%	32.0%
Reduced registration fee at conferences	39.3%	28.2%
Enhance stature within the profession	34.0%	28.9%
Volunteering	41.6%	25.1%
Local chapter activities	38.4%	25.3%
Give back to the world community	32.6%	24.3%
Support my industry	21.2%	24.7%
Discounts on professional and personal services	26.2%	18.4%
Participate in standards development	22.1%	15.8%
Participate in public policy	14.1%	9.7%
Because my employer pays for it	8.5%	9.4%
Student branch activities	14.0%	4.5%
Participate in student contests	12.3%	3.9%
Others	4.2%	3.7%
None of the above	1.2%	1.2%

But women and men responded very differently when considering why they maintained Magnetics Society membership, especially in five categories:

	Females	Males
Remain technically current	54.2%	60.3%
Obtain publications	37.5%	55.1%
Networking with others who share my professional interests	62.5%	46.7%
Continuing education	20.8%	36.4%
Enhance career opportunities	54.2%	29.0%
Reduced registration fee at conferences	50.0%	36.4%
Enhance stature within the profession	45.8%	30.8%
Volunteering	50.0%	27.6%
Local chapter activities	37.5%	32.2%
Give back to the world community	33.3%	25.7%
Support my industry	12.5%	21.5%
Discounts on professional and personal services	25.0%	15.9%
Participate in standards development	20.8%	16.4%
Participate in public policy	4.2%	7.9%
Because my employer pays for it	8.3%	10.7%
Student branch activities	12.5%	2.3%
Participate in student contests	4.2%	1.9%
Others	0.0%	0.9%
None of the above	0.0%	1.9%

To the extent that these data are representative, our female members especially value networking, career development, and volunteering opportunities compared to our male members and compared to IEEE society members as a whole.

This brings to mind the networking events and research workshops at MMM and Intermag conferences and the annual on-line leadership training seminars hosted by our

WOMEN IN MAGNETISM (WIM) AFFINITY GROUP

Please consider participating in the next IEEE survey. Search your unread emails for the subject, “Your Voice, Our Future: Shape IEEE's Direction in 2025” (closes 8 September 2025).

FEATURED ARTICLE

CHARACTERIZING MAGNETIC MATERIALS USING FIRST-ORDER REVERSAL CURVES

Brad Dodrill [1], Cosmin Radu [1], Harry Reichard [1], David Daughton [1], Victorino Franco [2], Joshua Feinberg [3]

[1] Lake Shore Cryotronics, USA
[2] Multidisciplinary Unit of Energy Science (MUFENS), Universidad de Sevilla, Spain
[3] Institute of Rock Magnetism, University of Minnesota, USA

The most common measurement used to characterize a material's magnetic properties is the measurement of the major hysteresis loop, i.e., that going from saturation to saturation. This is useful for determining saturation magnetization, remanence, coercivity, the maximum energy product, etc. These magnitudes give valuable information about the material but they do not provide further details about the magnetization process. More complex magnetization curves covering states with field and magnetization values located inside the major hysteresis loop, such as minor hysteresis loops and first-order reversal curves (FORCs), can give additional information that can be used for characterization of magnetic interactions.

FORC measurements and analysis are commonly applied to hysteretic magnetic materials because:

- FORC is relevant to *any* material for which hysteresis is significant, like fine (micron- or nano-scale) magnetic particles of permanent magnets, recording media, arrays of magnetic nanowires and dots, etc. [1,2,3].

- FORC [4] provides information regarding magnetic interactions and coercivity distributions that cannot be obtained from measurements of a material's hysteresis loop alone.

- The complex magnetic signatures of multi-phase magnets are difficult, if not impossible, to unravel from a hysteresis loop measurement alone. FORC can distinguish between phases in magnetic materials containing more than one phase (e.g., exchange spring magnets, soft shell/hard core nanowires, etc. [5]). This is why it has long been the standard measurement and analysis protocol used by earth and planetary scientists studying the magnetic properties of natural samples to distinguish between single-domain (SD), multi-domain (MD) and the so-called pseudo-single-domain (PSD) behavior and to also distinguish between different magnetic mineral species [6,7].

IF THERE IS HYSTERESIS OF ANY KIND, YOU CAN DO

FORC

TO UNDERSTAND HOW THE GLOBAL RESPONSE OF THE MATERIAL FORMS FROM ELEMENTAL CONTRIBUTIONS

The aim of FORC analysis is to perform a spectral decomposition of the global response of the material that emerges as the combination of the hysteresis loops of individual elements, called hysterons. By definition, these are square loops, with a certain value of coercivity H_c, and a certain shift of the loop with respect to zero field, the so-called interaction field H_u. Except in very specific cases, there is no identification of each hysteron with individual particles in the sample: the total response of the sample corresponds to the total response of the distribution of hysterons. However, knowing the distribution of hysterons corresponding to a sample, we can predict its behavior under arbitrary excitation (important for technological applications) and infer the type of processes that give rise to that global behavior. Following this reasoning, it is realized that FORC can be applied to any hysteretic process; therefore, it is natural to extend this procedure to magnetic materials that exhibit thermal hysteresis.

In this article we will discuss field FORC (*H*-FORC) and thermal FORC (*T*-FORC) measurement techniques and analysis, and for *T*-FORC we will present results for a magneto-caloric $(NiMnSi)_{0.66}(Fe_2Ge)_{0.34}$ alloy and a synthetic hematite sample. All measurement results presented in this article were recorded using a Lake Shore Model 8600 vibrating sample magnetometry (VSM) and the data were analyzed using Lake Shore's RTForc™ software [8].

H-FORC measurement and analysis

For *H*-FORC,

measurements are conducted by saturating a sample in a field H_{sat}, decreasing the field to a reversal field H_a, then sweeping the field back to H_{sat} in a series of regular field steps H_b.

This process is repeated for many values of H_a, yielding a series of FORCs as shown in Figure 1. The measured magnetization at each step as a function of H_a and H_b gives $M(H_a, H_b)$.

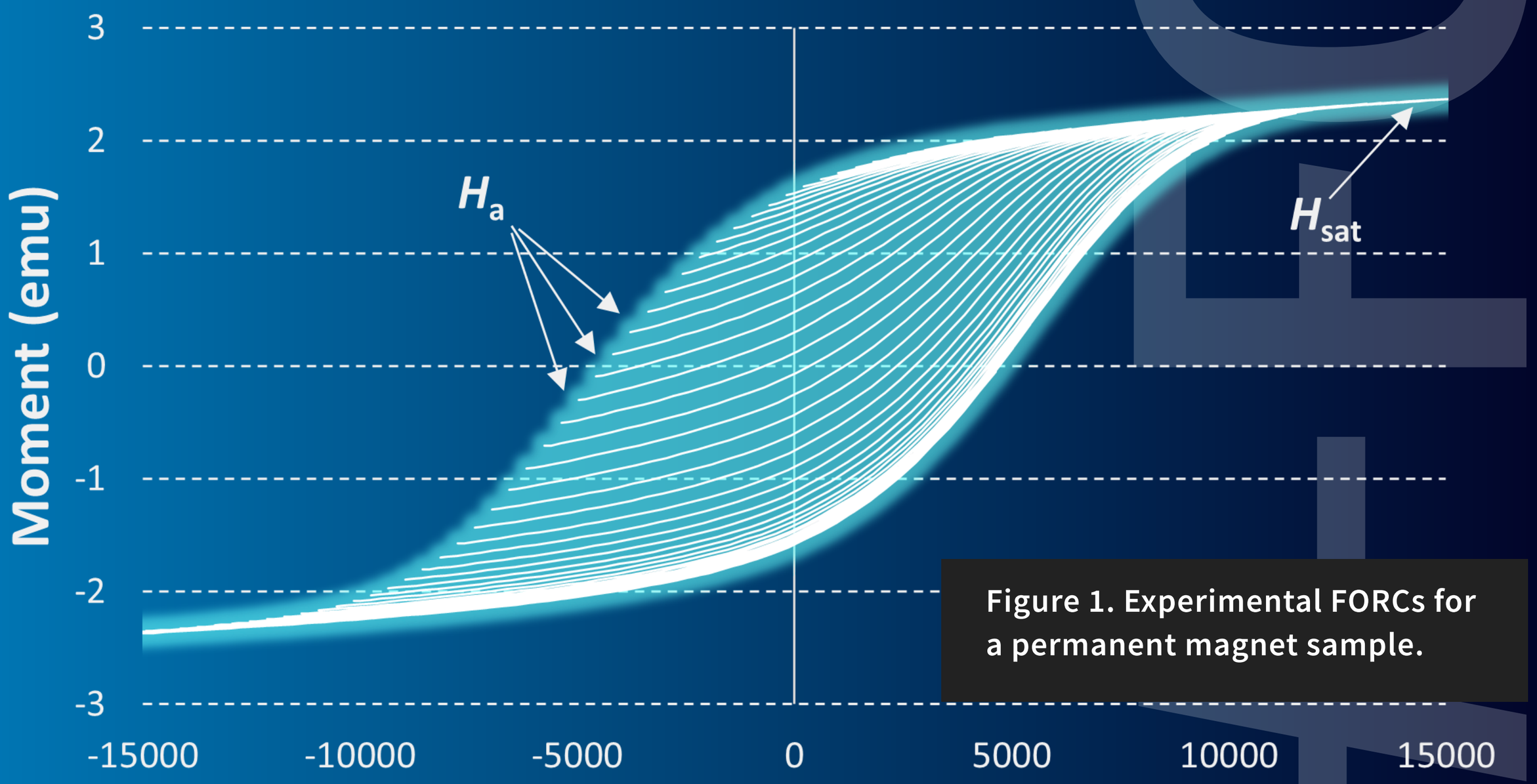


Figure 1. Experimental FORCs for a permanent magnet sample.

The FORC distribution $\rho(H_a, H_b)$ is the mixed second derivative:

$$\rho(H_a, H_b) = -(1/2)\partial^2 M(H_a, H_b) / \partial H_a \partial H_b$$

While H_a and H_b are characteristics of the experimental protocol, they can be related to the intrinsic properties of the hysteron: H_c and H_u.

Therefore, a FORC diagram is a 2-D or 3-D contour plot of $\rho(H_a, H_b)$ with the axis rotated by changing coordinates from (H_a, H_b) to:

$$H_c = (H_b - H_a)/2, \quad H_u = (H_b + H_a)/2$$

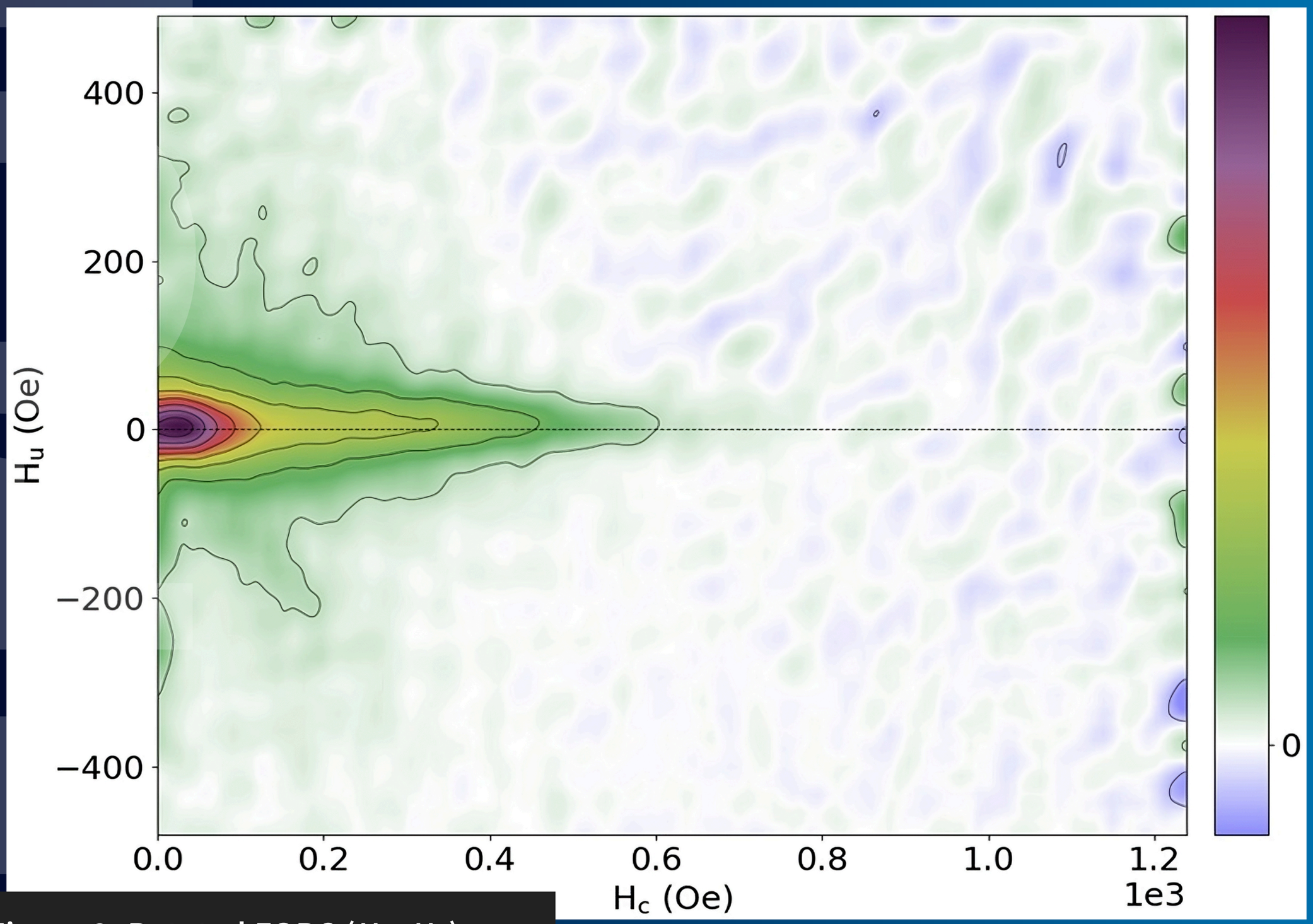


Figure 2. Rotated FORC (H_u, H_c) diagram for a sea sediment sample.

where H_c represents the distribution of switching or coercive fields and H_u represents the distribution of interaction or displacement fields. Figure 2 shows a rotated (H_u, H_c) FORC diagram for a sea sediment sample.

H-FORC diagram interpretation

A FORC diagram not only provides information regarding the distribution of interaction and switching fields but also serves as a "fingerprint" that gives insight into the domain state and nature of interactions occurring in magnetic materials.

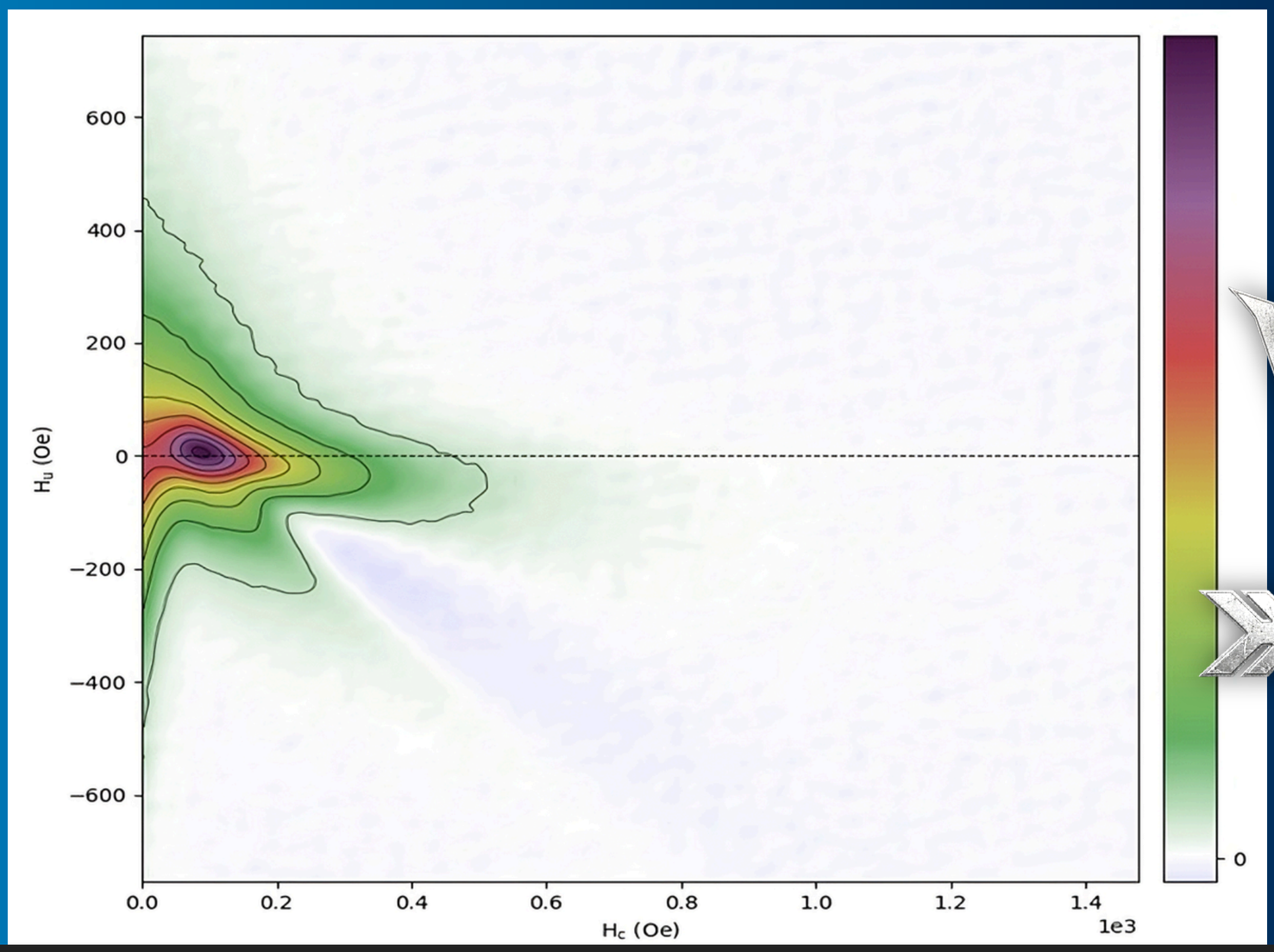


Figure 3. "Wishbone" FORC example for CoFe-based nanocrystalline alloy.

