Magnetic Resonance in Medicine *HIGHLIGHTS*

Nice to meet you, Cape Town!

MR stories from the African continent

ISMRM and ISMRT Presidential Interviews

Mark Griswold and Adam D. Scotson

Named Lecturers Profiles

Richard Bowtell, Kirsten Donald, Maruf Adewole

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Nice to meet you, Cape Town!

For the first time in its history, the ISMRM Annual Meeting arrives on African soil — in vibrant, inspiring Cape Town. This landmark moment is more than a change of geography: it is a powerful statement about the global nature of our magnetic resonance community and the importance of broadening participation, perspective, and impact.

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Hosting the conference in Cape Town invites us to look outward and inward at the same time. Outward, to recognize the growing scientific contributions emerging from across the entire globe. Inward, to reflect on how our community can become more inclusive, more collaborative, and more attentive to diverse healthcare realities and research environments.

• • •

In this eleventh issue of *MRM Highlights*, we celebrate this historic occasion by dedicating a significant portion of our content to voices connected to the continent of Africa, and especially to South Africa. You will find a rich collection of interviews with researchers who are currently working in Africa, as well as with scientists who have spent formative years there and continue to build bridges with the region. Their stories reflect scientific excellence, resilience, innovation under constraint, and a deep commitment to translating MR research into meaningful clinical and societal impact.

• • •

These conversations go beyond scientific achievements. They offer insight into building research ecosystems, fostering international collaboration, mentoring the next generation, and advancing MR in settings where creativity and adaptability are often as important as the technology itself.

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As always, this issue also features ISMRM and ISMRT Presidential Interviews, profiles of the Named Lecturers, selected highlights recently published in Magnetic Resonance in Medicine, the Editor's Picks, as well as other fascinating contributions regarding the impact of MRM research. We are also very happy to introduce you to two pillars of the MRM back office, Shannon Stepanian and Brandi Conroy.

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Together with our legendary MRM Editor-In-Chief, Peter Jezzard, we want to thank our volunteer collaborators, the ISMRM Central Office, the MRM team and the team at Wiley who have all helped this magazine to see the light of day.

• • •

We hope this issue accompanies you not only through the scientific sessions, but also through the conversations, connections, and new collaborations that this historic meeting will inspire.

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Welcome to Cape Town — and enjoy Issue 11!

Maria Eugenia Caligiuri
MRM Highlights Magazine Editor

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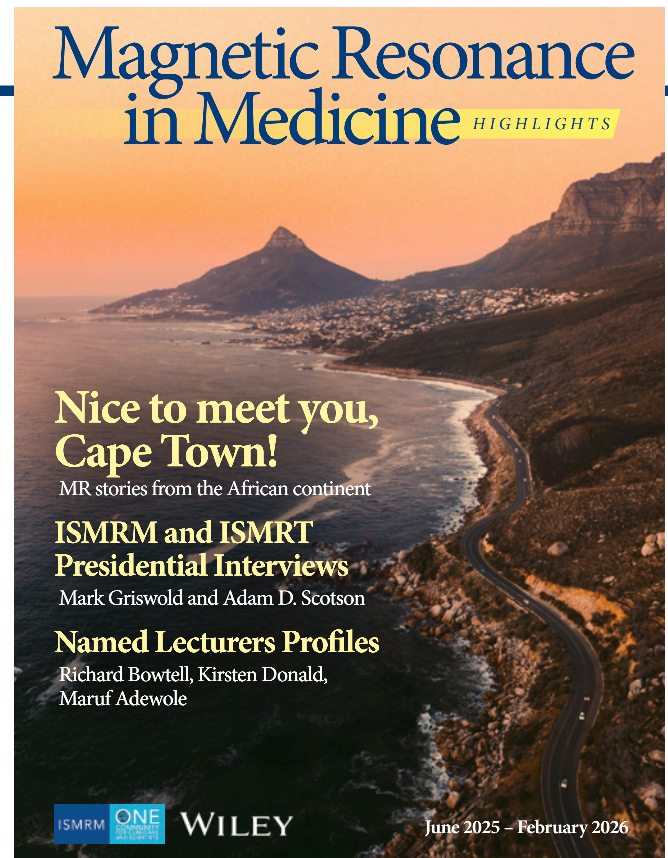

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Strengthening MRI Access, Research and Training in Africa: Interview with Godwin Ogbole

INTERVIEW BY **MALATHY ELUMALAI**

In this interview **Prof. Godwin Ogbole** describes his journey from a practicing neuroradiologist to an advocate for wider access to MRI on the continent of Africa.

MRMH: **Could you briefly introduce yourself and describe what motivated you to lead the SMART Africa Network (SMARTA), and how your background prepared you for that role?**

Godwin Ogbole: I'm a Nigerian clinician-researcher, Professor of Radiology, and Consultant Neuroradiologist at University College Hospital, Ibadan. I was born in Kano and knew early on that I wanted to become a doctor. Through a mix of chance and curiosity, I found my home in radiology. What began as a detour from orthopedic surgery became a lifelong fascination with images, computers, and the technologies that knit together every corner of medicine.

My training unfolded under significant constraints, especially the absence of modern equipment. I first encountered MRI in my final year of residency — an open 0.2 T Siemens system in 2005. Considered outdated and underpowered, it was, for us, transformative. We learned to read "blurry" images with discipline and creativity, and that single system served a population of more than 10 million people. It became a lifeline for neurosurgical care — supporting children with tumors, seizure disorders, and other neurological conditions, despite barriers of cost and distance.

Working with low-resolution images forced us to collaborate, adapt protocols, and teach trainees how to extract maximum diagnostic value from minimal resources. Those years taught me that impact doesn't always require the newest hardware — it requires ingenuity, training, and systems that fit local realities.

That experience planted the seed for SMART Africa. Short fellowships at Massachusetts General Hospital and Great

The 2nd ISMRM African Chapter pre-conference workshop, facilitated by the SMART Africa Network in Dar es Salaam, September 2024

Participants at the 1st ISMRM African Chapter pre-conference workshop, facilitated by SMARTA in Accra, 2023

Ormond Street Hospital, and collaborations with Northwestern, Oxford, and UCL, sharpened my understanding of what was missing back home: equipment, yes — but more urgently, trained personnel, a culture of maintenance, transparent procurement, and research networks that turn imaging into evidence and clinical impact.

SMARTA was created to address these gaps. Our goal is not to collect donated scanners, but to build capacity among young people. We expand MRI access through training, mentorship, and collaborative research that is appropriate, sustainable, and locally grounded. Support from the Chan Zuckerberg Initiative helped jump start this work and connected African centers with partners across Asia, Europe, and the United States. Our monthly seminars and annual hands-on workshops — and the growing community that gathers around them — are already boosting morale, strengthening expertise, seeding exchanges, and generating data for larger grants and new career pathways.

My motivation for capacity building is deep and unwavering. I believe modern healthcare in Africa can innovate and heal itself, given the right structures. SMARTA aligns with ISMRM's vision to democratize MRI access globally. As a neuroradiologist, I hold three truths: (1) *equitable brain health requires affordable, fit-for-purpose MR imaging*; (2) *technology without training is short-lived*; and (3) *research networks are the engine of sustainable change*. That is why I advocate for low-field MRI to expand access in our region.

MRMH: How did you come up with the name "SMART Africa Network (SMARTA)", and what does it reflect about the network's mission and values?

Godwin: The SMART Africa Network — SMARTA — is both a mission statement and a conviction. SMART stands for *Strengthening MRI Access, Research, and Training across Africa*, and it underscores an MRI future that is intentional, collaborative, and sustainable.

We chose "*Network*" deliberately. In many African cultures, progress is communal — knowledge is shared, hands are held, and strength comes from connection. SMARTA was envisioned as a continent-wide web linking hospitals, universities, engineers, radiographers, physicists, and radiologists so that no center works in isolation. Through this network, experience, mentorship, and opportunity can move freely, even in resource-limited settings.

SMARTA rests on a people-first belief: empower young professionals, build confidence, and nurture a self-sustaining ecosystem where training, research, and innovation reinforce one another. Over the past four years, with support from more than 20 global partners, SMARTA has upskilled over 300 early-career MRI scientists across Africa.

Through hands-on workshops and mentorship programs in Uganda, Ghana, Tanzania, and Nigeria, trainees have worked directly with leading experts. Several have secured doctoral positions in Africa, Europe, and North America, carrying skills forward — and, we hope, bringing new capacity back home.

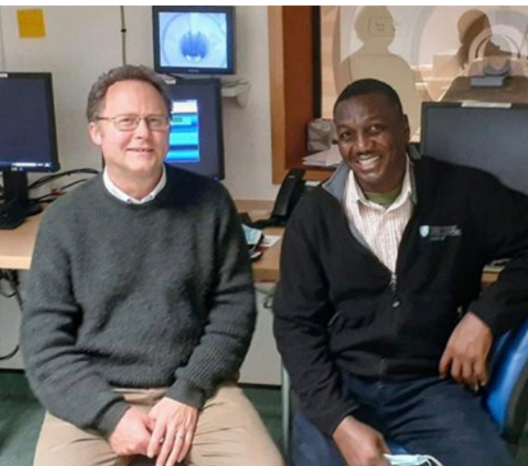
What inspires us most is the visible transformation: a radiographer running an advanced protocol for the first time; a trainee contributing to a first MRI research paper; a young scientist realizing that African neuroimaging can shape global science rather than merely consume it. SMARTA embodies our belief that, before the end of this decade, Africa can build a connected, resilient MRI ecosystem — driven by its own people, for its own populations, and in partnership with the world.

MRMH: From your experience, what are the top 2-3 practical requirements that must be in place for MRI practice and MR research initiatives to be sustainable in parts of Africa?

Godwin: From my experience, sustainable MRI practice and research in Africa rest on three practical pillars — people, appropriate technology, and purposeful partnerships — which I summarize as man, machine, and moving money.

First: human capacity: MRI does not run on magnets alone. It requires radiologists, radiographers, physicists, engineers, and researchers who can use scanners safely, creatively, and scientifically. Structured training, mentorship, and clear career pathways are essential. Just as importantly, African governments and institu-

Hands-on Practical sessions after lectures on the first day of the SMARTA workshop in Uganda, 2022



Godwin Ogbole at a 7T MRI lab with Peter Jezzard in Oxford in 2021

tions must invest in this capacity themselves. This is the most immediate and achievable starting point for any country.

Second: fit-for-purpose, maintainable technology: High-field MRI is powerful but often fragile and costly to sustain. Low- and ultra-low-field systems, supported by local maintenance capability, telemedicine, AI-enabled image enhancement, and reliable power solutions, can be transformative — especially for stroke, trauma, hydrocephalus, and tumors. This is a practical pathway for scalable, sustainable MRI services.

Third: collaborative networks and local research funding: MRI research thrives in ecosystems, not in isolation. Intra-African networks and equitable global partnerships enable the circulation of expertise, data, and ideas. Even modest local seed funding anchors research in real clinical needs and attracts larger grants. Tanzania's recent government investments are an encouraging example. This pillar ensures MRI growth becomes part of a nation's long-term health strategy.

Put simply: remove any one of these pillars, and MRI becomes fragile; put them all in place, and MRI can thrive across the continent.

MRMH: When building and sustaining initiatives like SMARTA across diverse contexts, what aspects of implementation have required the most adaptation or learning?

Godwin: The biggest lesson is simple but profound: context matters. No two countries, hospitals, or teams are the same, so effective implementation cannot be a copy-and-paste approach. We have had to continuously adapt training, mentoring, and workshops to local skill levels, infrastructure, and clinical realities.

Three areas have required the most learning. First, tailoring training to local needs and flexible, context-specific curricula work far better than one-size-fits-all models. Second, navigating diverse healthcare systems with its own regulatory, administrative, and resource constraints demands patience, local engagement, and adaptability. Third, building trust in sustainable partnerships depends on mutual respect, cultural sensitivity, and shared goals across disciplines and institutions.

Finally, funding has been a constant challenge. Limited resources have forced us to innovate by being frugal without compromising standards; negotiating for space and time, and maximizing impact from whatever support is available. That creativity has become one of SMARTA's greatest strengths, ensuring that every workshop or meeting remains genuinely transformative.

MRMH: What approaches or strategies have you found most effective in advancing MRI training and research through SMARTA, and what gives you optimism about the future?

Godwin: Several approaches have proven especially effective.

Hands-on training remains foundational. Nothing builds confidence like time on the scanner. One memorable moment occurred in Uganda in 2022, when trainees helped assemble an ultra-low-field Halbach MRI system at Mbarara University, supported by an NIH grant. Seeing young scientists realize that MRI is not a black box but a system they can understand — and even build — was transformative.

Mentorship and exchange have been equally powerful. Pairing African trainees with global MRI experts expands networks and fosters collaboration. Through SMARTA, several mentees have secured graduate positions at leading universities, while others have received competitive travel grants, including ISMRM–Gates Foundation awards. Importantly, trainees now mentor one another across borders, creating a self-reinforcing ecosystem of African MRI leadership.

Strategic partnerships have amplified our reach. Collaborations with universities, hospitals, ISMRM, the Chan Zuckerberg Initiative, Global BioImaging, CAMERA, and others have brought expertise, visibility, and momentum. The growing African presence at ISMRM — and the meeting being hosted in Africa for the first time — has been deeply affirming.

What gives me the greatest optimism is the passion of the next generation. From the Nile River to the Niger Delta, from the Sahara's edge to the forests of the Gold Coast, from Kilimanjaro to Victoria Falls — African MRI scientists are finding their voices and their place at the table. And now they gather at Table Mountain in Cape Town. The momentum is real.

Our time has come, and sustainable change is no longer just a hope — it is a horizon coming into view.

MRMH: Your work takes you across multiple countries and continents. Is there a place you've traveled for work that has particularly stayed with you — and why?

Godwin: Travel has shaped not only my science but also my sense of purpose as a teacher and mentor. Three places continue to stay with me.

Mauritius for its blue waters, rich greenery, and extraordinary hospitality — a reminder that serenity and kindness can inspire.

Albuquerque, New Mexico, for its steadfast preservation of Native American traditions, which taught me that innovation does not require abandoning one's roots. This insight shapes how I encourage young African scientists to lead from their own contexts.

Oxford for its living scholarship. My time at the Centre for Integrative Neuroimaging, under the mentorship of Peter Jezzard, was transformative. The generosity of intellect and spirit I encountered there strengthened my belief that mentorship is the true engine of scientific progress.

Together, these places — shaped by water, memory, and time — continue to guide how I teach the next generation: to pursue science with rigor, humility, and a deep sense of belonging. ■

ISMRM IN AFRICA

Deploying Low-Field MRI in Africa: Interview with Andrew Webb

INTERVIEW BY **MALATHY ELUMALAI**

In this interview **Prof. Andrew Webb**, founding Director of the Gorter MRI Center in Leiden, Netherlands, describes his work in deploying self-built low-field MRI in Africa.

MRMH: Could you briefly introduce yourself—and what's the connecting thread between your ultra-high-field work and your push toward low-/ultra-low-field MRI?

Andrew Webb: I'm a basic scientist by training — I studied chemistry in the UK — and I became fascinated by NMR, possibly because it was the only undergraduate course I dropped, since I didn't understand it at all at that time. That curiosity eventually led me into MRI.

Throughout my career, nearly every experiment I wanted to do required building new hardware, which gradually turned me into an enthusiastic amateur engineer, despite having no formal training — probably an advantage, since you don't always know what you can't do. That process naturally led me across a range of areas in MR, from high-sensitivity detectors for characterizing microscopic quantities of therapeutic agents, to combined fMRI and optical imaging to study fundamental brain function, and ultimately to the development of ultra-high-field human MRI.

That hardware-driven path eventually led me to think more carefully about not just what MRI can do, but where — and for whom — it can be done.

I believe that all of these topics — and the vast majority of what the MRI community as a whole is working on — have substantial societal value. But there are two sides to the coin. On one side, enormous resources are devoted to increasingly high-cost systems; on the other, far less attention is paid to widening the reach of MRI into communities that currently have no access at all. We represent, in many ways, the ultimate rich person's club. Increasingly, this imbalance weighed on me — perhaps because I have worked in many exceptionally privileged environments. So, at the risk of being seen as "white saviors," we felt it was important to try to do something about it.

Speaking at Aix Marseille Université

MRMH: What moment convinced you that making MRI affordable would require redesigning it from first principles rather than refining existing systems?

Andrew: There wasn't a single "eureka" moment — more a gradual realization. If you genuinely want to create MRI systems that can function in low-resource settings, incremental refinements to existing designs simply aren't enough.

To be fair, many researchers have worked on low-field MRI for decades, and our work isn't fundamentally different in concept. What *is* different is the emphasis on accessibility, mobility, and sustainability. In the environments we're targeting, power outages are common, electricity is expensive, transport is difficult, and infrastructure is unreliable. Those practical realities are what pushed us toward redesign, rather than simply refining existing systems.

MRMH: When you started "from scratch", what is one assumption you expected to hold — but that turned out to be wrong in practice?

Andrew: I initially assumed it would be extremely difficult to build a lightweight magnet with a sufficiently homogeneous B_0 field to perform conventional Fourier-based imaging. This was because the filling factor of a human head within a ~30 cm bore is much larger than in conventional systems (typically ~60 cm bore), and because we're using discrete magnets rather than a continuous conductor as in superconducting systems. As a result, I expected we would need very exotic acquisition or reconstruction techniques. Instead, it turned out that if you don't tell your students something is impossible, they often find a way to make it work!

MRMH: When you say "clinically useful" for point-of-care MRI, what are the 2-3 criteria you personally use to decide whether a system is good enough for a real clinical decision?

Andrew: For me, deciding whether a point-of-care MRI system is clinically useful comes down to a small number of criteria.

First, it depends absolutely on having a strong working relationship with clinicians—not only radiologists, but equally importantly specialists such as neurologists, rheumatologists, and ophthalmologists, who may have quite different views of what is "good enough". It's also important not to limit those conversations to privileged academic hospitals; regional hospitals scan far more patients, and clinical opinions there often have a more practical flavor.

Second, there needs to be a clearly articulated clinical need — either to increase access in higher-resource settings or to address an unmet need in lower-resource ones.

Only then do we move to more MRI-specific criteria: whether the system can produce robust, high-quality images day in and day out for all patients, across the full range of operating conditions one actually encounters, including wide variations in temperature, humidity, electromagnetic interference, and intermittent power.

Andrew Webb

I think we should be more embarrassed by the lack of international and geographic diversity in our laboratories, conferences, journals, and funding structures

MRMH: In the on-site Uganda build you were involved in — taking shipped components to first images with a small team — what was the one moment that best captured what "access" really means beyond the scanner?

Andrew: What really captured 'access' for me was realizing, during the build, that getting the scanner to work was only a small part of the problem.

On the positive side, there is now a functioning MRI system that students in Mbarara and elsewhere in Uganda can use—and, importantly, a model that can be replicated with the Ugandan team leading the design. There are many talented science and engineering students who want to work in medical imaging, but who have zero access to MRI, X-ray, or ultrasound facilities. Their only option is often to go abroad, and in most cases they never return.

The more difficult side of access is sustainability. That project was essentially a one-off, funded somewhat indirectly, to put it mildly. Making this type of access sustainable requires long-term funding — particularly for personnel — and that remains largely absent.

What became clear very quickly was that access isn't a single achievement — it's something that only exists if it can be sustained.

MRMH: If you could change one default mindset in the MRI community over the next decade, what would it be — and what experience in your work has reinforced why that shift is necessary?

Andrew: This is a dangerous question — or perhaps a dangerous answer. To be blunt, I think we should be more embarrassed by the lack of international and geographic diversity in our laboratories, conferences, journals, and funding structures.

We cringe at photos of early ISMRM meetings filled with badly dressed white men, and rightly so. While progress has been made — panels and male dominated awards are increasingly challenged — we are only slowly confronting the lack of geographic diversity. Even in supposedly liberal European academic environments, representation from large indigenous populations remains extremely limited.

ISMRM has been proactive in driving change, including strong support for open science and code sharing through journals like Mag Reson Med and J Magn Reson Imaging. But geographic inclusion should be treated as a major challenge for our Society. Change takes time, but perhaps in a decade we can look at conference photos that include leaders from institutions far beyond the usual suspects.

Why does this matter? One reason is that we are wasting at least half of the world's human potential. Another is that, without deliberate action, we are actively denying that half of the population the opportunity to participate at all. ■

Democratizing MRI from Africa to the World: An Interview with Udunna Anazodo of CAMERA

INTERVIEW BY **CRISTIAN MONTALBA**

Today, we're joined by CAMERA, led by **Udunna Anazodo**, a global network advancing equitable MRI and neuroimaging across Africa and low- and middle-income countries. Aside from developing multimodal brain PET/MRI methods at McGill University, Dr Anazodo's work spans global health initiatives, from BraTS-Africa, a landmark brain tumor segmentation challenge that addressed bias in AI by training models that included data from sub-Saharan African patients, to CAMERA—the Consortium for Advanced MRI Education and Research in Africa — a multidisciplinary network dedicated to building sustainable MRI expertise across the continent. Through hands-on educational initiatives like SWiM (Scan With Me), CAMERA champions a "Teach–Try–Use" approach, adapted from RAD-AID [1], that embeds training directly into clinical practice, ensuring that skills don't disappear once external trainers leave. On the data and AI front, programs such as CONNExIN and the SPARK Academy enable collaborative analysis and collective intelligence, bringing advanced neuroimaging and AI tools to resource-constrained settings. Together, these efforts are redefining what imaging without borders can look like—and today, we're excited to hear her story and CAMERA's impact.

MRMH: Dr Anazodo, what initially inspired you to become involved in these initiatives, and what continues to motivate you to drive them forward?

Udunna Anazodo: What initially inspired this work was witnessing visible inequities in access to diagnostic imaging especially regarding MRI access in LMIC settings. Growing up in Nigeria, I observed how limited healthcare infrastructure, training opportunities, and representation in research leadership constrained patient care and innovation. This motivated me to form CAMERA in 2019 with a clear aim to address these gaps through collaboration, education, and capacity building.

What continues to motivate this work is seeing tangible, system-level impact: The foundation of this work was based on a Needs Assessment Survey conducted to meet imaging needs in Africa. Through this we have created several training, mentorship, and networking opportunities that are developing local leaders, strengthening institutions' local MRI capability, and producing global partnerships with contextual relevant solutions. CAMERA is driven by the belief that sustainable imaging innovation must be inclusive by design, locally informed, ethically grounded, and globally connected. The momentum that comes from empowering communities to shape their own imaging futures will democratize MRI for everyone everywhere.

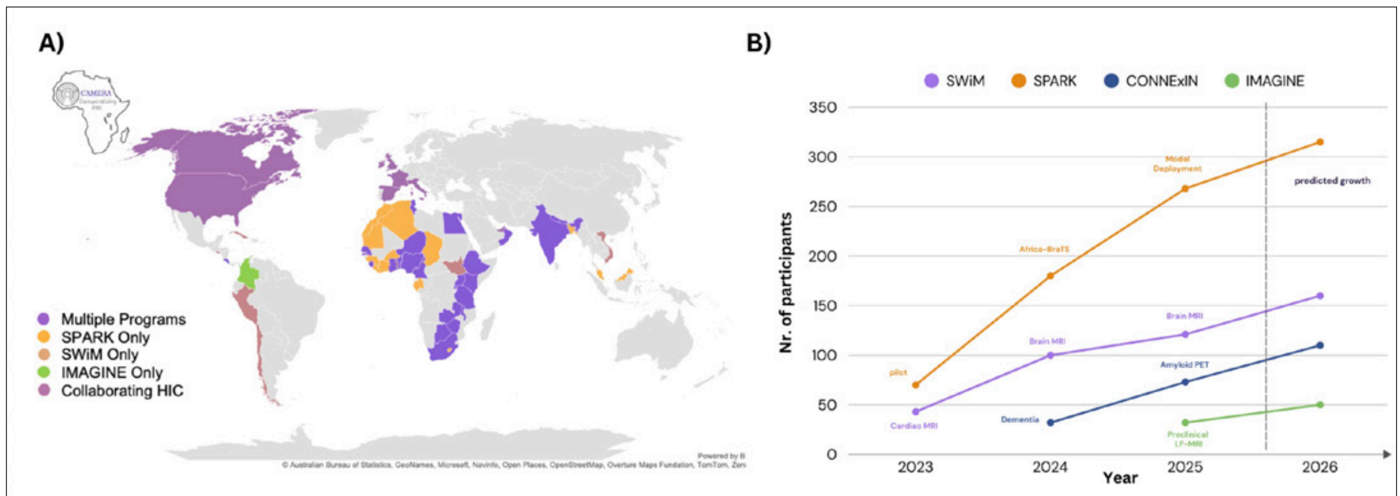
MRMH: What was the original spark that led to CAMERA, and how did it grow into a network of more than 800 multidisciplinary members?

Udunna: The original spark for CAMERA came from my lived experience of the diagnostic imaging challenges in Nigeria. The gaps in imaging access, training, and research leadership were stark despite clear local need. This led to the formation of CAMERA in October 2019, with the core mission focused on rethinking how MRI education and innovation could be more inclusive and scalable by creating sustainable training methods and empowering local talent to catalyze widespread and long-lasting solutions to enhance MRI access in an African context.

CAMERA's growth into a network of more than 800 multidisciplinary members was driven by deliberate collaboration with global and local partners who have an interest in contributing towards CAMERA's mission. CAMERA was formed as an *ad hoc* multidisciplinary working group within the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) which enabled access to diverse MRI expertise, and a trusted international platform that enabled rapid collaboration, strategic alignment, and scalable growth.

Udunna Anazodo

Through continual networking at local and international conferences and raising awareness of CAMERA's mission, the network attracted a range of partnerships ranging from: MRI experts, clinicians, educators, industry partners, and stakeholders who collectively helped formalize a clear strategic vision focused on capacity building and equitable participation. By prioritiz-



CAMERA's Global Footprint, Program Impact and Project Growth: Scalability and growth of all three programs in terms of geographical outreach (A) and participant numbers (B). A) shows the participants' workplaces from 2023 to 2025 for the different programs. B) shows the past and predicted number of participants in each program, as well as the total nr. of trainers which increases each year as dedicated trainees are up-skilled to trainers

ing people, partnerships, and long-term ecosystem development, CAMERA evolved from a small working group into a global community united around advancing accessible, ethical, and contextually relevant MRI education and research. Our ability to grow our initiatives rapidly is thanks to a global network of volunteers who carry on the vision and lead CAMERA initiatives, many of whom are emerging scientists and clinicians. We are also grateful to CAMERA's interdisciplinary Advisory Board of individuals who champion our cause.

MRMH: Many sites have MRI scanners but limited specialized expertise. How does CAMERA help transform hardware into meaningful clinical and research impact?

Udunna: MRI scanners are becoming available across Africa, the least resourced setting in the world. While these scanners can now be installed and run fairly well, despite power challenges, they remain underutilized because of limited expertise. The consortium helps bridge the gap between having MRI scanners and actually using them to improve patient care and research by building the human and institutional capacity that many sites currently lack. The core idea is that hardware alone doesn't create impact – expertise, training, and networks do.

CAMERA helps African and LMIC MRI sites turn underused scanners into ones with real clinical and research impact by strengthening the people, skills, and systems needed to use MRI effectively. Many facilities have MRI hardware but lack trained radiologists, physicists, technologists, and engineers. CAMERA addresses this gap by providing structured education, hands-on training, and long-term mentorship to build local expertise in MRI physics, protocol optimization, safety, and image interpretation. This ensures scanners are used safely and to their full diagnostic potential.

The consortium also creates a continent-wide professional network that connects African MRI practitioners with each other and with global experts. Through shared protocols, troubleshooting support, and collaborative projects, sites gain access to knowledge that would otherwise be difficult to obtain. CAMERA further expands research capacity by supporting early-career investigators, offering guidance on study design, and facilitating participation in multicenter research. This helps transform MRI from a costly diagnostic tool into a platform for generating new scientific insights relevant to African health priorities. For example, we are developing tailored cardiac and brain scan protocols [2, 3] and accompanying open-source image analysis pipelines [4].

By promoting high-value MRI practices, efficient workflows, cost-effective protocols, and techniques suited to older or lower-field scanners, CAMERA helps institutions achieve better patient outcomes and sustainable imaging services. This combination of training, mentorship, collaboration, and research support is what turns hardware into meaningful impact.

MRMH: BraTS-Africa challenged the bias of AI models trained largely on Western datasets. What surprised you most when working with data from sub-Saharan African populations?

Udunna: The Brain Tumor Segmentation (BraTS) Africa data and imaging Challenge is a three-year project sponsored by the Lacuna Fund and carried out by the Medical Artificial Intelligence (MAI) Laboratory in Lagos, Nigeria through the network of imaging centers collaborating with CAMERA.