- The peak in the FORC distribution is usually centered at a switching field H_c that correlates with the coercivity as determined from a hysteresis loop measurement. If the peak in the FORC distribution is centered at an interaction field $H_u = 0$, then this means that interactions between particles, grains, etc., are weak. On the other hand, if the peak is shifted towards positive H_u, then they are strong.

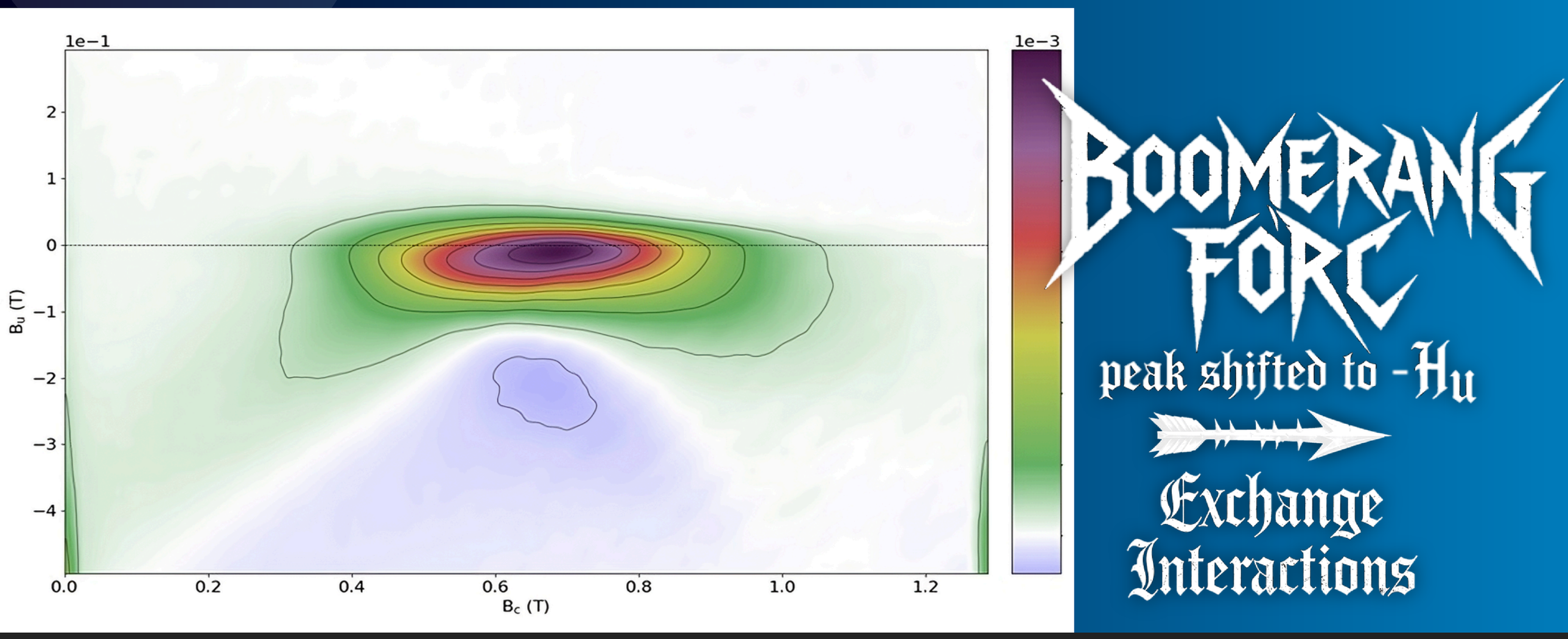


Figure 4. "Boomerang" FORC example for CoFe-based nanocrystalline alloy.

- In the area of rock magnetism, entirely closed contours are associated with SD behavior, open contours that diverge towards the H_u axis are associated with MD, and open and closed contours together are associated with PSD.

- Multiple peaks in a FORC diagram mean there are multiple magnetic phases in a material, which could be due to different compositions, different microstructures, different interactions, etc.

- The shape of the FORC distribution (wishbone, boomerang) provides insight into the nature of interactions (dipolar, exchange) that are occurring in a magnetic material. Examples of wishbone and boomerang FORC are shown in Figures 3 and 4.

T-FORC measurement and analysis

Analogous to *H*-FORC, for materials with a first-order thermomagnetic phase transition as a function of temperature, *T*-FORC is measured by saturating a sample at a temperature T_{sat} that is either well above or well below the first-order (hysteretic) transition temperature, to ensure that the phase transition is completed, and then either increasing or decreasing the temperature to a reversal temperature T_a. Data are then recorded either on warming or on cooling while sweeping the temperature back to T_{sat} in a series of regular temperature steps T_b as shown in Figure 5.

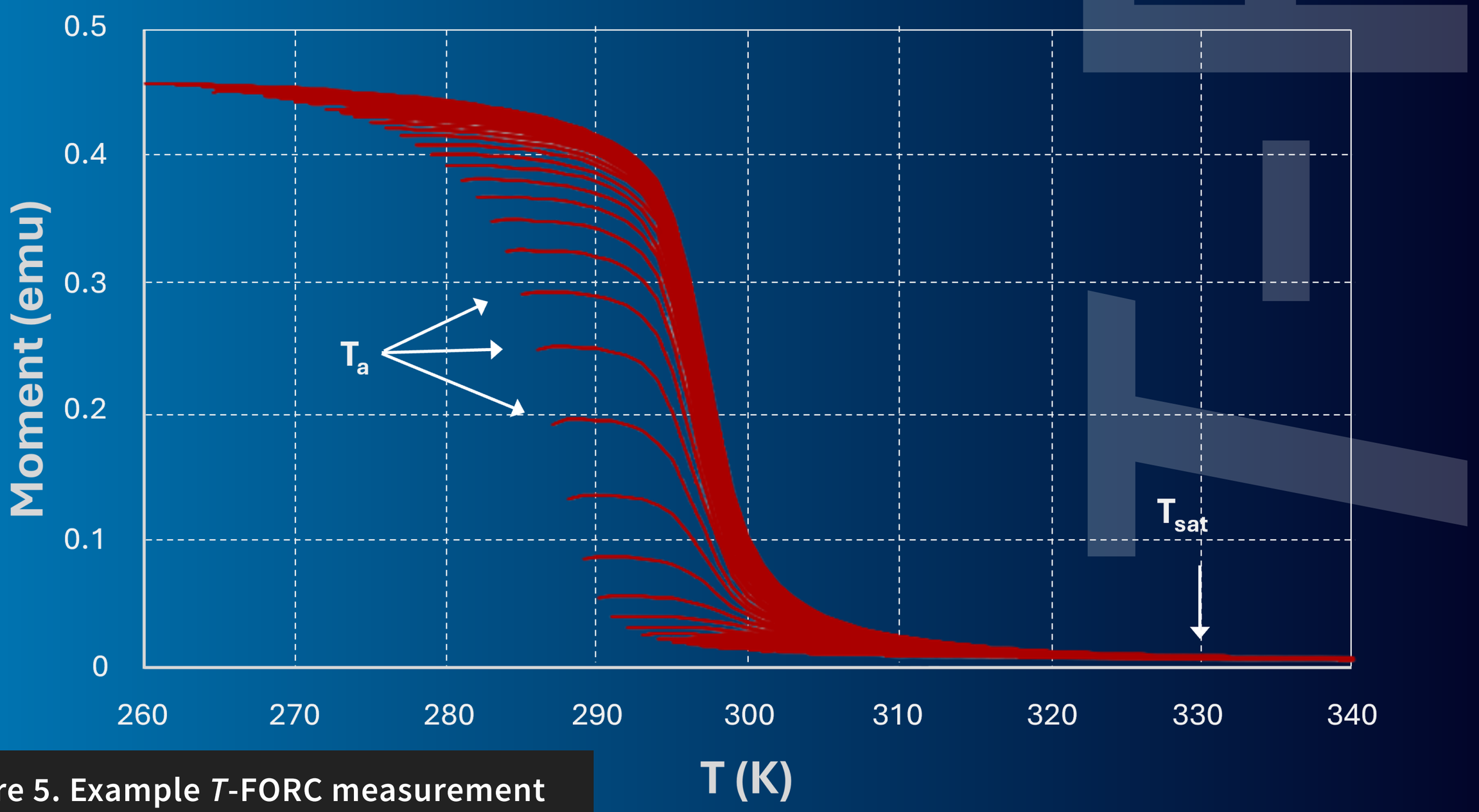


Figure 5. Example *T*-FORC measurement for a magneto-caloric material.

The T-FORC distribution $\rho(T_a, T_b)$ is the mixed second derivative:

$$\rho(T_a, T_b) = \pm(1/2)\partial^2 M(T_a, T_b) / \partial T_a \partial T_b$$

A T-FORC diagram is a 2-D or 3-D contour plot of $\rho(T_a, T_b)$ with the axis rotated by changing coordinates from (T_a, T_b) to:

$$T_c = \left| (T_a - T_b)/2 \right|, \quad T_u = (T_a + T_b)/2$$

where T_c represents the distribution of switching temperatures and T_u represents the distribution of displacement temperatures, in complete analogy to the H-FORC processing of data.

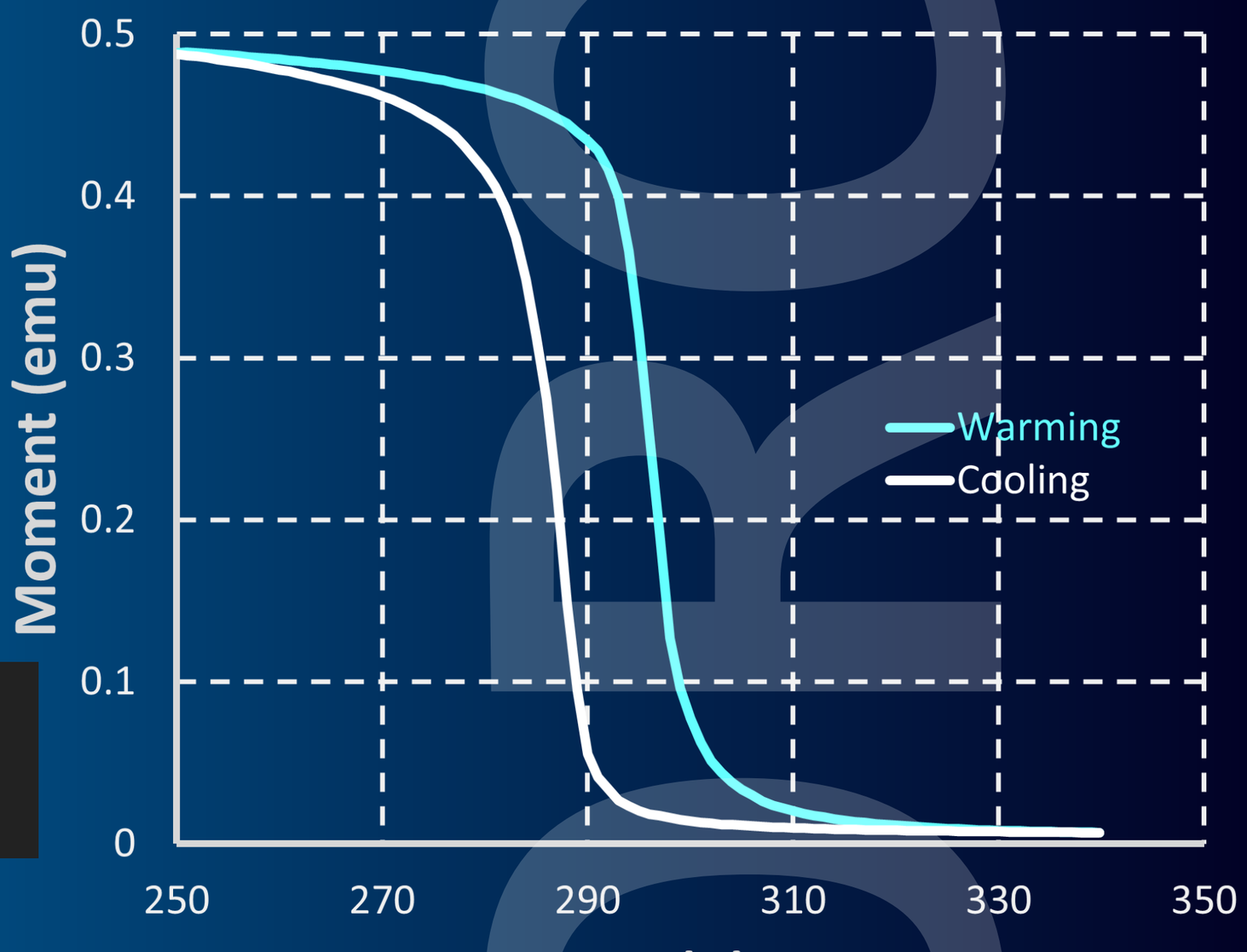


Figure 6. FCC/FCW $M(T)$ at a field of 0.5 T.

Field-cooled-cooling (FCC) and field-cooled-warming (FCW) $M(T)$ curves

for $(NiMnSi)_{0.66}(Fe_2Ge)_{0.34}$ alloy and synthetic hematite

Figure 6 shows the FCC/FCW $M(T)$ results for a $(NiMnSi)_{0.66}(Fe_2Ge)_{0.34}$ sample, measured at an applied field of 0.5 T. There is an evident thermal hysteresis in the sample due to the first-order phase transition. This sample exhibits a magnetostructural transformation from ferromagnetic orthorhombic TiNiSi-type structure to paramagnetic hexagonal Ni_2In-type near room temperature [9].

Hematite (Fe_2O_3) is a natural magnetic material found in rocks and soils. Hematite exhibits a Morin transition at ~250K: it is antiferromagnetic below and weakly ferromagnetic above the Morin transition. Figure 7 shows FCC/FCW $M(T)$ results at an applied field of 1 T for a synthetic hematite sample.

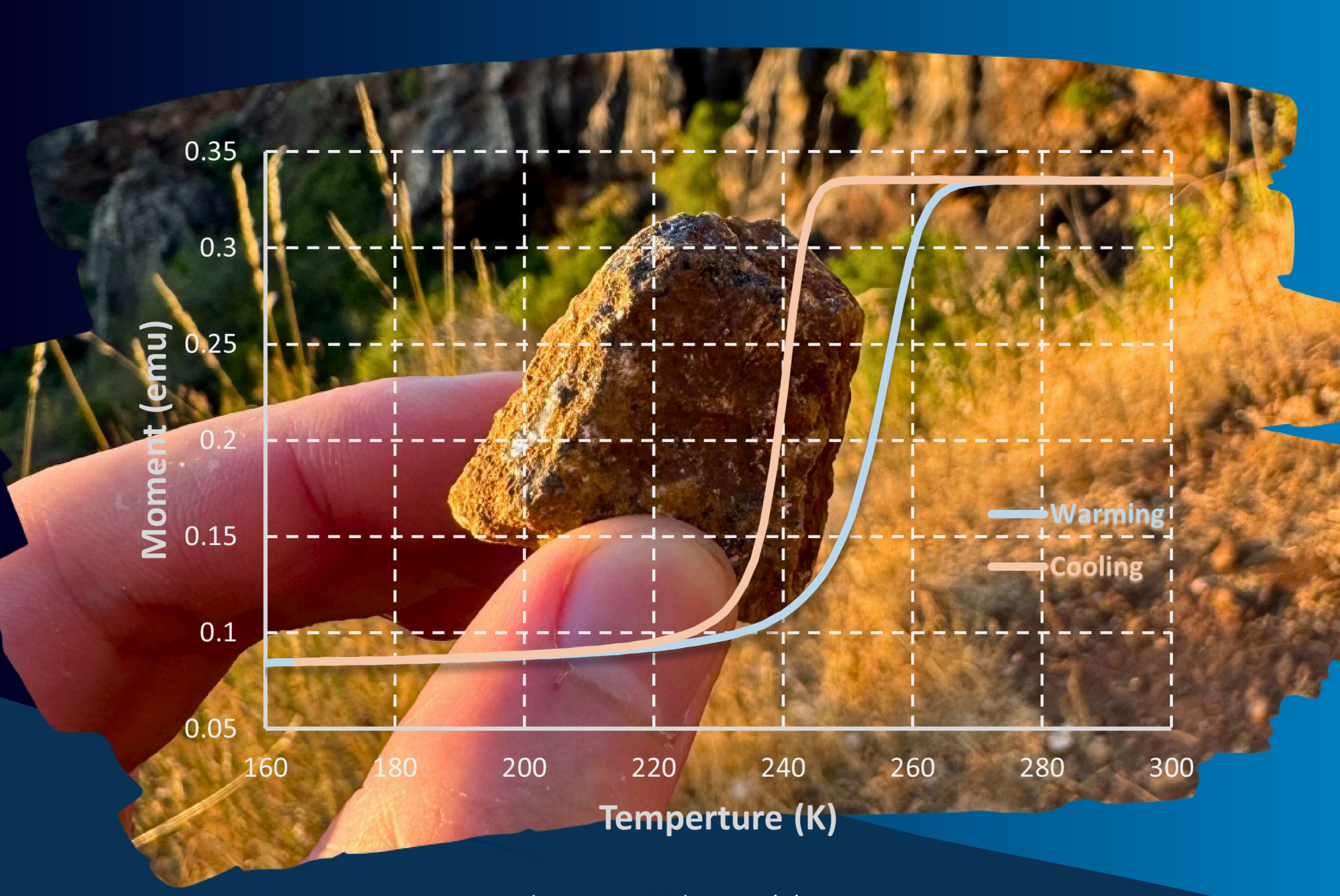
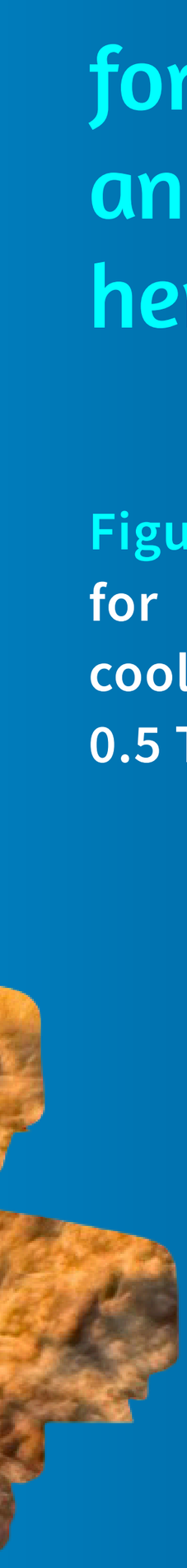


Figure 7. FCC/FCW $M(T)$ at 1.0 T.
(Photo courtesy of Zhonghao Chang, University of Seville, Spain).

T-FORC warming and cooling curves for $(NiMnSi)_{0.66}(Fe_2Ge)_{0.34}$ alloy and synthetic hematite

Figure 8 measured *T*-FORC for both warming and cooling cycles for a field of 0.5 T.



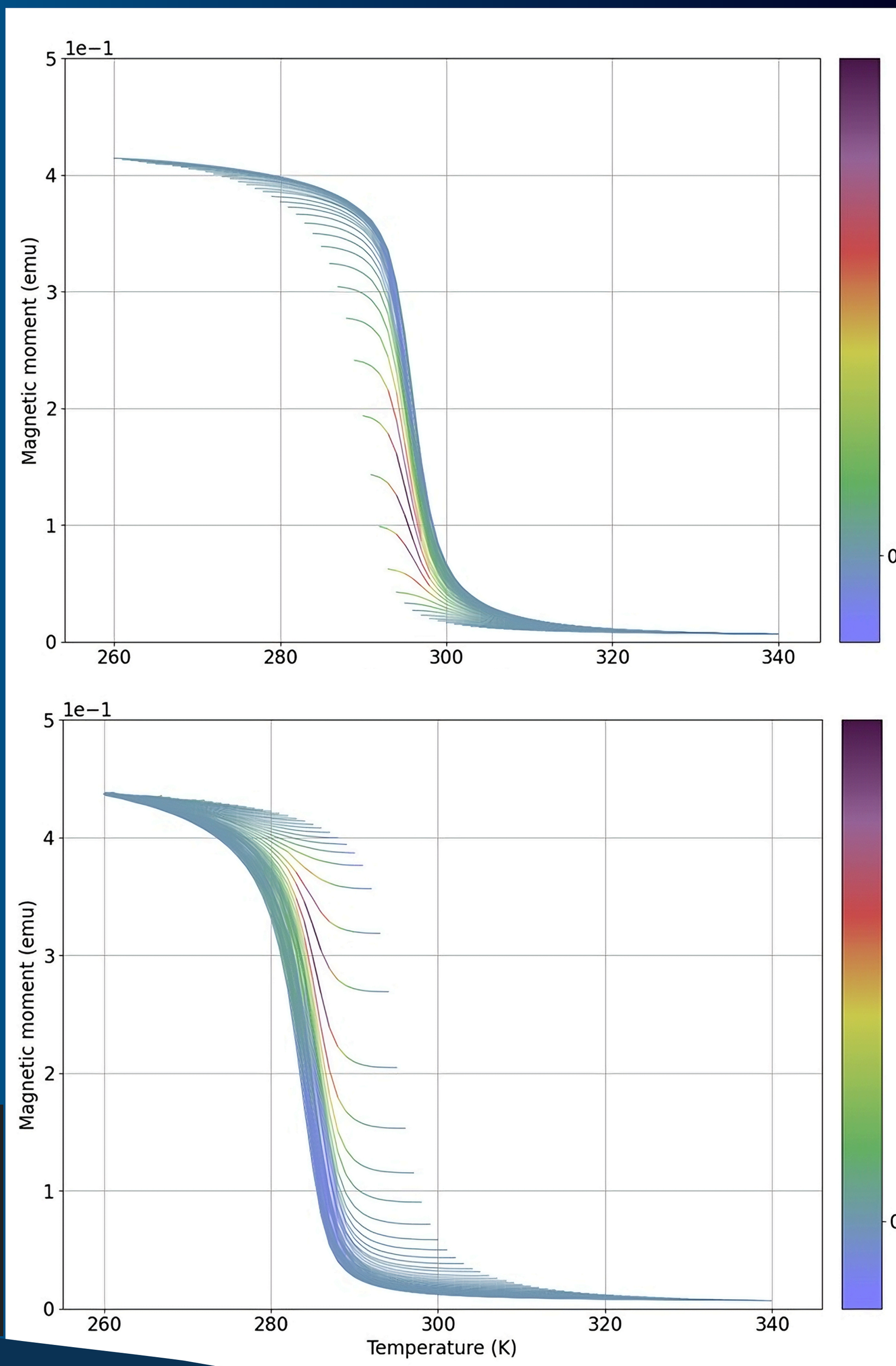


Figure 8. Measured (colorized) *T*-FORC for both warming and cooling cycles for a field of 0.5 T for $(NiMnSi)_{0.66}(Fe_2Ge)_{0.34}$.

Figure 9 shows the corresponding *T*-FORC diagrams for heating and cooling processes, with an asymmetric peak and a ridge along the ± 45° angle.

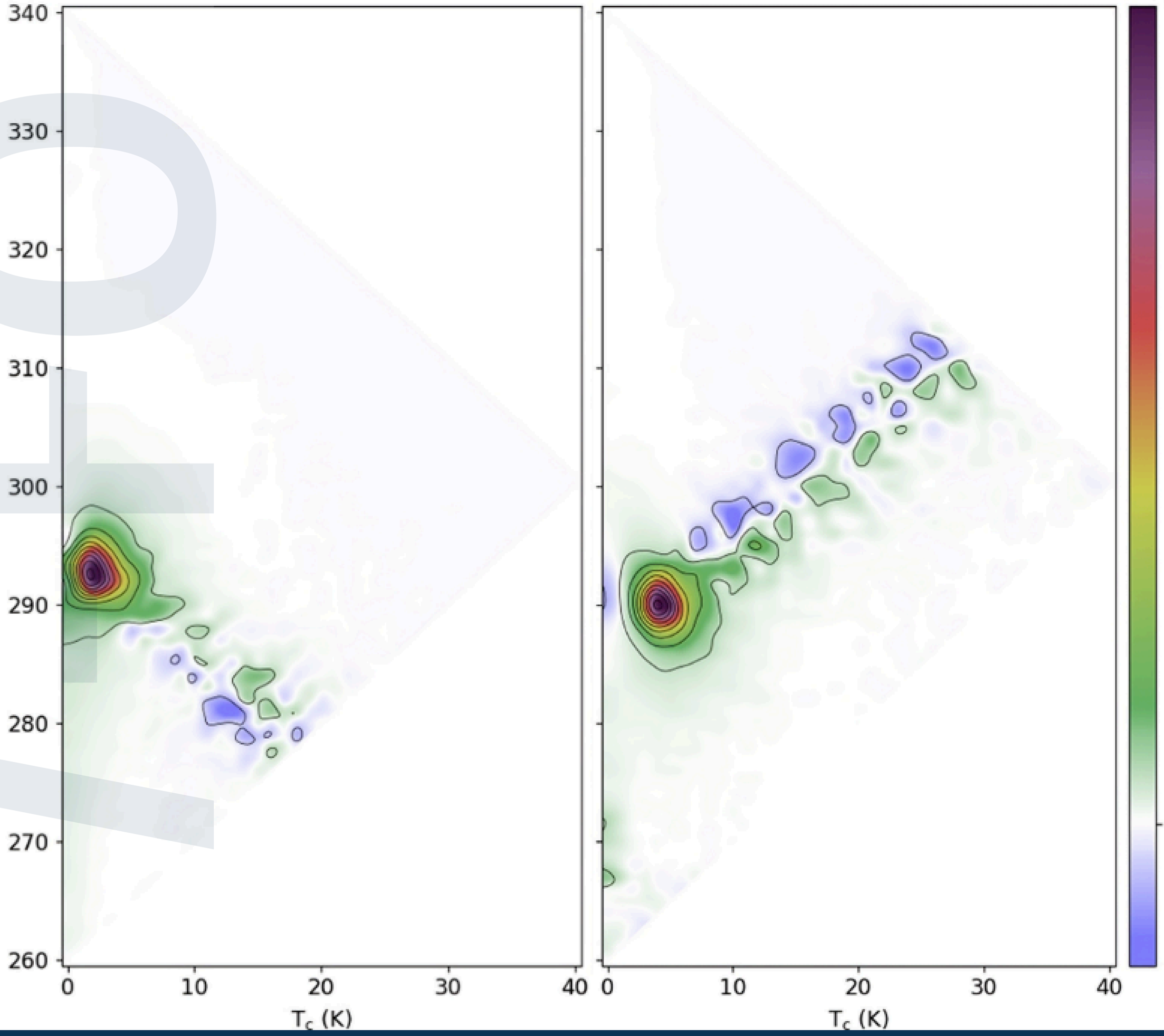


Figure 9. Warming and cooling *T*-FORC diagrams.

While *H*-FORC has been extensively studied experimentally and theoretically for over two decades, *T*-FORC is in its stages of infancy, and little work has been done, particularly with respect to modeling and simulation, for purposes of interpretation [10,11,12]. While for *H*-FORC interpretation is based on identifying wishbones and boomerangs, *T*-FORC shows ellipses, triangles, and ridges that give information about the phase transformation [11].

In the case of the experimental results shown here, the ridge observed at ± 45° consists of a combination of positive and negative values. This is ascribed to a very abrupt thermomagnetic transition at the extreme of the transition (the saturation envelope), coupled with the reversal of the transition.

The asymmetric main peak of the *T*-FORC distribution, especially in the warming protocol, clearly shows an asymmetry in the transformation rates of heating and cooling transitions, in line with features observed for other magnetostructural transformations. The observed asymmetry of the peak with an elongation in the -45° orientation indicates a faster heating process than the cooling one.

Figure 10 shows measured *T*-FORC for both warming and cooling cycles for a field of 1 T, and Figure 11 shows the corresponding T-FORC diagrams.

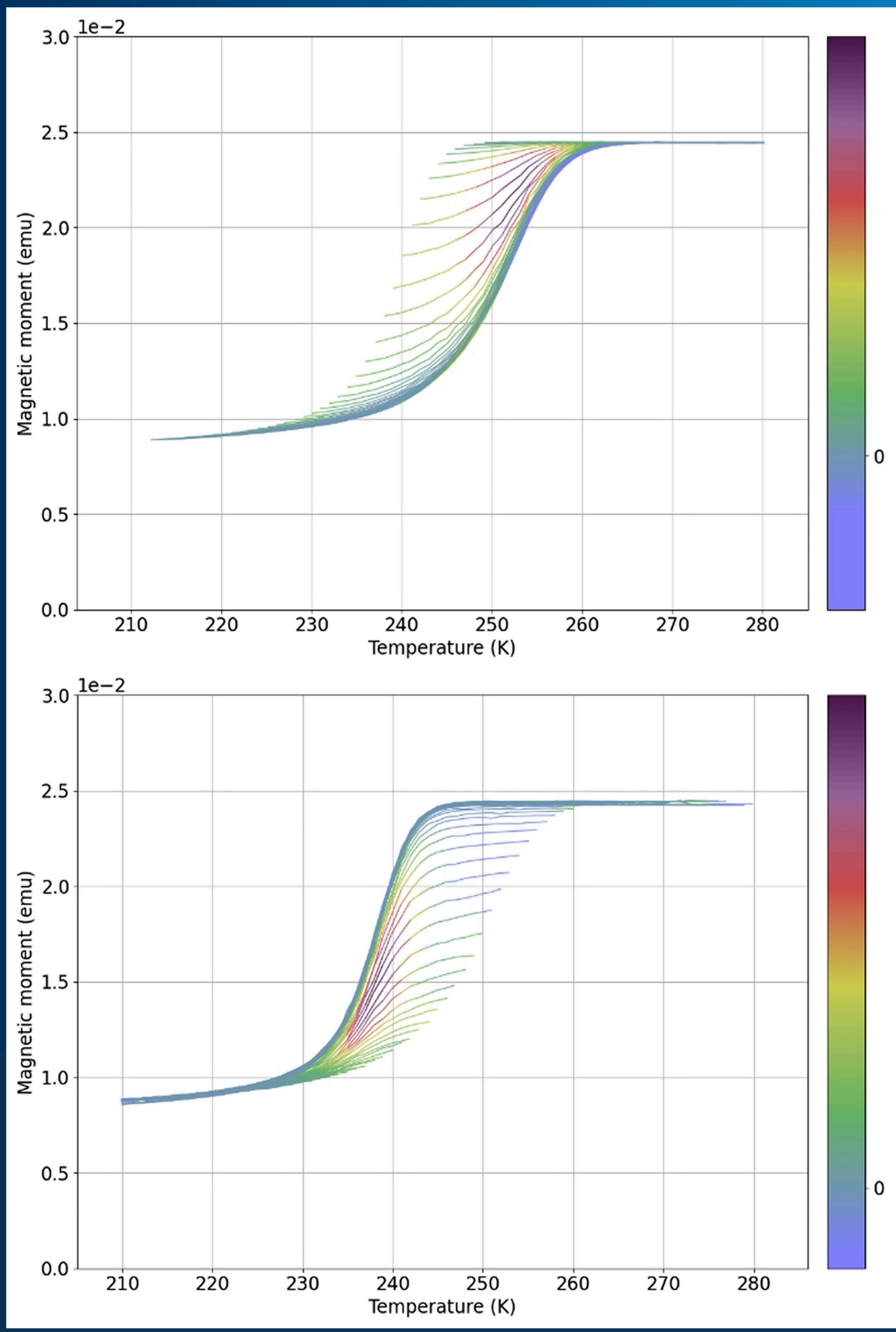


Figure 10. Measured (colorized) *T*-FORC both warming and cooling cycles for a field of 1 T for a synthetic hematite sample.

Both warming and cooling *T*-FORC distributions are nearly identical with T_c~6 K and T_u ~245 K. At each T_u, there is a distribution of T_c values. T_c is interpreted as being the thermal energy required during warming or cooling to overcome the energy barrier inhibiting the Morin transition from occurring (e.g., crystal morphology, crystallinity, impurities, and internal stress).

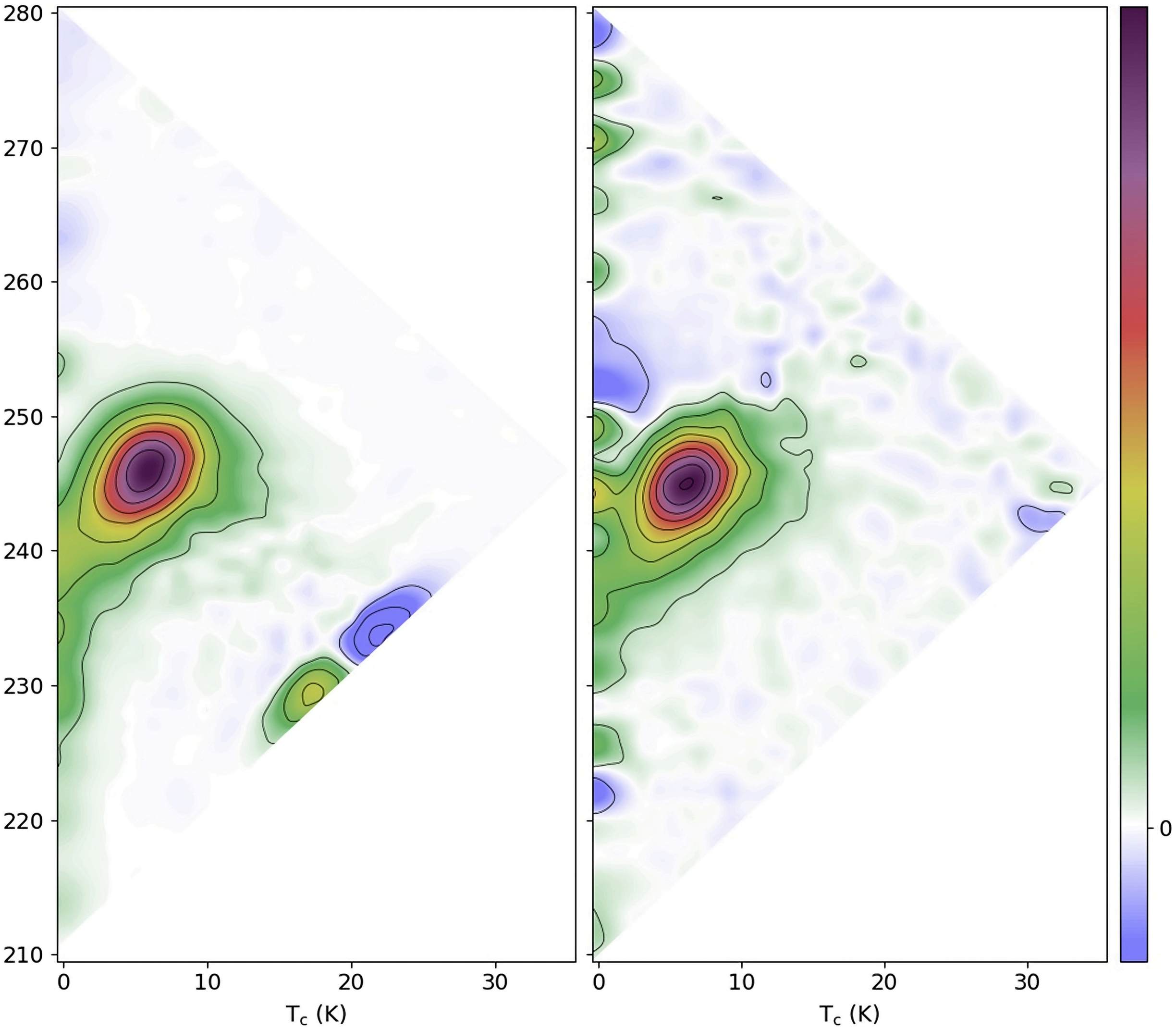


Figure 11. Warming and cooling *T*-FORC diagrams.