We curated 166 multiparametric MRI cases with labelled tumor sub-regions [5] and used it to run a Challenge from 2023 to 2025, as part of the Medical Image Computing and Computer Assisted Intervention (MICCAI) society satellite event. This provided the unique opportunity to benchmark AI methods for automated lesion segmentation that include African populations. The most striking part of working with BraTS-Africa data is how clearly it reveals how well-curated datasets, even if relatively small, can be used to do more to enhance tumor imaging patterns and diagnostics in resource-constrained settings. Up until the BraTS-Africa dataset,

AI methods developed for brain tumor segmentation were dominated by Western datasets, which do not represent the general clinical and imaging presentations in Africa and much of the rest of the world. In Sub-Saharan Africa, brain tumors often present with more advanced disease progression, atypical enhancement, and greater surrounding edema, reflecting later diagnosis and different patterns of care. These variations produced imaging phenotypes that Western-trained models rarely see, revealing how easily AI systems can misinterpret unfamiliar biology.

Technical factors played a larger role in the outcome of the dataset and the challenge posed when developing AI models that include or are exclusively designed using the dataset. Many scans across the region are still older or lower-field MRI systems, with more noise, motion, and protocol variability. Instead of being a minor nuisance, this variability exposed how brittle many high-performing models are when moved outside controlled academic environments, the usual source of datasets for AI model development.

Meet the Steering Committee

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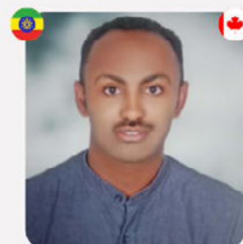

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The Team behind CAMERA

Together, these insights showed that building fair, reliable medical AI requires global data that reflects global realities. Through our SPARK AI training program we have 600 alumni across Africa, Southeast Asia and Latin America, who have the expertise to use AI to design homegrown solutions that expand beyond brain tumors.

MRMH: Your 'Teach–Try–Use' model moves away from traditional fly-in, fly-out training. Why is immersive learning so critical for sustainable MRI capacity?

Udunna: Immersive learning is vital for sustainable MRI capacity because it allows teams to develop the practical, context-specific skills that short, fly-in training cannot provide. MRI is a complex, hands-on discipline that depends on coordinated expertise across technologists, radiologists, physicists, and engineers. CAMERA's *Teach–Try–Use* model, adopted from RAD-AID, embeds training directly into real clinical workflows, giving teams repeated opportunities to practice on their own scanners, troubleshoot real cases, and adapt protocols to local constraints such as older hardware, limited coils, or inconsistent power. This kind of experiential learning helps participants internalize tacit skills like artifact recognition, safety decision-making, protocol optimization, and development of context-aware AI solutions that cannot be mastered through lectures alone.

Immersive learning also strengthens team-based competence. Because MRI research and care quality depends on how well different professionals collaborate, working together in their own environment builds shared understanding and confidence. The continuity of the model ensures that skills are reinforced over time, enabling teams to become independent rather than reliant on external experts. As a result, knowledge becomes embedded in daily practice, workflows improve, and sites gain the capacity to train others. This long-term, locally grounded approach is what transforms MRI from a fragile service into a sustainable, resilient part of the health system.

MRMH: Can you share a SWiM success story where hands-on training clearly improved scan quality, efficiency, or diagnostic confidence?

Udunna: Besides the immersive Teach-Try-Use curriculum, SWiM's success comes from robust partnerships with local radiology clinics and facilities and collaborative investments with MRI vendors, particularly Siemens Healthineers, Canon Medical

and Philips Healthcare. We have trained 200 technologists in LMICs to overcome the struggle with long, low-quality MRI scanning. Before training, scans took nearly an hour to obtain, in some cases for example cardiac imaging can take up to 1.5 hours. The images were often unusable with radiologists facing low diagnostic confidence. During SWiM, CAMERA mentors worked directly with trainees on the site's scanner, teaching technologists how to adjust parameters, streamline sequences, and troubleshoot artifacts in real time. When the trainees leave the program, they are versed in the related MR sequence including physics of image acquisition, patient preparation, and best practices in acquisition and processing. This has cut scan times by about one-third, improved sharpness and contrast, and overall image quality, allowing for more patients to be scanned at higher quality. The improvements were feasible because staff gained the confidence to adapt protocols independently. We are scaling the program year, after year, thanks to alumni who return to help train others, through our train-the-trainer approach.

MRMH: Once the formal training period ends, what mechanisms help ensure that the knowledge remains local and continues to evolve?

Udunna: Once formal training ends, we have managed to maintain continued innovation through continued networking and long-term collaboration among participants. Many of our alumni remain connected through social networking like WhatsApp groups and even have scheduled in-person meet-ups to work on shared projects, mentorship, and spin-off initiatives that build on the original training. This has allowed the knowledge they have learned to stay local while continuing to grow and to evolve. These ongoing relationships catalyze downstream innovation and capacity building, transforming short-term training into sustained, community-driven change.

MRMH: Referring to the CONNExIN and SPARK initiatives, why is it essential to train radiologists, physicists, and AI researchers together rather than in disciplinary silos when building sustainable imaging ecosystems?

Udunna: Training radiologists, physicists, and AI researchers together is essential because sustainable imaging solutions must function as integrated systems, not isolated components. When disciplines work in silos, innovations often fail at the point of real-world implementation; multidisciplinary training mirrors real clinical environments, enabling transferable, practical solutions that account for technical feasibility, clinical relevance, and ethical deployment. When learning occurs together, the stakeholders develop a shared language and mutual understanding, making it far more likely that imaging innovations are scalable, implementable, and effective in real-world settings.

MRMH: Looking ahead, what excites you most for CAMERA: low-field MRI, large-scale AI integration, or something we're not yet talking about?

Udunna: What's most exciting isn't a single technology, it's the convergence of several shifts that could let the Consortium reshape MRI in Africa in ways that high-income countries haven't managed yet. Low-field MRI and AI are part of it, but the real opportunity is how they combine with emerging infrastructure, training models, and new clinical pathways that are uniquely suited to African health systems.

Looking ahead, the most exciting opportunity for the Consortium is the chance to continue to build an Africa-first MRI ecosystem that is producing a critical mass of local talent, like Dr Maruf Adewole, the 2026 NIBIB New Horizons Lecturer, who is a member of CAMERA's Steering Committee. This ecosystem will include low-field MRI, as a potential near-term catalyst because it fits African clinical and infrastructure realities — lower cost, lower power needs, and strong performance for neuro, MSK, maternal, and infectious-disease imaging. Large-scale AI integration then becomes the multiplier, enabling automated protocols, real-time quality assurance, reconstruction that boosts low-field image quality, and continent-specific diagnostic models trained on African data. But the under-discussed frontier is Africa leading global MRI innovation through distributed scanner networks, task-shifted workflows, and disease-specific imaging pathways for conditions like TB, meningitis, and sickle cell disease, as well as the growing prevalence of oncological conditions. The real transformation comes from combining technology, training, and clinical pathways into a system designed for African needs that can be lower cost and more sustainable for adoption in health systems around the world. If it works in Africa, it will work well anywhere in the world. But what works well in most parts of the world, can fail in Africa. The future will require our global ISMRM community to join us as we work hand in hand with African colleagues where MRI can be done without barriers. *To learn more about our work, visit our website and read about our impact in our recent report. We would love to hear from you on how we can democratize MRI, together. Reach us at https://www.cameramriafrica.org/contact* ■

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A Story of Resilience: Interview with Ernesta Meintjes

INTERVIEW BY **ELISA SAKS**

Ernesta Meintjes is a Professor of Biomedical Engineering at the University of Cape Town and one of the central figures in establishing and advancing (f)MR research in Cape Town. She completed her BSc and MSc in Physics at the University of KwaZulu-Natal before earn-

MRMH: When did you first get introduced to MRI?

Ernesta: This was while I was doing my PhD in solid-state physics at Oregon State University. I was using NMR to look at the electronic structure of heavily doped silicon and phosphorus. Very material science-y stuff, but using NMR was the part that I actually loved. In 1996, at the American Physical Society meeting, Seiji Ogawa was getting an award for the discovery of fMRI. I heard that talk and did not understand anything, but I thought it looked an awful lot cooler than what I was doing, and that I want to do that one day.

MRMH: When you first got back to South Africa in 1998, what did the MR research environment look like?

Ernesta: Before I came back I wrote to all the medical physics departments in Cape Town saying that I would love to do fMRI. And they simply told me it would not be possible, since there were no MRI scanners in the public sector or at any of the teaching hospitals. Eventually, my application letter got passed to the Head of Biomedical Engineering at UCT, who offered me a postdoc position, but MR research was not an option. A few years later, in 2001, he called me to say that Groote Schuur Hospital was getting its first MRI scanner. Since I had told him I wanted to do fMRI, I should go and do it now.

MRMH: How did it go from there?

Ernesta: There was a cardiologist who had done his PhD at Oxford, the late Professor

Installation of the 3T full-body MRI scanner at CUBIC in 2015

Bongani Mayosi, who came to UCT at the same time as me and wanted to do cardiac MR research. But neither the fMRI nor the cardiac MRI packages had been purchased for the scanner. There was an enormous barrier to entry because neither of us had a track record in MRI, and you cannot really apply for funding without a CV that shows experience in the field. We had to raise around 750,000 ZAR before we could even start gaining any experience. But we were given a chance by UCT and managed to raise the funding for those add-ons over the next two or three years. In 2004, we could buy the functional and cardiac MRI software, but the hospital would not give us any scan time, even though we had just bought this extra equipment for them. There was a lot of begging and pleading. In the end, we managed to negotiate with the hospital leadership to give us one hour per week for fMRI and one afternoon per week for cardiac MR

CUBIC team

research. Then, in 2007, there were people at Stellenbosch University who were highly interested in doing fMRI. We started talking and agreed that there was no chance that both universities would independently get a research scanner, so we should join forces there. Luckily, on their side specifically, the senior university leadership was really backing them and knew people at Siemens. And we ended up getting a 3T head-only MRI scanner donated.

That was our first research-dedicated scanner, which absolutely boosted the neuroimaging research. The cardiology work was still running at the clinical 1.5T scanner for one afternoon per week. That extra capacity for scan time allowed us to train more people, and other researchers could become involved and start writing grant applications. In about 2010, we began fundraising earnestly for a full-body research scanner. That was largely driven by me, Bongani on the cardiology side, and the late Professor Dan Stein, who was the Head of Psychiatry and who was the key link to Stellenbosch University. We spent around 4 years fundraising and finally raised the money we needed. So, in March 2015, we got the full-body 3T research-dedicated scanner.

MRMH: You have had to overcome so many challenges and pushbacks, especially in the earlier days, before being able to do any MRI work at all. What kept you going?

Ernesta: I just love the physics of MRI. And I love the fact that it is such a dynamic, rapidly growing field. I come from a physics background where everyone getting awards is gray. And in MRI, what really struck me at the meetings was that the people invited to give plenaries were not gray. They were young, often even postdocs. The field is just moving so fast, and it is being driven by the young people, which I think is amazing.

Also, our disease burden is so different. It is naive to assume that everything found in the Global North will hold in our environment. Our disease burden is different, our environment is different, infections are different, nutrition is different, you know, so it feels like it is a space we absolutely have to bring MRI and MR research in. So, it was not easy, but I really wanted to do it. Also, working with Bongani was one of the most inspirational experiences you could ever have. We would meet roughly once a month to follow up on fundraising and discuss what we should try next. I was kind of the worker bee, and he was more the brain. And I would sometimes be super frustrated, but he always had a new idea and so much positive energy. And so, when you work with people like that, it can really energize you as well. It was an absolute privilege. And I always felt like I had institutional support as well. There were many things the institution did that really facilitated everything coming together. They had defined brain behavior research as a key focus for the university, which enabled us to secure a post, which became my post, and which funded my salary. We could then use that in funding applications as evidence that the university was backing this and would support it.

MRMH: Once you had the facilities to do fMRI research, your main applications were children affected by fetal alcohol syndrome or HIV, right?

Ernesta: Yes, but I am also a physicist, and what I always loved in my NMR days was the pulse sequences. So, I always had this wish to do pulse sequence programming and not just work on the application side. However, South Africa has quite strict intellectual property laws, which was a big issue when we were trying to get a research agreement to get access to the pulse programming environment.

I think it was 2006, at the ISMRM Annual Meeting in Seattle, when Andre van der Kouwe randomly reached out to me. He is also South African, and he had looked to see who from South Africa would be there. We went for dinner, and I think that was just one of those absolute life-changing things because Andre and I have worked together since. He has been so committed and passionate and played such a huge role in supporting the technology-research side. His focus is motion correction, which was also the PhD focus of Aaron Hess, one of my first students. We still did not have a research agreement at this point, but our students would travel to other sites, such as Boston, to work on the sequences there with Andre, because it was the only way to move forward. So, because of the motion correction work with Andre, we were looking for pediatric populations to scan.

MRMH: Since then, you have established the Cape Universities Body Imaging Center (CUBIC). What does the research infrastructure look like now?

Ernesta: It started as the Cape Universities Brain Imaging Center when we had just the

brain scanner. And when we got the full body scanner, we rebranded it as the Cape Universities Body Imaging Center. The facility is completely self-sustaining, meaning we have to cover all the staff and the maintenance contract. The center operates on a pay-for-use basis. Now and again, there are researchers who run small studies, but among those who have been running studies for a long time and have kept running them, it is quite a small pool of researchers. At the same time, despite saying it is a small pool of people, getting scanning slots is a bit like a catfight. It is extremely busy. And the problem in South Africa is, it is not the safest country. Many of our research participants come from disadvantaged areas because they tend to be the ones where you see fetal alcohol syndrome and HIV. Because public transport is really bad, we always pick them up and drop them off at home. But some of the areas where they live are not safe, so we do not want to send our drivers in after dark. So, there are these hours between 9 a.m. and 4 p.m. where everyone is trying to get slots, even though we open much longer. We have even considered renting small flats where participants could sleep overnight and be taken back the next day. Those kinds of challenges. That is why people have started approaching some public and private hospitals to see if they can access their scanners for research, but the prices are just too high. So, there is still a bit of a barrier to access, even though we have the research scanner.

MRMH: Having talked so much about the challenges associated with MR research in South Africa, what are some unique aspects that you really love about conducting research specifically there?

Ernesta: It really matters. When I travel overseas, it feels like people are so often doing this one little thing and just carrying on because it is kind of fun. But who cares? I mean, that sounds kind of horrible, I guess. But here, it feels like what we do really matters.

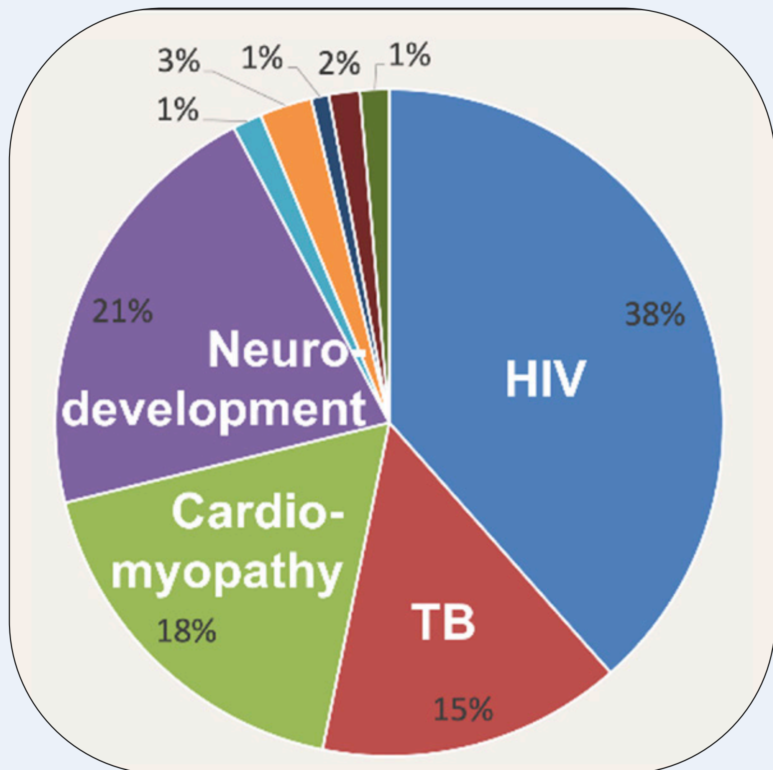
I often tell my students, when they are trying to decide whether to stay or leave after graduating, that it will be much harder to stay. Because getting funding is hard. None of our local funding agencies offers awards

A TIMELINE OF MR RESEARCH IN CAPE TOWN

2000: founding of the Medical Imaging Research Unit at the University of Cape Town (UCT)
2001: installation of the first 1.5T full-body MRI scanner at Groote Schuur Hospital (GSH, UCT teaching hospital), conceptualization of cardiac and brain MR research by Dr Bongani Mayosi and Dr Ernesta Meintjes
2003-2004: purchase of CMR and BOLD imaging packages for the MRI scanner at GSH, 1st MRI master's student (see interview with Dr Aaron Hess)
2005: launch of the UCT Brain-Behavior Initiative (BBI)
2006: joint negotiation of UCT and Stellenbosch University to purchase a refurbished 3T head-only MRI scanner
2007: establishing of the South African Research Chair in Brain Imaging (held by Dr. Ernesta Meintjes until 2021), launch of the Cape Universities Brain Imaging Centre (CUBIC), start of collaboration with Martinos Center in Boston (see interview with Dr Andre van der Kouwe)
2010-2014: fundraising for a 3T full-body MRI scanner for CUBIC
2015: installation of new 3T full-body MRI scanner and subsequent rebranding into Cape Universities Body Imaging Centre (CUBIC, directed by Dr. Ernesta Meintjes)

CUBIC KEY FACTS (2015-2025)

Scans: 16,088 MRI scans
People: 25 investigators, > 100 postgrad students trained
Work: 79 projects, > 279 journal papers



92% of research focuses on conditions of local relevance
Figure courtesy of Ernesta Meintjes

large enough for MR research. We absolutely have to get international grants, but competing for international grants is really hard. But chances are you will have much more impact because there are so few people here with these skills. So, you can actually make a difference. I always think that when I had to make that decision, whether to come back to South Africa or stay in the US after my PhD, it would have been much easier to stay in the US. But I am so glad I did not because I really feel like my life has had an impact here. And I do not think it would have had the same impact if I had stayed in the US.

MRMH: Can you see how the work you are doing at UCT extends beyond South Africa's borders? Do you think that it is part of your job to spread this knowledge and these skills, or is it maybe even a responsibility?

Ernesta: We at UCT believe that we have a responsibility. And I think that is, in large part, why we have worked so hard to make the African Chapter of the ISMRM work. And also why we are so committed to running courses. We run a lot of courses, keep them very cheap, and make them all very hands-on. We do it because we believe it is our responsibility to improve practice, to train people. Especially on the clinical front, there is a ton going on. Doctors from other African countries come to specialize at UCT, for example in radiology and MRI, and then return to their home countries. What has been a little bit hard on the MRI front, specifically, is that they often go back, and have no access to an MRI. So, there is definitely an attempt, but it is very difficult because resource constraints in many African countries are huge.

MRMH: What does it mean to you personally that the conference is coming to Cape Town for the first time?

Ernesta: Oh, I never thought it would happen in my lifetime! It is super exciting. I am really grateful to Derek Jones, who did so much work to advocate for this.

I think one thing I am a little worried about is the high registration rates. So, the conference is here, but people might not be able to come. That makes me sad. It is such a wonderful opportunity, but I am nervous that if we cannot get ISMRM leadership to agree to a reduced rate for people from Africa, it will not achieve what we hope it will, which is to grow interest and research in MRI locally. *[Editor's note: the ISMRM Board of Trustees did indeed make available a substantial reduction in registration fees for trainees in South Africa]* ■

MR research group 2010

MR research group 2019

MR research group 2022

ISMRM IN CAPE TOWN

A Student's Perspective: Interview with Aaron Hess

INTERVIEW BY **ELISA SAKS**

Aaron Hess is now an Associate Professor at the Oxford Centre for Integrative Neuroimaging, with a research focus on head and cardiac motion in MRI and MRS. Originally from Zimbabwe, he completed his BSc in Electrical and Computer Engineering and MSc in Biomedical Engineering at the University of Cape Town (UCT). After a brief period in industry, he returned to UCT for a PhD, working on motion-corrected pediatric MRI and MRS under the supervision of Dr. Ernesta Meintjes. During his PhD, he spent time as a visiting scientist at the Martinos Center for Biomedical Imaging in Boston, collaborating with Andre van der Kouwe. He later continued his career at the University of Oxford, where he has remained ever since.

MRMH: Please tell us a bit about your time and research at UCT.

Aaron Hess: I first came across MR research during my undergraduate studies at UCT in 2003. At that time, Professor Mayosi and Professor Meintjes were just starting the MR research initiative, and they introduced me to the field. I remember thinking it was so fascinating to see a moving object in the body, so I signed up for a master's program where I could do a project with MRI. In that project, we looked at how to quantify heart strain. Reflecting, the most exciting aspect was the opportunity to work with real clinicians who were interested in real problems, but in a very resource-limited setting. We had the chance to scan patients in quite critical condition, which makes testing new methods exciting because the sensitivity requirements differ. But more importantly, I think it was the ability of both Professor Meintjes and Professor Mayosi to have a vision for something that was seen as a first-world tool, MRI, in South Africa, and how we could use it for the benefit of the country.

After that project, I left academia to give industry a try. However, after two years, I was quite disillusioned, and I simply had to get back – MRI was just too interesting. By then, Professor Meintjes had secured funding for a research-dedicated head-only 3T scanner. The group was interested in children who were either exposed to alcohol during pregnancy or who were HIV positive, and the effects on their brains.

Aaron Hess (and son)

Both applications had existing studies in Cape Town, but a significant limitation was data quality, due to suboptimal data acquisition and the children's movement in the scanner. So, I worked on motion correction methods for spectroscopy, in particular, tracking B_0 field variations. Again, similar to the cardiac project, it felt like what I did could have a direct impact. My work was incorporated into studies involving well over 100 children, from whom we obtained useful spectroscopy data, which was very exciting and felt highly rewarding. But again, that was the vision and perseverance of Professor Meintjes.

MRMH: Besides the limited scanner availability, were there any other noticeable challenges in conducting MR research at UCT or, generally, in South Africa back then?

Aaron: I would say the biggest challenge is the conundrum between medical research that can directly save lives and research that helps us to understand. For example, malaria is one of the biggest killers in Southern Africa. But MR has a very limited role in understanding why that is such a problem. Actually, it is mostly poverty that is the answer, like access to basic things such as mosquito nets. However, I think that it is very

Chilling with cheetahs (photo provided by Aaron Hess)

important for those who are living, not just those who face death, to understand what makes them who they are. And the hard part is convincing the funders to say "Yes, that's a worthwhile cause". It is much easier to say "By inventing this vaccine for malaria, we are going to save 1000 lives!" Whereas, by understanding those affected by alcohol when they are *in utero*, we are not saving lives, but we are understanding lives.

MRMH: During your PhD, you went to the Martinos Center for Biomedical Imaging twice as a visiting scientist. Were there any striking differences that you noticed when directly comparing your work at UCT and in Boston?

Aaron: A huge difference was the access to resources – going from a center that had one scanner shared across universities to another where they had something like five dedicated research MRI scanners. It actually turned out to be a brilliant combination because in Boston I had access to all the nerdy scientific talk from people interested in things for the sake of being curious. I could quickly learn about MR, building MRI coils and sequences, and then come back to UCT to implement it in a scenario that had a positive impact.

MRMH: Were there any particularly positive aspects about conducting research at UCT?

Aaron: Oh, absolutely! It was the direct connection to interesting studies. In Boston, for example, there is a plethora of interesting studies going on, but they almost get lost in the volume. As a physicist, I was surrounded by many other physicists, and I learned from them. Still, I never got exposed to the day-to-day practicalities of studying children or studying a population with particular needs. Whereas, in South Africa, I would work right next to the radiographers, the doctors, therapists, and scientists who are interested in what the results mean. So, because it is a much smaller place, you are directly involved across the breadth of research. And I think that it is a really refreshing place to be.

MRMH: Do you think there are any specific qualities or skills that you have explicitly obtained by being trained in South Africa that you still benefit from today?

Aaron: I would say it has given me unique insight into problem-solving. When you are tasked with solving a broad range of problems, you have to prioritize them. But it also gives you an opportunity to come up with unique, maybe more alternative solutions than you might in a resource-rich setting.

MRMH: Is there anything you wish the global MR community understood better about the South African research context?

Aaron: I would say that it is important to recognize that South Africa has a world-class medical system. But, at the same time, it is in Southern Africa with a high level of poverty, which makes it a unique place to study an underrepresented population.

MRMH: Is there some advice you would give to young (South) African students interested in pursuing MR physics or imaging research today?

Aaron: I would suggest picking what you're interested in and sticking with it. Because when things are difficult, building up your expertise in that one area can benefit you and everyone else. In a situation of limited resources, you might end up doing the jobs of everyone. And that makes it very difficult to stay focused and choose what is important to you.

MRMH: I think that is some excellent advice! Will you be attending this year's ISMRM Annual Meeting? What does it mean to you personally that the conference will be held in Cape Town for the first time?

Aaron: Of course! I think, for me, it is just very exciting to see that crossover of work and history. It is very important to highlight the research that has been done and continues to be done here, for example, through this article series. I think that South Africa is very easily sidelined or seen as a minority destination, but the challenges they face in doing MR research in the African context are immense, such that any research that comes out is extremely valuable from anywhere on the continent. I grew up in Zimbabwe, and South Africa was so much more advanced than where we lived. I never dreamed that we could do MR research in Zimbabwe. But since then, I have met people who have done it, and I am just blown away by their resilience and ability to pull together something so exciting in a continent that is significantly underrepresented. ■

Supporting Research from Across the Pond: Interview with Andre van der Kouwe

INTERVIEW BY **ELISA SAKS**

Andre van der Kouwe is a Principal Investigator at the Athinoula A. Martinos Center for Biomedical Imaging, renowned for developing advanced MRI pulse sequences and real-time motion-correction methods. Originally trained in Electronic and Computer Engineering at the University of Pretoria, he completed a PhD in Biomedical Engineering at Ohio State University before moving into MR research in Boston. His contributions include the original Siemens AutoAlign prototype, MEMPRAGE, and vNav-based motion-corrected structural imaging. He maintains long-standing collaborations with Ernesta Meintjes and colleagues, which have earned him a position as Honorary Associate Professor at the University of Cape Town.

Andre van der Kouwe

MRMH: **Could you briefly introduce yourself?**

Andre van der Kouwe: I was born in Canada, but I was less than two years old when my family moved to South Africa. We lived in Pretoria, and so I basically feel South African in that sense. I grew up there and went to the University of Pretoria, where I earned bachelor's and master's degrees in Electronic and Computer Engineering. I worked at a company, sort of overlapping with my master's degree, for a couple of years, and then I moved to Ohio, where I got a PhD in Biomedical Engineering at Ohio State University, focusing on electrophysiology. From there, I went to the Martinos Center at MGH, where I was supposed to be working on MEG (magnetoencephalography). But, you know, as happens in many places, there was a delay in installing the machine. So, Anders Dale suggested that I work on MRI instead of waiting for the MEG system to get installed. And then I did that, and that was kind of fun and more exciting than MEG, so I just stuck with it. I am actually not trained in MRI. I just got into it by accident and really enjoyed it. And then I have stayed in Boston ever since.

MRMH: **What was it specifically about MRI that caught your attention and made you stay?**

Andre: I guess two things. In MEG, you get one-dimensional signals, and you just look at lines, while in MRI, it is just so satisfying to get an image to look at, right? But I think maybe more than that, and this might not be necessarily specific to MRI, but MRI certainly has this feature that there are so many different types of people involved. You are the guy setting up protocols and modifying sequences, but you get to talk to MDs, psychologists, chemists, and all these people. It is just a lot of fun to come to work, and every day I am doing something different.

MRMH: **You have done a lot of sequence design and method development work. What were some practical applications that you have been working on throughout the years?**

Andre: My specialty in electrical engineering and then biomedical engineering was signal processing. So, that is applicable to all sorts of things. My first major MRI project was implementing a prototype for AutoAlign together with Anders Dale and Franz Schmitt, who was our collaboration manager from Siemens at that time. From there, I worked on some motion correction, cloverleaf navigators, and case-based navigators. And then I just wanted to see if there was something going on in South Africa, just because it would be nice to collaborate with people back home. And that was how I found Ernesta. We met for the first time at the ISMRM Annual Meeting in Seattle in 2006.

MRMH: **Ernesta told me about meeting you at that ISMRM meeting in Seattle, and she even described it as a life-changing event. Could you tell me about that meeting from your perspective?**

Andre: I didn't know too much about her beforehand, but it certainly was life-changing. I do not know if I realized that in the moment. I mean, I was just thinking, "Oh, maybe we can collaborate. Let's see what's going on." Of course, I immediately recognized that she was a very friendly and honest person. She

is very straightforward about things. Also, as a South African, I just understand her personality well.

MRMH: What was the initial plan for the collaboration? How did it go from that initial meeting?