CONCLUSIONS

In this article, we have discussed the *H*-FORC and *T*-FORC measurement and analysis techniques and shown that *T*-FORC measurements of thermally hysteretic materials yield far more information about the transformation processes than can be extracted from conventional *M*(*T*) experiments alone. We presented *T*-FORC results for a magneto-caloric and natural sample, and we are advancing this technique further by performing additional *T*-FORC measurements on a variety of thermally hysteretic materials, and coupling them to numerical simulations to be able to identify the fine details of microscopic phase transformations by using a macroscopic technique.

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AUTHOR INFORMATION

Brad Dodrill graduated from The Ohio State University with a BSc degree in Physics. He completed 2 years of graduate studies in Physics and Electrical Engineering and took a position with Lake Shore Cryotronics in 1984 as a Research Scientist. He was promoted to Systems Applications Engineer (1989 – 1996) and served a key role in the development of a commercial AC susceptometer/DC magnetometer and a vibrating sample magnetometer. He later served as an Applications Scientist and Product Manager (1996 – 2002), and in 2002 he was appointed VP of Sales.

In 2018, Brad transitioned to his position as VP of Applications. He is now Senior Scientist. He has co-edited a book (Magnetic Measurement Techniques for Materials Characterization), has 57 paper publications to his credit, and holds 3 U.S. patents. He has lectured at numerous universities and given invited and contributed talks at technical conferences in the U.S., Europe, Asia, and Mexico on vibrating sample magnetometry, AC susceptometry, alternating gradient magnetometry, and on the use of the first-order reversal curve (FORC) measurement and analysis technique for the characterization of magnetic materials.

DC MOMENT: MEASURED TWO WAYS

Randy K. Dumas
Quantum Design Inc.

Measurements of the field and/or temperature dependence of the DC magnetic moment are a necessary, and often first, step when studying magnetic materials. Inductive measurement techniques, whether they utilize a traditional vibrating sample magnetometer (VSM) or superconducting quantum interference device (SQUID), are ubiquitous and provide a quantitative measure of the magnetic moment. The SQUID-based magnetic property measurement system (MPMS®3) from Quantum Design [1] uses two complementary measurement protocols to calculate the same quantity, namely the DC magnetic moment. This article aims to first describe the differences between the traditional DC-scan and SQUID-VSM modes and the circumstances which one should use each, or both.

DC-Scan

The traditional DC-scan measurement mode,

summarized in Figure 1, relies on moving a magnetic sample through the entirety of a superconducting 2nd-order gradiometer.

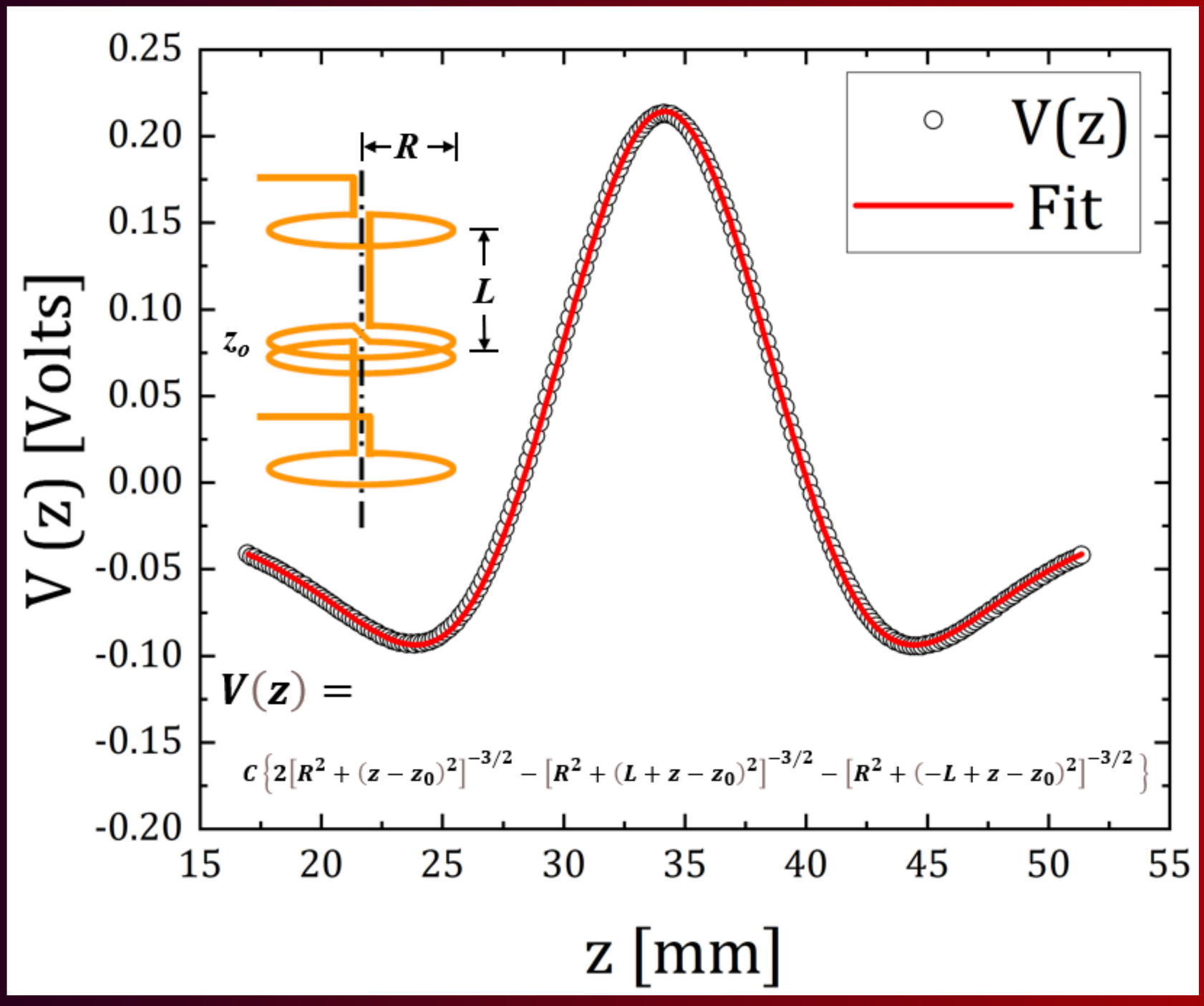

Figure 1. DC-Scan basics. A typical experimental voltage waveform, $V(z)$, is shown (open circles). The sample is scanned vertically in the z-direction through the 2nd-order gradiometer (inset). The geometry of the 2nd-order gradiometer can be parameterized by its radius, R, and the distance between the center, z_0, and upper coils, L. The expected functional form for $V(z)$ is shown at the bottom where an overall calibration factor, C, is also included. The resulting fit to the experimental data is shown as a red line.

SQUID-VSM

For the SQUID-VSM mode,

summarized in Figure 2, the sample oscillates sinusoidally at the center of the 2nd-order gradiometer with a given frequency (ω) and amplitude (*A*). As the spatially dependent voltage waveform is parabolic near the center of the gradiometer, $V(z)^2 = z$, this results in a time-dependent voltage, $V(t)$ at twice the physical oscillation frequency. Standard lock-in techniques can be used to detect this now time-dependent voltage. The in-phase voltage amplitude is then used to calculate the DC magnetic moment, after suitable calibrations are applied.

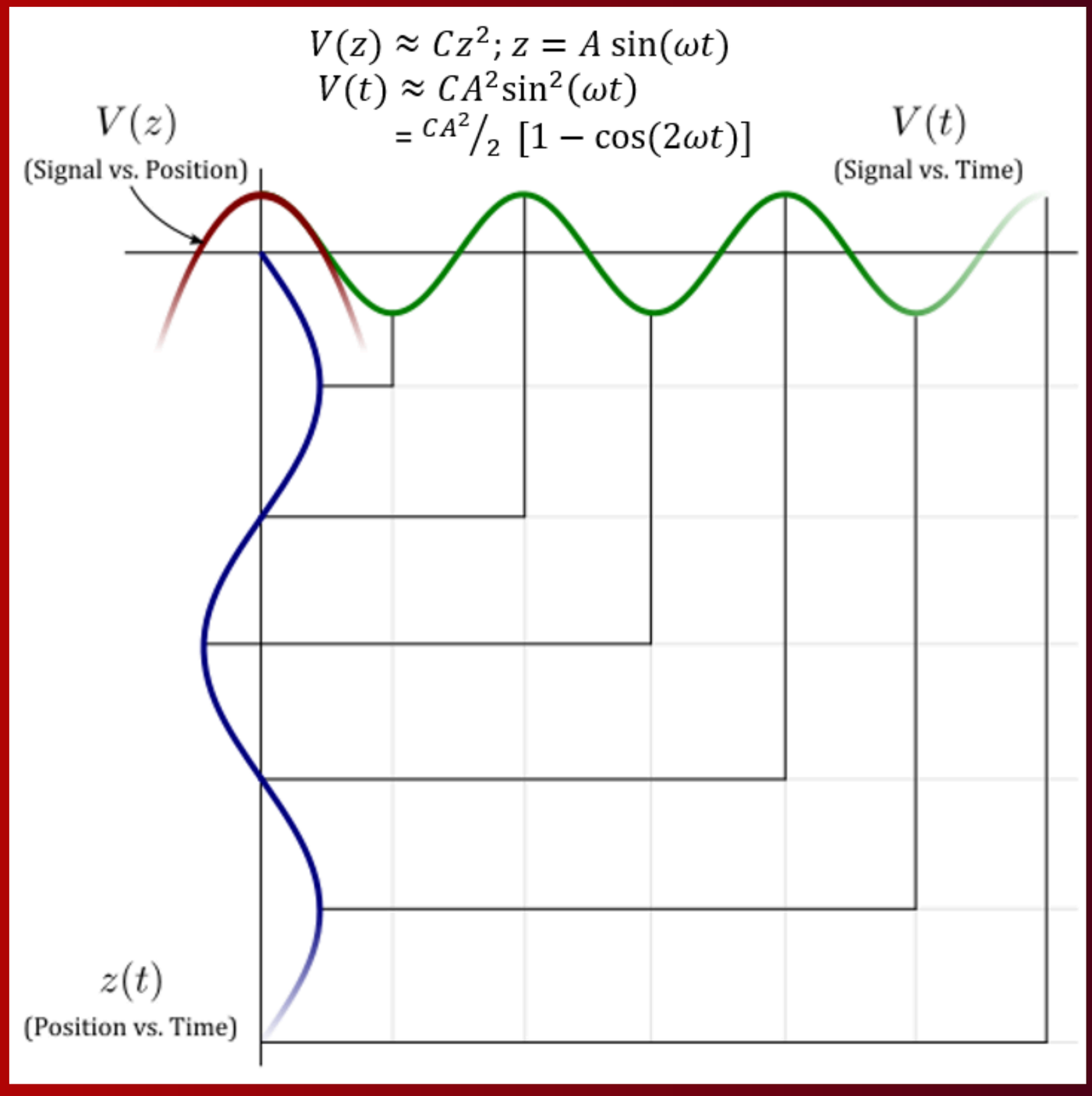

Figure 2. SQUID-VSM basics. Schematic highlighting how the position-dependent voltage waveform $V(z)$ transforms into a time-dependent $V(t)$ signal. This transform is facilitated by the fact that the central portion of the total $V(z)$ waveform can be approximated as a parabola, $z \approx Cz^2$, where C is an overall calibration factor. As the sample moves sinusoidally $z(t) = A\sin(\omega t)$ within the gradiometer with an amplitude, A, and frequency, ω, the resulting time-dependent voltage signal occurs at twice the physical oscillation frequency, i.e. at 2 ω.

When to use the DC-Scan mode

The *tried-and-true* DC-scan, which has been utilized since the early 1980s, is still relevant in several situations.

The slow and gradual motion employed during a DC-scan measurement is better suited for certain sample mounting techniques and sample holders. For example, liquid samples generally benefit from DC-scan measurements as the liquid will undoubtedly jostle too much when vibrated. Furthermore, vibrating a large and relatively massive sample holder, *e.g.* pressure cell, generally results in temperature instabilities and so these types of samples are best measured with slow DC-scans. Finally, as the DC-scan mode naturally measures the response as a function of position, ensuring the sample is properly centered is straightforward. This is much more difficult for SQUID-VSM measurements where it is a time-dependent voltage that is being measured, and additional calibrations need to be carried out to ensure the sample remains centered during variable temperature measurements.

Benefits of the SQUID-VSM mode

Sensitivity and Dynamic Range

The sensitivity of the SQUID-VSM mode is approximately a factor of 5 better than the DC-scan mode. This is not surprising given the additional lock-in detection required. Furthermore, due to the strong dependence of measured voltage on the amplitude, $V(t) \sim A^2$, the dynamic range, spanning 10 orders of magnitude, is significantly larger for the SQUID-VSM mode. A large vibration amplitude is best for low-moment samples to maximize the generated voltage, and small amplitudes can be used to measure large-moment samples without saturating the sensitive SQUID detection circuitry.

BENEFITS OF SQUID-VSM

Uniform temperature/field profile

Typical DC-scans require movement of the sample over distances of at least 35 mm, whereas the largest SQUID-VSM amplitudes are 8 mm. For all else equal, the sample will always be in a more uniform temperature and field environment for a SQUID-VSM measurement as compared to a typical DC-scan measurement. This is usually not critical except for samples, *e.g.* superconductors, where small changes in temperature and field can have dramatic effects on their magnetic properties.

Measurement Speed

Data acquisition is generally an order of magnitude faster for the SQUID-VSM mode. This results in either a faster turn-around between sample measurements or a significant increase in point-density. This can be an important time saver if one wants to precisely measure the temperature dependence of a sharp $m(T)$ phase transition or acquire as many points as possible near a sharp $m(H)$ switching field.

Insensitive to SQUID Drift

The SQUID voltage naturally slowly drifts with time. Remember, the absolute SQUID voltage is generally not critical, only the differences observed upon translating or oscillating the sample through the gradiometer. If this drift is linear, as it usually is over short time scales, it can be easily accounted for and subtracted from the DC-scan $V(z)$ waveform. However, DC-scans are particularly sensitive to non-linear SQUID drift. Non-linear SQUID drift

can arise from multiple sources, but the most prevalent is changing the external magnetic field in unidirectional steps, as one would be required to perform for a standard $m(H)$ hysteresis loop measurement. For details related to the superconducting solenoid used to generate the applied field, this non-linear SQUID drift is also most prevalent for magnetic field magnitudes less than 7500 Oe. As non-linear SQUID drift cannot be properly accounted for during a DC-scan, measurements are usually far noisier than their counterparts measured using the SQUID-VSM mode; see Figure 3, for exemplary hysteresis loops .

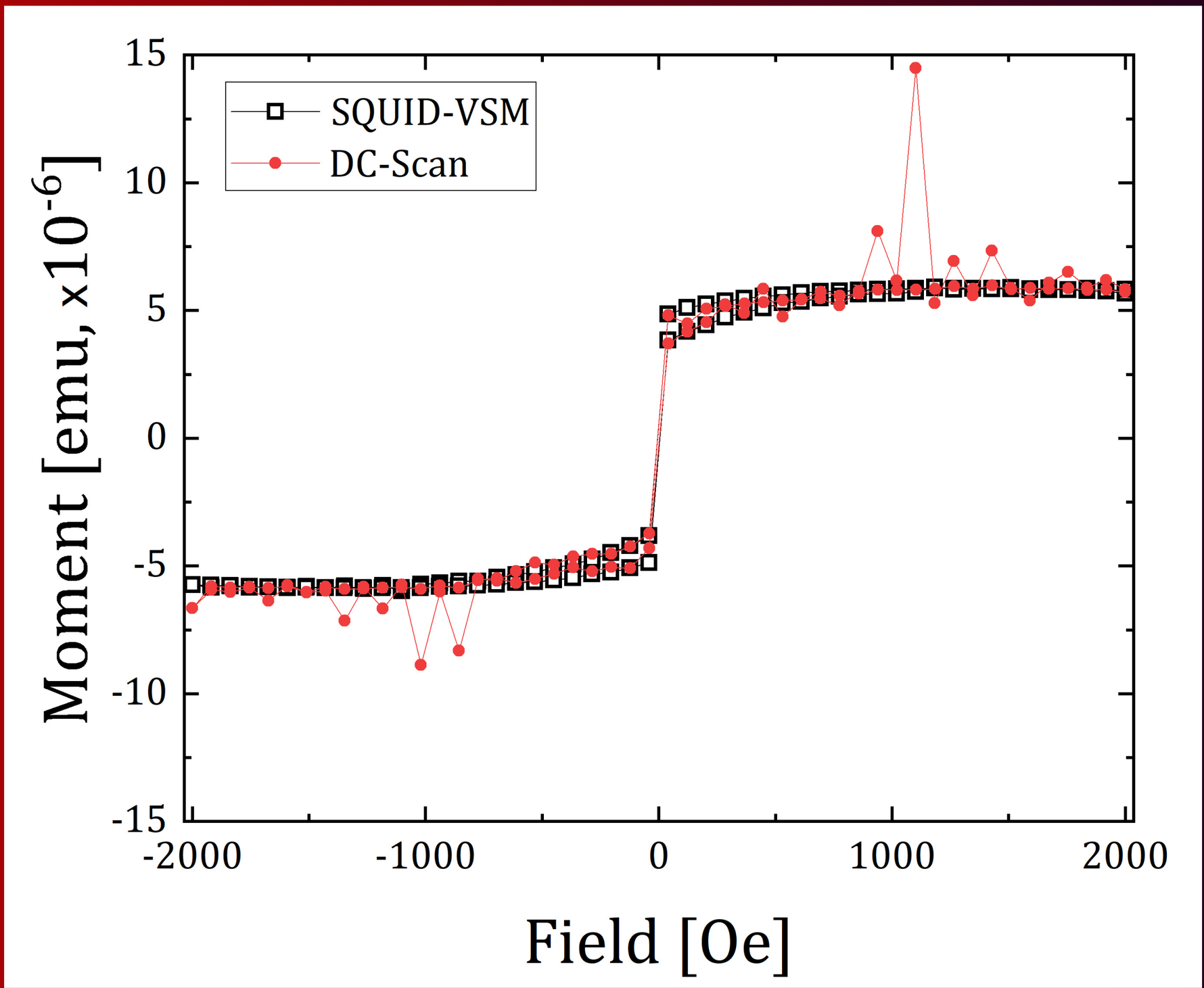

Figure 3. Comparison of the DC-Scan (red circles) and SQUID-VSM (black squares).

Easier background subtraction

Depending on the sample holder and sample mounting, a measurement of the background moment may be required. The process is different depending on whether the measurements were obtained via a DC-scan or the SQUID-VSM mode.

As the DC-Scan requires first fitting a position-dependent voltage waveform to calculate the resulting magnetic moment, one cannot simply subtract the background moment ($m_{background}$) from the sample+background moment ($m_{sample+background}$). Instead, it is recommended to first subtract the corresponding voltage waveforms from each other:

$$V(z)_{background+sample} - V(z)_{background}$$

and then refit the resulting sample voltage waveform to calculate the magnetic moment. There are freely available software packages that help facilitate this process [2].

However, for measurements using the SQUID-VSM mode, one can simply subtract the measured moment of the background from that of the sample+background measurement:

$$m_{background+sample} - m_{background}.$$

Therefore, for low-moment samples and/or sample holders with non-negligible backgrounds, the SQUID-VSM mode would be much preferred and expected to yield far more accurate results compared to the DC-Scan mode.

DC-Scan + SQUID VSM: Calculate a geometry independent scale factor

The SQUID-based MPMS3 is one of the most sensitive commercial magnetometers on the market.

In addition to sensitivity, accuracy is also often of paramount importance for most researchers. A point often ignored by researchers is that the accuracy of the reported moment depends on the size and shape of the sample being measured as compared to the sample used to calibrate the instrument. If the sample size and/or shape differs significantly from the calibration sample, a significant loss (>10%) of accuracy is not uncommon. For the MPMS3 a Pd cylinder (3.8 mm height/2.8 mm diameter) is used as the calibration standard. It's also important to remember that even for this calibration standard, our specification is to within ±1%. Furthermore, one of the most often overlooked factors is the radial centering of the sample within the gradiometer. The radial centering is difficult to estimate and adjust. Most importantly, radial centering can be the most significant factor in determining measurement accuracy.

As it is often impossible to match the size/shape of the test sample to the calibration sample, corrections often need to be performed in post-processing, which usually assumes well-defined sample geometries and a well-defined radial offset [3]. Such ideal conditions can limit the accuracy of the correction factors and calculated moment.

A recent publication [4] empirically uncovered a systematic relation between the normalized difference of SQUID-VSM and DC-scan measurements:

$$x = (m_{\text{SQUID-VSM}} - m_{\text{DC-Scan}}) / m_{\text{SQUID-VSM}}$$

It turns out that for a given DC-Scan length and SQUID-VSM vibration amplitude, this difference, x, can be modeled by a simple 3rd-order polynomial:

$$\alpha(x) = 1 + Ax + Bx^2 + Cx^3$$

Finally, the corrected moment can be calculated as:

$$m_{\text{corrected}} = m_{\text{SQUID-VSM}} / \alpha(x)$$

Interestingly, this relation follows a clear and predictive trend, independent of sample geometry, i.e. size and shape, and radial offset for a given pair of DC-scan and SQUID-VSM measurements.

EXPLOITING THIS TREND

A GEOMETRY-INDEPENDENT CORRECTION CAN BE CALCULATED BY SIMPLY MEASURING THE DC MOMENT TWO DIFFERENT WAYS.

This technique is demonstrated using a 0.025 mm thick Ni foil (Alfa Aesar, 99.5%) cut into a 7 mm x 4 mm sheet that is glued to a quartz paddle sample holder, Figure 4. Clearly this sample geometry differs significantly from the Pd reference sample. At saturation, the measured moments for the SQUID-VSM (black squares) and DC-Scan (red circles) modes differ from one another by approximately 11% (x = -0.11). This difference is expected and consistent with the fact that the sample is not of the same size/shape as the Pd reference. The empirically determined polynomial coefficients for a SQUID-VSM amplitude of 5 mm and DC-Scan length of 35 mm are: A = 2.068, B = 4.00, C = 7.1 [4], resulting in a correction factor of $\alpha(-0.11)$ = 0.808. Dividing the as-measured SQUID-VSM moment by this factor yields the corrected moment (blue triangles), which agrees exceptionally well (within 1%) with the expected moment calculated from the sample mass (3.2 mg) and magnetization [5].

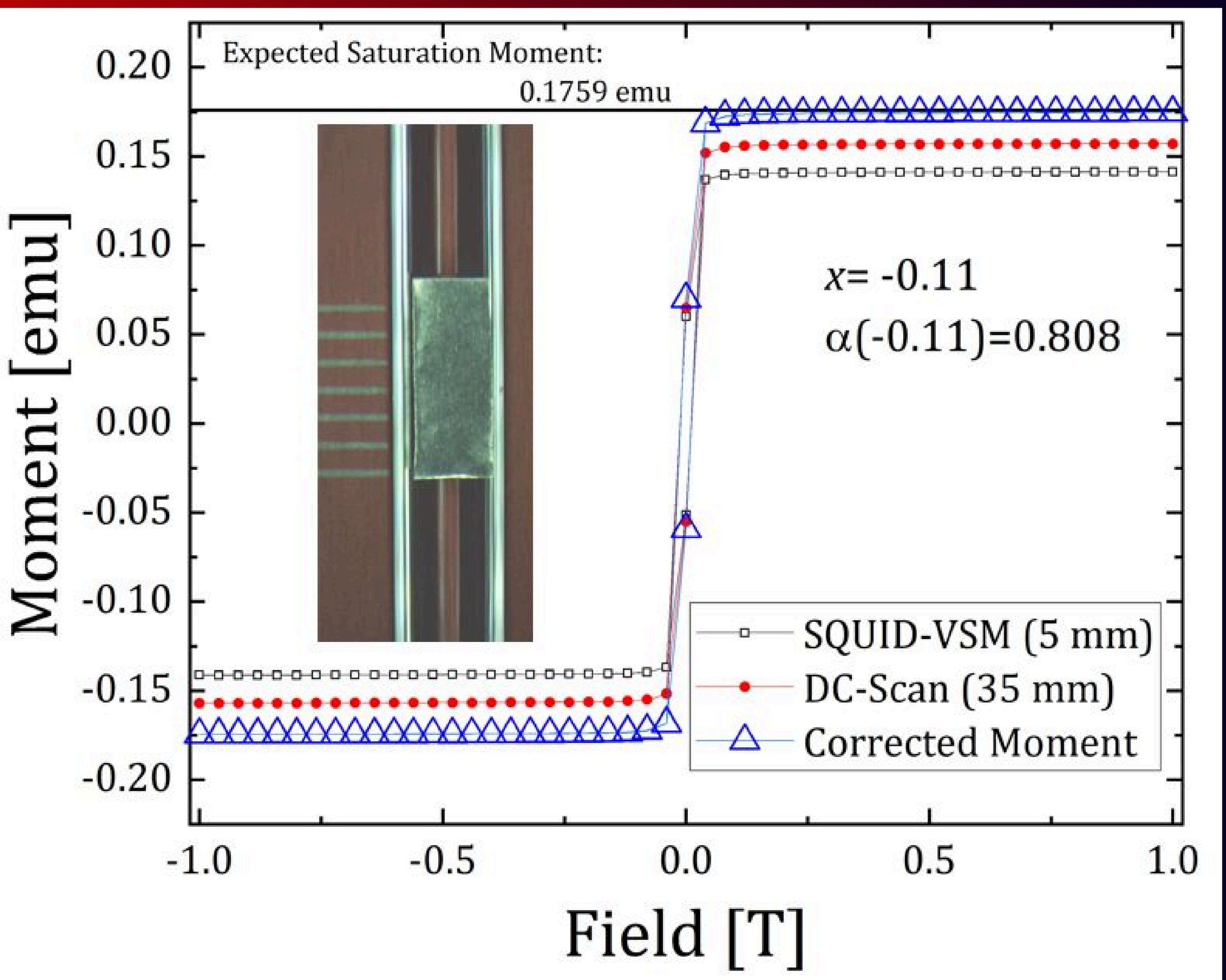

Figure 4. DC moment of a thin Ni foil measured with the SQUID-VSM (black squares) and DC-Scan (red circles) modes. The corrected moment (blue triangles) agrees with the expected saturation moment.

Summary

The SQUID-based MPMS3 from Quantum Design is a versatile DC and AC magnetometer that enables sensitive sample measurements over a wide temperature (1.8-400 K for the base system) and magnetic field (±7 T) range. The DC magnetic moment, in particular the differences and utility of the DC-Scan and SQUID-VSM detection modes, was our primary focus here. While it may at first seem redundant to have two techniques that measure the same fundamental property, each detection mode has its own unique benefits depending on the sample and sample mounting constraints. Finally, by measuring the DC magnetic moment with both the DC-Scan and SQUID-VSM modes, one can calculate a scaling factor that is independent of the sample size, shape, and radial offset that can be used to dramatically improve the accuracy of the measured DC moment. This technique is particularly useful for samples that are irregularly shaped and/or cannot be modified to mimic the size/shape of the Pd reference sample and where measurement accuracy if of prime importance.

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AUTHOR INFORMATION



Randy Dumas is an Applications Scientist at Quantum Design. He received his Ph.D. in 2009 from the University of California, Davis on the topic of reversal mechanisms in magnetic nanostructures. As a postdoctoral fellow at the University of Gothenburg, Sweden, he studied next-generation magnetic and spin wave-based data storage and processing paradigms. Randy joined Quantum Design in August 2016, and his specialty lies primarily in magnetic characterization of both fundamentally interesting and technologically relevant materials.

BECOME THE CHIEF EDITOR OF IEEE MAGNETICS LETTERS

CALL FOR CHIEF EDITOR

In accordance with the Magnetics Society bylaws and operating procedures, we are soliciting applications for the position of Chief Editor of the *IEEE Magnetics Letters*. IEEE Magnetics Letters is a peer-reviewed, archival journal covering the physics and engineering of magnetism, magnetic materials, applied magnetics, design and application of magnetic devices, bio-magnetics, magneto-electronics, and spin electronics. *IEEE Magnetics Letters* publishes short articles of substantial current interest. The journal accepts submissions that are regular papers, papers associated with conferences or articles that offer perspectives on current topics. *IEEE Magnetics Letters* is a hybrid Open Access (OA) journal. For a fee, authors have the option making their articles freely available to all, including non-subscribers. OA articles are identified as Open Access.

KEY RESPONSIBILITIES

The Chief Editor manages the operations of the journal with the help of an editorial assistant, recruits' editors, associate editors and members of the editorial review board, examines incoming manuscripts for originality and scope, assigns them to associate editors to manage the reviews which are undertaken speedily by the editorial review board.

A key responsibility of the Chief Editor is to lead and develop the journal and the successful candidate will, together with the editors and the publication committee, be responsible for the strategic development of the journal. Candidates able to share a vision for the future of the journal will be favoured. It is an unpaid, volunteer position.

COMMITMENT

The Chief Editor will start a two-year appointment in January 2026 which is renewable for up to two re-appointments giving a total of 6 possible years. Our current Chief Editor – Massimiliano d'Aquino – has now reach this milestone and will therefore step down at the end of 2025.

QUALIFICATIONS

Qualified candidates are expected to have a doctorate in engineering, physics, materials sciences, or a related area; at least five years of editorial experience; broad interest across the full spectrum of magnetism and magnetic materials and devices; an established network in the magnetics community; and project-management skills.

TO APPLY, PLEASE SUBMIT YOUR BRIEF RESUME | AND | A LETTER | OUTLINING YOUR QUALIFICATIONS | AND | POSITION STATEMENT | TO:

THOMAS.THOMSON @MANCHESTER.AC.UK

CLOSING DATE FOR APPLICATIONS SEPT 30, 2025

THE APPOINTMENT WILL BE SUBJECT TO APPROVAL BY THE MAGNETICS SOCIETY ADMINISTRATIVE COMMITTEE. INFORMAL ENQUIRES CAN BE MADE TO EITHER THE CURRENT CHIEF EDITOR (MDAQUINO@UNINA.IT) OR MYSELF.

by Tom Thomson, Publications Committee Chair

EDITOR-IN-CHIEF
OF IEEE TRANSACTIONS ON MAGNETICS



The qualified candidate is expected to have a doctorate in engineering, physics, materials sciences, or a related area; at least five years of editorial experience; broad interest across the full spectrum of magnetism and magnetic materials and devices; an established network in the magnetics community; and project-management skills.

In accordance with Magnetics Society procedures, we are soliciting applications for the position of Editor-in-Chief (EiC) of the *IEEE Transactions on Magnetics*.

Our current Editor-in-Chief has decided, after many years of dedicated service, to step down from the role. *IEEE Transactions on Magnetics* is a peer-reviewed, archival journal in science and technology related to the basic physics and engineering of magnetism, magnetic materials, applied magnetics, magnetic devices, and magnetic data storage. The journal publishes scholarly articles of archival value as well as tutorial expositions and critical reviews of classical subjects and topics of current interest. *IEEE Transactions on Magnetics* is a hybrid Open Access (OA) journal. For a fee, authors have the option making their articles freely available to all, including non-subscribers. OA articles are identified as Open Access.

The new Editor-in-Chief (EiC) will start a two-year appointment in January 2026 which is renewable for up to two re-appointments giving a total of 6 possible years.

The appointment will be subject to approval by the Magnetics Society Administrative Committee.

The EiC manages the operations of the journal with the help of an editorial assistant, recruits' editors, associate editors and members of the editorial board, examines incoming manuscripts for originality and scope, assigns them to associate editors to manage the reviews which are undertaken speedily by the reviewers. The EiC shapes and leads the journal and will be responsible (together with editors and the publication committee chair) for the strategic development of the journal. It is an unpaid, volunteer position.

Submit your brief resume and a letter outlining your qualifications and position statement to

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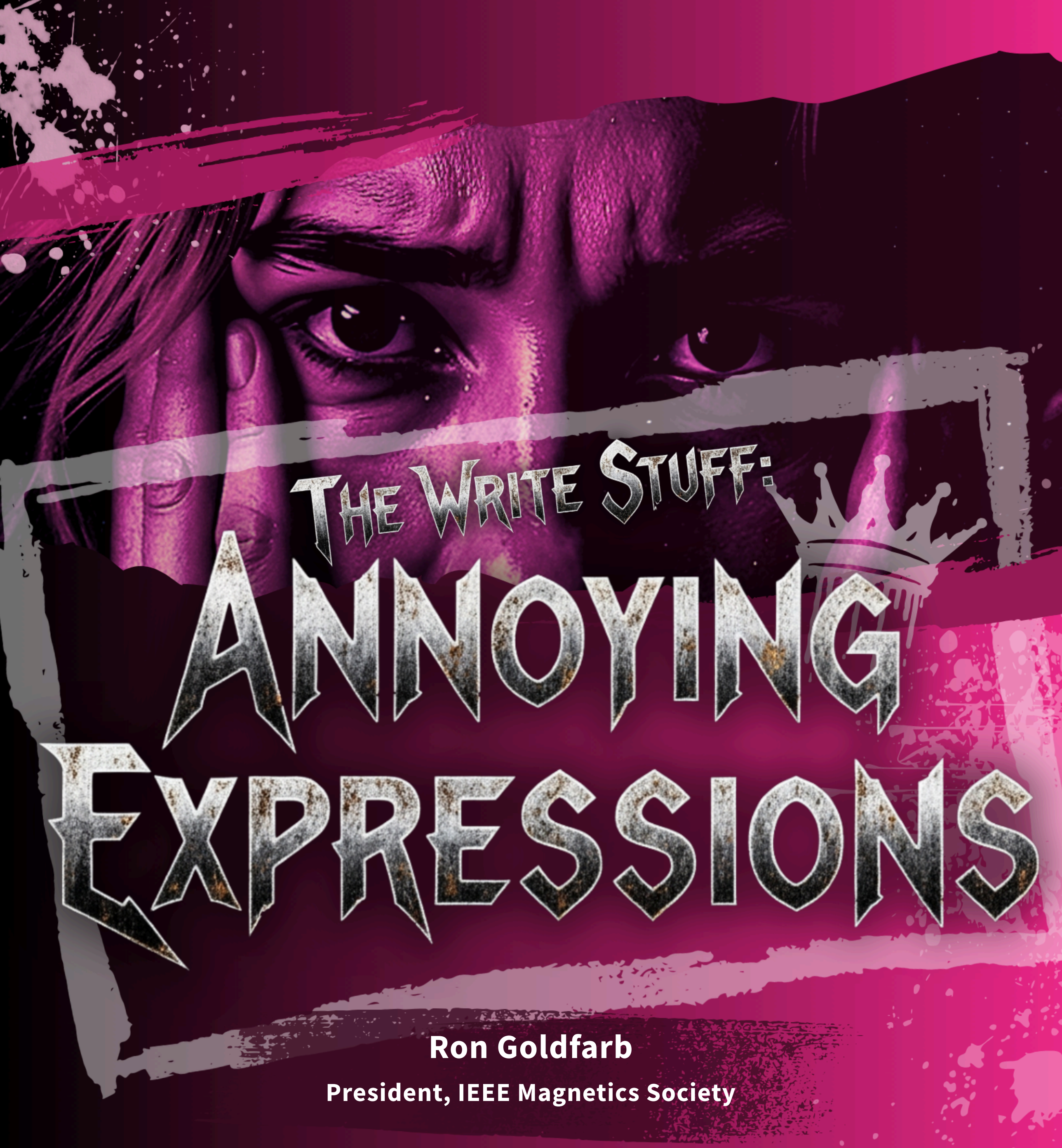
Applications will be considered until **OCT 31, 2025**



The Write Stuff: Annoying Expressions

Ron Goldfarb

President, IEEE Magnetics Society

We have settled into predictable word patterns. Have you noticed that your email app offers to finish sentences for you? Artificial intelligence large language models, based on common structures used in their training, can finish entire documents for you.