Andre: As I remember, I came away thinking we should apply for funding together and just see how it goes. That was what I could help with on my end, to channel NIH funding to support their work. At that time, Ernesta had already been working together with Sandra and Joseph Jacobsen from Wayne State University in Detroit to study children affected by fetal alcohol syndrome. There is, unfortunately, a large population of people exposed to alcohol *in utero* in the Cape Town region. So, this is something of interest to public health there and also instructive to the world. We applied for a small NIH grant to do motion correction work because these kids were moving around a lot in the scanner, and it was awarded. CUBIC had the 3T head-only MRI scanner, which was a pretty good scanner in those days, and I was excited to support the sequence design and potentially help out in other ways. This grant also funded some students to come to Boston, and Aaron Hess was the first one. He was a very motivated, diligent student and worked hard on the sequences. He built a coil with Larry Wald in his lab for scanning

Attendees of the 2017 ISMRM MoCo Workshop hiking in Table Mountain National Park

babies. Based on that, we conducted the first neonatal imaging studies in South Africa for research purposes. Aaron also worked on shim volumetric navigators (vNavs), which are still being implemented and used to this day. In fact, I was looking at his code yesterday. We have changed the sequence, accelerated it, and done other stuff, but he laid the foundation for that. I think the story there is that for Africa, we always think that we need low-field scanners. And that is true to make MRI more accessible. But at the same time, the University of Cape Town is very sophisticated and has clever people. They contribute just like anybody, with sophisticated software and even hardware. Aaron was an example of that. Of course, it was also not all just imaging, we also did some sailing in Boston Harbor, for example, and had a lot of fun together here.

MRMH: How has the collaboration evolved? Do you go to Cape Town regularly?

Andre: I used to go every year before the pandemic. I would always go around March or April because it is a nice compromise between the cold weather here and the warmer weather there. Then the pandemic came along, and I skipped three or four years. Now I have been going again every year for the last two years, but at different times.

MRMH: How would you describe your role within the research environment in Cape Town?

Andre: What I am trying to do is to facilitate some joint grants. For the NIH, some mechanisms can be applied for directly from South Africa, but others require collaboration. And sometimes it is easier to apply as a collaboration between a US institute and one from a low- or middle-income country, because you then qualify for certain grants. And then I enjoyed working with the students very much, but since Ernesta's chair ended, it has been a little bit trickier to send students over. So, we have been collaborating recently, for example, on motion correction at low fields, but it is quite difficult to work at that distance. A few years back, we had a very independent student named Adam van Niekerk (now an Assistant Professor at the Karolinska Institutet in Stockholm, and featured in another of these articles), who was very much into electronics, building circuits, and stuff. He built a little orientation and motion correction device, originally for 3T. It turned out to be very useful for low field, so we are adapting it now together with some new students, but, of course, it is mainly his device. This is, similar to Aaron, another example of how these guys from Cape Town are doing their things. I am trying to be involved and support where I can, but I also do not want to interfere or take any credit. That is important for me to make clear.

MRMH: Throughout your career, you have collaborated with a number of institutes worldwide. What makes the collaboration with Cape Town special?

Andre: It is very positive working with them because I just feel like these are my people. Generally, it is a beautiful country, and Cape Town is a beautiful city. I remember visiting and going to the top of Table Mountain, looking out from there, and seeing the ocean. And I was thinking that this is such a beautiful, peaceful place, but at the same time, there are such serious health problems, and politics is very complicated. But the research is contributing in a real way, and you can actually make a difference. You know, sometimes we build some weird coil here, write a paper, and then maybe nothing comes of it, but I feel like you can really make a difference there because the issues are so profound. So, it was kind of a weird thing to sit on the mountain and think it is so peaceful and nice here, while at the same time, serious problems are going on. South Africa is a land of contrasts.

MRMH: Will you be attending the ISMRM Annual Meeting? What does it mean to you personally that the conference is coming to Cape Town for the first time?

Andre: Yes, I will be there for sure! I am excited and proud of Cape Town. I am slightly worried because Cape Town is a bit dangerous, but on the other hand, I think it is the most European of all African cities. So, in some sense, people will not be having an African experience but, at the same time,

Sunset on Table Mountain

it is still pretty African. It will be enjoyable for people and give them the impression that Africa is not just someplace where everybody is crawling around in the dust and starving. People can be very productive and contributing, technologically as well. Of all the continents, Africa is the one with the most scope for future development. I kind of wonder whether the ISMRM Workshop on Motion Correction in MRI & MRS that Ernesta and I organized in Cape Town in 2017 might have paved the way a little bit for the Annual Meeting to be held here. It was a great workshop, and we had a lot of fun. So hopefully the main meeting will be like that, and people will get a chance to hike up the mountain, go to Cape Point, and see ostriches, baboons, and all those things. ■

Growing up in South Africa: Interview with Adam van Niekerk

INTERVIEW BY **SOPHIE SCHAUMAN**

Adam van Niekerk is a researcher specializing in motion correction for MRI, currently based at Karolinska Institutet in Stockholm, Sweden. Originally from Pretoria, South Africa, he completed his graduate studies at the University of Cape Town (UCT), where he developed hardware-based motion tracking techniques for MRI. As an alumnus of the Cape Universities Body Imaging Centre (CUBIC), Adam shares his journey from biomedical engineering to MRI research, the unique aspects of conducting research in South Africa, and what visitors to Cape Town can look forward to at the upcoming ISMRM meeting.

MRMH: As someone who started in biomedical engineering, could you briefly tell us how you ended up in MRI research and at the University of Cape Town?

Adam van Niekerk: I grew up in Pretoria and pretty much wanted to go to a university with beaches because I was really into kite surfing at the time. Cape Town was also one of only two universities in South Africa offering biomedical engineering as a postgraduate course, so that's how I ended up there. I actually came to biomedical engineering with plans to build a prosthetic limb, so I wasn't very interested in imaging at all. But one of the professors there explained to me how cool MRI is – that you can have an idea and test it, and you get this really fast feedback for trying new things. That intrigued me, combined with the fact that they said motion was a problem. I'd been doing inertial measurement using the Earth's magnetic field for direction finding, and I thought it would be pretty easy to try this on an MRI scanner because the static field is so big.

MRMH: Did you have any mentors who played a significant role in your career?

Adam: Yes, I'd say Ernesta Meintjes, who is the head of the MR imaging lab at UCT, and André van der Kouwe from MGH. They've been collaborating for a really long time and do a lot of studies imaging children, which is why they had this motion correction flavor to their research. They were willing to fund what started off as a master's project, and they've been incredibly important to my development. I should also mention Marcin Jankiewicz, who first got me interested in how cool MRI is.

Adam van Niekerk

MRMH: What are some of the unique aspects of conducting MRI research at UCT?

Adam: It's a really cool imaging center. When I was a master's student, we had to drive to Tygerberg Hospital, which was about 30 kilometres away. There was this old Siemens scanner that had pretty much been discontinued for support – we couldn't even get it serviced anymore. It was a head-only 3T scanner with a lot of issues. But I was lucky timing-wise, because a Skyra was installed at the Cape Universities Body Imaging Centre – CUBIC – just across the road. That first period where none of the research studies had really started up yet, I had a lot of scan time, which was really lucky because nowadays it's much harder to get. CUBIC is actually quite close to the operating theatres where Chris Barnard did the first heart transplant. And speaking of medical imaging history, Allan Cormack, who co-won the Nobel Prize for inventing CT, was also from UCT. So the university has quite a history in this field.

MRMH: You've specialized in motion correction. What is it about this area that excites you?

Adam: I'm still working on motion correction quite a while later. I'm now living in Sweden, in Stockholm, building hardware for motion tracking. What excites me is that MRI is pretty special in that it's a camera that doesn't have any mechanical moving parts but can view from any angle. You can have algorithms that make the magnetic encoding move with the image. It's kind of magic. You don't have that opportunity in some other imaging modalities. There's nothing physically moving, but you can actually view someone from different angles – it's close to magic.

MRMH: What are the biggest differences you've experienced doing research in Africa compared to Northern Europe?

Adam: I would say it's much harder to get information from the vendors in Africa. MRI

research has this maybe unfortunate aspect where you need the vendor to open up data for you, and I would say collaborating with vendors from South Africa was much more difficult. For students doing pulse sequence development or needing to modify how the scanner works, we would have to find the money to travel to Boston where there was a collaboration set up. The technical support just doesn't feel as open as it does in Europe. I think CUBIC is one of the biggest and most productive imaging centers in Africa, but by European standards it's still a small center. So maybe it's a bit of both – geography and size.

MRMH: What would be your advice for students or researchers considering going to study or work in South Africa?

Adam: It's a really great place. Cape Town is a fantastic place to do research and the nature is amazing. If you go to ISMRM this year, I would highly recommend visiting the campus. It's kind of like a fairy tale version of a campus, up on the hill of Devil's Peak. Sometimes if you go to class in the mornings, there's a mist coming over the ocean from either side, and you'd be just above it – a campus in the clouds. In terms of research, there's been a big push recently in low-field MR, and Ernesta is really getting a collaboration going with the electrical engineering department. I'd watch that space for cool innovations in low-field MRI. I think if you have fewer resources, people often come up with better solutions.

MRMH: For ISMRM attendees visiting Cape Town, what would you recommend they do during their time there?

Adam: Absolutely hike up Table Mountain. Go visit some beaches. There are hop-on, hop-off buses that leave from near the conference center and they're pretty good. If you're there on a Saturday, there are some really nice markets to check out. Go to Muizenberg and try out surfing at Surfers Corner. Visit Boulders Beach to see the penguins – they're fantastic. And Cape Point is very beautiful and wild; you can do a hike there, but just keep an eye out for snakes and baboons as you get further down the point. It's a bit longer than people expect, so spend a full day doing a trip to the point and back from the city.

MRMH: Is there anything else you'd like the readers to know?

Adam: I'd just like to mention that the radiographers at CUBIC are fantastic. They've been winning prizes at ISMRT for a few years now – they're a really great group. ■

Adam at Devil's peak

City view from half way up Devil's peak. (Conference center is pretty much where Adam's face is)

A Radiographer's Perspective: Interview with Petronella Samuels

INTERVIEW BY **CRISTIAN MONTALBA**

Petronella (Petty) Samuels is Head Radiographer at the University of Cape Town, which hosts the only research-dedicated MRI facility on the African continent. She told us about how her role extends far beyond image acquisition, functioning as the interface between clinical MRI operations, research design, safety governance, and technical implementation.

MRMH: Could you briefly describe your role as a radiographer in MR research at your facility?

Petronella Samuels: When a Principal Investigator (PI) and their research team approach our facility, my first responsibility is to review the research protocol in collaboration with one of our MR physicists to assess technical feasibility. This includes evaluating sequence requirements, scan duration, hardware constraints, safety considerations, and whether the proposed methodology can be reliably implemented within our system capabilities.

Once feasibility is confirmed, I work closely with the PI and research assistants (RAs) to refine the imaging protocol. This involves adapting sequences to optimise image quality while ensuring reproducibility and maintaining safety standards. I also coordinate the logistical aspects of the study — including scheduling, workflow integration, and ensuring alignment between the research timeline and scanner availability.

A critical component of my role is MR safety oversight. Our team of MR radiographers provide MR safety education to all members of the various research teams involved in data acquisition on our 3T scanner, ensuring compliance with international safety standards and fostering a culture of shared responsibility. In a research environment, where non-clinical personnel may be present in the MR setting, structured safety training is essential.

Before participant recruitment begins, our team conducts pilot scans to validate sequence performance and image quality. This allows us to troubleshoot potential technical issues, optimise parameters, and ensure data integrity before formal data collection commences.

Ultimately, my role is to ensure that each study conducted at our facility is technically sound, operationally feasible, and aligned with best practices in MR acquisition and safety. In the African context, where research MRI infrastructure is limited, this responsibility carries added significance in supporting high-quality, globally competitive imaging research.

MRMH: What makes doing MR research in Africa unique from a scientific perspective?

Ultimately, my role is to ensure that each study conducted at our facility is technically sound, operationally feasible, and aligned with best practices in MR acquisition and safety.

Petronella Samuels

Petronella: From a scientific perspective, conducting MR research in Africa is uniquely important because of the disease burden, limited access to healthcare facilities in certain areas, and population diversity differ significantly from those in high-income countries, where most imaging research has traditionally been conducted.

Many patients in African settings face limited access to specialised healthcare facilities and advanced imaging. As a result, treatment is often initiated only once disease is clinically advanced. This provides a distinct opportunity to study the full phenotypic spectrum and

natural progression of disease, including structural and functional changes that may no longer be visible in early-detection healthcare systems. Scientifically, this helps us better understand how disease develops over time, how organs change in response to it, and how these changes appear on imaging.

For my Master's research, I investigated the MRI features of rheumatic heart disease (RHD), a condition that remains highly prevalent in many parts of Africa but is relatively uncommon in high-income countries. We found a striking lack of literature describing the detailed CMR characteristics of this patient cohort. Much of the existing global CMR data focuses on cardiomyopathies more common in high-income populations.

African populations represent the greatest human genetic diversity worldwide. Including these populations in MR research strengthens the generalisability and equity of imaging science. Without this inclusion, global models risk being incomplete.

MR research in Africa is not simply about conducting studies in a different location — it is about addressing gaps in global scientific knowledge. It allows us to characterise disease phenotypes, examine advanced disease presentations, expand datasets, and contribute data that improves the accuracy and applicability of imaging science worldwide.

MRMH: What are the key strengths of the MR research ecosystem in Africa?

Petronella: The MR research ecosystem in Africa is strengthened by the fact that it is scientifically relevant, adaptable, and has a strong collaborative culture. Close collaboration between radiographers, physicists, and clinicians ensures that imaging remains tightly aligned with meaningful clinical questions and patient outcomes. Growing international partnerships further enhance technical development, training, and global visibility, while emerging local expertise supports sustainable research capacity. Despite infrastructure limitations, African MR research has strong translational potential, with findings often directly influencing clinical practice within the same healthcare systems.

MRMH: What challenges strongly shape how MR research is conducted locally?

Petronella: One of the strongest factors shaping how MR research is conducted locally is resource limitation that extends far beyond simply having fewer scanners.

In South Africa, we operate within a two-tiered healthcare system consisting of public and private sectors. In the Western Cape, with a population of approximately 7 million people, approximately 57% of people rely on public healthcare facilities. This creates a significant demand on the limited infrastructure. Within the public sector, we have only two MRI scanners located at tertiary hospitals, servicing patients from Cape Town and surrounding regions.

African populations represent the greatest human genetic diversity worldwide. Including these populations in MR research strengthens the generalisability and equity of imaging science.

Clinical care must always take priority. These scanners are primarily dedicated to patients requiring imaging to guide urgent diagnosis and treatment. As a result, research cannot compete with clinical demand. Studies are often scheduled after-hours or during periods of lower clinical volume, which restricts recruitment rates, prolongs study timelines, and places additional strain on staff.

Another major challenge is human resources. Research MRI requires highly skilled radiographers who are not only technically proficient but also comfortable implementing advanced sequences, troubleshooting artifacts, and maintaining strict protocol adherence. However, there is a shortage of MR-trained radiographers in the public sector. Many experienced professionals migrate internationally for better opportunities, leading to a continuous loss of expertise. This impacts continuity, mentorship, and the sustainability of advanced imaging research programs.

These constraints fundamentally shape how we design and conduct studies. Protocols must be efficient and time-conscious. However, it is not always feasible to optimise sequences to minimise scan duration as data integrity needs to be maintained. Workflow planning becomes critical. Collaboration between radiographers, physicists, and investigators must be tightly coordinated to maximise limited scanner availability.

At the same time, these challenges foster innovation. Working within constrained environments requires adaptable protocols, strong safety governance, and a culture of shared responsibility. Research teams must be highly organised and technically competent to ensure that valuable scanner time is used optimally.

In essence, MR research in our setting is shaped by a balance between clinical obligation and scientific ambition. The limited infrastructure, workforce constraints, and high public-sector demand require us to conduct research deliberately, efficiently, and collaboratively — ensuring that despite constraints, the scientific output remains rigorous and meaningful.

MRMH: How does multidisciplinary collaboration influence the quality and impact of your work?

Petronella: Multidisciplinary collaboration is central to the quality, accu-

racy, and impact of our work within a research-dedicated MRI environment in a resource-constrained African setting.

As Head Radiographer, I function at the intersection of clinical operations, research design, physics, and safety governance. Close collaboration with MR physicists during protocol development ensures technical feasibility, parameter optimisation, reproducibility, and high data integrity within our system constraints.

Collaboration with clinicians is equally critical. They provide essential insight into disease pathophysiology, patient presentation, and clinical decision-making, ensuring that imaging protocols are not only technically robust but clinically meaningful. In Africa — where patients often present with advanced disease and where certain pathologies are underrepresented in the literature — their input strengthens the translational value and relevance of our research.

Working closely with PIs and research teams aligns imaging strategy with scientific hypotheses, while radiographers maintain protocol fidelity and quality control. MR safety training across disciplines fosters a shared culture of responsibility, particularly in research environments where non-imaging personnel are present.

In a setting with limited scanner time and skilled personnel, collaboration maximizes efficiency, safeguards ethical conduct, and enhances scientific output. Ultimately, it ensures that our research is locally relevant, globally competitive, and capable of influencing clinical practice and policy.

MRMH: What role do international collaborations play in advancing your MR research?

Petronella: International collaborations play a critical role in advancing our MR research, particularly within the African context, where resources, infrastructure, and specialist expertise are limited.

From a technical perspective, these collaborations provide access to advanced methodological support, sequence optimisation, and expert input that may not always be readily available locally. Working with international physicists, imaging scientists, and experienced research groups allows us to refine our protocols, troubleshoot complex challenges, and ensure that our work aligns with global standards of quality and reproducibility.

Importantly, collaboration is not one-directional. We contribute unique and clinically relevant data to the global community. Many of our patients present with advanced disease and pathologies that are underrepresented in the literature, such as rheumatic heart disease and HIV-related cardiac conditions.

They are also essential for capacity building. Through shared projects, training opportunities, and ongoing engagement, there is meaningful skills transfer to our local team. In a setting where highly trained MR radiographers often leave to work abroad, international collaboration helps strengthen local expertise and supports the development of sustainable research capacity.

Importantly, collaboration is not one-directional. We contribute unique and clinically relevant data to the global community. Many of our patients present with advanced disease and pathologies that are underrepresented in the literature, such as rheumatic heart disease and HIV-related cardiac conditions. By contributing data collected from African cohorts to international studies, we help broaden scientific understanding and ensure that global imaging research reflects diverse populations.

Therefore, in our setting, international partnerships are not only advantageous, but they also enhance the integrity of our projects, strengthen training, and ensure that MR research conducted in Africa is both globally competitive and locally meaningful.

MRMH: What excites you most about the future of MR research in Africa?

Petronella: What excites me most is its immediate potential to change how we detect, understand, and treat disease. Not only for future generations, but for the very patients participating in our studies today. In our clinical setting, patients often present with advanced pathology, which creates a powerful opportunity to identify earlier imaging biomarkers that can shift care toward earlier detection and better risk stratification.

MR Research allows us to move beyond structural assessment to tissue characterisation, metabolic imaging, and functional evaluation. These are tools that can unmask subclinical disease before irreversible damage occurs. If we can identify high-risk phenotypes earlier, we can influence treatment decisions, guide closer follow-up, and potentially alter disease trajectories in real time.

What is particularly meaningful in the African context is that our research questions are directly driven by the disease burden we see daily. The answers we generate are not abstract. They are clinically relevant and often immediately translatable into practice within the same healthcare system. That ability to make a tangible difference, to provide evidence that informs current patient management while shaping future standards of care, is what makes the future of MR research in Africa so exciting. ■

ISMRM PRESIDENTIAL INTERVIEW

ISMRM President Mark Griswold

INTERVIEW BY **KEXIN WANG**

Prof. Mark Griswold, the Pavey Family Designated Professor of Innovative Imaging, and Professor of Radiology, Biomedical Engineering at Case Western Reserve University, is currently President of ISMRM. In this interview we talked about his first steps in the field, the path that led him to this point and his priorities as ISMRM President.

Mark Griswold

MRMH: What initially drew you to the field of MRI?

Mark Griswold: It was one of Andrew Webb's first courses in the mid-1980s. I was fortunate to attend and immediately fell in love with the idea of applying my engineering skills to visualize the inside of the body. I later spent some time in Boston working in Justin Pearlman and Bob Edelman's labs, where I built RF coils. There, I met Dan Sodickson, who introduced me to the concept of SMASH. It was there that I established connections with Siemens. Interestingly, I didn't complete my PhD until later. I was working on SMASH while only holding an undergraduate degree. Peter Jakob invited me to Germany to finish my PhD in Würzburg, where I worked on GRAPPA and CAIPIRINHA.

MRMH: Oh, wow. That's awesome! When did you realize you wanted to pursue a career in research?

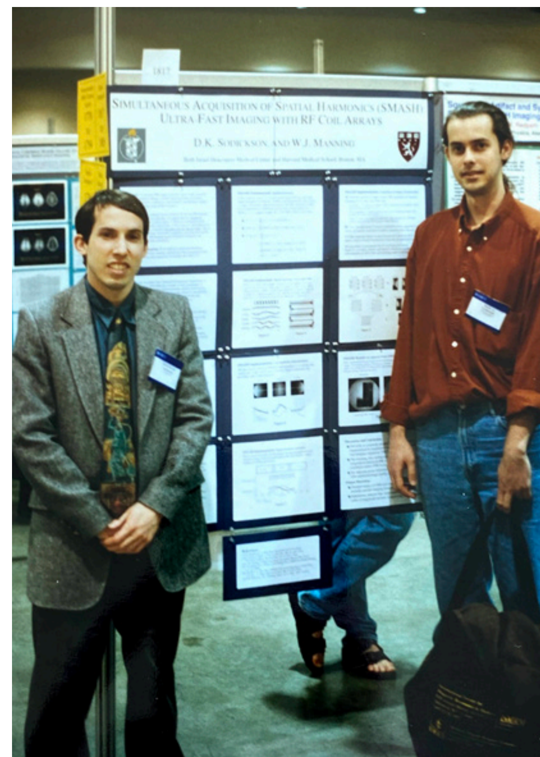
Mark: I think that happened pretty early. I was working as a computer programmer when I was 14. I was getting paid for programming on computers that probably then had less memory than the watch on your wrist has now. I had a job offer at a company which was later bought by IBM. And literally the week that I was going to accept that job offer, I got an offer to work in Bob's lab. It kept me on a path that I thought was probably better than going to work for the company.

MRMH: How did you first get involved with the ISMRM and what do you remember about your first Annual Meeting?

Mark: As mentioned, I started doing work in MRI in the early 1990s with Andrew Webb, and I remember my friends coming back from the conference of the predecessor society, the SMRM, that existed before the ISMRM was formed. That's when BOLD first came out, and we were all very excited about it when my friend came back and told us about those developments. I was always eager to go to the Annual Meeting, but my first chance was in 1995 in Nice. The meeting core was very small, and posters were hanging on the meeting room's walls. At that meeting, my poster was right next to the bathroom, and lots of people came by, which was an interesting experience! But it was a great opportunity to meet a lot of wonderful people in the field.

MRMH: And how did you get more involved with the Society over the years and eventually become the President?

Mark: I don't know exactly how it happened, but I got asked to do things on various ISMRM committees early on. And that's been invaluable. I've made so many close friends through the Society that I wouldn't have otherwise, like the ones you can share your bad days with. The diverse international perspective has also been hugely influential on my work. Finding connections between different groups solving the same problems has been immensely helpful for my career. I still don't know who nominated me for so many committees. I've been involved in nearly every one, starting from Education to Publications and beyond. My lesson has been to never say no, as these opportunities have proven incredible. ISMRM is such a diverse scientific society, offering more than you can imagine.



Dan Sodickson and Mark at the famous SMASH poster at SMRM 1997

Mark and his wife Sherry and son Gabriel at Gabe's graduation

Mark with his mentors Andrew Webb and Zhi-Pei Liang

MRMH: That's great to hear. Looking back at ISMRM 2025, how did the ISMRM decide on the theme "ISMRM Towards a Healthier Footprint"?

Mark: The credit for that should go to Margaret Hall-Craggs, one of my close friends whom I met at ISMRM. She chose that name, and without her I wouldn't have become familiar with these issues. I thank ISMRM that I can know her, although she's a radiologist in the UK and I'm based in Cleveland, USA. We've been working on sustainability since 2008, and she has truly inspired us all. I want to highlight her role in spearheading our efforts regarding sustainability, carbon footprint reduction, and accessibility within ISMRM. I'd also like to acknowledge Derek Jones, who was President before Margaret. Both have had a significant influence on me and the Society in addressing how we can minimize our carbon footprint and bring more people into the field. It's incredibly important work.

Mark with Nicole Seiberlich (ISMRM Vice-President-Elect) and her son Krishan on Mark's family's farm in Ohio

MRMH: That's wonderful to hear. And as we look ahead to this year's ISMRM in Cape Town, what should attendees be most excited about?

Mark: The theme this year is Ubuntu, which is a Southern African concept meaning "I am because we are". It's a clear sign that we're all part of a global society, and that we can't succeed without our friends, neighbors, and collaborators around the world. And I think the primary celebration of this year is to open our thoughts to more people around the world. It's the ISMRM Meeting's first time in Africa. I'm really excited that we have some great Africa-focused plenaries and courses planned. And we have to be very upfront about poverty. There will be lots of things that the majority of our members don't see every day. I hope that our members can open their eyes and just ask the question: what can I do to make the greater world a better place? 7 billion people probably don't have regular access to MRI. I hope that we all just pause for a second and ask that question, is there something that I'm doing that can help that 7 billion people? On the other hand, Cape Town is an amazing, modern city with so much to explore. There are some really good cafés. And you can watch wild penguins on the beach. I highly recommend people take the time to get out and experience the local culture and sights. So we're going to see a little bit of everything on this trip.

MRMH: And for those attending the ISMRM for the first time, what advice would you give them?

Mark: I hope they can take advantage of study groups. For the first time, we have moved the study group meetings to Sunday, and I hope with Sunday dedicated to only study groups, newbies can find their community, and they will find their connections and friends. And there are lots of fantastic programs filling the week, please check them out!

MRMH: How do you envision advancements in AI impacting the field of diagnostic radiology, particularly in cancer?

Mark with 'Big Red', Paul Lauterbur's early (1975) magnet, now at the Beckman Institute in Illinois

Mark at the 2011 wedding of Nicole Seiberlich and Vikas Gulani (note the rare sight of a tie)

Mark: I think many publications have shown that AI is helping us make better and faster images. I have to admit that I was pretty skeptical at the beginning as to the level of hallucinations that were coming out in some of the early versions. But some of the stuff I've seen in the last year is starting to convince me that this is really going to make a huge difference. I think that we're not there yet, but once you have better images and faster images, it's only a matter of time before you have better diagnostic tools as well. I hesitate to put a timeframe on it, but that's going to be the next big change. I can imagine a pathway where we have MRI scanners that are fast and cheap, and the AI radiologists can read them and give good results. And I don't know what the world will look like because of that. But I also think that it's an amazing opportunity to provide healthcare for a lot of people who don't have it now.

MRMH: Your research focuses on fast imaging acquisition, magnetic resonance fingerprinting, and quantitative assessment. What emerging developments excite you the most in this field over the next decade?

Mark: There are many exciting developments in AI image generation outside our field, such as DALL-E, Nano Banana, and many other innovative technologies. They teach us about the fundamental concepts of what an image is. Humans excel at quickly assessing whether an image represents reality, demonstrating an incredible sensitivity to detail. Our visual systems have been optimized over millions of years, and teaching that to a computer is fascinating. We are approaching a point where the AI community is beginning to truly understand what an image represents. As we explore virtual reality, we are also gaining insights into its 3D counterparts. I believe that within four to five years, we will achieve a meaningful 3D understanding. In MRI, we will also require 4D and 5D perspectives. It's crucial to improve our comprehension of anatomical structures. When we obtain 4D and 5D datasets, we can start to delve into physiology and disease processes, and I believe we are not far from realizing that potential.

Mark and Klaas Pruessmann saluting 25 years since Klaas proposed SENSE imaging

MRMH: Beyond the amazing cafés and sights, what other must-do activities would you recommend for ISMRM attendees visiting Cape Town?

Mark: The most important thing is to engage with the local people and understand life in Cape Town. It's a unique part of the world, and I encourage everyone to venture beyond the conference area. For a truly unforgettable experience, don't miss the chance to see wild penguins on the beach! ■

ISMRT President Adam D. Scotson

INTERVIEW BY **CRISTIAN MONTALBA**

Adam D. Scotson is MRI Lead at NHS Highland in Inverness, Scotland, where he oversees MRI services within the cross-sectional imaging team. In this interview, he tells us about his role as President of the International Society for MR Radiographers & Technologists (ISMRT), with a focus on strengthening global engagement, education, and professional development within the MRI technologist community.

Adam D. Scotson

MRMH: Can you briefly share your journey into MRI and how you became involved with the ISMRT?

Adam Scotson: I work for NHS Highland and am based in Inverness, in the north of Scotland. I was very fortunate to have the opportunity to begin learning MRI early in my career, which strongly shaped my professional direction. I initially moved from a rotational radiographer post into a non-rotational MRI role, and as my experience developed I progressed into the position of Team Lead for the cross-sectional imaging team. That progression eventually led me into my current role as MRI Lead, where I am able to combine clinical expertise with service leadership.

Alongside my clinical career in NHS Highland, I enjoyed supporting the wider profession through active involvement in professional bodies. I served as a union representative and sat on the Scottish Board of the Society of Radiographers, experiences that allowed me to advocate for colleagues, contribute to strategic discussions, and gain insight into professional standards and workforce issues at a national level.

In parallel with this, I became involved with professional engagement in MRI at an early stage. Before I officially joined the ISMRT, I was already assisting my line manager at the time, Muriel Cockburn, who ran the Scottish ISMRT meetings. Through this involvement, I saw first-hand the value of professional communities and the positive impact they can have on both individuals and services. It was at one of these meetings that I met Titti Owman, and both she and Muriel encouraged me not only to join the SMRT, as it was known then, but also to become more actively involved.

Their encouragement proved to be a real turning point for me. It gave me the confidence to put myself forward for the Governing Board, and from there my involvement grew steadily. I went on to serve on multiple committees, including the Executive Committee, completed two terms as Secretary, and was ultimately very honored to be nominated for the role of President. Reflecting on this journey highlights the importance of early opportunity, mentorship, and encouragement in shaping not only a career, but also a lasting commitment to the wider profession.

MRMH: How has the ISMRT influenced your professional development over the years?

Adam: It's had a big influence on my professional development. Being involved gave me exposure to MRI practice far beyond my own department and even beyond the UK, which really broadened my perspective. It made me think differently about how services are run, how education is delivered, and how important collaboration is within our profession.

Through my roles on committees and the Governing Board, I picked up skills that I wouldn't necessarily have developed in my clinical role alone — things like leadership, communication, and understanding how decisions are made at a professional level. Serving as Secretary and being part of the Executive also helped build my confidence and encouraged me to step outside my comfort zone.

Just as importantly, the people have made a huge difference. The support, mentorship, and conversations I've had through the ISMRT have stayed with me throughout my career. It's helped shape how I work, how I lead, and how I support others, and it's been a really important part of my professional journey

MRMH: What inspired you to take on the role of ISMRT President?

Adam: It was a combination of encouragement, opportunity, and a desire to give back to the profession that has given me so

much. Early on, mentors like Muriel and Titti encouraged me to get involved and to contribute beyond my day-to-day clinical work. Over the years, as I served on committees and the Governing Board, I saw the impact that dedicated leadership can have — not just on services, but on people, education, and the wider MRI community.

My experience outside of work has also shaped my approach to leadership. I've been a Boy Scout leader for over 20 years, which has taught me a lot about mentoring, teamwork, and supporting people to reach their potential. Taking on the ISMRT Presidency felt like a natural extension of that — an opportunity to help shape the Society, support colleagues, and hopefully encourage others to take part in committees and support each other as well.

It's been an honour, but also a responsibility, and it's incredibly motivating to be able to contribute in a way that strengthens both the profession and the people within it.

MRMH: As President, what are your main priorities for the Society during your term?

Adam: One of my main priorities as President has been membership. In the run-up to the Cape Town meeting, we're hoping to sign off on much of the work that our committees have been doing throughout the year and set the groundwork for initiatives that will continue into next year.

Some of the key initiatives include updating institutional membership, developing new guidelines for the formation of Divisions and Chapters, and revamping that structure to ensure we can better support grassroots growth across the Society. We're also exploring options for a "join anytime" and auto-renew membership model, to make it easier for members to engage and stay involved. Overall, the focus is on making the Society more accessible, flexible, and supportive, so that members feel encouraged to participate, take on leadership roles, and contribute to the growth and development of our profession.

Adam with ISMRT colleagues at ISMRM 2025 in Honolulu, Hawai'i

MRMH: How is the ISMRT working to better support MRI technologists around the world, particularly in underrepresented regions?

Adam: The ISMRT is committed to supporting MRI technologists worldwide, with a particular focus on colleagues working in underrepresented regions. One of the key initiatives we have been running for several years is the Future Leaders initiative, which focuses on mentoring, leadership development, and building professional networks that enable the sharing of best practice and access to educational opportunities.

The Society also delivers initiatives such as MRI Safety Week, providing a full week of free educational resources focused on MRI safety. This ensures that high-quality, evidence-based guidance is accessible to technologists regardless of location or available resources.

More recently, the ISMRT launched the One Community Hub, a global platform designed to connect members across regions, roles, and experience levels. The hub enables collaboration, peer support, and knowledge sharing across the entire membership, helping to break down geographical barriers and strengthen the sense of a truly international MRI community.

In addition, the ISMRT is actively working to develop new Divisions and Chapters in regions where the society currently has limited or no presence. This grassroots approach helps expand access to education, professional development, and local networking opportunities.

Overall, the ISMRT aims to support MRI professionals in growing their skills, developing their careers, and delivering the highest standards of patient care, while fostering a connected, inclusive, and supportive global community.

MRMH: Why is it important for MRI technologists to engage with professional societies like ISMRT?

Adam: It is really important for MRI technologists/radiographers because it offers opportunities that go far beyond day-to-day clinical work. Being involved allows you to learn from others, share best practice, and stay up to date with current research and future developments in MRI.

Societies also provide opportunities to develop leadership skills, participate in committees, and contribute to initiatives that shape the profession — experiences that can be transformative and help you grow both professionally and personally.

Beyond personal development, engagement with the Society helps build networks and connections, locally, nationally, and internationally, which is invaluable for support, mentorship, and collaboration. Ultimately, being involved allows MRI technologists / radiographers to have a voice in the profession, contribute to its growth, and help ensure high-quality care for patients.

MRMH: What advice would you give to technologists who want to get involved in research, education, or leadership within ISMRT?

Adam: My advice is to start small and get involved early. You don't need to hold a senior role to make a meaningful difference — even volunteering on a committee or contributing to a project can be a valuable first step. Reaching out to see whether there is a local Division or Chapter you can join is also an excellent way to become involved through local meetings and activities.

I would also encourage seeking out mentorship and learning from others. Throughout my career, I've seen how encouragement from mentors and colleagues can open doors and provide the confidence to step into new opportunities. In my experience, the ISMRT is one of the most supportive professional societies I've ever been part of.

It's equally important to be curious and proactive — attend meetings, engage with Society initiatives, don't be afraid to reach out to members of the Governing Board, and respond to the yearly call for committee members. Over time, these experiences help build your skills, expand your network, and strengthen your confidence.

Finally, remember that involvement isn't just about personal development; it's about contributing to the growth of the profession, supporting colleagues, and helping improve patient care. Getting involved can feel challenging at first, but it is incredibly rewarding and can shape your career in ways you might not expect.

MRMH: What do you see as the biggest challenges and opportunities for MRI technologists today?

Adam: I think one of the biggest challenges is keeping up with how fast technology is moving, especially with developments like AI and automation. There's always something new — techniques, software updates, safety considerations — and it can feel tricky to stay on top of everything while managing a busy clinical workload. Staffing pressures in some areas can add to that challenge.

But I actually see those challenges as real opportunities for the role to grow and evolve. AI, for example, can help improve efficiency and open up space for technologists to develop specialist skills, take on research, or get more involved in education and leadership — while always keeping safety as the number one priority.

There's also a lot of opportunity through collaboration and engagement. Connecting with colleagues, sharing ideas, and getting involved with initiatives through societies like the ISMRT can really help you stay current, support others, and shape the profession. I think the key is to stay curious, get involved, and be open to learning throughout your career.

MRMH: What advice would you give to technologists preparing for the future of MRI?

Adam: My advice would be to stay curious, adaptable, and don't be scared of change and advancements. MRI is evolving rapidly, with new technology, AI developments, and advanced techniques changing the way we work. Being open to learning and embracing new tools will help you stay ahead and make the most of these changes.

Finally, never lose sight of the core principles of patient and staff safety. No matter how technology evolves, maintaining high standards of safety and care is always the foundation of our profession. Balancing innovation with safety, curiosity, and collaboration is the key to thriving in the future of MRI. ■

2026 MANSFIELD LECTURER

Richard Bowtell

INTERVIEW BY **ANAIS ARTIGES**

Richard Bowtell is Professor of Physics and Director of the Sir Peter Mansfield Imaging Centre at the University of Nottingham, UK. He has been invited to present his groundbreaking work on pushing the boundaries of MRI hardware in the prestigious Mansfield lecture.

MRMH: Can you tell us a bit about your academic background and your current position?

Richard Bowtell: After taking an undergraduate degree in Natural Sciences at Cambridge University, I came to Nottingham in 1984 to study for a PhD with Peter Mansfield. I then stayed on as a postdoc., to build an 11.7T NMR microscope. I became a lecturer in 1988 and worked on the development of EPI. We built one of the first 3T scanners, which was optimised for EPI. It became operational around the time the BOLD effect was discovered, enabling us to get involved in early fMRI experiments. I then moved onto working on one of the first 7T scanners, where I focused on quantitative susceptibility mapping, amongst other things. I also did some work on EEG and fMRI, and that eventually led into work on wearable magnetoencephalography systems.

In 2000, I became a Professor and later served as Head of the School of Physics and Astronomy in Nottingham for eight years. Currently, I am the Director of the Sir Peter Mansfield Imaging Centre, which is a cross-faculty interdisciplinary center at the University of Nottingham, focusing on human imaging.

MRMH: If you had to describe your work in one sentence, what would you say you focus on, and why does it matter to you personally?

Richard: Put slightly facetiously, I play around with magnetic fields, which range from 11.7T to a few nano-tesla, and sometimes get useful outcomes. Even after 40-plus years of working in this area, I still find electromagnetism and electromagnetics fascinating. I also really like how this work has benefits for human health and well-being.

1988 - The team involved in developing the 11.7T NMR microscope in Nottingham (L-R Mark McJury, Richard Bowtell, Paul Harvey, Paul Glover & Geoff Brown)

MRMH: What keeps you motivated to take on the long, difficult process of developing new instruments?

Richard: My experience of working in Peter Mansfield's lab, with its history of constructing MRI systems, makes the task of building new instruments a bit less daunting. My motivation is to always keep in mind the end uses of a new system and the areas where it could provide new understanding of the human body in health and disease.

MRMH: What would you describe as a turning point in your career, something that changed the way you think about research or your role in the field?

Richard: I was planning to do a PhD in radio astronomy in Cambridge, but via a medical physics course, I heard that interesting things were going on in Nottingham in medical imaging and I contacted Peter Mansfield about doing a PhD, which I suppose was a 'sliding door' moment in my career. I was very lucky that this led to the opportunity to work with Peter Mansfield for many years, as in 1984 I was unaware that his lab was 'the' place to be doing MRI.

In fact, I didn't find the first year of research in Nottingham very fulfilling. My first project involved measuring water diffusion in plastic with MRI, while others were doing exciting human imaging. Just when I was thinking about leaving and doing a PhD in astronomy

2015 - Richard Bowtell, still learning from Peter Mansfield, 30 years on from joining his lab

in the US, I got involved in the development of novel gradient coils. I realised that I really, really liked the mathematics of electromagnetism and developing new hardware. My research took off from that point.

MRMH: What has been one of the hardest challenges you've faced in your work, and what did it teach you?

Richard: I found it challenging to become Head of Department. As an academic, you focus very much on your own research and teaching, but in taking on that sort of leadership role, you have to care about the work of everyone in the department. This opened my eyes to a wide range of amazing science and taught me that success in research relies on many people - the technical staff, the administrative staff, and the central university staff, as well as the researchers. That experience was challenging, but in the end, rewarding.

2025 - Richard Bowtell presenting at a recent British Society of Gastrointestinal and Abdominal Radiology meeting

MRMH: When you look ahead a few years, what feels like the most exciting bottleneck to solve?

Richard: Currently I'm focusing on plans to develop an 11.7T human scanner in Nottingham, which will be a national facility for the UK. The cost, complexity and size of the magnets form a bottleneck for this research. Development of new magnet technologies that make high field systems cheaper, more accessible and easier to operate would be a great advance here.

MRMH: For early-career researchers, what's one piece of advice you wish you'd heard earlier?

Richard: Everyone has papers rejected, everyone has grant applications that are unsuccessful. It still happens even after you have been working in a research field for a long time and might have been successful with applications many times before. It still hurts, but you have to pick yourself up and carry on showing that your ideas are good and can cut through.

MRMH: I've heard that ISMRM 2026 is going to be your 38th annual meeting. That's impressive! Is there a moment or interaction that stayed with you, something that shaped how you see the community or the field?

Richard: The first ISMRM meeting I attended was in London in 1985. As a first-year PhD it was daunting but exciting to see that there were so many clever people working in MRI. I gave my first talk at an ISMRM meeting in 1987 using an overhead projector. It felt like it was a chance to present my work to the right people.

Later I was involved in the Annual Meeting Program Committee, and that was an incredibly rewarding experience that gave some insight into the challenges and excitement of putting together the program for the Annual Meeting. I'd encourage anyone who has the opportunity to get involved with the AMPC to take it up. ■

Kirsten Donald

INTERVIEW BY **ANAIS ARTIGES**

Dr Kirsten Donald is a professor of paediatric neurology at the University of Cape Town. She has been invited to present her ground-breaking work on brain development in resource-constrained settings in the prestigious ISMRM Lauterbur lecture.

MRMH: Can you tell us a bit about your academic background and your current position?

Kirsten Donald: I am a pediatric neurologist and head of Developmental Pediatrics at a tertiary Children's Hospital in Cape Town, the only standalone tertiary children's hospital in sub-Saharan Africa, caring for children with autism, cerebral palsy, epilepsy, and developmental risks from infections and HIV. My clinical work sparked my interest in neuroimaging, studying how alcohol, methamphetamine, HIV, and TB meningitis affect children's outcomes, which grew into a research program on environmental risks and interventions. I now lead population-based studies on child and brain development and work on democratizing MRI, including low-field MRI for research and clinical use in less privileged settings.

MRMH: If you had to describe your work in one sentence, what would you say you focus on, and why does it matter to you personally?

Kirsten: I am interested in understanding the factors that put children at risk and what allows them to be resilient and reach their cognitive and developmental potential. This involves three main goals: first, asking and answering the questions that matter most to the children I see in clinic and across our region, using the sophisticated investigative tools available where I work. Second, supporting multi-site studies that test scalable tools like low-field MRI, EEG, and machine-learning approaches across Africa's vast and diverse populations, so they can reliably address locally important exposures such as anemia, iron deficiency, malaria, and HIV. And third, building regional capacity by giving students, academics, and clinical staff hands-on experience with these tools,

Kirsten Donald

I am interested in understanding the factors that put children at risk and what allows them to be resilient and reach their cognitive and developmental potential.

enabling them to generate their own questions, publish, and lead sustainable research programs from within the region.

MRMH: A lot of your work depends on trust, collaboration, and long-term relationships. In your experience, what does it take to build collaborations that are genuinely productive and long-lasting, especially across institutions and countries?

Kirsten: The key to successful collaborations is being intentional and authentic — investing in understanding what matters to a team, respecting what you can learn as much as what you contribute, and valuing operational work. From experience as both a subcontractor and PI in the US, UK, and Africa, I've learned that it's vital to stand up for yourself and your team, especially those collecting data. Authorship and credit should be discussed upfront, and long-term collaborations require openness, respectful hard conversations, and fostering reciprocal learning and leadership. Over time, I've also learned the importance of clearly defining and embedding your research culture in everything you do.

MRMH: Would you say you had a turning point in your career, a particular moment that made you decide that this was the work you wanted to commit to?

Kirsten: I don't think there was one dramatic turning point, but rather a gradual commitment that became clearer over time. I wanted to be a doctor from around age 12 or 13, and once I started studying medicine, pediatrics and maternal health quickly felt like the right fit. Many of my career steps were deliberate choices (pediatrics, pediatric neurology, neuroimaging, and a PhD), though the path has had a few twists. Looking back, the consistent thread has always been children, mothers, and development, and even if it looks a bit patchy, it has all served that purpose. Key opportunities, especially early access to imaging, my first grant, and involvement in a birth cohort study before my PhD, were foundational in building this area of work.

MRMH: What has been one of the hardest challenges you've faced in your work, and what did it teach you?

Kirsten: Early in my career, I applied for a pediatric oncology job and a backup in pediatric neurology. I didn't get oncology, which was disappointing, but taking the neurology role taught me that fully investing yourself in whatever opportunity comes your way can shape your path in unexpected but meaningful ways. Similarly, covering clinics outside your main interest or supporting students in unfamiliar areas stretches you and teaches valuable lessons. Working in our environment requires embracing a wide range of topics, from autism and ADHD genetics to the effects of drugs and alcohol on child development, which means you can't be an expert in everything, but you can make connections across fields. Success comes from paying attention, collaborating widely, and being open to what others contribute, rather than focusing narrowly.

MRMH: Looking ahead a few years, what question or challenge do you feel most driven to tackle next?

Kirsten: Looking ahead, I am most driven to tackle three challenges. First, ensuring children from low- and middle-income countries are represented in global research databases (especially in genetics and neuroimaging). Then, integrating research across the lifespan to link early childhood development with adult and old-age brain health, stemming from the young African population to dementia studies in older populations. Last, integrating studies that combine behavioral, neuroimaging, and EEG approaches to understand brain development, injury, and resilience, moving beyond siloed science.

MRMH: The ISMRM is meeting in Cape Town for the first time this year. What does it mean to you personally?

Kirsten: This means a lot to me and ties to the geographic gap I mentioned earlier: not just in research, but in scientific representation. Hosting the conference in Africa shows that

Hosting the conference in Africa shows that the Society is addressing this gap, and I'm excited to be speaking and representing a slice of the scientists and the ongoing work in our region.

the Society is addressing this gap, and I'm excited to be speaking and representing a slice of the scientists and the ongoing work in our region. So thank you!

MRMH: For early-career researchers, what's one piece of advice you wish you'd heard earlier?

Kirsten: I believe researchers should seize every chance to follow their curiosity, even within someone else's lab or a funded project, because the best science comes from pursuing what genuinely interests you rather than just the hottest or most fundable topic. ■

Maruf Adewole

INTERVIEW BY **ANAIS ARTIGES**

Dr Maruf Adewole is a medical physicist and the Executive Director at the Medical Artificial Intelligence Laboratory (MAI Lab) in Lagos, Nigeria. He is also a postdoctoral scholar at the University of Pennsylvania. He has been invited to present his community-building MRI work in the prestigious National Institute of Biomedical Imaging and Bioengineering (NIBIB) New Horizons Lecture.

MRMH: Can you tell us a bit about your academic background and your current position?

Maruf Adewole: After a Master's in Medical Physics, I worked in oncology centers in Nigeria before pursuing a PhD in computational MRI, focusing on deep learning-based brain tumor segmentation, which led me to participate in the creation of the BraTS-Africa dataset and challenge. I am now Executive Director of the MAI Lab, leading the development of biomedical imaging solutions for resource-constrained settings, including Africa, Latin America, and Southeast Asia.

MRMH: If you had to describe your work in one sentence, what would you say you focus on, and why does it matter to you personally?

Maruf: My focus is on oncological imaging majorly, my experience as a medical physicist showed me how accurately visualizing tumors directly impacts treatment and patient outcomes. I believe solutions that help radiologists and oncologists see images better, especially using machine learning, can reveal insights beyond what the human eye can detect.

MRMH: Was there a particular moment, project, or experience that shaped your commitment to both technical research and community-facing work?

Maruf: Doing a PhD in Nigeria is quite different from the West. At the University of Lagos, many PIs lack dedicated labs or research funding and are heavily burdened with teaching and administration, which limits their ability to pursue cutting-edge research.

During my PhD, I had mentorship support but often worked alone, and the lack of peers to exchange ideas with was frustrating. I realize how much more could be achieved if peer support and mentorship framework exists, this led me to get involved in community-focused programs.

MRMH: Speaking about communities, how did you get involved in so many initiatives?

Maruf: It all started when Prof. Udunna Anazodo and I founded MAI Lab. We were fortunate to be funded by Lacuna Fund to create the BraTS-Africa dataset. In the process, we faced challenges peculiar to the settings where we were working from, including a sub-standard PACS system and poorly acquired scans. We provided solutions to each of them, such as creating an AI-aided PACS platform (Haske), training radiographers on advanced imaging protocols through the Scan-With-Me (SWIM) program, and advancing neuroimaging analysis through the COmprehensive Neuroimaging aNalysis Experience In resource-constraiNed settings (CONNExIN).

Afterward, we hosted the BraTS-Africa Challenge, which revealed a skills gap between African and other international participants. This inspired the Sprint AI Training for African Medical Imaging Knowledge Translation (SPARK) Academy, a hackathon program training programmers and clinicians to apply AI in medical imaging. Over time, participants have grown, succeeded in competitions, built collaborative networks and championed neuroimaging ecosystems on the continent.

MRMH: What has been one of the hardest challenges you've faced in your work, and what did it teach you?

Maruf Adewole

Maruf: The biggest challenge has been funding. Most scientific enquiries we wish to perform often don't fit the global funders' interest. Still, we have learned to maximize the little we have to achieve multiple objectives. This approach has helped us build resilient solutions in Africa that are cost-efficient, robust, and agile. These solutions are beginning to support frameworks in high-income countries.

MRMH: When you look ahead a few years, what kind of questions or problems do you feel most drawn to, either in research or in strengthening clinical

Maruf and his team

MRI ecosystems in Africa?

Maruf: My goal is to build a sustainable MRI ecosystem in Africa, covering hardware, service maintenance, clinical use, protocol development, sequence engineering, and image analysis. To support this, we launched IMAGINE to enable the development of low-field scanners and local maintenance capacity on the continent. We also launched CONNExIN to train researchers to create locally optimized sequences, and perform image analysis with open-source tools like FSL and Freesurfer. We will also be creating more programs as the needs arise.

MRMH: What does "open" mean to you in practice, and what do you think MRI as a community still struggles with?

Maruf: To me, "open" means accessible: deployable, understandable, and tweakable by those who need it. At MAI Lab, we embrace the open science philosophy. We make use of only open-source tools. We believe that to truly advance science, there is a need to reuse and adapt existing tools rather than reinvent the wheel. All our research products are licensed equally under CC-BY 4.0 for non-commercial research use.

MRMH: For early-career researchers, what's one piece of advice you wish you'd heard earlier?

Maruf: It's truly an interesting time to be an ECR; the challenges and uncertainties currently faced are enormous and distracting. My advice is that you pursue only what you are truly passionate about and that have long-lasting impact potential. I'd also like to advocate for more funding dedicated to ECRs to enable them to investigate curiosity-driven work that builds lasting knowledge and wisdom, not just commercially viable products.

MRMH: Is there anything else you want to add?

Maruf: As civilization advances, humans continue to evolve. MRI will revolutionize medicine even further, with advances in metabolic and inflammation imaging. The potential to become the primary tool for monitoring the evolution of diseases, treatments, and our species as a whole is extremely high. In our endeavors to advance this frontier, let's give rise to solutions that bridge the health equity gap and solve healthcare disparities. ■

MRM SPOTLIGHT

A conversation with Shannon Stepanian and Brandi Conroy

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

In this interview, we turn the spotlight to two people who play a crucial role in the life of Magnetic Resonance in Medicine: **Shannon Stepanian** and **Brandi Conroy**. Their work ensures that submissions move smoothly from authors to editors to reviewers — and ultimately into the pages of the journal – often behind the scenes, but at the heart of our journal's workflow.

MRMH: How long have you been part of the MRM team?

Shannon: I've been with MRM since the end of 2004 — so quite a long time! I started full-time, then moved to part-time while raising my daughter, and now I'm back full-time again.

Brandi: I started in the fall of 2005. Shannon and I were both based at Penn State at the time, working on site with Mike Smith, who was Editor-in-Chief of the journal then. I went part-time briefly around 2006 and returned full-time in 2009. Shannon moved to remote work in 2010, and over time the position became fully remote.

Shannon Stepanian, Managing Editor

MRMH: You've seen several editorial transitions. How has your role evolved over the years?

Shannon: I began as an Editorial Assistant, and at some point my role transitioned into Managing Editor — I don't remember the exact date. The biggest difference is probably the scope of interaction. I work very closely with Peter (Jezzard), with the production team, and on initiatives like annual board reports and internal initiatives. I also attend ISMRM meetings, so I serve as a kind of central point of contact between the Editorial Office and the broader scientific community.

MRMH: Brandi, what are your main responsibilities?

Brandi: I handle the day-to-day manuscript check-ins. When a manuscript is submitted, I make sure it complies with our formatting guidelines and communicate with authors if anything is missing.

For original submissions, once everything is in order, I pass the manuscript to Peter, who assigns a Deputy Editor to handle the review process. For revisions, it goes directly to the Deputy Editor.

I also add notes for Peter or the Deputy Editors — for example, if the word count exceeds limits, if certain formatting issues need to be addressed at revision, or if authors request to exclude specific reviewers.

Beyond that, I prepare semi-annual and annual statistics reports on our Deputy Editors, looking at decisions and turnaround times. Occasionally I help Shannon with referee invitations or proofs.

Shannon Stepanian (center), Brandi Conroy (right) and former colleague Anne Garber

MRMH: One of the biggest challenges journals face today is finding reliable reviewers. How difficult is that at MRM?

Shannon: It's actually quite difficult. There's clearly increased demands on reviewers' time, so people have to be selective about what they agree to review.

We also run into technical issues — sometimes our invitations don't reach certain institutions, or they get blocked by mail servers. That's frustrating, because we're trying to engage the right experts and sometimes we can't even get through to them.

Shannon with Amanda Buring (Wiley Publisher), Matt Bernstein (former Editor-in-Chief) and Roberta Kravitz (former ISMRM Executive Director)

It's especially challenging during busy academic periods — like the end of semesters — when faculty schedules are extremely tight.

MRMH: What aspect of your work do you enjoy the most?

Shannon: I've always been impressed with our community of scientists. After so many years, I feel like I've developed virtual relationships with many of them through email correspondence. I genuinely enjoy working with the people behind the science.

Brandi: I enjoy working on the statistics reports because they're not part of my daily routine — it's a change of pace. I also like helping with proofs from time to time. It's fun to do something a little different from the usual submission workflow.

MRMH: You've witnessed major changes in publishing platforms. What has had the biggest impact on your work?

Shannon: When I first joined the journal, we were using an old FileMaker Pro database. Soon after, we transitioned to Manuscript Central, which evolved significantly over the years. As procedures change, we've had to develop workarounds to make the system function the way we need it to.

Our most recent challenge is the transition to Research Exchange (the new Wiley tool for manuscript handling, replacing Manuscript Central). We've been discussing and preparing for this move for about a year. We now have a test site and are figuring out how to adapt our procedures. We're losing some capabilities we had before, so that's proving challenging.

So far, it hasn't caused delays because we've only migrated the submissions element of the new tool. The review phase on Research Exchange is just beginning. I think the main learning curve will be for us — making sure we don't lose anything in the mix and that turnaround times remain strong. At MRM, we typically aim for about 30 days for an initial decision, and we definitely want to try to maintain that.

MRMH: How does the office balance the needs of authors and reviewers?

Shannon: That's one of the most delicate parts of the job. You're advocating for both sides. Reviewers need time, especially with all their other responsibilities. But, authors also deserve timely decisions.

Earlier in my career, I probably took a firmer stance in my reminder emails. Once, someone met me in person and said they had imagined me as a stern older woman based on my emails! That was great feedback — it made me adjust my tone and soften my approach a bit.

MRMH: MRM has been pioneering initiatives such as the Code Review. How does that process work behind the scenes?

Shannon: The Code Review initiative is handled externally. When authors request it, Brandi notes that during submission. After the first decision, Peter initiates the process by contacting the representative of the Reproducible Research Study Group (currently Shaihan Malik at KCL). I then help coordinate communication and track the reviews.

Those Code Reviewers are amazing — they usually return their feedback very quickly. There's rarely any chasing involved.

We have noticed a slight dip in Code Review requests since moving to Research Exchange. Previously, Manuscript Central allowed us to include a specific submission question asking whether authors wanted code review. Now authors must mention it in their cover letter, which may be less visible. We're working on refining that process.

MRMH: Finally — any funny or memorable stories from your years at MRM?

Brandi: One of the funniest things is when authors receive a decision they're unhappy with — and accidentally hit "reply all" instead of replying just to their co-authors. We sometimes receive very passionate emails that clearly weren't meant for us… followed quickly by an apology!

Shannon: It is funny — and we don't take it personally. We don't know the authors well enough to hold grudges. It's just part of the human side of publishing.

More generally, each Editor-in-Chief has had their own personality and style. Peter, for example, brings a great sense of humor, which makes the working relationship enjoyable and relaxed. ■

2001 W.S. Moore Young Investigator Award winner: Andrew Janke

INTERVIEW BY **KEXIN WANG**

Dr Andrew Janke won the W.S. Moore Young Investigator Award for his work titled "4D Deformation Modeling of Cortical Disease Progression in Alzheimer's Dementia" 25 years ago. After completing PhD in the University of Queensland, he had been working on the development of imaging techniques for MR, PET, Ultrasound and Microscopy at the Montreal Neurological Institute, McGill University and the National Imaging Facility at the Centre for Advanced Imaging, University of Queensland, before he moved into enterprise technology and digital research infrastructure at the University of Sydney. He is now the Associate Director of Enterprise Technology and Digital Research Infrastructure at Queensland University of Technology (QUT).