Children learn to talk through imitation. Graduate students acquire writing and speaking patterns through imitation of the phrases used by their peers or superiors.

Some recycled patterns of speech are annoying. Have you noticed any annoying word patterns at conferences? I have.



Annoying Session Chair:

"Our next speaker is, um, Cuchufleta Pérez."

Cuchufleta gives her presentation.

Audience applauds.

Annoying Session Chair:

"Any questions?"

No questions.

Annoying Session Chair:

"Let's thank *the speaker* again."

Weak applause from some in the audience.

Despite having introduced Cuchufleta 15 minutes earlier, the session chair has forgotten her name and is too lazy to look at the program in order to recall it.

More effective alternative: "Thank you, Cuchufleta, for showing how exposure to high magnetic fields can make people cynical." Session chair claps his hands, which induces the audience to do so without instruction.

Annoying Speaker:

“Thanks to the previous speaker for introducing the subject for me, so I can skip my introductory slides and get right into the equations.”

Implication: You are all here mainly to listen to me. The previous talk was useful only because it served as an introduction to my talk. Ha ha, just kidding (not really).

Gracious alternative: “I will start by reiterating the important background material that Cuchufleta Pérez covered so well.”

Annoying Speaker:

“Multilayer films are a *playground* in which we can explore different magnetic interactions.”

Implication: I am a gentleman natural philosopher. Whereas you work, I just play and have fun. For some reason, I get paid to do it.

Unpretentious alternative: “Multilayer films can tell us a lot about magnetic interactions.”

How about
video conferences?

Annoying Host: “Good morning, good afternoon, good evening.”

Desired reaction: This host is so clever and original! Until he said that, I never realized that we are all in different time zones!

Less clever alternative: “Hello everyone, thank you for attending this meeting.”

Creative expressions are clever the first time they are used. Maybe also the second time. After that?



I do not know if flight attendants take classes in airplane-speak as part of their training, but have you noticed that they all use the same expressions?

Annoying Flight Attendant: “At this time, please put your seats and tray tables in their full upright and locked positions.”

Subtle message: “At this time” indicates that this is part of the normal routine, nothing unusual, so you have to do it. (You would never hear a flight attendant say, “At this time, we are going to have our emergency landing.”) At most times, “at this time” can be eliminated, or the unpretentious word *now* can substitute for the sake of variety.

Redundancy: “Full upright and locked” overstates the obvious. (Do not try to trick us by putting seats and tables in partially upright and unlocked positions.)

Less annoying alternative: “Please check that your seats and tray tables are upright.”

For your amusement, the next time you fly in the U.S., count the number of times you hear airline personnel say, “At this time.”

For further amusement, count the number of times you hear flight attendants emphasize the auxiliary verbs *do* and *have* in their past, present, and future tenses.

Annoying Flight Attendant: “The captain *has* turned on the seatbelt sign” (with emphasis on *has*).

Apparent message: Some of you have been wondering, when will the captain turn on the seatbelt sign? I am happy to report that the captain *has* turned on the seatbelt sign. And because it was The Captain, you must obey the sign.

Common-sense alternative: “Please fasten your seatbelts.”

Some people try to seem more important than they really are.

Annoying Receptionist: “I am going to have you fill out these forms. Then I will have you take a seat.”

Intended message: I am in charge here. Because you need to see the doctor, you have to do as I say.

Polite alternative: “Could you please fill out these forms for me and take a seat?”

Finally, after sitting and waiting for a long time, you get to see the doctor.

Annoying Doctor: “I am going to have you turn your head and cough.”

Intended message: I am in charge here. Your fate is in my hands.

Well, maybe a doctor is permitted to “have you” do something.

MEET OUR CHAPTER CHAIR

RADHIKA BARUA

RICHMOND CHAPTER

WHAT DO YOU GET

WHEN YOU COMBINE DOMAIN KNOWLEDGE IN MAGNETISM WITH A PASSION FOR EDUCATION AND OUTREACH?





You get Dr. Radhika Barua, who seeks to transform the IEEE Magnetics Society Richmond Chapter into a vibrant hub for technical innovation and community connection.

At Virginia Commonwealth University, Dr. Barua, an Assistant Professor at Virginia Commonwealth University, leads the Advanced Magnetic Materials Processing (AM^2P) Lab, where her research group bridges fundamental studies of magnetism with applied research in advanced manufacturing.







Their work spans atomic-level investigations in exchange-coupled nanocomposite magnetic systems to the development of scalable, energy-efficient processes for fabricating rare-earth-free magnets, magnetocaloric materials, and next-generation devices using extrusion- and laser-based additive manufacturing routes.

Since stepping into the role of Chapter Chair in 2022, Dr. Barua has energized the chapter with a bold vision: make magnetics approachable, hands-on, and fun for everyone. Under her leadership, the chapter has become a magnet of its own, attracting students, researchers, educators, and community partners into a growing ecosystem of STEM learning and collaboration. Recent activities include expert-led seminars on cutting-edge magnetic materials, K–12 workshops where students build motors and explore levitation, faculty panels demystifying science careers, and inclusive outreach with local schools and organizations.

Through its blend of technical excellence and community connection, the Richmond Chapter of IEEE Magnetics Society is setting a high bar for what local IEEE engagement can look like - creating space for learning, collaboration, and curiosity at every level.

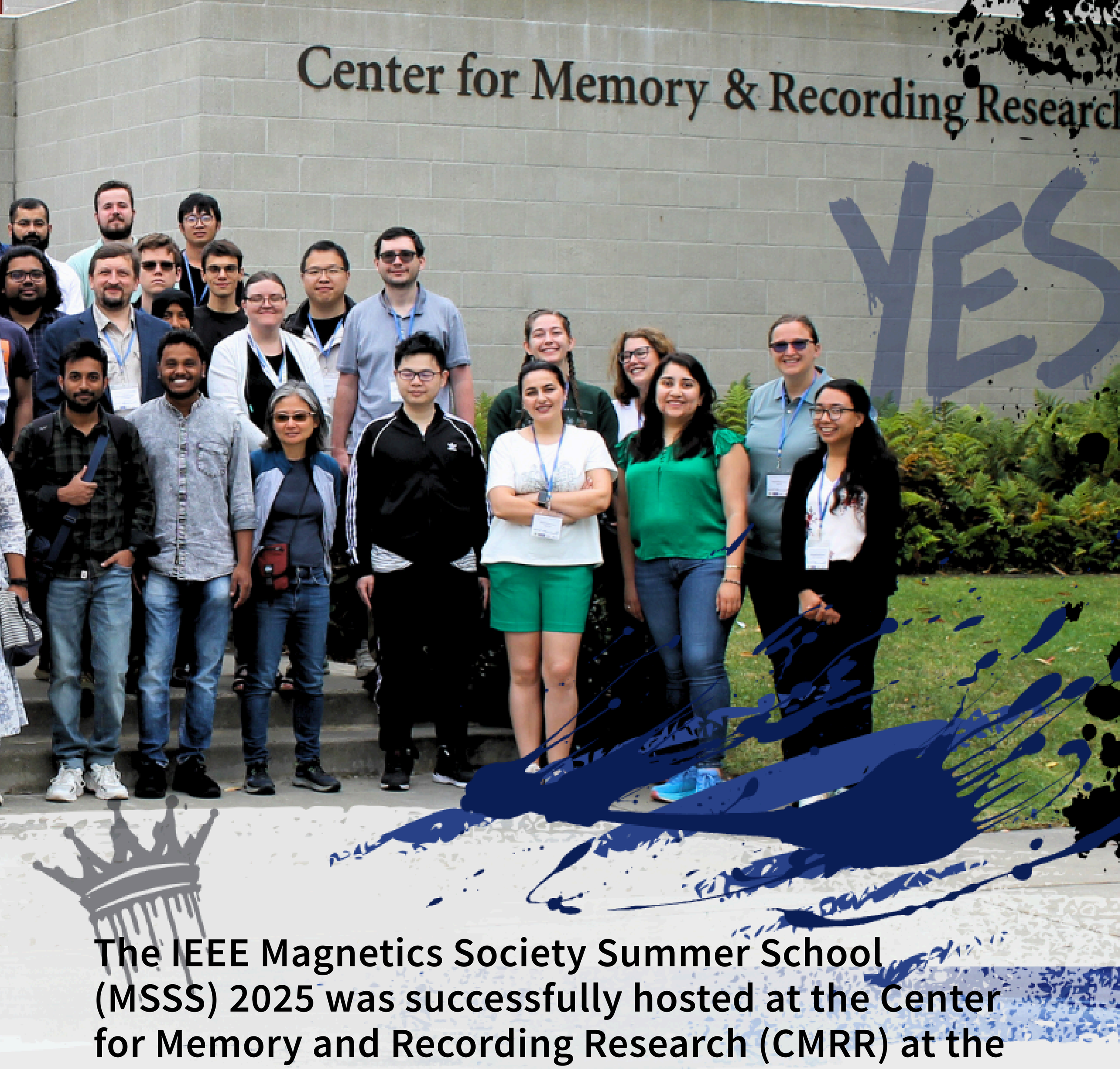
At the entrance to the Center for Memory and Recording Research, where t school was held.

IEEE MAGNETICS SOCIETY

SUMMER SCHOOL 2025

Vitaliy Lomakin

Local Chair, IEEE Magnetics Society Summer School 2025, University of California, San Diego



The IEEE Magnetics Society Summer School (MSSS) 2025 was successfully hosted at the Center for Memory and Recording Research (CMRR) at the University of California, San Diego (UCSD), from June 21 to 25, 2025. This annual event gathered approximately 85 Ph.D. students from around the globe, selected through a competitive process, for an immersive educational experience in magnetism and spintronics.

SUMMER SCHOOL

(Left to right):
Vitaliy Lomakin
& Eric Fullerton

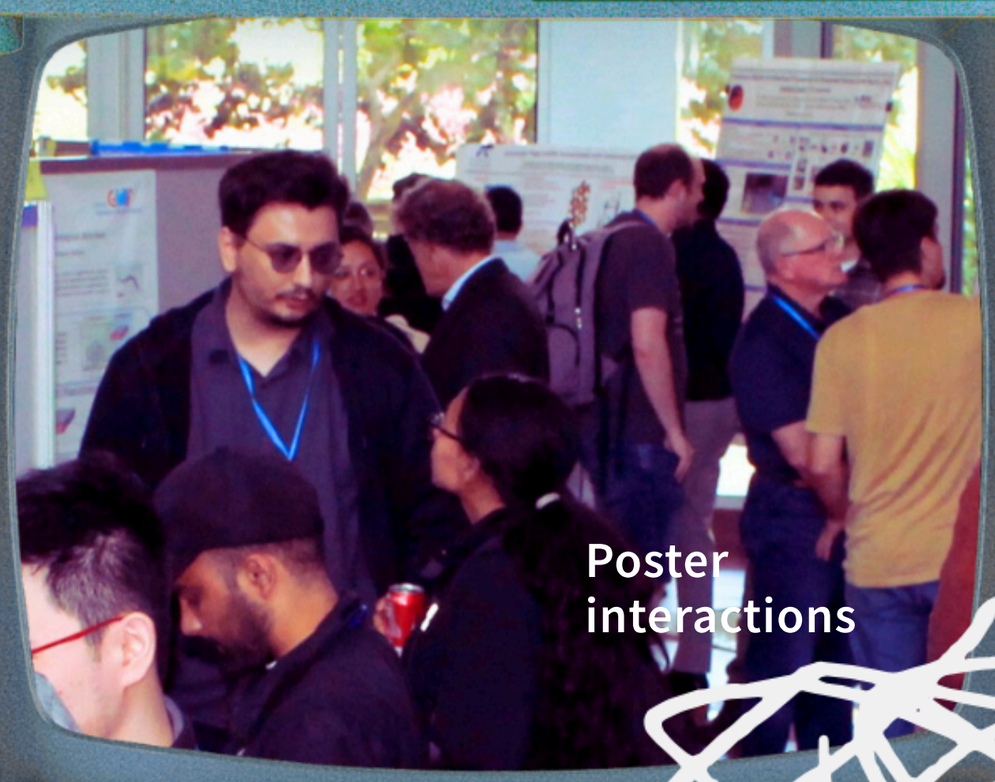
Academic Excellence:

The program featured 13 comprehensive lectures by world-renowned experts, covering foundational topics in magnetism and advanced research in spintronics and magnetic data recording.



During the lecture

The lectures fostered intellectual engagement, helping students explore new research questions and methodologies. Interactive activities, such as poster sessions, provided students with the opportunity to present their ongoing research and receive constructive feedback.



Poster interactions

Hands-on demonstrations, notably the hard-drive teardown facilitated by Ian McFadyen from Western Digital Corporation, were particularly popular, as were lab tours at Quantum Design led by Randy Dumas, giving participants practical insights into measurement tools commonly used in academia and industry.



Judging the posters

Industry Collaboration:

Strong support and participation from industry leaders, including Western Digital Corporation, Seagate, GMW Associates, and Quantum Design, significantly enriched the educational experience. Industry professionals contributed real-world insights, enhancing the practical relevance of academic concepts and fostering valuable academia-industry connections.

06.2025

INTERACTIVE ATMOSPHERE DURING THE WEEK



Social and Cultural Engagement:

The social events organized during the Summer School were particularly memorable. Activities included kayaking at the scenic La Jolla Shores and La Jolla Cove, where participants enjoyed sightings of sea lions, dolphins, and leopard sharks. A highlight was also the dinner party at Torrey Pines Gliderport, featuring gourmet barbecue, a cooking class with Chef Taras, and live electronic music by DJs Mike and Will, all set against beautiful ocean and glider views.

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2025 - 2026 IEEE MAGSOC
DISTINGUISHED LECTURERS



LIVE ELECTRONIC MUSIC
THANKS TO OUR DJ



RANDY K. DUMAS



CHEF TEAM,
LED BY TARAS

Networking is key, and there’s no better time to kick it off than during school!

Let's celebrate the connections we make and the amazing opportunities that lie ahead!

PARTICIPANTS' FEEDBACK

The social events organized during the Summer School were particularly memorable. Activities included kayaking at the scenic La Jolla Shores and La Jolla Cove, where participants enjoyed sightings of sea lions, dolphins, and leopard sharks. A highlight was also the dinner party at Torrey Pines Gliderport, featuring gourmet barbecue, a cooking class with Chef Taras, and live electronic music by DJs Mike and Will, all set against beautiful ocean and glider views.

We thank everyone supporting the school, including support from the IEEE MagSoc Educational Committee led by Hyunsoo Yang, NSF support facilitated by Dr. Lukaszew, industrial sponsors' support and their representatives, CMRR and UCSD support team, including Marina Robenko and Cyndi Meeves, CMRR and UCSD volunteers, and the UCSD and local committee members, including Vitaliy Lomakin, Eric Fullerton, Jeongmin Hong, and Sergio Montoya.

SOME OF THE STUDENTS' COMMENTS INCLUDED

"The IEEE MSSS 2025 was a grand event! The lectures were very enriching, ranging from basics of magnetism to advanced spintronics. The hands-on activities, especially dismantling a hard drive, were fascinating. The environment was welcoming, and the social events, especially kayaking and visiting Quantum Design, were memorable. I hope to return to UCSD soon!"

"Participating in this IEEE Summer School was one of the finest events of my PhD. The interaction with experts and the stimulating discussions were immensely beneficial. The program was perfectly organized, balancing educational content with fun activities like kayaking and parties. San Diego's pleasant climate made everything even better. Thanks to the organizers for this wonderful event!"

"Overall, the IEEE Magnetics Society Summer School 2025 at UCSD successfully fostered a vibrant international community of emerging scholars, significantly contributing to the advancement of knowledge and innovation in magnetism and spintronics."



Call for Applications and Nominations

Search for the Editor-in-Chief

The IEEE Journal on Exploratory Solid-State Computational Devices and Circuits (JXCDC)

The IEEE Journal on Exploratory Solid-State Computational Devices and Circuits (JXCDC) is published as archival journal under the financial co-sponsorship of the IEEE Solid-State Circuits Society, the Electron Devices Society, the Circuits and Systems Society, the Magnetics Society and the Council of Electronic Design Automation and the technical co-sponsorship of the Council on Superconductivity and the Nanotechnology Council. We are currently seeking nominations and applications for the position of the Editor-in-Chief (EiC) of the IEEE JXCDC for the publication years of 2026-2028. IEEE JXCDC is designed for rapid publication of results across the areas of solid-state materials, devices, and circuits for novel computation (logic, memory, and communication) beyond the limits of conventional CMOS technology. The scope of the JXCDC is not limited to digital information processing, rather it also encompasses non-Boolean computation – including analog, neuromorphic computation, and novel concepts in computer automata. It is envisioned that these exploratory methods of computation could augment CMOS-based information processing. By its nature, the JXCDC is a publication that connects researchers across the design abstraction hierarchy of materials, devices, circuits, architectures, systems, and algorithms. It is a selective, archival publication that scientists and engineers can read to follow developments in beyond-CMOS technology for energy-efficient computation, and communication.

Applicants must have strong, relevant experience in roles such as author, reviewer, and associate editor for JXCDC and/or other related journals, and/or technical or program chair or similar roles in high-quality peer reviewed conferences. They must also be a member of one of the sponsoring societies or councils. To attract high-quality articles to the journal the EiC must be a well-recognized leader in a filed relevant to the journal.

Applications or nominations must include a cover letter and a complete curriculum vitae (CV) and sent via email to Ms. Danielle Marinese (d.marinese@ieee.org) by September 1, 2025.

Detailed information about JxCDC can be found here.