MRMH: Can you tell us a bit about your background and how you got involved in the field of MRI?

Andrew: I first got interested in MRI as a junior undergraduate when I took a guest lecture on the topic. I was fascinated and ended up doing an honors project at the Center for Magnetic Resonance at the University of Queensland. That led me to pursue a PhD in the field, working on early image processing and analysis techniques for dementia research. The early days of MRI in Australia were quite different from the northern hemisphere. We had fewer scanners and less funding, so we had to get creative, even building small MRI systems in the lab. But the support from my director and supervisor to travel to ISMRM conferences each year was invaluable. That's where I made the key collaborations that shaped my career.

The support from my director and supervisor to travel to ISMRM conferences each year was invaluable. That's where I made the key collaborations that shaped my career.

MRMH: What was it like winning the ISMRM Young Investigator Award in 2001? How did that impact your trajectory?

Andrew: It was such a surprise and honor. I still remember the year ISMRM was held in Scotland. When my name was announced in the lecture theatre, I was in the back with what looked like a thousand people in the audience. It took me about five minutes to run to the front, which was quite embarrassing! It was my supervisors who encouraged me to apply, and I'm grateful they did. My advice is to trust your supervisors; they obviously believed I had a chance. And don't underestimate yourself, even if you're working in a small lab on a seemingly minor project. The expertise you have in that specific area is valuable, and others recognize it. The award opened many doors for me. I remember during the same meeting, several people approached my poster and one later invited me to visit the Montreal Neurological Institute. I was fortunate to collaborate with leaders in the field like Derek Jones, Louis Collins, Paul Thompson and Alan Evans. Those collaborations and exposure to different ways of working were incredibly influential in my career.

Andrew Janke

MRMH: And what's been your career path after that?

Andrew: For the first ten years after my PhD, I focused primarily on research in stroke and dementia, with significant work

My advice is to trust your supervisors; they obviously believed I had a chance. And don't underestimate yourself, even if you're working in a small lab on a seemingly minor project.

in epilepsy while at Montreal Neuro. I was really lucky to be in the right place at the right time, contributing to the nonlinear versions of the human brain atlas like ICBM152. When I returned to Australia, we were using a 16.4T vertical bore magnet to scan ex vivo zebrafish and mouse brains at 30µm resolution, which we later developed atlases and minimum deformation models matching the histology results. And we also scanned birds and other reptiles like crocodiles and lizards. Then I transitioned into a support role, similar to research engineering, assisting researchers with MRI, PET, CT, post-processing, and technique development. For nearly 60% of researchers at an institution I worked at, imaging characterisation such as MRI, PET or Microscopy is essential, even if it accounts for a smaller portion of their work. I also became involved in cybersecurity, data storage, and high-performance computing as these areas grew in importance. I led a project to build central research storage for the University of Queensland, which fundamentally changed the direction of my career. My role was to help central IT understand the academic perspective. Many professionals in central IT come from commercial backgrounds and often don't grasp the pressures academics face, such as maintaining PhD students, securing funding and collaborating with partners like NIH. For instance, they didn't see the issues that arose from restricting Google or Dropbox usage within the organization. Today, I work with the Deputy Vice-Chancellor of Research at QUT and maintain a joint position in central IT reporting to a CIO. I manage and run a team of about 180 staff, we run the University Network, Datacenters, AV services, Enterprise Virtual machine cluster, Research HPC, research data storage and many other services that keep the University going. I've found that working in MRI and related fields leads to utilizing every central service at a university because substantial infrastructure is needed to support an MRI machine. I'm glad to assist in this regard. While my path may not be typical, it's a fulfilling career for those who understand how academia and research function, and I always enjoy helping the University advance their academics' research.

MRMH: You mentioned shifting away from a traditional academic path later in your career. What led you to that transition?

Andrew: After about 15 years as a fairly typical academic, doing my own research, running a small lab, and chasing grants, I realized the infrastructure challenges we faced in Australia were really holding me back. I was constantly frustrated by a lack of computing power, storage, and other resources. I started getting more involved in the central IT and research support functions at the University, acting as a bridge between the academics and the professional staff. I found I really enjoyed that role, using my technical expertise combined with my understanding of the academic mindset. Eventually I made a full transition to a professional staff position, working in research infrastructure and digital platforms. It's been a very rewarding path. I get to apply my deep knowledge of MRI and imaging research to build better systems and support for the whole University community. And I find a lot of satisfaction in helping researchers overcome the same frustrations I experienced earlier in my career.

MRMH: Would you recommend this career path to PhD students specializing in MRI?

Andrew: Yes, it's rewarding. I believe that most universities recognize the importance of having academic representation on project teams and initiatives. It's a good way to try the professional side of a university. One often underestimated but highly transferable skill in a PhD toolkit is the ability to build collaborations, which is equally vital in the professional world. Being able to present well in a professional context is an important skill that many PhD students may not realize is valued outside the academic environment. For anyone considering a career path like mine, I encourage you to not hesitate in volunteering, getting involved, and showcasing the unique perspective your research background can offer. This can be a significant asset to your organization.

Eventually I made a full transition to a professional staff position, working in research infrastructure and digital platforms. It's been a very rewarding path.

MRMH: What advice would you give to yourself if you were just starting your career in MRI 25 years ago?

Andrew: Don't underestimate the value of your expertise, even if you're working in a small lab. Identify the niche where you can make a meaningful contribution and be competitive. Additionally, take advantage of conferences like ISMRM to build your network and foster collaborations. I can honestly say that most of my collaborators I later worked with were people I met during ISMRM. Those connections can open numerous doors. ■

YIA 2001: LOOKING BACK

2001 I.I. Rabi Young Investigator Award winner: Gunnar Krueger

INTERVIEW BY **KEXIN WANG**

Dr Gunnar Krueger is an accomplished expert in MR physics, holding a PhD from the Max Planck Institute and having completed his postdoctoral work at Stanford University. With over 25 years of experience in academic and industrial research and development, he has successfully managed international collaborations and demonstrated strong leadership. Dr Krueger has authored more than 90 scientific publications and holds over 15 patents, showcasing his commitment to advancing medical imaging. He currently leads Business Development, Innovation, and Patent Management at Siemens Healthineers MR business line, where he and his team advance the future of MRI technology and identify strategic opportunities to unlock new markets. His extensive network in healthcare and strategic mindset make him a pivotal figure in driving innovation and enhancing value within the healthcare system.

MRMH: Can you tell us how you first became involved in the field of MRI?

Gunnar Krueger: My MRI journey began early in my career. I studied physics at the University of Braunschweig and developed an interest in medical imaging. After my Bachelor's, I explored different universities. I learned about the Max Planck Institute in Göttingen and was intrigued by an article on functional magnetic resonance imaging that had been published there. Functional MRI was a new area at the time, and after visiting the site and discussing with Jens Frahm and his team, I was inspired to pursue my diploma thesis there. My project focused on MR spectroscopy, particularly on lactate accumulation during functional stimulation of the visual cortex. I also learnt about imaging in Jens' Göttingen group and that it had significantly better signal-to-noise ratios than spectroscopy, laying the foundation for my ongoing interest in neuroimaging.

MRMH: What do you remember when you received the Rabi Young Investigator Award in 2001?

Gunnar: I was incredibly proud to receive that award. I didn't expect to be a finalist, let alone win, as the competition was very intense at that time. It was a significant milestone and a great start to my academic career, helping me build many activities and networks based on that work. A couple of weeks before the ISMRM conference in 2001, I began working at Siemens, which made that year even more memorable, especially since I am also celebrating my 25th anniversary at Siemens Healthineers this year.

In academia, researchers push the boundaries and innovate often using tools provided by industry, while in industry we drive innovation to create better products based on a solid understanding of customer needs.

MRMH: Can you share your career trajectory following the award in 2001?

Gunnar: Upon arriving at Stanford, I had exposure to both the academic and industrial worlds. I worked with Gary Glover and benefited greatly from his supervision and his insights, which encouraged me to explore a career in industry. My strong foundation in

Gunnar Krueger

MRI came in handy at Siemens as I focused on implementing new imaging sequences. Eventually, I transitioned into a managerial role, leading new imaging developments and fostering collaboration with academic partners. One important station of my career

AI has already had a profound impact on the performance of modern MRI systems… As AI capabilities continue to grow, they will not only enhance image quality and accelerate acquisition, but significantly influence how the MRI industry operates and how radiologists work in the future.

has been that I created a pre-development hub for Siemens Healthineers in Switzerland to strengthen our ties with clinical partners, allowing for innovation that bridged industrial interests and academic research. Later, I spent some years in the USA for Siemens to support and drive with my team industry—academic collaborations with key academic partners along the East Coast, before returning to the Siemens headquarters in Erlangen, Germany, for my current role. My academic background and network were instrumental in shaping my role at Siemens, especially in establishing collaborations with researchers using our equipment, leading to numerous publications.

MRMH: That's a significant journey! Given your experience in both realms, how do you compare academia and industry?

Gunnar: Both fields have their unique challenges and touch points. In academia, researchers push the boundaries and innovate often using tools provided by industry, while in industry we drive innovation to create better products based on a solid understanding of customer needs. Industry has more structure, deadlines and roadmaps. Academia allows for more flexibility, giving room to explore new ideas. Each has its strengths, and individuals may prefer one over the other, depending on their interests.

MRMH: What advice would you offer to students in the MRI field aspiring to enter the industry?

Gunnar: It's essential to recognize that some people are more suited for academia while others thrive in industry. Students should try to understand both paths and converse with professionals from both sides to understand the varied landscapes. Networking is crucial, as the people are crucial with whom you work, who inspire and advise you. Understanding that the "grass often appears greener in the neighbor's garden" can lead to a more informed perspective on career choices.

MRMH: For those determined to pursue industry after graduation, what skills do you believe are often lacking from traditional PhD training?

Gunnar: PhD training fosters deep subject matter expertise, which serves as a strong foundation for both academia and industry. However, students should aim to broaden their business acumen, learning about business models and marketing their accomplishments. Staying up to date with industry developments and maintaining connections can be critical for a successful career start in industry.

MRMH: What does a typical day look like in your current role? Does it vary?

Gunnar: My days are quite diverse. I engage frequently with customers and collaborate with my team to identify future opportunities. To give you one example, we've explored applying MRI in dental imaging: a promising area where MR can provide insights into inflamed tissues that traditional imaging in dentistry can't. This involves not only technical considerations but also strategic market planning. These sort of activities involving exploring new opportunities really drive me. With my team, I oversee innovation management, and part of my role is ensuring that the team is inspired and has the resources to drive innovation and business developments.

MRMH: That's an interesting initiative! As technology progresses, especially with AI and Deep Learning, what role do you see these advancements playing in the future of MRI?

Gunnar: AI has already had a profound impact on the performance of modern MRI systems. Advanced reconstruction algorithms now enable image quality that radiologists often consider comparable to that of higher-field systems from previous generations, despite using the same underlying hardware. As AI capabilities continue to grow, they will not only enhance image quality and accelerate acquisition, but I also expect it to significantly influence how the MRI industry operates and how radiologists work in the future.

Be always curious and build a strong network. It's also crucial to find joy in your work; productivity scales with enjoyment.

MRMH: As we wrap up, what advice would you give yourself if starting in the MRI field 25 years ago?

Gunnar: I would advise myself to be always curious and build a strong network. It's also crucial to find joy in your work; productivity scales with enjoyment. Additionally, adapting to different environments and continuously learning about technology and interpersonal dynamics is vital. ■

YIA FINALISTS

2026 ISMRM Young Investigator Award Finalists

EDITED BY **MARIA EUGENIA CALIGIURI**

This year, the Society has nominated **nine** finalists for its Young Investigator Awards (YIAs), and the winners will be announced at the Annual Meeting. The I.I. Rabi Award is given for a paper published on original basic science research, whereas the W.S. Moore Award is given for a paper published on original clinical research. The Prince-Meaney Award is given for a paper published on translational science research. As usual, we have an outstanding group of finalists, and we have the pleasure of showcasing them here, in the MRM Highlights magazine.

Saurin Kantesaria

I am a 7th year MD/PhD candidate at the University of Minnesota MSTP and Center for Magnetic Resonance Research (CMRR), developing pulse sequences and hardware for low-cost magnetic resonance imaging and devices without B_0 gradients.

Saurin Kantesaria

I started my program in 2019 and became immediately fascinated by MR pulse sequence design and RF engineering during my PhD rotations at CMRR. The ability to tie together physics, electrical engineering, math, and many other engineering-related fields and directly translate them towards improving clinical care is something I found and continue to find both fun and rewarding. I formally started working in Dr Michael Garwood's lab in 2021 and earned my PhD in Biomedical Engineering in 2025. I am currently going through my clinical rotations and see many ways our field of MRI research can impact patient care for the better and hope to translate devices and pulse sequences like these towards clinical applications.

My overall work focuses on developing low-cost magnetic resonance devices and pulse sequence design for our head-only MRI scanner. My primary project is actually quite different from my current work as it is focused on developing a low-cost, variable-frequency electron paramagnetic resonance system for quantifying iron oxide nanoparticles in vivo. Our primary application was related to rapid rewarming of cryopreserved tissues using iron oxide nanoparticles, tumor ablation, and drug delivery. I had an interest in developing imaging methods for this system and spent a significant portion of my PhD developing B1-selective pulse sequences in an attempt to find methods of overcoming the broad linewidth of these particles. While our method still needs further work for our primary application, we realized it could be readily applied towards MRI. The pulse we developed, AMHS1, can perform slice- and slab-selection using only B1 gradients, robust to B0 and B1 inhomogeneity.

NOMINATED PAPER

Designing B1-Selective Pulses by Frequency Modulating in a Second Rotating Frame

For this paper, our goal was to create a frequency-modulated pulse for slice selection of arbitrary, uniform flip angles even when B0 and B1 are inhomogeneous, without B0 gradients. While current methods exist for B1 slice-selection they are limited by specific absorption ratio (SAR) or sensitivity to resonance offsets such as those in compact, low-cost, MRI scanners.

Adiabatic pulses, such as hyperbolic secant (HS) pulses, are known for their robustness to resonance offset. Combining them with a method for B1-selective imaging, originally developed by David Hoult, could ideally achieve B1-only slice selection that is robust to resonance offset. Thus, we derived an amplitude-modulated, frequency-swept, hyperbolic secant pulse (AMHS1). Hoult's original pulse utilized two RF coils: B1y, as a gradient and another, B1x, for selective excitation of Rabi frequencies along said gradient. In AMHS1, we use a time-dependent amplitude-modulation of B1x to create a frequency sweep which defines a band of nutation frequencies to select

along the B1y gradient. We demonstrated both slice- and slab-selective imaging experimentally in phantoms and rat brains in vivo using only surface coils at 9.4T to demonstrate feasibility. Our simulations of AMHS1 demonstrated slice inversion despite B0 and B1 inhomogeneities. By scaling B1x(t) by the normalized frequency-sweep functions, we achieved slice profile correction when operating AMHS1 sub-adiabatically for low flip angles.

We believe that AMHS1 combined with other pulses like Frequency-Modulated Rabi-Encoded Echoes (FREE), complete the minimum set of sequences needed for MRI without B0 gradients and robust to resonance offset for compact low- to mid-field scanners such as head-only MRI. In our simulations we also discovered that a z-coil tuned to the kilohertz modulation frequency of B1x could reduce SAR by producing a circularly polarized field in the xz-plane. AMHS1 produces a combination of T1 and T2p contrast, highlighting both CSF and vasculature, suggesting pulses in higher-rank rotating frames may produce other unique forms of contrast.

Mira Liu

I am a current Postdoctoral Fellow at the Icahn School of Medicine in the Biomedical Engineering and Imaging Institute, working with Drs Sara Lewis, Octavia Bane, and Bachir Taouli in abdominal multiparametric (mp) MRI. My NIH NCATS TL1 Postdoctoral Fellowship was focused on separating multiple diffusion compartments from DWI for clinical use including intravoxel incoherent motion (IVIM), tri-exponential and spectral diffusion of the kidney, and mpMRI to improve early detection, prediction, and prognosis of native and transplanted kidney disease beyond current clinical standards. With the team at Mount Sinai I tested spectral diffusion, tri-exponentials, intravoxel incoherent motion, apparent diffusion coefficient, arterial spin labeling, blood-oxygen-level dependent R_2*, and T1 of the kidney for early detection of fibrosis and chronic kidney disease (CKD), immuno-oncologic profiling of renal cell carcinoma, and pre-surgical mpMRI for prediction of CKD development.

I completed my PhD in Medical Physics as an NSF GRFP Fellow at the University of Chicago on quantifying delay-and-dispersion-corrected dynamic susceptibility (DSC) and IVIM MRI in pre-clinical stroke with Dr Timothy Carroll. My dissertation examined quantification of local perfusion, including collateral supply with DSC and IVIM, against neutron capture microspheres, and quantifying perfusion augmentation from novel stroke therapeutics. Beyond MRI research, I first began in astrophysics working on a novel compact Fourier transform spectrometer for the South Pole Telescope with UChicago and Fermilab and got a chance to collaborate with Argonne in muon tomography simulating a two-plane muon detector for high-resolution images of the great pyramid of Giza.

The main drive of my work in MRI has been pushing for clear clinical application and translation of quantitative perfusion and diffusion MRI in preclinical and clinical studies. I am dedicated to extensive interdisciplinary collaboration for improving quantitative MRI of physiology, microstructure, microvasculature, and pathophysiology to further the understanding and prediction of disease and treatment.

Mira Liu

NOMINATED PAPER

Multiparametric MRI Predicting Renal Function Deterioration & Chronic Kidney Disease Development in Patients Undergoing Nephrectomy for Renal Masses: A Pilot Study

Participants with kidney tumors often undergo invasive surgery to remove the tumor without knowing their individual risk of developing chronic kidney disease afterwards. My nominated work tested if pre-surgical kidney MRI could predict post-surgical decline in kidney function and chronic kidney disease progression. With quantitative T1, BOLD-R2*, DCE, ASL, and advanced diffusion models, kidney MRI provided clinically relevant information beyond conventional biomarkers. Further, while advanced diffusion models shed light on underlying biology and physiology, simple diffusion MRI alone provided a fast predictive biomarker with high sensitivity compared to a proposed clinical risk score.

Elevated corticomedullary ADC difference can be captured with a simple clinical DWI and can detect in vivo hyperfiltration. Since hyperfiltration signals a reduced functional reserve and indicates a higher risk of developing stage 3 CKD after surgery, one non-contrast pre-surgical kidney MRI may indicate future post-surgical kidney decline. As new medications become available to protect kidney function, pre-operative MRI in addition to clinical and laboratory data may help guide treatment planning, monitoring, and early intervention for high-risk participants preparing to undergo kidney tumor surgery.

While MRI has continued expanding and advancing, there is a high barrier

to entry for new techniques in clinical practice. The new method must either outperform the conventional methods in terms of accessibility and affordability or significantly improve patient and provider risk. Hyperfiltration could not be detected by the standard clinical and laboratory measures used by the clinical risk score; DWI is a non-contrast scan that is sensitive to individual patient kidney health and might enable more personalized earlier intervention. Beyond further studies on mpMRI improving prediction of CKD development, I hope this work encourages the continuation of research in kidney MRI with the main goal of improving patient health and precision medicine, reducing healthcare cost, and minimizing patient and provider risk.

Kelly Payette

Improving fetal and maternal health through earlier diagnosis and individualized, interpretable, and reliable assessments is the driving motivation of my research. MRI is ideally suited to address the challenges of perinatal healthcare – particularly when acquisition techniques, MR physics methodology and advanced image processing development are intertwined.

After focusing on post-processing methodology for fetal brain MRI during my PhD at the Center for MR Research at the University Children's Hospital Zurich with Andras Jakab and a research stay in Boston, I actively sought opportunities to complement my skill set with more experiences on the acquisition side. Joining the Department of Early Life Imaging at the School of Biomedical Engineering & Imaging Sciences at King's College London (KCL) working with Jana Hutter provided such an opportunity. At KCL, I developed expertise with mid-field imaging systems (0.55T), and explored how to best leverage their advantages for fetal MRI while addressing emerging challenges. I was particularly excited by the improved accessibility, reduced magnetic field inhomogeneities, and improved functional quantitative imaging techniques due to the potential for clinical translation in fetal imaging.

Piloting a project on a 20-week mid-field MRI-based screening was a formative step towards this goal. In addition, leading the FeTA Challenge, an international challenge on fetal brain segmentation, reinforced my commitment to reproducible, clinically applicable and collaborative research in prenatal imaging.

My current research continues to focus on developing innovative imaging methodologies for fetal and placental MRI, with the aim to longitudinally characterize and investigate fetal development in pathologies such as spina bifida and gestational diabetes during pregnancy.

I am honored to be selected as a finalist for the YIA, and am grateful to the ISMRM community for this recognition and for the opportunity to present my work at the meeting.

NOMINATED PAPER

T2* Relaxometry of Fetal Brain Structures Using Low-Field (0.55T) Magnetic Resonance Imaging

The nominated work combines acquisition strategies bespoke to the specific opportunities arising from mid-field and advanced AI-guided analysis to address an important gap in current clinical and research settings - functional human brain development. While structural maturation has been extensively studied, functional human brain development *in utero* remains to be investigated. Current functional approaches largely focus on whole-brain mean values, not suitable for the complex and highly heterogeneous neurodevelopmental pathways. Furthermore, motion is typically seen as the leading challenge to be avoided and corrected for, leading to individual repeats, or other techniques to avoid motion.

In this work, I took a different approach by embracing fetal motion with a modified dynamic gradient-echo sequence to enable efficient multi-echo acquisitions adapted to the longer intrinsic T2* values at mid-field strength (0.55T). Using acquisition time efficiently, foregoing the need for manual corrections, it allows both to extract motion and to exploit the redundancy for regional high-resolution brain T2* information.

Such dynamic multi-echo gradient-echo sequences (MEGE) were used in a cohort of 135 cases between 20-40 gestational weeks. Using super-resolution reconstruction and automatic brain segmentation, we were able to quantify regional brain T2* values in seven anatomical structures (external cerebrospinal fluid; gray matter; white matter; deep gray matter; ventricles; cerebellum and vermis; and brainstem). Importantly, we were able to demonstrate the accessibility and robustness of this method across a wide range of gestational ages, maternal ages and in mothers with a BMI up to 40, highlighting the practical advantages of low-field MRI.

Our results demonstrate that T2* values of all regions decrease with increasing gestational age, consistent

Kelly Payette

with ongoing microstructural maturation. In addition, absolute T2* values and decay rates differed across anatomical structures, our findings demonstrate that regional analysis reveals distinct growth trajectories that should be investigated independently rather than only whole-brain mean values.

We generated normative regional T2* curves throughout gestation and demonstrated the method in both typically developing and pathological fetal brains. Our work paves the way for using regional brain T2* values in a clinical setting, requiring no specialist planning and an automated analysis pipeline. Low-field MRI is a powerful, accessible prenatal imaging tool which could be potentially used to help us to understand prenatal brain development.

Jonathan Stelter

My research focuses on advancing quantitative MRI toward robust and clinically applicable imaging. I am particularly interested in developing acquisition and reconstruction strategies that address challenges across the entire imaging chain, from hardware-related imperfections to downstream analysis, to enable reproducible and reliable parameter mapping under realistic conditions.

My interest in MRI began during my physics studies at Heidelberg University, where I conducted my bachelor's thesis at the German Cancer Research Center (DKFZ) under the mentorship of Dr Thomas Fiedler. The project focused on electromagnetic simulations to compare RF transceiver arrays for 7T body imaging and resulted in my first contribution at the ISMRM Annual Meeting in 2020.

Extending this hardware-oriented perspective, I continued at the Technical University of Munich (TUM), where I joined the Body Magnetic Resonance Research Group for my Master's thesis under the supervision of Prof. Dimitrios Karampinos and Dr Christof Böhm. The project focused on chemical-shift-encoding-based water–fat MRI and led to the development of a multi-resolution graph cut algorithm for two-echo water–fat separation, as well as a novel method for water–fat–silicone separation in breast MRI.

To further deepen my expertise in acquisition and reconstruction, I started a PhD at TUM within the Joint Academy of Doctoral Studies between TUM and Imperial College London under the supervision of Prof. Dimitrios Karampinos and Prof. Bernhard Kainz. My PhD research developed novel acquisition and reconstruction strategies for respiratory motion-compensated 3D relaxometry in body MRI, aiming to enable robust quantitative imaging under free-breathing conditions. In addition to addressing direct motion effects, my work investigated temporal main magnetic field variations and their impact on quantitative imaging. I further contributed to developing deep learning–based methods for motion-corrected MRI super-resolution during a nine-month research stay at Imperial.

I expect to complete my PhD in early 2026 and am currently transitioning to a postdoctoral position at École Polytechnique Fédérale de Lausanne (EPFL) in the newly established Laboratory of Magnetic Resonance Imaging Systems and Methods. I am eager to engage with the ISMRM community and hope to contribute to the further development of quantitative MRI as a tool for routine clinical use.

NOMINATED PAPER

Abdominal Simultaneous 3D Water T1 & T2 Mapping Using a Free-Breathing Cartesian Acquisition with Spiral Profile Ordering

T1 and T2 mapping have significant potential for non-invasive assessment of chronic liver and oncological diseases in the abdomen. However, respiratory motion, long acquisition times inherent to relaxometry, fat signal contamination, and pronounced B_0 and B_1 inhomogeneities at 3T substantially limit robustness and spatial coverage. These factors typically enforce a trade-off between resolution, coverage, and scan efficiency that restrict further research and clinical applicability. Although free-breathing water-specific T1 mapping approaches have been recently proposed in liver imaging, their extension to combined 3D water-specific T1 and T2 mapping of different abdominal organs remains technically challenging and has not yet been comprehensively addressed.

To overcome these challenges, we developed a free-breathing 3D multiparametric relaxometry method for abdominal imaging. The method combines a modified BIR-4-based T2-prepared inversion module with a Look-Locker readout and dual-echo Dixon acquisition, enabling simultaneous water-specific T1 and T2 mapping. A Cartesian acquisition with spiral profile ordering (CASPR) provides incoherent and motion-robust k-space sampling while providing large field-of-view imaging along the feet-head frequency-encoding direction. Image reconstruction was performed using a low-rank constrained subspace approach

Jonathan Stelter

with respiratory soft-gating. Parameter mapping employed a Bloch-simulated dictionary that models residual B_0 sensitivity of the adiabatic preparation pulses. This acquisition and reconstruction framework enables large-coverage abdominal mapping at 3mm isotropic resolution within a fixed acquisition time of around five minutes under free breathing.

The method was validated in phantoms, volunteers, and patients with oncological pathologies. Robust performance was maintained under clinically realistic conditions, including irregular respiration, metal implants, ascites-induced B_1 inhomogeneities, and smaller lesions (~1 cm). In particular, CASPR sampling enabled multi-organ coverage, supporting multiparametric abdominal mapping in a single acquisition beyond the constraints of today's single-slice and breath-held scans.

Building on the published work, we further demonstrate at this year's Annual Meeting the feasibility of pulmonary lesion assessment with the proposed method and explore motion-corrected reconstruction strategies to accelerate the acquisition while preserving quantitative accuracy.

Jianing Tang

I am a PhD candidate in Biomedical Engineering at Northwestern University, and my research focuses on developing advanced MRI techniques to characterize neurovascular and cerebrospinal fluid (CSF) dynamics. My interest in MRI began during an undergraduate medical imaging course, where I was captivated by the physics of MRI's spin behavior, gradient encoding mechanisms, high-resolution images, and broad clinical applications. In graduate school, I joined Dr Lirong Yan's lab, where I was introduced to the application of MRI in neurodegenerative diseases. Seeing how quantitative imaging could uncover subtle physiological changes in the brain solidified my commitment to this field since then.

My doctoral research focuses on developing and optimizing phase-contrast MRI (PC-MRI) techniques to quantify slow and small-scale flow in the brain. I have developed a high-resolution dual-VENC PC-MRI to image flow dynamics in cerebral perforating arteries, in which I designed the dual-VENC acquisition strategy to enhance the sensitivity of a wider range of flow velocities and reproducibility while minimizing phase wrapping and noise amplification. I further developed a multi-band dual-VENC PC-MRI technique that allows one to simultaneously assess flow dynamics and coupling of cerebral arteries, veins, and CSF. In parallel with sequence development, I have constructed quantitative analysis pipelines that integrate three-directional velocity encoding to generate magnitude maps, vector field visualizations, and cardiac phase-resolved flow measurements.

Throughout my PhD studies, I have gained training in pulse sequence programming, image reconstruction, and quantitative post-processing. Collaborating closely with MR physicists, clinicians, and engineers has strengthened my ability to translate technical innovation into clinically meaningful imaging biomarkers. I am driven by the opportunity to bridge engineering advances with real-world neurological applications and to advance MRI toward more precise, reproducible, and mechanistically informed assessment of brain physiology.

Jianing Tang

NOMINATED PAPER

High-Fidelity Pulsatility Assessment of Cerebral Perforating Arteries Using Submillimeter-Resolution Dual-VENC Phase-Contrast MRI at 3T

Cerebral small vessel disease (SVD) is a leading cause of stroke and vascular cognitive impairment, yet assessing the earliest microvascular alterations *in vivo* remains challenging. Cerebral perforating arteries that directly supply deep brain structures are thought to play a central role in SVD pathophysiology. Increased flow pulsatility in these vessels reflects impaired vascular compliance and altered hemodynamic buffering, potentially preceding overt structural damage. While prior work using high-resolution 2D PC-MRI at ultra-high field 7T has demonstrated the feasibility of quantifying perforator pulsatility, 7T MRI is not yet in widespread use. To facilitate broader applicability in both clinical and research settings, the development of a reliable imaging technique for assessing flow pulsatility of cerebral perforating arteries at widely accessible 3T MRI would be advantageous. Therefore, in this work, we developed and validated a dual-VENC PC-MRI technique at 3T to enable robust assessment of flow pulsatility of cerebral perforating arteries. By leveraging low-VENC acquisitions to enhance velocity-to-noise ratio (VNR) and with high-VENC data to allow phase unwrapping, we hypothesized that this approach could overcome the low SNR limitations at 3T. We further optimized the acquisition and postprocessing strategies to achieve reliable perforator detection and flow pulsatility measurements at 3T within clinically feasible scan times.

The test-retest reproducibility study demonstrated good inter-scan reliability of perforator count and pulsatility at 3T. Importantly, pulsatility measurements obtained with 3T dual-VENC showed strong agreement with those acquired at 7T, further demonstrating the feasibility of 3T dual-VENC PC-MRI for imaging cerebral perforating arteries. In an aging cohort, the pulsatility index was significantly associated with advancing age and global vascular risk burden, consistent with the hypothesis that dysfunction of cerebral perforating arteries contributes to cSVD.

Together, this study demonstrated that 3T dual-VENC PC-MRI can be a practical and reliable tool for probing cerebral perforating artery hemodynamics. By enabling advanced perforators' flow assessment on widely accessible 3T clinical scanners, this technique lowers the barrier for translational research and multi-center studies and provides a promising imaging biomarker for investigating early vascular dysfunction in cSVD.

Rui Tian

I received a BS in Electrical Engineering from Purdue University (USA), an MS in Biomedical Engineering from ETH Zurich (Switzerland), and am currently finishing my PhD in Physics at the Max Planck Institute for Biological Cybernetics (Germany). Since undergrad, I have been broadly interested in the fundamental mechanisms of MRI; it seems to me that these mechanisms might reveal important physiological phenomena through novel approaches in physics. This interest in visualizing "hidden" physiology is likely rooted in my personal experience in competitive swimming, traditional Chinese martial arts, and acupuncture meridians.

At Purdue, while I did undergraduate research in wireless communication with Prof. James Krogmeier and assisted with MRI concussion scans under Prof. Thomas Talavage, I struggled for quite some time to get involved in technical MR research. Fortunately, that changed in my final semester when Prof. Joseph Rispoli joined Purdue; his hands-on mentorship in RF coil design convinced me to continue along this path.

I subsequently moved to ETH Zurich for a Master's degree and systematic MR training, thanks to Prof. Mark Lundstrom's recommendation letter. There, I worked on a multi-shot EPI technique called phaseless encoding at its early stages, supervised by Dr Franciszek Hennel in Prof. Klaas Pruessmann's group. I also did an internship at Siemens Healthineers with Caixia Fu and Drs Aurélien Stalder and Yi Sun, and another internship in quantum sensing of nitrogen vacancy centers with Dr Takuya Segawa in Prof. Christian Degen's group.

Now in Tübingen, my PhD task is establishing a nonlinear gradient platform in a 9.4T human scanner supervised by Prof. Klaus Scheffler, while I sometimes receive mathematical guidance from Prof. Martin Uecker. While this YIA finalist paper on EPI may seem a digression to my main project, it actually came from transferring the mathematics I learned during my PhD to solve physics problems I first encountered during my Master's research. Currently, for overlap-kernel EPI, I am working on its implementation for high-performance gradients, in collaboration with Prof. Maxim Zaitsev, Prof. Nikolaus Weiskopf, and Prof. Oliver Speck.

Rui Tian

NOMINATED PAPER

Overlapped-Kernel EPI: Estimating MRI Shot-to-Shot Phase Variations by Shifted-Kernel Extraction from Overlapped Regions at Arbitrary k-Space Locations

EPI is a foundational MRI sequence and a neuroimaging workhorse. While multi-shot EPI is essential for reaching high spatial resolution and low distortion, its main barrier to widespread adoption, beyond the longer scan time, is the notorious shot-to-shot phase variations, particularly in the presence of diffusion-encoding gradients. Even today, single-shot EPI remains much more popular, despite several inter-shot phase-correction strategies proposed in the past decades. Thus, rather than adding further optimization and complexity to existing approaches, this YIA finalist paper re-evaluates this problem from first principles, and propose a novel technique termed overlap-kernel EPI.

Conventionally, sampling k-space in "chunks" requires either separate navigator scans (e.g., RESOLVE), or redundant resampling of the k-space center in every shot. These constraints have historically limited self-navigation of mosaic EPI to only a few specific trajectories (e.g., PROPELLER). Overlap-kernel EPI eliminates these restrictions, requiring only that "chunks" between shots slightly overlap at arbitrary k-space locations, rather than being confined to the k-space center. From such overlap regions, phase fluctuations can be auto-calibrated by explicitly extracting convolution kernels in shifts. This transfers the core mechanism of GRAPPA/ESPIRiT in parallel imaging – originally designed for auto-calibrating RF receiv-

er sensitivities – to self-estimate shot-to-shot phase variations, analogous to the evolution of SAKE/LORAKS into MUSSEL.

Interestingly, its benefits extend beyond multi-shot mosaic EPI. For self-navigation using phase-interleaved EPI, our method can be implemented as an optimized form of MUSE, applying one-step kernel extraction based on central k-space "chunks" reconstructed from different interleave shots. Consequently, the diffusion phase can be robustly estimated from thousands of linear equations. This evolution mirrors how the original SENSE can be optimized via ESPIRiT maps or GRAPPA kernels. Theoretically, the calibration region restricted to the central k-space should have higher SNR than the ones at the periphery of k-space used in the original MUSSEL, especially given high b-values.

Therefore, instead of advocating a specific multi-shot sequence, a fundamental contribution of our work is that it expands the basic definition of self-navigation, enabling robust self-navigation for various multi-shot trajectories in their optimized forms, and making parallel imaging and multi-shot EPI much more connected.

Ziyan Wang

Ziyan Wang is a PhD student in the Department of Diagnostic Radiology at The University of Hong Kong (HKU), under the supervision of Dr Jianpan Huang, having previously completed her Master of Medical Science at the same institution. She holds a BSc in Medical Imaging Technology from Capital Medical University, Beijing, China. Her academic foundation is complemented by a one-year internship at the Department of Radiology, Beijing Tiantan Hospital. This clinical internship deepened her understanding of clinical neuroradiology workflows and the practical needs driving the development of advanced imaging technologies. During her Master's and Doctoral studies, she actively participated in international conferences. Her achievements include a Power Pitch presentation at the 2026 ISMRM Annual Meeting, a digital poster at the 2025 ISMRM Annual Meeting, and the Best Oral Presentation award at the 2024 International CEST Workshop. Her research interests lie at the intersection of MRI methodology and clinical translation, with a focus on enhancing the sensitivity, specificity, and efficiency of MRI.

Her primary research direction is chemical exchange saturation transfer (CEST) MRI, covering data acquisition, quantitative analysis, and clinical validation. A key focus of her work is neuroimaging, specifically the application of 3T MRI in the brain for multiple sclerosis (MS). In this field, she has published an article in *J Magn Reson Imaging* utilizing CEST and magnetization transfer indirect spin labeling (MISL) MRI to detect pathophysiological changes in MS that may not be captured by conventional MRI sequences. Beyond saturation transfer techniques, she maintains a broad interest in other advanced MRI technologies. She is also dedicated to integrating CEST MRI with other MRI sequences and routine neuroradiology protocols to improve characterization and longitudinal monitoring of intracranial diseases.

NOMINATED PAPER

Saturation-Transfer-Based MRI of the Brain in Multiple Sclerosis Patients at 3T

This nominated work developed and evaluated a saturation-transfer-based MRI framework to assess molecular changes and cerebrospinal fluid (CSF) dynamics in the brain of patients with multiple sclerosis (MS) using a clinical 3T MRI scanner. MS is an autoimmune demyelinating disease that attacks myelin. As there is currently no curative treatment, early diagnosis and effective longitudinal monitoring of disease progression are crucial to minimizing irreversible damage. Our framework integrates chemical exchange saturation transfer (CEST) and magnetization transfer indirect spin labeling (MISL) to address the limitations of conventional MRI protocols. While traditional sequences are sensitive to lesion burden and brain atrophy, they often lack sensitivity to molecular alterations in brain tissue and water exchange dynamics between tissue and CSF, which could better reflect underlying pathophysiology.

In this prospective study of 52 participants (21 MS patients and 31 healthy controls), results demonstrated the feasibility and effectiveness of CEST MRI in detecting molecular changes, such as proteins and lipids, with decreased signals observed in MS brains using different analysis methods. Notably, quantitative analysis using double-step multi-pool Lorentzian fitting (DMPLF) exhibited superior diagnostic performance. Additionally, MISL MRI revealed significantly reduced tissue-CSF water exchange in MS patients.

The potential impact of this work is that saturation-transfer-based MRI provides a clinically feasible, multi-contrast imaging approach for imaging molecular changes and CSF dynamics. By offering additional biomarkers beyond conventional MRI, this method holds promise for the earlier and

Ziyan Wang

more sensitive detection of pathophysiological changes. The saturation-transfer-based MRI framework provides robust quantitative metrics with the potential to monitor disease progression and treatment response in MS, both in clinical research and, ultimately, in routine patient care.

Horace Zhang

I am a fifth-year PhD candidate in Biomedical Engineering at Yale University, working under the supervision of Dr Gigi Galiana. My research focuses on unleashing the potential of nonlinear magnetic field gradients.

My journey into MRI research grew from a passion for physics modeling, driven by the idea that elegant theories can decode complex physical signals. During my undergraduate studies in Engineering Physics at Tsinghua University, I enjoyed studying nuclear physics while exploring a field with a tangible impact on healthcare. I had the privilege of exploring this intersection with Dr Kui Ying's vibrant team, focusing on MR-guided interventions, and later with Dr Kawin Setsompop, where I applied propeller EPTI for real-time thermometry.

Nonlinear fields are in fact ubiquitous in MRI scanners, from high-order shimming coils to fringe fields, and are especially accessible in modern multi-gradient-amplifier systems. Rather than treating them as nuisances, one can embrace their flexibility and provide additional power for spatial or contrast encoding.

My recent research centers on an inside-out gradient insert designed to provide organ-specific, spatially varying, strong gradient for prostate diffusion-weighted imaging (DWI), the dominant contrast in multi-parametric MRI for prostate cancer screening. My work involves characterizing and addressing field imperfections and their implications on EPI readouts, while developing advanced acquisition and reconstruction strategies to further reduce echo time for enhanced lesion conspicuity. This platform also paves the way for probing tissue microstructure in the short-echo-time, short-diffusion-time regime.

Importantly, this device does not require comprehensive infrastructure upgrades associated with whole-body high-gradient systems, making it a practical and accessible solution for community hospitals that perform the routine prostate cancer screening.

I am honored to be selected as an ISMRM YIA finalist. I want to thank my advisor, Gigi, for her brave ideas, strong conviction, and the impressive open-mindedness with which she has guided and shaped me as a researcher.

NOMINATED PAPER

Strong-Gradient Diffusion-Weighted Imaging of Prostate Cancer Using an Inside-Out Nonlinear Gradient Coil

Prostate cancer is the second leading cause of cancer-related death in men and MRI has shown tremendous potential to improve detection and treatment. DWI is the most informative contrast in multiparametric MRI for prostate cancer screening, where the lesion has bright signal in high b-value images due to restricted and hindered diffusion in hyperplastic epithelial cells. Constrained by required diffusion weighting and limited gradient strength on most clinical scanners, the achievable echo time (TE) is too long to be ideal, causing signal to decay and lesion conspicuity to fade. Beyond the expensive whole-body strong gradient systems, my work proposed a compact, inside-out nonlinear gradient coil that sits between the patient's legs and delivers locally strong gradients (200–500 mT/m) at the prostate.

The key idea is that by supplementing the scanner's linear gradients with this organ-specific nonlinear insert, diffusion encoding takes substantially less time and reduces the required TE, improving not only signal-to-noise ratio (SNR) but also contrast-to-noise ratio (CNR) at high b-values. The coil is lightweight (15 kg), installs in under a minute, and costs significantly less than whole-body strong gradient systems on upfront installation and maintenance. This could extend high-quality prostate DWI to under-resourced clinical sites, improving diagnostic confidence and reducing the need for invasive biopsy.

In this study, I characterized the imaging artifacts introduced by the coil, including geometric distortion from background field inhomogeneity and eddy currents from the coupling with the main field coil. This allowed me to identify and implement modifications to enable EPI-DWI with nonlinear gradient diffusion encoding. I proved that the nonlinear gradient field map can yield accurate apparent diffusion coefficient (ADC) maps. I also achieved a TE accommodating $b = 3000$ s/mm^2 that is reduced from 72 to 42–54 ms, which translates to SNR and CNR boosts. The improvement in lesion conspicuity is further corroborated by biophysical modeling which shows greater fractions of restricted diffusion at shorter TE in lesions. Our current work is

Horace Zhang

exploring additional capabilities allowed by this gradient, including microstructure characterization, multi-echo acquisition, and zoomed FOV encoding.

Chenyang Zhao

Dr Chenyang Zhao is a research scientist at the Mark and Mary Stevens Neuroimaging and Informatics Institute at the Keck School of Medicine of the University of Southern California (USC). He earned his Bachelor's degree in Biomedical Engineering from Tianjin University in 2017, followed by dual Master's degrees in Biomedical Engineering and Electrical and Computer Engineering, and a PhD in Biomedical Engineering from USC in 2025. His expertise spans MR physics, pulse sequence development, and advanced image reconstruction.

He develops noninvasive MRI methods to characterize the structural, functional, and network organization of the living human brain. By leveraging innovative MRI acquisition strategies, state-of-the-art reconstruction techniques, and the complementary advantages of different magnetic field strengths, he seeks to enhance the spatiotemporal resolution and physiological specificity of neuroimaging, revealing what was once unseen in the human brain.

Over the past five years, his research has focused on pushing arterial spin labeling (ASL) beyond its conventional limits. He has led a series of technical innovations to systematically improve the robustness, resolution, and reliability of 7T ASL. Through systematic advances in sequence design, sampling strategies, and reconstruction approaches in conjunction with next-generation hardware, his work achieved submillimeter, laminar-resolved mapping of cortical blood flow across the whole brain. This framework enabled mesoscale perfusion imaging that demonstrates strong correspondence with cortical laminar organization and reveals layer-specific functional perfusion patterns during cognitive tasks. Together, these advances established ASL as a viable approach for studying cerebrovascular function at the scale of brain circuits.

Beyond perfusion imaging, Dr Zhao is extending ASL to assess blood–brain barrier (BBB) function and advancing high-resolution MR angiography to characterize cerebral macro- and microvasculature. By integrating perfusion, BBB assessment, and angiography, his work aims to provide comprehensive and multidimensional *in vivo* characterization of the human cerebrovascular system and support both neuroscience research and clinical translation.

NOMINATED PAPER

Next Generation 7 Tesla Arterial Spin Labeling with Rotated Spiral Acquisition Enables Mesoscale Resolution in 3D Brain Perfusion & Functional MRI

My nominated work focuses on pushing arterial spin labeling (ASL) at 7T to a spatial scale that has not been achievable before. Conventional ASL has been fundamentally limited by low SNR and coarse spatial resolution, which have restricted its ability to resolve fine-scale cortical organization. Although ASL has been proposed as one of the "killer" applications for ultra-high field (UHF), this potential has not been realized over the past decade due to challenges such as B_0/B_1 inhomogeneities, RF power limits, motion sensitivity, and inefficient sampling.

In this work, I developed a next-generation ASL framework at 7T built on three major innovations: (1) a FLASH-based pCASL sequence with rotated golden-angle stack-of-spirals sampling for efficient and distortion-minimized acquisition; (2) dynamic compressed sensing reconstruction with high spatiotemporal resolution and self-navigation for preventing motion artifacts; and (3) implementation on the NexGen 7T scanner using a high-density receive array and high-performance gradients. By jointly optimizing sequence design, sampling strategy, reconstruction, and hardware, the framework overcomes long-standing SNR and stability barriers at ultrahigh field.

Together, these advances enabled whole-brain laminar perfusion imaging at 0.8 mm isotropic resolution, with more than three-fold higher sensitivity and two-fold improved test–retest reliability compared with existing techniques. Importantly, laminar perfusion imaging allows layer-resolved characterization of cortical input–output organization and neurovascular coupling beyond conventional resolution limits, and provides greater layer specificity than BOLD fMRI.

Chenyang Zhao

The biological relevance of the method was supported by strong correlations between laminar perfusion profiles and histological cell-density data from the BigBrain atlas. The technique also resolved distinct laminar patterns associated with sensory input and motor output, and revealed different patterns of laminar profiles between task-positive and task-negative networks during a working memory task.

This work advances mesoscale perfusion imaging and creates new opportunities to study cortical microvascular physiology in the living human brain. ■

The True Impact of Research Published in the ISMRM's Journals

BY TOM GRIESLER, UTSAV SHRESTHA, JULIUS HEIDENREICH, FRANCESCO GIGANTI, DAIKI TAMADA, ANDRADA IANUS, DIEGO HERNANDO

Diego Hernando, who is one of Magn Reson Med's Deputy Editors, is leading an initiative to illustrate the impact that work presented at the ISMRM Annual Meetings, and published in its Society journals, has had on clinical practice and wider society. In this article, the team tells the story of parallel imaging, from its roots in RF array coil design, to widespread use in radiological practice to mitigate a long-standing challenge in MRI: long acquisition times related to the need to acquire data sequentially. The bulk of this work has emerged from ISMRM members and has been published in ISMRM journals. Diego and his team hope to show, in this first article in a series that will be posted on the ISMRM web site, that the true impact of our journals' articles is so much more than the journals' widely reported Impact Factor.

Most people will never read a scientific paper or attend a medical research conference. Yet many of us benefit from biomedical research without ever realizing it. If you've had an MRI exam — to diagnose a sports injury, examine your brain, or monitor a disease — you've relied on decades of research that quietly shaped how that exam was performed, how long it took, and how clear the images were.

For researchers, it is not always clear when that impact happens. New ideas are tested, refined, and eventually published, often years before they reach hospitals and clinics. Traditionally, scientists measure the influence of this work using academic metrics: how often a paper is cited by other researchers, or how prominent the journal is. These metrics help track scientific discussion, but they say little about how research ultimately affects patients' lives.

This gap is especially visible in medical imaging. The global MRI research community is relatively small; its main scientific gathering — the ISMRM Annual Meeting & Exhibition — brings together around 5,000 specialists each year. These are the people most likely to read and cite papers published in the Society's journals, *Magnetic Resonance in Medicine* (MRM) and *Journal of Magnetic Resonance Imaging* (JMRI), resulting in modest citation numbers compared to other scientific fields.

And yet, MRI itself has become a routine part of modern medicine. Ask friends or family whether they've had an MRI scan in the past decade, and many will say yes. Importantly, these exams are often essential for guiding care — helping diagnose disease, plan treatment, or monitor recovery. Many of today's faster, safer, more informative MRI exams would not be possible without research first shared at ISMRM conferences and published in ISMRM journals.

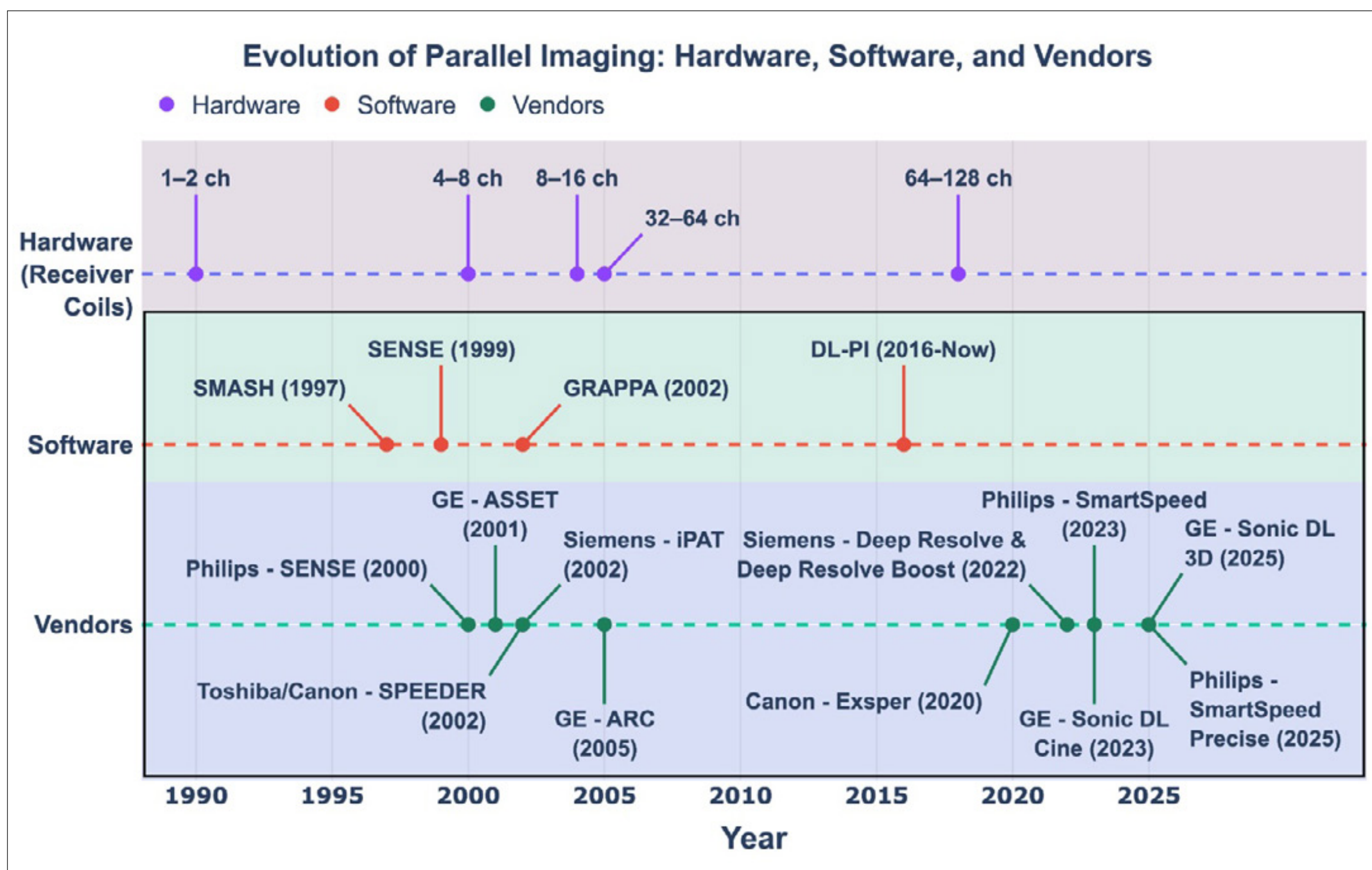
SMASH was also shared with the community at that year's ISMRM meeting in Vancouver. However, as is sometimes the case with major innovations, its significance was not immediately recognized.

In this occasional series, we look back at MRI innovations that had a major impact on clinical practice. To illustrate this impact, we trace how ideas moved from early conference abstracts to scientific papers, to widespread use in hospitals, and how they improved real-world patient care.

Our first article highlights one of the true cornerstones of modern, fast MRI: parallel imaging. Few developments have had such a broad and sustained impact on clinical practice. Remarkably, this entire evolution — inception, breakthrough discoveries, and clinical dissemination — has unfolded within the ISMRM community, from the first conference abstracts to pivotal papers and rigorous clinical evaluation. Christiane Kuhl, MD; Tom Grist, MD; and Howard Rowley, MD were interviewed and describe first-hand experiences of how parallel imaging was adopted and integrated into routine clinical MR imaging.

From Abstract to Paper to Product

Whether you're an MRI expert or not, it's unlikely that you'll need to be convinced that MRI is a fascinating technology. It can visualize nearly any anatomy with unparalleled soft tissue contrast — and it accomplishes this without the need for harmful radiation. However, one persistent challenge has troubled researchers and clinicians: MRI is slow. Instead of capturing the whole picture at once, an MRI system typically performs many separate measurements, one after another, until there is enough informa-



Timeline illustrating the co-evolution of hardware, software, and vendor implementations contributing to the success of parallel imaging (PI). The top panel highlights the progression of receiver coil technology from early 1–2 channel (ch) systems to modern 64–128 channel arrays. The middle panel summarizes key advances in PI software, including SMASH (1997), SENSE (1999), GRAPPA (2002), and the emergence of deep-learning–based parallel imaging (DL-PI, ~2016–present). The bottom panel shows major vendor-specific clinical implementations and adoption corresponding to these software developments (enclosed by the black rectangle). Together, the figure emphasizes how advances in coil hardware enabled increasingly sophisticated reconstruction algorithms and their translation into routine clinical MRI.

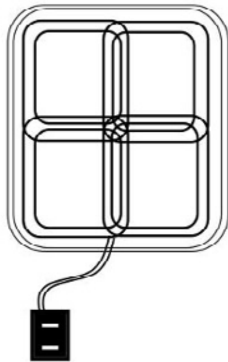
tion to reconstruct an image. This results in an inherent tradeoff between spatial resolution, signal-to-noise ratio (SNR), and acquisition time — sometimes called the "vicious circle of image quality" or "MRI triangle". In essence, this means that you can't achieve high-resolution, high-SNR images quickly; at least one factor must be compromised. While this tradeoff still exists, decades of innovation have steadily shifted the triangle in a more favorable direction. Today's MRI systems can achieve combinations of speed, resolution, and image quality that were once thought impossible.

An early milestone in this technological shift was the "NMR phased array" introduced by Pete Roemer and colleagues (*MRM*, 1990). Roemer demonstrated that you could use multiple receiver antennae ("coils") at once — designed so they don't interfere with each other — and combine their signals to get substantially higher SNR over a large field of view without longer acquisition times or lower spatial resolution. While Roemer's work was mainly focused on image quality and coverage, rather than speed, it established a crucial ingredient: each coil "sees" the body a little differently. By the late 1990s, several groups independently realized that these coil-to-coil differences could be used not just to improve SNR, but also to reconstruct images from less acquired data — shortening acquisition times. Parallel imaging was born.

One of the first concrete implementations of parallel imaging *acceleration* arrived in 1997 with the introduction of SMASH — short for *Simultaneous Acquisition of Spatial Harmonics*. Authored by Dan Sodickson and published in *MRM*, the paper demonstrated for the first time how the coils' different spatial "views" could be used to mathematically replace some of the measurements MRI would otherwise have to acquire one-by-one. In this way, SMASH enabled faster MRI without a proportional loss in image quality. SMASH was also shared with the community at that year's ISMRM meeting in Vancouver. However, as is sometimes the case with major innovations, its significance was not immediately recognized. Although SMASH received considerable scientific attention, persuading industry partners of its

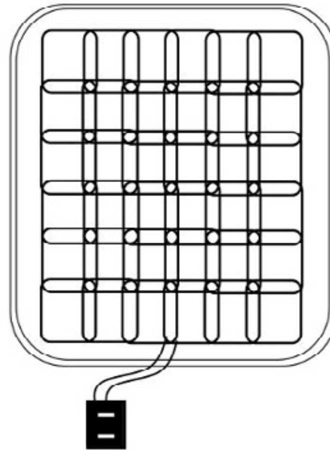
Evolution of Receiver Coils for Parallel Imaging in MRI

1990s: Phased-Array



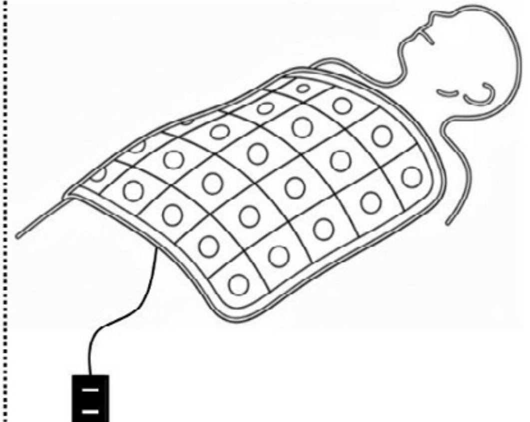
- Overlapping elements provide the high SNR of small surface coils over a larger field of view.
- Established the foundation for early parallel imaging.

2000s-2010s: High-Element Coils



- 32–128 dense elements optimized for higher PI acceleration.
- Rigid, bulky, and heavy for technologists and patients.