SUMMER SCHOOL 2025 REVIEWS

by IEEE MAGNETICS

Article coordinated by Summer School students Ana Isabel Jimenez Ramirez, Esther Chen, Jose Luis Marqués-Fernández, and Students in Magnetism (SiM)

The attendees of the IEEE Magnetics Society Summer School 2025 @ San Diego have come together to prepare this article as a token of appreciation for the organizers, lecturers, and support staff who made the event such an enriching and inspiring experience. What follows is a collection of personal reflections, insights, and highlights from the students. These testimonies capture not only the scientific depth of the program but also the human connections and shared enthusiasm that made the Summer School truly unforgettable.

Kicked off an incredible week of magnetism—from fundamentals to frontier research—all thanks to the professors who poured heart and soul into this perfectly organized summer school. Truly a magnetic experience in every sense ;)

These photos (in the background) were snapped after an afternoon of kayaking in La Jolla, just as the sun was setting and the grills were heating up. Picture this: sunset skies, a beachfront breeze, cold drinks in hand, and yes—a DJ spinning tracks while a bunch of physics nerds danced like nobody was watching. It was wild, it was wholesome, it was unforgettable.

100% recommend this summer school to anyone who wants to learn, connect, and vibe with the coolest people in magnetism.

Thanks for the memories!

Jiacheng Liu
Hong Kong University of Science and Technology, Hong Kong



Many thanks to the organizers and lecturers of the 2025 IEEE Magnetics Society Summer School! It was quite an amazing experience and a comprehensive crash course for PhD students studying magnetics, and it was also very fun!

Haosen Yin
Cornell University, USA

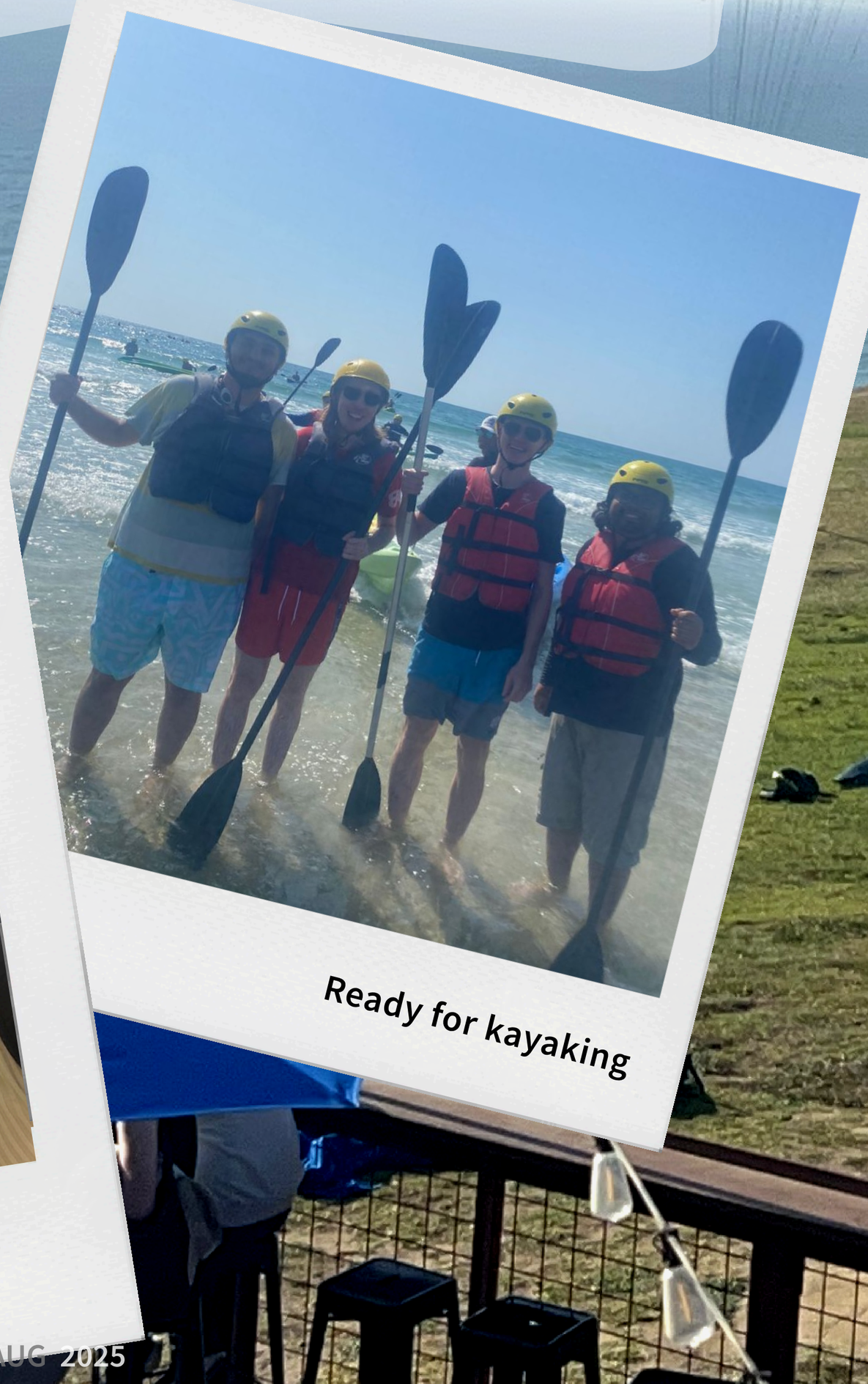
It was a fantastic week in San Diego — a great city with great people! I had the privilege of attending lectures from some of the leading researchers in magnetism and connecting with fellow peers. I learned a great deal about theoretical fundamentals, recent academic advancements, and industrial applications of magnetism. I truly wish we could do this every year.

A big thank-you to my roommates — Juuso, Robert, and Sabbir — and to all the friends we met along the way for the unforgettable moments. Spotting raccoons, sharks, sea lions, and, most memorably, dolphins with you was absolutely priceless.



Tamer Taskiran
Bilkent University, Turkeye

Already looking forward to crossing paths again and sharing more inspiring experiences in the future.
Huge thanks to the organizers of the school for putting together such a rich, engaging, and unforgettable program — it was truly world-class.



Ready for kayaking

Having lunch together



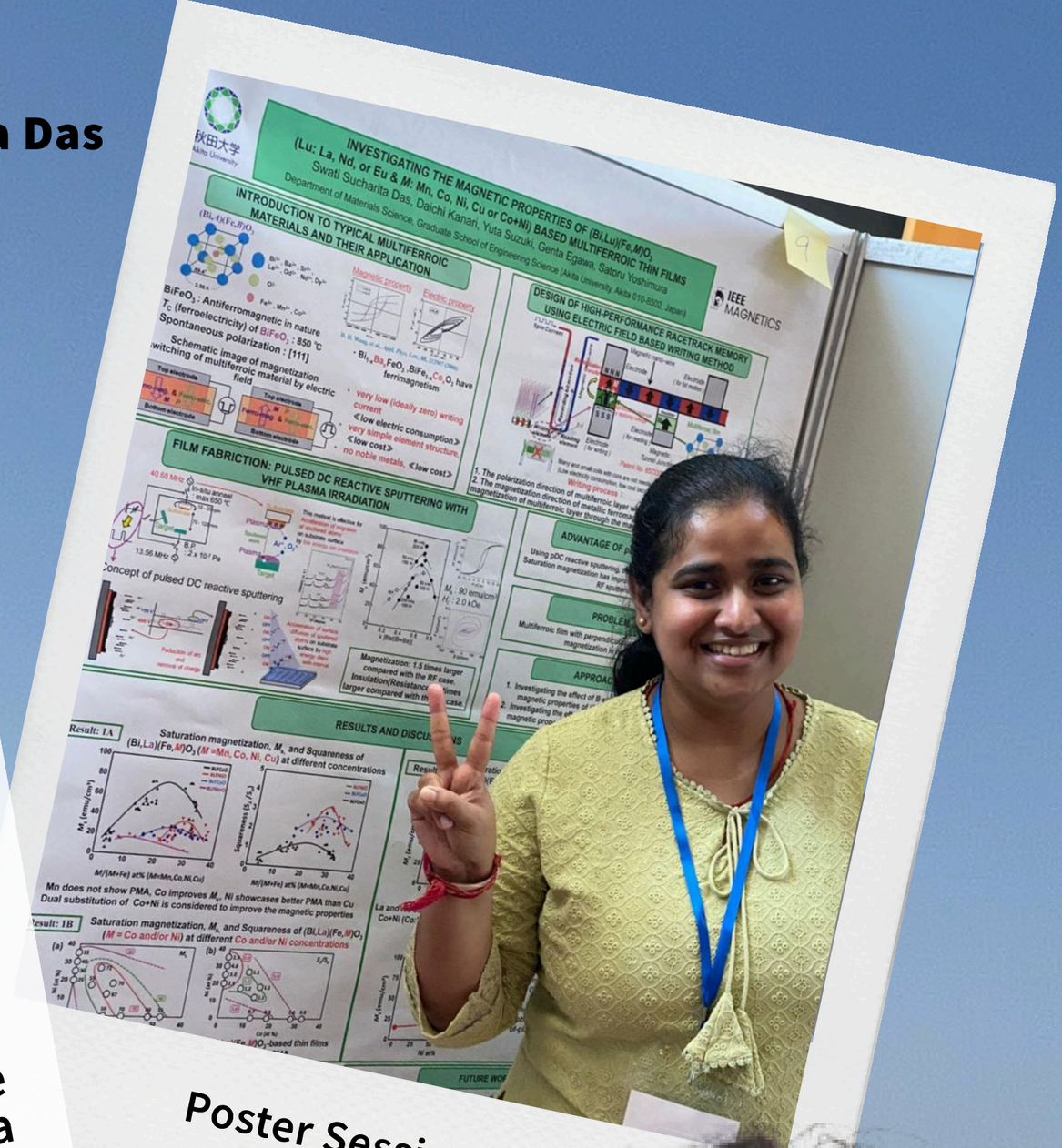
Swati Sucharita Das
Akita University, Japan

This Summer school was one of the most amazing events I have attended.

It was wholesome to hear words directly from the wizards of the field. Not only the lectures but also the meaningful discussions with the Professors and the students were worth noting.

Meeting the magnetic diaspora from all over the world was worth mentioning. Being friends to a lot, discussing further research collaborations were great.

I would love to thank MagSoc for organizing such a wonderful event.



Poster Session





Ashley Argueta
New York University, USA

I had an incredible time learning about magnetism and connecting with others in the field! It was truly inspiring to see the diverse ways people are applying their skills and knowledge. Gaining insights into both academic and industry pathways has given me a clearer vision of where my career could go. On top of that, I made amazing friends and unforgettable memories like going paragliding for the first time and going kayaking !

Background photo courtesy of Ashley Argueta

Wonderful experience at the UCSD! Engaging classes on magnetism by Professors, Poster sessions, Interaction with fellow researchers and Professors, discussing science and life, getting the chance to visit the headquarter of Quantum Design - it was a lot to take in! The session for dismantling a commercial hard disk drive was a fun experiment! We learnt how data is stored in a hard disk drive.

The fun got even better when we were told to assemble the dismantled parts of the same drive!! Additionally, the food and hospitality at the UCSD, the kayaking at the Pacific, friendly interaction with Prof. Lomakin and Prof. Hong during the party at the beach-- it was a memorable experience. I thank all the Professors, the people at the hospitality, and the Quantum Design team for organising such a successful and grand event! Looking forward to seeing you at UCSD!!!

Sourav Sarkar
S. N. Bose National Centre for Basic Sciences, India

THE LOVE-HATE OF DISMANTLING THE HARD DRIVE



Surprise

HERE'S MY MEME FOR YOU! ;)

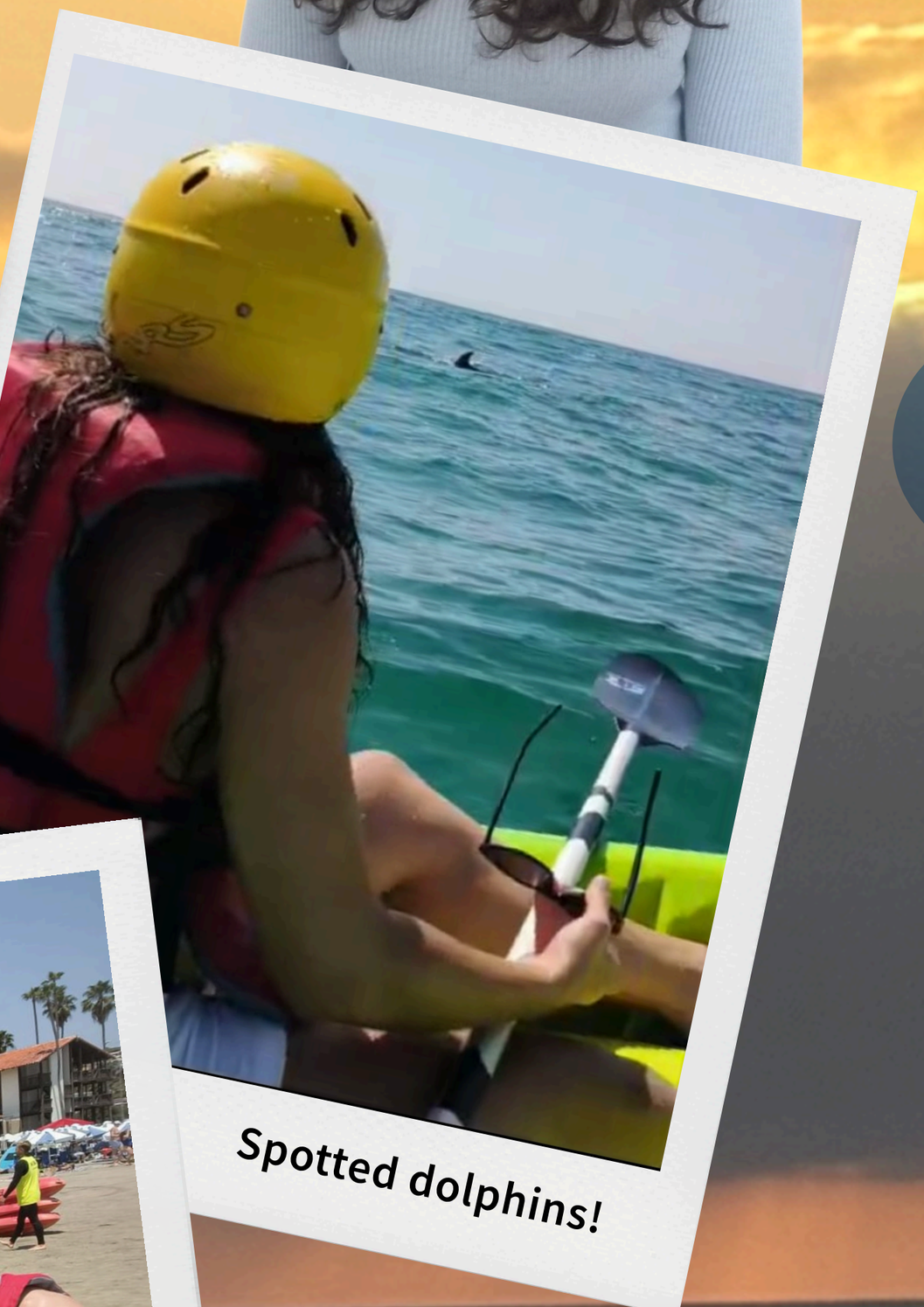
The Summer School was an amazing experience. Besides attending really interesting talks on magnetism, spintronics, and functional materials, one of the best parts was getting to meet and share time with other PhD students from all over the world. Learning about their work and spending those days together was truly enriching.

Beyond the academic activities—which were excellent—the kayak excursion was a lot of fun. We got to see sea lions and dolphins up close; at one point, the dolphins swam so close to our kayaks that it felt like we could almost touch them. It was a truly beautiful and magical moment.

I feel very grateful for having been given the opportunity and a spot to attend this Summer School. Huge thanks to the organizers for making it all possible and for such a wonderful experience!

Ana Isabel Jiménez Ramírez
University of Oviedo, Spain





Spotted dolphins!



Preparing for kayaking

Background photo courtesy of Esther Chen



Leonor Andrade
University of Porto / IFIMUP, Portugal



Last day, saying goodbye

The IEEE Magnetics Summer School in San Diego was a once-in-a-lifetime experience. The scientific quality of the talks was outstanding, and we had the opportunity to truly connect with students from all over the world. Exploring San Diego, kayaking at the beach, and watching the sunset while enjoying good music and barbecue are memories we'll be telling our grandkids about decades from now.