Today: High-Impedance & Flexible



- High-impedance elements enable ultra-flexible designs that conform closely to patient.
- Light-weight cables enabled by on-coil signal digitization.

Evolution of receiver coils for parallel imaging (PI). (Left) In the 1990s, a phased-array coil, which used overlapping elements to prevent cross-talk (via de-coupling), was invented to achieve the high SNR of small surface coils over a large field of view. This breakthrough became the foundation of early PI. (Middle) In the 2000s-2010s, dense arrays (32-128 channels) maximized PI acceleration. However, hard housings and heavy analog cables affected patient comfort and caused air gaps between the coil and patient which limit SNR. (Right) Today, high-impedance elements enable ultra-flexible design fitting to patient anatomy, minimizing air gaps to maximize SNR. Furthermore, on-coil digitization enables light-weight cables, reducing operator burden and improving patient comfort.

broader impact took additional effort, as Sodickson later recounted in a 2018 interview with *MRM Highlights*. Only when competing parallel imaging approaches began to emerge did momentum in the field truly start to build.

Among those inspired by Sodickson's 1997 ISMRM presentation were Klaas Pruessmann and Markus Weiger. The story goes that, while decompressing after the meeting on a canoe trip, they talked through ideas and sketched a different path that they would later call SENSE (Sensitivity Encoding), presented at ISMRM just one year later and published in *MRM* in 1999. At a high level, the contrast with SMASH was this: SMASH aimed to use the coils' different "views" to recreate some of the missing measurements MRI would normally collect, whereas SENSE moved the problem to the image itself — accepting that faster acquisition causes signals from different parts of the body to overlap in the image, which could be mathematically "unmixed" using the additional coil information. That shift offered a direct and broadly applicable framework for reconstruction. In Sodickson's recollection (as discussed in the aforementioned *MRM Highlights* interview), the competition between SMASH and SENSE was ultimately beneficial: it sharpened the field's focus, generated wider interest, and helped drive both academic attention and eventual industry adoption and clinical dissemination.

Anther major milestone followed a few years later with GRAPPA (Generalized Autocalibrating Partially Parallel Acquisitions), introduced by Mark Griswold and colleagues in *MRM* in 2002. Similar to SMASH, from which it evolved, in GRAPPA the MRI system deliberately skips some of the usual measurements to save time. Now, however, it also acquires a small amount of built-in reference data during the same acquisition. From that reference data, GRAPPA "learns" how the different coils' signals relate to each other, and then uses that learned relationship to synthesize the missing measurements before forming the final image. Compared with SENSE's strategy of unmixing overlap in the image, GRAPPA's appeal

was that it could often achieve similar acceleration without requiring additional acquisitions to obtain the necessary coil information. This helped make parallel imaging easier to deploy across a wide range of clinical protocols.

Within just a few years, parallel imaging had gained major scientific momentum, and captured the attention of the MRI industry. While translating academic ideas into clinical products is often a slow process, commercialization in this case moved unusually quickly. The commercial introduction of parallel imaging became a textbook example of the value of close collaboration between university researchers and industry partners. At the time Klaas Pruessmann and his group at ETH Zurich published the SENSE method, they were already working with Philips, enabling them to become the first manufacturer to make parallel imaging widely available on clinical MRI systems around 2000. Other major MRI vendors quickly realized they needed to follow to remain competitive. Siemens Healthineers introduced its iPAT technology the same year, initially offering a mix of SENSE-like and autocalibrating methods and later placing strong emphasis on GRAPPA through collaborations that included Mark Griswold. GE Healthcare

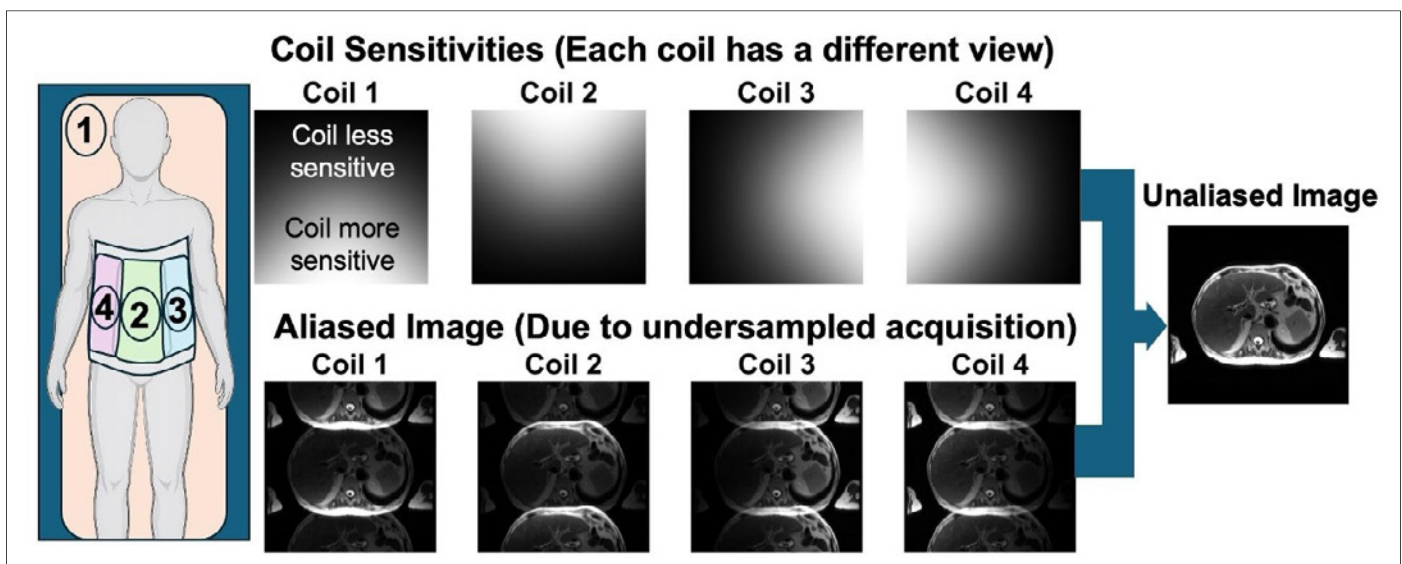
The commercial introduction of parallel imaging became a textbook example of the value of close collaboration between university researchers and industry partners.

introduced ASSET, a coil-sensitivity–based implementation, and later added an autocalibrating extension of GRAPPA known as ARC. By 2002, Toshiba Medical Systems (now Canon Medical Systems) had entered the field with its own implementation, SPEEDER — marking parallel imaging's broad adoption across the major MRI vendors. Toshiba/Canon would later include a GRAPPA-like autocalibrating implementation known as Exsper. Finally, by the time United Imaging entered the MRI market in the 2010s, parallel imaging had become ubiquitous and was therefore integrated by default into its workflows.

Real World Impact: Clinical Dissemination

In clinical practice, parallel imaging is chiefly employed to address three key challenges: prolonged acquisition times, patient motion, and image artifacts. While often mainly described as an acceleration method, parallel imaging did more than make MRI faster: it changed what MRI could realistically do in clinical practice, and who could benefit from it. Clinicians recognized its value early because the benefits were obvious and directly relevant. Notably, parallel imaging is not tied to a specific acquisition type or body part - instead, it can be integrated with various techniques and speed up a broad range of MRI examinations.

To illustrate how parallel imaging made its way into clinical practice, we interviewed three internationally recognized academic radiologists and clinical leaders who witnessed and shaped its adoption from different clinical perspectives: *Christiane Kuhl* (breast imaging), *Howard Rowley* (neuroimaging), and *Tom Grist*



Conceptual illustration of SENSE-based parallel imaging reconstruction. The figure on the left is a schematic of a multi-coil receiver array (four coils shown for illustration) positioned over a patient. In parallel imaging, each coil acquires a reduced amount of data (undersampling) for faster acquisition, resulting in aliased images for individual coils (bottom). The spatial sensitivity map of the coils (top), obtained through pre-calibration or joint estimation, are used to separate the overlaps from the aliased images and then combined to recover the unaliased image (right).

(cardiovascular imaging). Their reflections provide first-hand perspectives on how parallel imaging reshaped clinical workflows, technical expectations and standards of image quality.

Howard Rowley recalled that seeing diffusion-weighted imaging performed with parallel imaging acceleration was an immediate relief. The technique dramatically reduced geometric distortions and improved image quality. Importantly, parallel imaging did not impose a single trade-off. Instead, it gave clinicians flexibility: the gained acceleration could be used for shorter acquisition times, higher spatial resolution, or reduced artifacts. Rowley likened this flexibility to "money in the bank", ready to be invested where it mattered most.

Beyond improving image quality and robustness, parallel imaging also expanded access to MRI. By shortening acquisition times and reducing sensitivity to motion, it made MRI feasible for patients who previously struggled to tolerate long or demanding examinations. This includes children, elderly patients, and patients with pain, neurological disease, or limited ability to remain still or hold their breath.

In some body regions, parallel imaging was not only an incremental improvement, but a prerequisite for clinical viability. Breast MRI is a prominent example, as *Christiane Kuhl* emphasized – she described the introduction of parallel imaging as "a game changer for breast imaging". By resolving the long-standing trade-off between spatial and temporal resolution, parallel imaging helped establish breast MRI not only as the most sensitive diagnostic modality for breast cancer detection, but also as a viable screening tool in high-risk populations.

Similar gains played out across many other applications. In cardiac MRI, parallel imaging allowed rapid image sequences of the beating heart to be acquired in a shorter breath-hold, enabling reliable evaluation of heart motion even in patients with limited breath-holding capacity. In cancer imaging, especially during contrast-enhanced exams, faster acquisitions made it easier to reliably capture the brief early moment when a tumor first becomes visible as the contrast agent arrives during arterial phase enhancement. Likewise, parallel imaging improved the ability of dynamic MR angiography to capture the arterial phase of enhancement and allowed larger volumetric spatial coverage during a limited breath-hold time. In musculoskeletal MRI, time savings were often reinvested into higher spatial resolution, enabling more detailed visualization of small anatomical structures. Today, parallel imaging acceleration is so deeply embedded in routine MRI protocols that it often goes unnoticed – yet it fundamentally changed expectations of what clinical MRI can deliver.

By shortening acquisition times and reducing sensitivity to motion, it made MRI feasible for patients who previously struggled to tolerate long or demanding examinations. This includes children, elderly patients, and patients with pain, neurological disease, or limited ability to remain still or hold their breath.

Importantly, the close collaboration between clinicians and those developing MRI technology was essential to the rapid clinical dissemination of parallel imaging. As noted by *Tom Grist*, the deployment of parallel imaging acceleration benefited from the presence of many physician-scientists who were directly involved in understanding new MRI methods and helping to bring them into clinical use. Although the mathematical foundations of parallel imaging were complex, its clinical benefits were easy to appreciate, which helped build trust and speed up adoption.

In this context, *Christiane Kuhl and Tom Grist* both emphasized that the close interaction between clinicians and researchers/physicists is what made — and continues to make — ISMRM a uniquely collaborative scientific society. Dr Kuhl notes that while researchers must learn about real-world clinical challenges from practitioners, clinicians also need a solid technical understanding of the imaging modality they use. She compares this relationship to a pianist and an instrument: even the finest instrument cannot produce great music if the musician does not understand how to use it.

Current and Future Developments

Meanwhile, MRI research within the ISMRM community keeps pushing the MRI triangle for the benefit of patients worldwide. Since the introduction of parallel imaging acceleration, newer methods have been developed to enable further acceleration. Simultaneous multi-slice imaging allows the acquisition of several imaging slices at once, increasing coverage without extending acquisition times. Higher dimensional MR applications (for example, 4D MRI, which captures three spatial dimensions over time) have benefited from increased data redundancy to enable further acceleration. More recently, artificial intelligence-based methods have enabled even faster imaging while maintaining high resolution and image quality.

Following in the footsteps of parallel imaging pioneers, the ISMRM community keeps driving innovation. By working across disciplines including clinicians and scientists, we have an opportunity to continue the ISMRM's tradition of clinical impact while tackling some of the world's most pressing healthcare challenges. ■

About a three-paper series on *Considerations and recommendations from the ISMRM Diffusion Study Group for preclinical diffusion MRI*

INTERVIEW BY **CHRISTIAN LANGKAMMER**

EDITOR'S PICK FOR JUNE 2025

This month, we feature an interview with **Ileana Jelescu** and **Kurt Schilling** about their three-paper series for preclinical diffusion MRI. They and numerous co-authors were motivated by the lack of harmonization in preclinical diffusion MRI protocols and aimed to create a checklist of best practices. These papers cover in vivo and ex vivo imaging, hardware, acquisition, processing, and modeling, serving as a 'cookbook' and go-to resource for both newcomers and experienced researchers. Their core message advocates for open, reproducible science and standardization to ensure interpretable data and foster the ability to pool diffusion data across different sites.

MRMH: Ileana and Kurt, would you briefly introduce yourselves, your research backgrounds, and what motivated you for this work?

Ileana Jelescu: I'm an Assistant Professor in Radiology at Lausanne University Hospital in Switzerland. I'm a physicist by training, and I develop MR methodology related to diffusion MRI, specifically microstructure mapping. Over the course of my research, I have worked on both preclinical and human clinical systems, including extensive work on ultra-high field preclinical systems for rodent imaging — and even sea slug imaging.

Comparing the human and animal scanning worlds, you quickly realize that software and protocols are usually tailored for humans, not small animals. In the preclinical world, there isn't much harmonization; everyone does things differently in their own labs. Kurt and I were motivated to tidy things up and write practical recommendations for good practices in preclinical diffusion imaging. We hope this helps with harmonization and makes it easier for newcomers to get started.

Kurt Schilling: I'm an Assistant Professor in Radiology and Radiological Sciences at Vanderbilt University Medical Center. I did my PhD and postdoc at Vanderbilt and continued on as faculty. I've done a mix of preclinical and human imaging. I was trying to think of the coolest thing I've scanned—I don't have anything as exotic as a sea slug, but we have scanned dolphins, whales, and all sorts of monkey brains. More recently, I've expanded outside of the brain into the

Ileana and her group

https://doi.org/10.1002/mrm.30429 | optional part 2: https://doi.org/10.1002/mrm.30435
optional part 3: https://doi.org/10.1002/mrm.30424

Kurt with his hippo and galago brains

spinal cord. Broadly speaking, I do anything related to tissue microstructure, mostly using diffusion MRI, as well as structural connectivity using diffusion fiber tractography.

For these papers, I was motivated by the lack of harmonization. Every lab does it differently than another, and there is very little consensus. We really wanted this checklist — these recommendations and "good to know" items — so that we can perform reproducible experiments.

MRMH: **Could you summarize the idea behind your paper series in accessible terms for a general MRI audience?**

Kurt: Preclinical and *ex vivo* imaging are valuable to our field for many reasons: validating methods, acquiring state-of-the-art datasets, and understanding pathophysiology, anatomy, and evolution. While these ideas are important, they are often only accessible to the few who understand the nuances of acquiring good, interpretable, reproducible data. We wanted to provide a checklist so that anyone doing this work can do it well. We want to advocate for open science, reproducible science, harmonization, and better validation.

Ileana: These papers are written to make the necessary choices understandable for a newcomer. They are meant for a broad readership — experienced people who want a go-to reference, as well as those who are naive to diffusion MRI.

Kurt: The most important message is a line we added to the papers: "This does not serve as a consensus, but a snapshot of best practices from the community... that will be useful to imaging centers using small animal scanners, sites that may not have personnel with this knowledge, pharmaceutical or industry employees, or new trainees."

MRMH: **You tackle preclinical diffusion MRI for the aforementioned motives. However, besides preclinical imaging, is there currently a consensus on acquisition and data analysis *in vivo* in human brains?**

Ileana: In that context, the acquisition protocol is guided by the downstream analysis. Is it clinical DTI, or tractography, or advanced microstructure? Whether you use single-shell, multi-shell, or something fancier is dictated by the analysis you need to perform. However, the pre-processing pipeline for human brain data is quite solid and well-accepted. People tend to use a few established tools.

Kurt: I also think there is something close to a consensus on best practices for human *in vivo* imaging. There are other recommendations from the Diffusion Study Group that started around the same time — covering pre-processing, clinical DTI, multi-compartment modeling, and tractography.

MRMH: **Your three papers have a massive list of co-authors. How was the organization behind that?**

Kurt: It was effectively an open invite to the entire Diffusion Study Group. It started at a member-initiated symposium, perhaps in 2019. At ISMRM, we decided it was worth propagating this knowledge to the field. We advertised the initiative through mailing lists and discussed it at subsequent ISMRM meetings. Subsequently we gathered experts in specific areas: preclinical imaging, *ex vivo* imaging, hardware, acquisition, processing, modeling, tissue

fixation, and storage. We didn't turn away anyone interested in contributing.

Ileana: Regarding author management, we used a shared document with tracked changes. We strongly encouraged people to take the lead on sections where they had the most expertise. We held a couple of large Zoom meetings to recap our progress, but much of the work was done via offline contributions and proofreading. In the end, it worked out very well.

MRMH: Was the original idea to separate it into three papers?

Kurt: At one point, we had a tremendously long manuscript covering everything. The amount of knowledge from these 30 or 40 co-authors was unbelievable. It was a massive "knowledge dump" that we spent a long time organizing—we must have had 80 or 90 pages of text. We initially split it into two, and finally split the *ex vivo* section again because it was still too lengthy.

Ileana: We also realized that the recommendations were different enough between *in vivo* and *ex vivo* that splitting them made sense. It allowed us to have specific leads for each section.

MRMH: Are we finally reaching a point where preclinical diffusion MRI can serve as a ground truth for human studies?

Kurt: We dedicated a section to that in every paper — considerations for translatability or validation studies. It depends on what you're validating: a model, pathophysiology, or connections. We discuss what may or may not be translatable regarding the brain model (mice vs rats vs monkeys vs humans), microstructural differences, and the diffusion process itself.

MRMH: What about the reproducibility of white matter maps across different preclinical labs?

Kurt: The goal of our paper was to foster reproducibility. We discussed scan-rescan reproducibility and repeatability, but ultimately, we wanted standardization and transparency. If I find something, you should be able to replicate it.

MRMH: Do you think we have reached a level where we can pool diffusion data acquired from different sites?

Kurt: When using "identical sequences", I'm a little more confident. But as soon as you start changing sequence parameters and sensitivity, you enter a huge multi-dimensional space of diffusion contrast and models.

Ileana: The challenge in preclinical mapping is that the hardware variety is much wider than in clinical systems. However, if people simply reported their diffusion time — not just the b-value — that would already enable us to account for much of the variability. If the goal is to aggregate data, the bare minimum is that parameters are matched as closely as possible.

MRMH: Why is it so hard to turn a water diffusion signal into a specific measurement of axons, diameter, or density?

Ileana: The main challenge is that we measure a very indirect signature of the underlying microstructure. You have to work hard to translate how that attenuation curve is explained by the tissue. This is where the biophysical model comes in. You must parameterize the tissue with the minimum number of parameters valid to explain it, and ensure your signal is actually sensitive to those features. Finally, if you write it as an analytical equation to solve by fitting, you often face mathematical challenges — multiple solutions where you cannot exclude one because they are all "biologically plausible". You then have to do complementary experiments to determine which solution is correct.

MRMH: What about modeling in gray matter? With the virtually endless scan time in *ex vivo* providing high SNR, what can we learn about diffusion properties there?

Ileana: You can use *ex vivo* data to determine the minimum acquisition set needed to estimate your model. You acquire a comprehensive dataset, prune it, and then translate that shorter protocol to the *in vivo* situation. Regarding gray matter specifically, there are features we should account for, such as exchange between compartments. There is also the soma compartment (predominant in gray matter) and dendrite complexity (beading, undulation, spines) that break Gaussian assumptions. For now, we retain cell membrane permeability because the signature of exchange is dominant. You could use *ex vivo* to look at complex models accounting for exchange, soma, and dendrites to see if they can be estimated reliably.

MRMH: What was the biggest challenge in preparing these papers?

Kurt: For me, it was the sheer amount of knowledge combined with the fact that everyone had their own way of doing things. Distilling that into commonalities was a challenge, but a good one.

Ileana: Finding the common denominator — information everyone would agree on — was difficult. We stayed away from "consensus", but everyone on the author list vetted the content, which meant we had to trim down to aspects everyone was ready to sign off on.

MRMH: How could this work be extended in future?

Kurt: We created a GitHub list of repositories and resources. It's a living effort from the Diffusion Study Group where you can upload protocols, datasets, and pipelines. https://github.com/Diffusion-MRI/awesome-preclinical-diffusion-mri.

MRMH: What do you hope readers will take away?

Ileana: That it becomes a go-to resource—a "cookbook", if you will.

Kurt: I'd love for readers to walk away understanding that preclinical and *ex vivo* diffusion imaging is extremely powerful, provided you follow recommendations on sample preparation, hardware, acquisition, and processing.

MRMH: Thanks for the nice interview and insights! See you in Cape Town. ■

Q&A AN LI AND JUN SHEN

In vivo GABA detection by single-pulse editing with one shot

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR JULY 2025

Li An and **Jun Shen** tell us about their paper "In vivo GABA detection by single-pulse editing with one shot". In this Editor's Pick, they proposed a method to effectively minimize interference from the glutamate H4 signal in the detection of the full GABA H2 signal, which resonates at a spectral region with much reduced macromolecule contamination.

MRMH: Can you briefly introduce yourselves and your research background, and how you came to work on this topic?

Li An: I am a staff scientist in the NIMH intramural research program. Over the past 15 years, my research has focused primarily on developing novel MRS techniques to detect mental health-related metabolites, such as glutamate, glutamine, and GABA, particularly at 7 Tesla. The pulse sequence used in this work (SPEOS) was inspired by our multi-edit method introduced in 2018. Before joining NIH, I worked at Schlumberger, where I developed tool-control and data-processing software for magnetic resonance oil-well logging tools. I received my PhD from UBC, Canada. My thesis, titled "Chemical Shift Imaging with Spectrum Modeling", focused on water-fat and water-fat-silicone imaging.

Jun Shen: I am a Principal Investigator in the NIMH intramural research program. Our laboratory has been engaged in methodological advances in high-field MRS and their clinical applications. We are particularly interested in developing novel strategies to address key technological hurdles in probing brain function and brain disorders. One of our long-standing pursuits has been to find ways to monitor GABA metabolism in real time *in vivo* — first in rodent brains and then in the human brain.

MRMH: Why is this problem important — scientifically, clinically, or methodologically?

Li An

Jun: GABA is the primary inhibitory neurotransmitter in the brain. Reliable detection of alterations in GABA levels in brain disorders is essential for understanding its role in these diseases.

The prevailing method for detecting GABA relies on measuring the GABA H4 signal using a two-shot subtraction approach. This approach sacrifices approximately 50% of the signal and yields what is commonly referred to as "GABA+", because of substantial contamination from overlapping macromolecules.

In comparison, our SPEOS technique detects the full GABA H2 signal in a single shot, eliminating errors introduced by scan subtraction. Because far weaker macromolecule signals resonate at the GABA H2 frequency, the signal measured using SPEOS contains much less macromolecular contribution.

Jun Shen

From a metabolic perspective, GABA turnover begins at its C2 carbon, which is attached to GABA H2 — not H4. This makes GABA H2 a unique and sensitive reporter for monitoring GABA metabolism. SPEOS therefore enables real-time monitoring of the GABA metabolic process from a prescribed voxel placed, for example, in the frontal cortex, where structural and functional abnormalities are strongly associated with symptoms of many psychiatric disorders.

https://onlinelibrary.wiley.com/doi/10.1002/mrm.30423

MRMH: Can you summarize the main idea of your paper in accessible terms for a broad MR audience?

Jun: In conventional spectral editing, interfering signals are "physically" removed or suppressed in the spectrum. Through analysis of MRS signal correlations, we realized that "spectral isolation" can also be achieved in the presence of spectral overlap, provided that the lineshapes of overlapping signals are made orthogonal to each other.

At 7 Tesla, although GABA H2 is still partially overlapped by glutamate H4, we demonstrated that through pulse sequence design, the GABA—glutamate correlation can be reduced to practically zero. In this way, we achieve *de facto* spectral editing of GABA H2 without subtraction.

MRMH: What distinguishes your approach from previous work in this area?

Li: There have been other single-shot techniques for GABA editing, including multiple-quantum filtering, homonuclear Hartmann–Hahn coherence transfer, and homonuclear polarization transfer. However, all these methods rely on multiple additional RF pulses to detect GABA H4. In contrast, SPEOS uses PRESS with a single soft pulse. It detects the full GABA H2 triplet, which resides in a spectral region with much less macromolecular interference and uniquely reports on GABA turnover. SPEOS also retains the creatine signal, which can serve as an internal concentration reference and, together with choline, as a phase reference.

MRMH: What are the key technical or conceptual innovations introduced in this work?

Jun: The key innovations can be summarized as follows: Firstly, the Bloch–Siegert phase shift introduced by the editing pulse can be accurately corrected without introducing a second identical editing pulse to cancel it. Secondly, GABA H2 can be effectively "edited" by orthogonalizing the GABA and glutamate lineshapes through the combined action of a soft pulse and TE optimization. Lastly, by targeting GABA H2, the GABA metabolic process can be monitored with the high sensitivity and spatial resolution of proton MRS.

MRMH: How did you validate your method or findings, and what gave you confidence in the results?

Li: We evaluated several independent indicators. First, we confirmed reproducibility. The GABA peaks from two separate measurements in the same subject were highly consistent, which gave us confidence in measurement reliability. Second, following oral administration of ^{13}C-labeled glucose, we observed a gradual reduction of the GABA H2 peak at 2.28 ppm over time. After approximately two hours, the peak was largely diminished and the baseline was flat, confirming that we were specifically detecting the GABA H2 signal. Finally, inversion recovery spectra showed that the macromolecule peak at 2.27 ppm was much weaker than the overlapping macromolecule signal at 3.00 ppm. This indicated minimal macromolecular contamination in our GABA measurement.

MRMH: How could this work be used or extended by other researchers or clinicians?

Jun: SPEOS can be used in two primary ways. First, it can serve as a standalone proton MRS technique for measuring GABA levels, offering several advantages: reduced motion artifacts through single-shot acquisition, high signal sensitivity through detection of the full GABA H2 triplet, and markedly reduced macromolecular contamination. Second, when combined with administration of exogenous isotope labels such as [U-^{13}C]glucose, it can monitor GABA turnover. Because detection is performed via protons, the method benefits from substantially higher sensitivity and spatial resolution compared to direct observation of the heteronucleus.

Importantly, SPEOS eliminates major technical barriers to employing ^{13}C labels in clinical studies of GABA abnormalities, such as the need for broadband channels, custom RF coils, and high-power broadband decoupling. This makes ^{13}C-based approaches for studying biochemical mechanisms of GABAergic dysfunction much more accessible in clinical settings.

MRMH: How easy or difficult do you think it is for others to reproduce or build on your work?

Li: Reproducing or building upon this work should be straightforward. SPEOS is based on PRESS with the addition of a single soft pulse using commercially available hardware. We have also provided a detailed timing diagram (Figure S1 in the Supporting Information) specifying the exact delays, RF pulses, and gradient parameters.

MRMH: What does this work tell us about the future direction of this research area?

Jun: Through collaboration with NIMH clinical investigators, we have observed reduced prefrontal GABA levels in major depressive disorder and normal GABA levels in remitted patients. The normalization of GABA levels during remission not only underscores the pivotal role of GABA metabolism in symptom improvement but also provides a compelling rationale for investigating the metabolic processes underlying these changes.

SPEOS enables, for the first time, *in vivo* investigation of the biochemical mechanisms underlying altered frontal lobe GABA levels in psychiatric disorders. We hope this approach will contribute to a causal understanding of the metabolic mechanisms driving GABAergic abnormalities, provide insight into the biochemical basis of inhibition dysregulation.

MRMH: What are the next steps or follow-up studies you are most excited about?

Jun: We have already acquired time-course data of GABA turnover using SPEOS. We are currently looking into using Deep Learning to map these time-course data to metabolic rates. We are excited that the full development of these capabilities will enable measurement of metabolic fluxes underlying altered GABA levels in patients, potentially aiding the development of treatments modulating the GABAergic system. ■

Vendor-agnostic 3D multiparametric relaxometry improves cross-platform reproducibility

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR SEPTEMBER 2025

Shohei Fujita and **Berkin Bilgic** tell us more about their recent paper "Vendor-agnostic 3D multiparametric relaxometry improves cross-platform reproducibility", selected as one of the Editor's Picks for September 2025. With us they share their views on the importance of quantitative MRI, and on the efforts needed to grant reproducibility across scanners.

Shohei Fujita

Berkin Bilgic

MRMH: Can you briefly introduce yourself and your research background, and how you came to work on this topic?

Shohei Fujita: I earned my MD and PhD degrees in Biomedical Engineering and Radiology from the University of Tokyo in 2015 and 2023. I did my postdoctoral fellowship at the BRAIN (Bilgic Reconstruction Acquisition for Imaging Neuroscience) lab at the Martinos Center for Biomedical Imaging. I am a radiologist and currently a clinical fellow in the Department of Radiology at Massachusetts General Hospital (MGH) and Harvard Medical School (HMS).