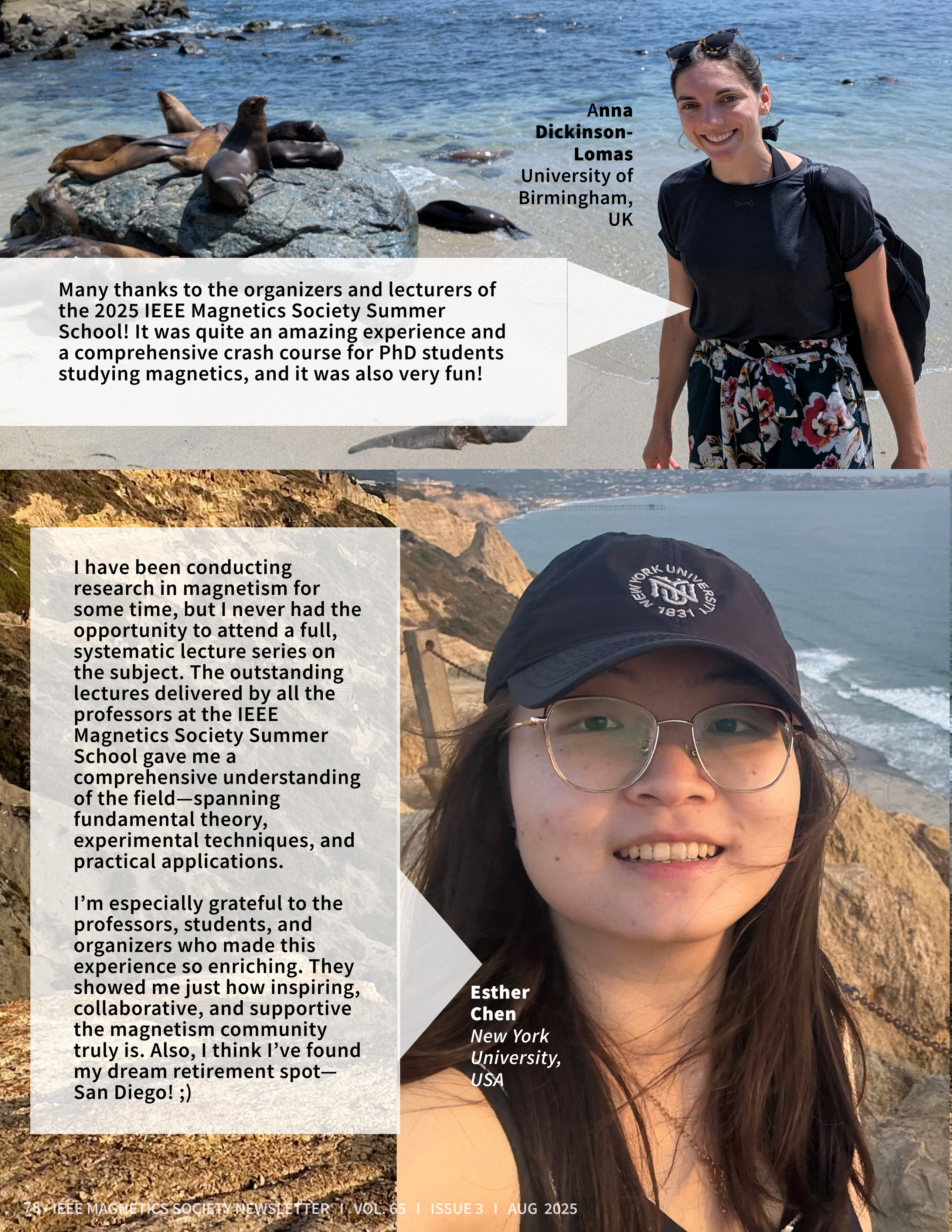
I'm grateful to have been selected and honored to attend. I genuinely hope to see everyone I met again at another IEEE event very soon.

A huge note of appreciation to the organizers, especially Vitaliy Lomakin and Jeongmin Hong, for making me feel at home, even so far away from it! <3

It was a great opportunity to meet people from all over the globe pushing the forefronts of research in magnetism and make friends among them. The environment was great for talking to and learning from the experts in the field. I particularly miss the bell that Professor Lomakin used to ring, reminding everyone to gather inside for the start of the lectures. Thank you so much for creating a space to learn, network, and make memories!



Shreya Shrestha
University of Delaware, USA



Anna Dickinson-Lomas
University of Birmingham, UK

Many thanks to the organizers and lecturers of the 2025 IEEE Magnetics Society Summer School! It was quite an amazing experience and a comprehensive crash course for PhD students studying magnetics, and it was also very fun!

I have been conducting research in magnetism for some time, but I never had the opportunity to attend a full, systematic lecture series on the subject. The outstanding lectures delivered by all the professors at the IEEE Magnetics Society Summer School gave me a comprehensive understanding of the field—spanning fundamental theory, experimental techniques, and practical applications.

I'm especially grateful to the professors, students, and organizers who made this experience so enriching. They showed me just how inspiring, collaborative, and supportive the magnetism community truly is. Also, I think I've found my dream retirement spot—San Diego! ;)

Esther Chen
New York University, USA



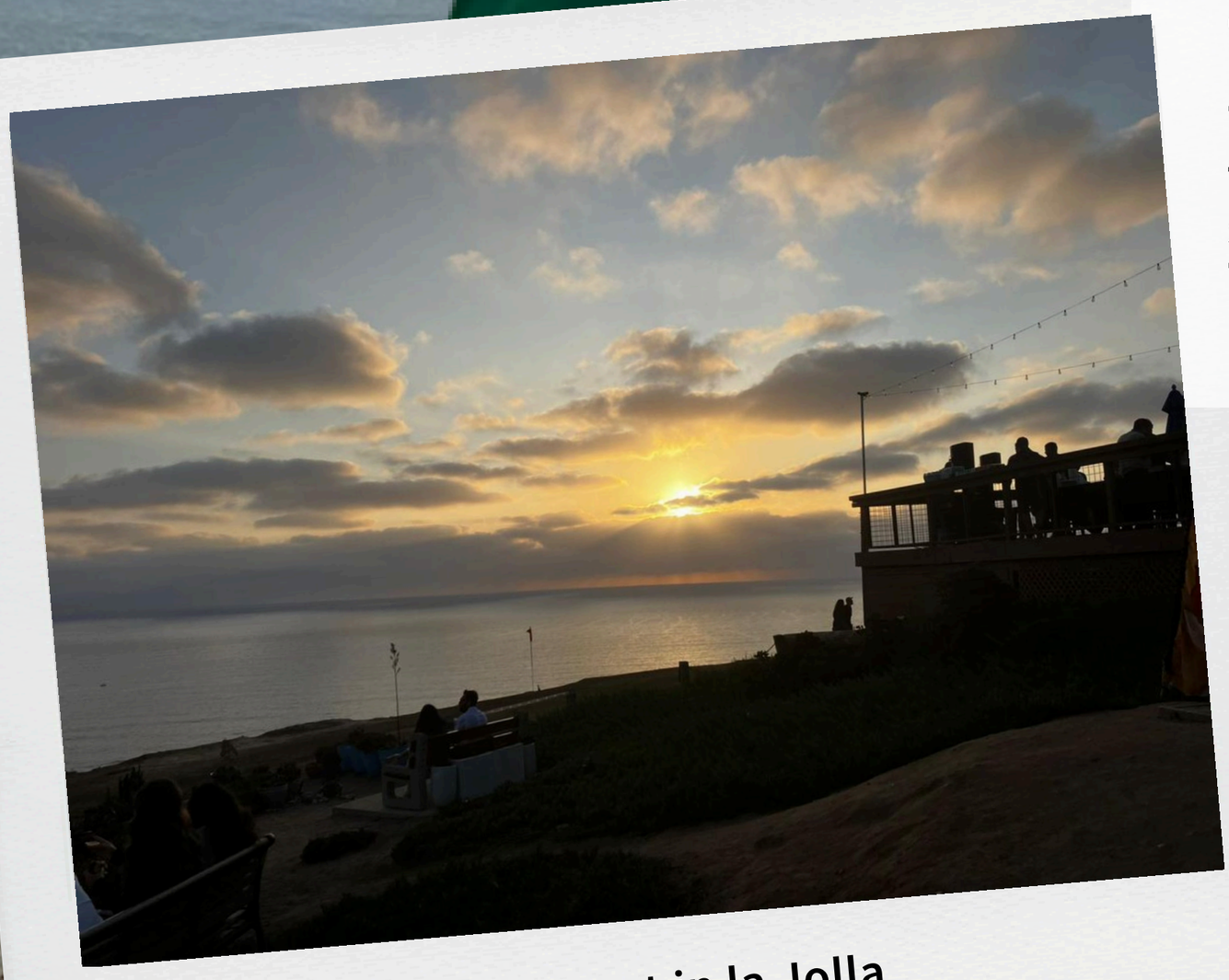
William Bouckaert
Université Paris Saclay, France

Thank you so much to Vitaliy and the entire organizing team!

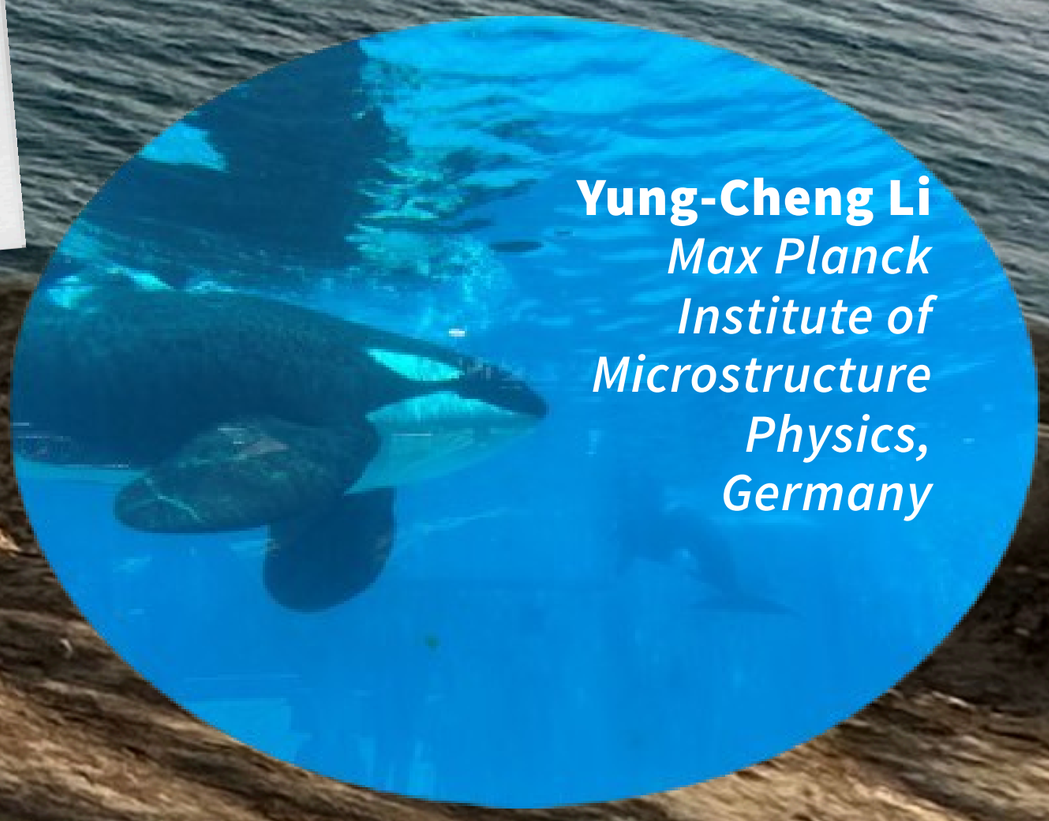
Not only was the summer school incredibly well organized, but the talks were also truly engaging, always starting from the basics and gradually building up the concepts. It made the content accessible and enriching for everyone.

The team was very attentive and did their best to accommodate everyone's needs. Of course, the setting was just beautiful. The kayaking day was amazing, and we even saw dolphins in the wild! (No photos, unfortunately, I left my phone behind for obvious reasons.) The dinner afterward was fantastic, with delicious food and a breathtaking view of the sunset, as you can see in the photo I've attached.

Thank you again, it was such a pleasure to meet all the PhD students as well, such a diverse and international crowd. Truly great memories.



Sunset in la Jolla



Yung-Cheng Li
Max Planck Institute of Microstructure Physics, Germany

Thanks for showing us the nice place La Jolla. It's a precious memory that we could discuss all lots of possibilities of spintronics in different aspects.

Background photo courtesy of Yung-Cheng Li



Yui Wiranya
Chomphurach Mahasarakham University, Thailand

I feel very honored and happy to join the Summer School 2025. During this past week, I learned so many things from expert lecturers. All of them explained the topics clearly and in an interesting way. The classroom atmosphere was full of energy and very friendly.

I didn’t just gain knowledge; I also felt warmth, shared special moments, and built wonderful friendships with friends and professors. Thank you to the organizers for hosting such a great event.



I have so many good memories from this week: the beautiful university, the fun kayaking activity, and the lovely dinner. Thank you for the delicious meals every day, truly from my heart.

This was one of the happiest weeks of my life. I really recommend this program; don’t miss a chance like this!





Background photo courtesy of Esther Chen





Lecturers

Ran Cheng	*University of California*
Randy Dumas	*Quantum Design*
Amal El-Ghazaly	*Cornell University*
Eric Fullerton	*University of California, San Diego (USCD)*
Ron Goldfarb	*National Institute of Standards and Technology (NIST)*
Stephanie Hernandez	*Seagate*
Min-Fu Hsieh	*National Chen Kung University*
Andrew D. Kent	*New York University*
Vasyl Tyberkevich	*Oakland University*
Vitaliy Lomakin	*USCD*
Günter Reiss	*Bielefeld University*
Yayoi Takamura	*University of California, Davis*
Hyunsoo Yang	*National University of Singapore (NUS)*

Industry Sessions

Ian McFadyen	*Western Digital*
Brian Richter	*GMW*
Cerwyn Chiew	*GMW*

IEEE Magnetics Society President

Ron Goldfarb *NIST*

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Eric Fullerton	*UCSD*
Jeongmin Hong	*University of California, Berkeley*
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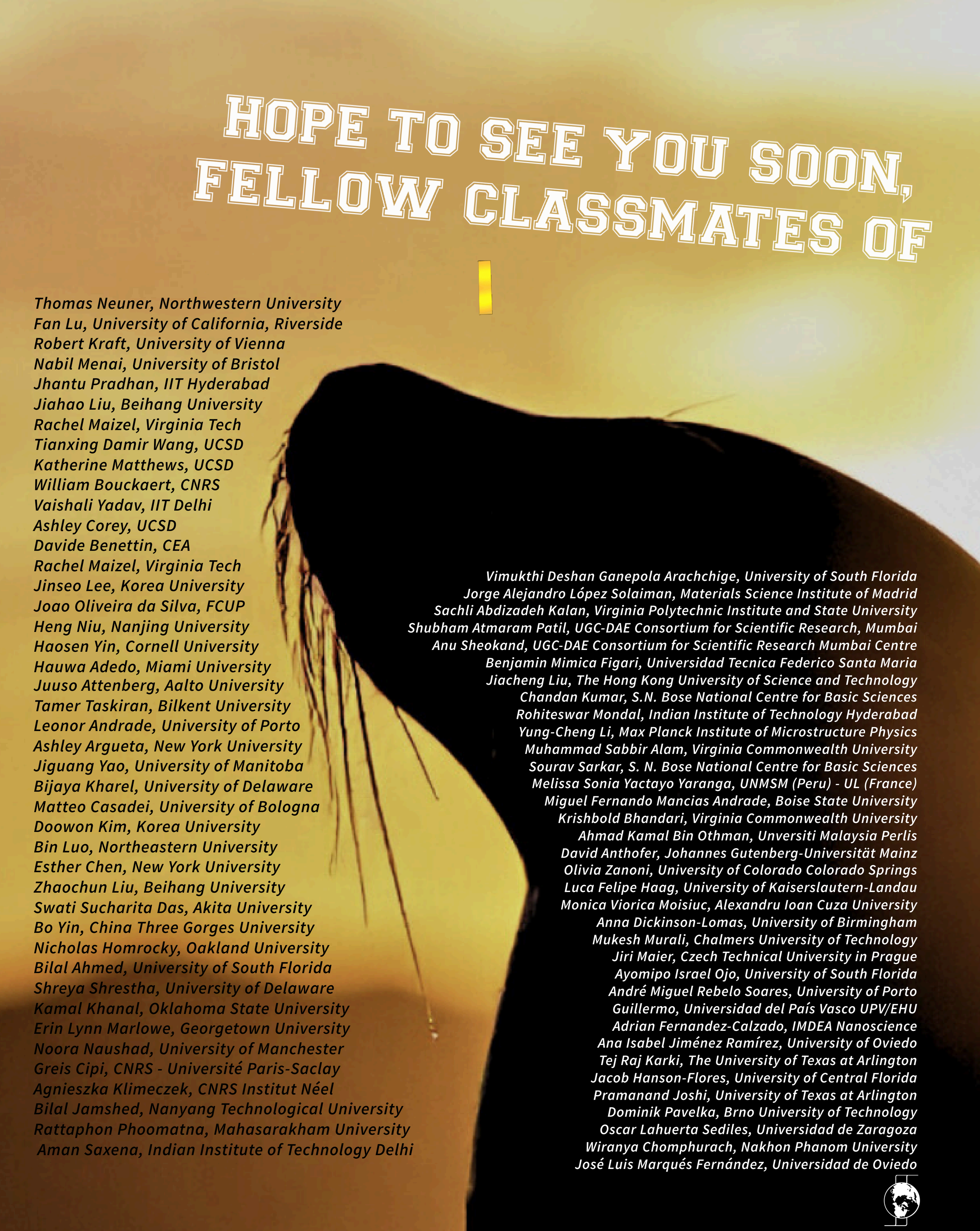

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Fan Lu, University of California, Riverside
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Jhantu Pradhan, IIT Hyderabad
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Swati Sucharita Das, Akita University
Bo Yin, China Three Gorges University
Nicholas Homrocky, Oakland University
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Brad Dodrill

(Newsletter Associate Editor for Industrial Liaison, brad.dodrill (at) lakeshore.com)

CONFERENCE & SCHOOL CALENDAR

To list your conference/events in the Newsletter in a future edition, please contact the Editor.

JEMS 2025

2025 14th Joint European Magnetic Symposia

Aug 24-29, 2025
Frankfurt am Main, Germany

TRENDS iN MAGNETiSM 2025

Trends in Magnetism 2025 - IV edition

Sep 1-5, 2025
Bari, Italy

SMM 27

Soft Magnetic Materials Conference 2025

Sep 8-11, 2025
Torino,Italy

SWiSS NANOMAGNETiSM SUMMiT 2025

Sep 8-9, 2025
Zurich, Switzerland

iCFPM 25

International Conference on Fine Particle Magnetism

Oct 19-23, 2025
Bariloche, Argentina

IEEE BRAiN DiSCOVERY AND NANOTECHNOLOGY WORKSHOP

Sep 12-13, 2025
Vancouver, BC, Canada

MMM 2025

70th Annual Conference on Magnetism and Magnetic Materials

Oct 27-31, 2025
Florida, USA

INTERMAG 2026

2026 IEEE International Magnetics Conference

Apr 13-17, 2026
Manchester, UK

THERMAG XI

11th IIR International Conference on Solid State Cooling, Heating, and Energy Harvesting

Jun 7-11, 2026
Ljubljana, Slovenia

PM'26

Physics of Magnetism 2026

Jun 22 -26, 2026
Poznań, Poland

MMM 2026

71st Annual Conference on Magnetism and Magnetic Materials

Nov 2-7, 2026
Hawaii, USA

STAY TUNED

NEXT ISSUE

Nov/Dec 2025

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