Berkin Bilgic: I got my BS degrees in Physics and Electrical/Electronics Engineering from Bogazici University in 2008, MS and PhD degrees in Electrical Engineering and Computer Science from MIT in 2010 and 2013. I have been at the Martinos Center for Biomedical Imaging since 2013. I am currently an associate professor of radiology at HMS and an investigator at MGH.

We started working on quantitative MRI (qMRI) with my colleague Borjan Gagoski at Boston Children's Hospital a few years ago. He developed the 3D QALAS sequence in Siemens' native programming environment to support the qMRI efforts in the multi-center HBCD project. Shortly after we started using Pulseq as a vendor-agnostic programming tool and had the idea of using it to implement 3D QALAS and deploy it across multiple vendors to boost its reproducibility. Shohei led this project and was able to get it to work on both Siemens and GE systems with the help of the co-authors.

https://onlinelibrary.wiley.com/doi/10.1002/mrm.30566

MRMH: What motivated you to pursue this particular problem, and why is it timely for the MRI community?

Berkin: In qMRI, we hope that the numbers we measure are reproducible across systems. Taking temperature or blood pressure should not give different numbers based on the device being used. Although things are more complex when measuring T1 and T2 in the brain, our hypothesis was that using identical gradient and RF waveforms and identical image reconstruction / parameter estimation algorithms should yield more comparable values across different vendors. We think this is an important problem to tackle given the "reproducibility crisis" in neuroimaging, and the emergence of large-scale, multi-center studies. It is timely because we finally have an open-source, vendor agnostic sequence programming tool in our arsenal to tackle this problem.

MRMH: What problem or limitation in current MRI practice does your paper aim to address?

Shohei: We aim to address the limited reproducibility in qMRI sequences when implemented in closed, vendor-native programming environments where the sequence timing, RF/gradient waveforms as well as reconstruction algorithms are often opaque and difficult to compare and harmonize across vendors.

MRMH: Why is this problem important—scientifically, clinically, or methodologically?

Berkin: Scientifically, pooling data across multiple centers where a large number of scanner models from different vendors reduce the statistical power for the differences we want to be sensitive to. This necessitates more subjects to be scanned, or the use post-hoc methods to harmonize differences in the data.

Clinically, if we aim to detect any differences due to disease in e.g. T1 and T2 from normative values, the specific range of normative values would depend on the scanner model/vendor we are using. If it is desired to have normative values that generalize across systems, harmonization is critical.

Methodologically, we were interested in understanding the extent to which we can minimize differences between qMRI maps if we fully harmonized everything in our control – there are still differences we can't address e.g. vendors operating at 3T vs 2.89T.

MRMH: Can you summarize the main idea of your paper in accessible terms for a broad MR audience?

Shohei: Our goal was to use identical pulse sequences and reconstruction/post-processing algorithms on different vendors and implement a quantitative MRI sequence, and show that this yields more similar T1 and T2 values compared to vendor-native sequences and reconstruction algorithms which are opaque to the user and have differences under the hood.

MRMH: What distinguishes your approach from previous work in this area?

Shohei: There is important existing literature in harmonized qMRI across vendors. The one that was most influential to us was Agah and Nikola's work (https://doi.org/10.1002/mrm.29292) using RTHawk to harmonize T1 mapping across vendors. Our difference is that we used a free pulse sequence programming tool and obtained multiple parameters at once. But we wouldn't have accomplished this without such influential work guiding the way.

MRMH: What are the key technical or conceptual innovations introduced in this work?

Berkin: The key components were: (i) developing a Bloch simulator that matched the sequence parameters which are fully transparent in the Pulseq implementation to help address any biases in the obtained parameter maps; and (ii) translating these identically to GE and Siemens systems.

MRMH: Were there any design decisions or trade-offs that were particularly critical?

Shohei: Incorporating an inversion efficiency map (jointly estimated with the data) was key to minimizing errors in the T1 maps. The need for such a correction was not clear to us initially, so Jose Marques' MP2RAGE paper (https://doi.org/10.1016/j.neuroimage.2009.10.002) was influential in this respect.

MRMH: What were the biggest challenges you encountered during this research?

Berkin: Hardware differences between the vendors presented a challenge, we needed to harmonize the peak B_1^+ amplitude, gradient and slew rates, gradient, RF and ADC raster times to name a few.

MRMH: How did you overcome these challenges, either technically or practically?

Berkin: I think it was Shohei's attention to detail and the substantial amount of help we received from our colleagues (thanks to Jon-Fredrik Nielsen and Maxim Zaitsev).

Shohei: Berkin was incredibly helpful in teaching me how to troubleshoot and think critically about sequence implementation. We were also fortunate to have Jon and Maxim on the team. Regular discussions with them were invaluable for deepening our understanding of Pulseq and systematically tackling implementation issues.

Shohei, Berkin and their lab mates

MRMH: How did you validate your method or findings, and what gave you confidence in the results?

Berkin: We validated the method by simulating the sequence to ensure that every sequence block, RF shape, gradient event, and timing parameter was executed exactly as intended. This allowed us to confirm that the implementation faithfully matched the theoretical design before proceeding to experimental testing. Finally, scanning the NIST phantom as well as the same traveling subject gave us confidence when assessing reproducibility.

MRMH: Were there any results that surprised you or changed how you think about the problem?

Shohei: The temperature dependence of the T1/T2 values in the NIST was quite significant and beyond what we were expecting – we had to leave the phantom in the bay way in advance to account for this.

MRMH: How could this work be used or extended by other researchers or clinicians?

Berkin: Shohei recently extended this work to map myelin water fraction (MWF) alongside T1 and T2 values. I think this is of importance when investigating brain development and demyelinating diseases. We are attempting to deploy this in the liver where iron, fat and fibrosis quantification, if can be performed with a motion-robust, multi-parametric sequence, will be of substantial clinical benefit.

MRMH: What are the main barriers to broader adoption or implementation?

Berkin: Sadly the main barrier to adoption was not technical or physiological, but rather due to IP protection. We further explain this below.

MRMH: How easy or difficult do you think it is for others to reproduce or build on your work?

Berkin: Thanks to Shohei's tremendous effort, reconstruction and parameter estimation code is freely shared on GitHub. So the main difficulty to reproduce our results lies with the sequence availability.

MRMH: Are data, code, sequences, or tools from this study publicly available?

Berkin: Unfortunately, the company who owns the IP for the 3D QALAS sequence did not allow us to share the sequence generation code. However, we have multiple extensions of this work that we freely share on GitHub, including Shohei's MWF QALAS sequence (https://github.com/shoheifujitaSF/mwf-qalas).

MRMH: What does this work tell us about the future direction of this research area?

Shohei: Pulseq is continuing to gain popularity and it is becoming more than a rapid prototyping tool and will likely be used in clinical research including multi-site studies in the future.

MRMH: How do you see this approach integrating with other emerging MRI techniques or frameworks?

Berkin: The modularity of the sequence allows us to replace the Cartesian readout with non-Cartesian techniques such as radials and spirals, which could be combined with XD-GRASP-type motion-resolved reconstruction frameworks to be deployed in, e.g., the abdomen.

MRMH: What are the next steps or follow-up studies you are most excited about?

Shohei: We are excited about extending 3D QALAS to enable mapping of additional parameters. Yuting Chen's MIMOSA sequence (https://doi.org/10.1002/mrm.70143) is a step in this direction, where we were able to obtain additional T2* and source-separation susceptibility maps. The sequence and reconstruction code is also available on GitHub.

MRMH: If you could revisit this project today, is there anything you would do differently?

Berkin Including vendors such as Philips, United, and Canon would have been an added benefit. While the development of a Pulseq interpreter for Philips is ongoing work in the community, we were since then able to run the 3D QALAS sequence using the Pulseq interpreter developed by United Imaging and Canon.

MRMH: What advice would you give to researchers — especially early-career scientists — interested in this area?

Berkin: I think sharing code for either sequence or reconstruction algorithm shows that the work is rigorous and reproducible. It also improves the visibility of the work.

Shohei: For me, being open to learning new skills and collaborating with others has been essential.

MRMH: What do you hope readers take away most from this paper?

Shohei: Open, community-driven pipelines can make quantitative measurements highly reproducible across systems from different vendors, thus bringing MRI closer to the realm of metrology.

MRMH: How does collaboration (academic, industrial, or open-science) factor into this project?

Shohei: There were certainly technical challenges in this project, but collaboration was really at the heart of this project, as it required coordination across multiple academic sites and implementation/execution of the sequence on different scanner platforms. Working closely with team members who had deep expertise in the Pulseq interpreter (Jon and Maxim) enabled reliable deployment across systems. We also benefited from industry collaborators (Eugene Milshteyn) who made sure our implementation was technically realistic and aligned with real-world scanner constraints.

Berkin: In the end, this cross-platform project required this kind of academic, industrial, and open-science collaboration. It's hard to imagine a single group accomplishing that alone, and we're truly grateful to all of our co-authors for their dedication throughout the project!

MRMH: Finally, what do you enjoy doing outside of your research and work in MRI?

Shohei: I like spending time swimming and skating with my kids.

Berkin: For me it is playing Minecraft with my kids, a great way to decompress but spend time together as well. ■

Q&A BERK CAN ACIKGOZ AND JESSICA BASTIAANSEN

Quantitative susceptibility mapping in the human brain at 7T with phase-cycled balanced SSFP

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR OCTOBER 2025

Berk Can Acikgoz and **Jessica Bastiaansen** guide us through their work on quantitative susceptibility mapping at 7T. Their work "Quantitative susceptibility mapping in the human brain at 7T with phase-cycled balanced SSFP" has successfully demonstrated the feasibility of a novel method for off-resonance frequency estimation and QSM which could enable the concurrent estimation of multiple tissue properties.

MRMH: Can you briefly introduce yourselves and how you came to this topic?

Jessica Bastiaansen: I'm an Associate Professor at the University of Bern (Switzerland). My research has touched a range of topics, but there's a running theme: metabolism, fat, and off-resonance. In earlier work with Siemens Healthineers, we explored how signal asymmetries in phase-cycled bSSFP can quantify off-resonance sources such as fat. When I started my lab in Bern, we wanted to characterize fat in the body at 7T, but before moving into moving organs, we tested the same approach in the brain, where the environment is more controlled. That led to collaborations with Dr. Joao Jorge and Dr. Cristina Sainz, and eventually to this study combining bSSFP-based off-resonance estimation with QSM and relaxometry.

Berk Can Acikgoz: I'm currently a postdoctoral researcher at the University of Bern. I work in quantitative MRI with a strong focus on phase-cycled bSSFP. Instead of treating bSSFP's off-resonance sensitivity as a limitation, we view it as a source of rich information that can be exploited for quantitative imaging. This QSM project evolved naturally from our previous work on proton density fat fraction mapping using phase-cycled bSSFP: once you understand the phase behavior of bSSFP profiles in detail, you realize you can estimate off-resonance very robustly. Then the key question became: is that off-resonance information accurate enough to support full quantitative susceptibility mapping at 7T?

Berk Can Acikgoz and Jessica Bastiaansen

https://onlinelibrary.wiley.com/doi/10.1002/mrm.30571

MRMH: What motivated you to pursue this problem, and why is it timely now?

The team from Quantitative MR Imaging Science Lab (QIS) of Bern University

Jessica: What fascinates me is how much quantitative information is hidden in phase-cycled bSSFP data. At the same time, quantitative MRI as a field is pushing hard on reproducibility and reducing confounders, including through efforts like the ISMRM quantitative MRI study group (where I'm actively involved). Phase-cycled bSSFP is unusual: it doesn't share all the same biases as common mapping approaches. For example, it can have less T1 bias than some alternatives and it avoids some limitations tied to T2*-weighted gradient-echo readouts. But it comes with its own challenges (motion sensitivity, eddy currents, and profile distortions), so there is still a lot to explore related to its quantitative potential, and that's exactly what makes it timely.

MRMH: What problem in MRI practice does your paper aim to address?

Jessica: In conventional QSM workflows, multi-echo gradient-echo acquisitions are widely used, but at ultrahigh field some regions can suffer from strong T2* decay, which makes phase information harder to use robustly. Phase-cycled bSSFP does not rely on the same principle and can be less limited by rapid signal decay. Our broader goal was to advance quantitative MRI with phase-cycled bSSFP, not only for measuring susceptibility, but also for relaxometry and quantifying tissue composition.

Berk: I would emphasize that we are not claiming "there is something wrong" with established approaches for QSM. Instead, we explore an alternative framework that could become valuable especially when you want multiparametric information. Many neurodegenerative diseases are associated with changes in both susceptibility and relaxation properties, so a framework that can probe them together is especially attractive. Phase-cycled bSSFP encodes multiple tissue properties simultaneously: off-resonance, but also T1, T2, and proton density. The "problem" we address is that this potential has been underexploited in a full pipeline like QSM, which is an important metric for off-resonance accuracy.

MRMH: In accessible terms, what is the main idea of the paper?

Jessica: The short version is that we use phase-cycled bSSFP to estimate the off-resonance field, and from that we can reconstruct tissue susceptibility (QSM), even in settings where gradient-echo approaches can be challenged by strong T2* decay. Because bSSFP also contains relaxation information, this moves us toward measuring multiple tissue properties in a more integrated way.

MRMH: What distinguishes your approach from previous work in this area?

Jessica: Conceptually, we're not varying echo times in a GRE sequence. Instead, we vary RF phase increments within a bSSFP acquisition (phase cycling) and use how the signal profile changes to estimate off-resonance and susceptibility.

Berk: From a bSSFP perspective: off-resonance sensitivity is well known, but this is (to our knowledge) the first study to systematically test whether bSSFP-based frequency estimation is accurate enough to support the QSM pipeline. From an ultrahigh-field perspective: many quantitative approaches target one parameter at a time. Our framework pushes toward integrated tissue characterization by combining susceptibility with T1/T2/proton density estimates within a single acquisition strategy at 7T.

MRMH: What are the key technical innovations in this work?

Jessica: A central innovation is both the acquisition strategy (phase-cycled bSSFP) and the processing strategy needed to make it quantitative. In particular, we had to disentangle signal asymmetries induced by myelin-related effects, because those asymmetries can bias off-resonance estimates and therefore susceptibility mapping.

Berk: I'd summarize our main contribution as an off-resonance estimation framework tailored for phase-cycled bSSFP at 7T. Our approach is simple and stays robust even when voxel signals reflect more complex microstructure or tissue composition. Myelin water has a different chemical shift relative to extracellular water, which distorts the bSSFP profile shape and can bias frequen-

cy estimation. Correcting for that reduces systematic errors and also reveals sensitivity to myelin-related effects.

MRMH: Were there any design decisions or trade-offs that turned out to be critical?

Berk: Acquisition strategy mattered more than we expected. Early on we used a slab-selective acquisition to reduce scan time, but bSSFP is sensitive to flow effects—especially in cerebral arteries. Balanced gradients provide intrinsic flow compensation mainly along the readout direction, but not fully in all directions, and the resulting phase inconsistencies can propagate into frequency estimation and QSM. Changing the acquisition orientation (to sagittal) significantly improved stability of off-resonance estimation and susceptibility reconstruction.

MRMH: What were the biggest challenges, and how did you handle them?

Jessica: The biggest conceptual challenge was separating the different contributors to the measured bSSFP signal. Especially teasing apart "pure" off-resonance effects from myelin-related signal components that distort the profile. We spent substantial effort modeling and correcting those asymmetries, because accurate off-resonance estimation is essential for QSM. Interestingly, this same line of thinking is now helping us in a different direction: disentangling B0 from water and fat to support robust fat fraction mapping with phase-cycled bSSFP.

Berk: Practically, as a proof-of-concept, the acquisition was relatively lengthy, producing large datasets that were cumbersome to handle. That forced us to be careful about pipeline structure and motivated ongoing work on subsampling and acceleration strategies.

MRMH: How did you validate your method or findings, and what gave you confidence in the results?

Jessica: We validated our approach by comparing the resulting susceptibility maps against established QSM pipelines, and by checking consistency with complementary quantitative contrasts (including relaxometry). Agreement with conventional approaches, combined with predictable behavior in known anatomical regions, gave us confidence that the bSSFP-derived off-resonance estimates were accurate enough to support QSM reconstruction.

MRMH: What do you see as the main barriers to broader adoption?

Jessica: One barrier is general to quantitative MRI: beyond technical feasibility, we need to show clinical relevance of the parameters and determine when they can serve as robust biomarkers. On the technical side, bSSFP has its own sensitivities—motion, flow, eddy currents, and profile distortions—so turning a proof-of-concept into a broadly deployable tool requires careful engineering and validation.

Berk: I'd add that scan time is a practical barrier right now. This framework becomes much more attractive if we can substantially accelerate without losing parameter stability.

MRMH: How can other researchers build on this work, and what's next for you?

Jessica: We've made a point of supporting reuse: we coded the sequences in IDEA and Pulseq and shared sequence and reconstruction code publicly, along with data. We're eager to collaborate, if groups want to try this on their systems or adapt it to new applications, we're happy to help. Methodologically, we're working on extensions to reduce dependence on B1 effects (with Dr. Anke Henning and Dr. Celik Boga), and we're extending the approach toward proton density fat fraction mapping in the liver. Longer term, I'm also excited about exploring related ideas for metabolic imaging.

Berk: Acceleration is the immediate priority. We're exploring model-based reconstruction with spatial regularization, using spatial consistency to stabilize parameter estimation and enable major undersampling. Another promising property of bSSFP at ultrahigh field is its ability to quantify T2 without relying on spin-echo–based methods and with reduced sensitivity to B1 inhomogeneities. We're also excited about the myelin sensitivity: extending the framework toward more explicit myelin mapping is a natural next step. Initial acceleration results are planned for presentation at the upcoming ISMRM meeting in Cape Town.

MRMH: What advice would you give to researchers—especially early-career scientists—interested in this area?

Berk: I have just finished my PhD myself, so I clearly remember the challenges of early-career research. Quantitative MRI can be demanding and requires patience and persistence. Progress is often incremental. Developing a strong conceptual understanding of the underlying signal behavior is essential. And perhaps most importantly: stay strong.

MRMH: What do you hope readers take away from this paper?

Berk: One key takeaway is that bSSFP-based QSM is confounded by myelination, and that this matters. Different quantitative MRI methods are sensitive to different aspects of tissue microstructure and have different confounders. We often compare outputs across sequences as if they measure the same "ground truth," but that can be like comparing apples to oranges. Understanding what a method is biased by is just as important as understanding what it measures.

Jessica: And more broadly: there is still a lot of room to discover new quantitative contrasts and more integrated measurement strategies. Phase-cycled bSSFP has a lot of untapped potential, but we need to understand and correct its confounders.

MRMH: Finally, what do you enjoy doing outside of your research and work in MRI?

Jessica: Outside the lab I like group fitness (BodyPump) and spending time with friends and family

Berk: I enjoy strategy games and reading, good ways to reset after coding and reconstruction work. ■

In vivo evaluation of population-specific inversion pulses in parallel transmission

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR NOVEMBER 2025

We asked **Igor Tyshchenko** and **Leigh Johnston** about addressing technical limitations that currently hinder translation of ultra-high field MRI into clinical settings. Their paper "in vivo evaluation of population-specific inversion pulses in parallel transmission" proposes a practical solution to tailor RF pulses to subject-specific field maps.

Igor Tyshchenko and Leigh Johnston

MRMH: Can you briefly introduce yourself and your research background? What motivated you to pursue this particular problem?

Igor Tyshchenko: I completed my PhD in biomedical engineering at the University of Melbourne. My journey into MRI research started during my Master's degree, where Leigh Johnston's infectious enthusiasm (note from **Leigh:** Aww, thanks Igor!) opened my eyes to the elegance of the mathematics underpinning MRI. I still remember visiting the ultra-high field scanner for the first time — seeing the sheer scale of the 7T system in person cemented my desire to work in this space.

Our lab then received a parallel transmit (pTx) coil upgrade for the 7T scanner, and I jumped at the opportunity. At ultra-high field strengths, the shortened RF wavelength causes significant B_1^+ inhomogeneity, and pTx addresses this by independently driving multiple RF channels to shape a more homogeneous excitation field. It was the most technically demanding challenge in the lab, and with support from collaborators at Siemens Healthineers and my supervisory team, I dove in.

MRMH: Tell us why this work is of particular relevance to our field.

Leigh Johnston: We tackle robust parallel transmit pulse design in our paper. The full potential of UHF MRI will not be realised until pTx pulses are fast to generate and high performing for all individuals being scanned, irrespective of anatomical variations.

MRMH: Can you summarize the main idea of your paper in accessible terms for a broad MR audience? What distinguishes your approach from previous work in this area?

Igor: The main idea of our paper is to perform an *in vivo* validation of subpopulation-based pulse design for pTx systems. This is the notion that, while Universal Pulses are great for a one-size-fits-all approach to pTx pulse design, by clustering brain shapes and sizes into sub-populations of anatomies, a more robust and yet still computationally efficient solution can be found.

Leigh: Our approach lies in the gap between Universal Pulses at one end of the design spectrum and fully personalized (and therefore computationally tricky) pulse design at the other.

https://onlinelibrary.wiley.com/doi/10.1002/mrm.30593

MRMH: Were there difficulties encountered while carrying out the work? How did you overcome them?

Igor: Challenges arose in unexpected places in this project! It was surprisingly difficult to measure precise metrics of brain shape (head breadth and length measurements) from localizer scans to the degree of accuracy that we were wanting. This took some work to arrive at a robust method.

MRMH: What did you learn from these, and how will you employ this knowledge in future studies?

Igor: We find it very interesting that the sub-population of brain shapes that end up benefiting most from this form of pulse design are the smaller brain shapes. This provides an opportunity for robust pTx pulse design for pediatric populations in the future, for example. It also highlighted to us further the challenge of pTx pulse design for those of us with large brains!

MRMH: What do you hope readers take away most from this paper?

Leigh: Simple (and we believe elegant) ideas are always worth exploring!

MRMH: Was collaboration (academic, industrial, or open-science) an important factor into this project?

Leigh: This work is part of an on-going collaboration between those of us at the Melbourne Brain Centre Imaging Unit and the Siemens Healthineers' Australian MR scientific collaborations team. It is such a great environment in which to undertake research, with an end goal of practical and impactful improvements to 7T MRI technology. ■

Q&A CLAUDIA PRIETO AND RAFAEL DE LA SOTTA

Motion corrected 3D whole-heart SAVA T1 mapping at 0.55T

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR JANUARY 2026

Claudia Prieto and **Rafael de la Sotta** tell us about their paper *Motion corrected 3D whole-heart SAVA T1 mapping at 0.55 T,* in which they propose a novel highly efficient isotropic-resolution 3D whole-heart saturation-recovery and variable-flip-angle T1 mapping sequence at 0.55T, incorporating image navigator (iNAV)-based non-rigid motion correction and dictionary matching.

MRMH: Can you briefly introduce yourself and your research background, and how you came to work on this topic?

Claudia Prieto: My research focuses on cardiovascular magnetic resonance imaging, particularly image reconstruction and motion correction. I completed my PhD at Pontificia Universidad Católica de Chile. I later pursued a postdoctoral fellowship at King's College London, where I continued my career until becoming Professor in 2020. Since 2023, I have been a professor at Pontificia Universidad Católica de Chile and Director of the Millennium Institute for Intelligent Healthcare Engineering (iHEALTH). In recent years, my research has increasingly focused on low-field MRI, with the goal of expanding access to advanced imaging technologies. Our aim is to develop physics- and artificial intelligence-based methods that reduce acquisition time while improving the accuracy and robustness of quantitative imaging.

Rafael de la Sotta: My research background includes evolutionary algorithms and MRI. I studied Electrical Engineering at Universidad de Chile and later worked as a research engineer at iHEALTH. This was my first project as a research assistant and my first project related to MRI. It was an excellent project to begin working in this field, as it involved multiple components of the MRI pipeline, including sequence design, reconstruction, motion correction, and quantitative mapping.

Claudia Prieto

MRMH: What motivated you to pursue this particular problem, and why is it timely for the MRI community?

Claudia: Cardiovascular diseases remain one of the leading causes of death worldwide, and MRI is considered a gold-standard modality for the assessment of many cardiac conditions. However, most technical developments in cardiac MRI have been performed at 1.5T and 3T, which are still the dominant field strengths in clinical practice. Low-field MRI offers several advantages, including lower system cost, larger bore size, reduced acoustic noise, and improved safety for patients with implanted electronic devices. Despite these benefits, advanced quantitative cardiac techniques such as 3D T1 mapping have not yet been fully optimized or translated to low-field systems.

In this work, we focus on extending and adapting a 3D whole-heart T1 mapping technique to 0.55T, addressing both technical and practical challenges specific to low-field imaging. We believe this is timely as interest in low-field MRI continues to grow globally.

Rafael de la Sotta

MRMH: What problem or limitation in current MRI practice does your paper aim to address?

Rafael: Currently, T1 mapping in clinical practice is typically performed using 2D acquisitions that require breath-holding. However, 2D imaging provides limited spatial coverage and may miss focal or localized pathologies. In addition, breath-holding can be challenging or even infeasible for very sick patients. Our work contributes to the broader effort of developing fast and robust 3D T1 mapping techniques that can be performed during free breathing and are suitable for routine clinical use.

https://onlinelibrary.wiley.com/doi/epdf/10.1002/mrm.70038

MRMH: Why is this problem important—scientifically, clinically, or methodologically?

Claudia: From a clinical perspective, the development of robust cardiac 3D T1 mapping methods at lower field strength can significantly increase access to advanced imaging, particularly for patients who are obese, claustrophobic, or have implanted electronic devices. Scientifically and methodologically, 3D whole-heart T1 mapping enables comprehensive tissue characterization, facilitating the detection of both focal and diffuse myocardial disease. Continued development in this area is important to support broader clinical adoption.

MRMH: Can you summarize the main idea of your paper in accessible terms for a broad MR audience?

Rafael: This study proposes a free-breathing 3D whole-heart T1 mapping method at 0.55T with 2 mm isotropic resolution and a scan time of about 7 minutes. It uses motion correction and dictionary matching to improve reconstruction and quantification accuracy. Results showed excellent agreement with reference measurements in phantoms and comparable T1 values to 2D MOLLI in healthy subjects, demonstrating that this method is reliable for 3D T1 mapping at low field.

MRMH: What distinguishes your approach from previous work in this area?

Rafael: A saturation-recovery and variable-flip-angle (SAVA) T1 mapping sequence was proposed at 3T where it showed excellent results. Nevertheless, this method used a non-isotropic resolution, diaphragmatic navigator for motion estimation and exponential fitting for T1 mapping. Our approach presented SAVA at 0.55T using isotropic resolution, an image-based navigator for motion estimation, non-rigid motion correction, and dictionary matching for mapping.

MRMH: What are the key technical or conceptual innovations introduced in this work?

Claudia: In this work, we adapted the SAVA sequence to the low-field regime and incorporated multiple advanced techniques. For T1 mapping, we used dictionary matching rather than exponential fitting, reducing model-based bias and allowing the use of Bloch equation simulations. In addition, we employed an image-based navigator (iNAV) for respiratory motion estimation combined with patch-based low-rank non-rigid motion correction, improving robustness during free-breathing acquisition.

The iHEALTH Team

MRMH: How did you validate your method or findings, and what gave you confidence in the results?

Rafael: We compared our method in phantoms and using *in vivo* experiments against standard methods and literature values. Based on these results, we are confident that the method is reliable for 3D T1 mapping at 0.55 T. The proposed approach was evaluated in the standardized T1MES phantom and in 10 healthy subjects. 2D MOLLI was acquired in 5 of the 10 subjects for comparison. We also compared our sequence performance with the previous SAVA implementation at 3T and with reported myocardial T1 literature values at 0.55T. Bloch equation-based simulations were used for sequence parameter optimization and for dictionary-based T1 estimation. This strengthened both confidence in the sequence design and the physical interpretability of the mapping

MRMH: How could this work be used or extended by other researchers or clinicians?

Claudia: Further studies involving a larger cohort of healthy subjects and patients with suspected cardiovascular disease are needed to determine the clinical feasibility and value of the proposed approach. In addition, 3D iNAV-SAVA was investigated only pre-contrast, and evaluation after contrast injection is warranted to enable ECV mapping and the calculation of synthetic LGE images. Once validated in patients, this method could support comprehensive volumetric myocardial tissue characterization in a single free-breathing scan, including the assessment of diffuse fibrosis and other disease processes where quantitative T1 mapping is clinically informative.

MRMH: What advice would you give to researchers — especially early-career scientists — interested in this area?

Rafael: MRI has many different applications, but they all share a common physical foundation. Taking this into account, we would advise early-career researchers to learn the theory in depth and to simulate signals extensively across different sequence variations to gain hands-on experience and a stronger intuition for the underlying physics. A solid understanding of sequence programming is important, as it enables understanding of both the acquisition and reconstruction pipelines. In particular, for 3D T1 mapping and motion correction, knowing the physical foundation and how to perform multiple simulations is key for a good understanding of the methodologies and parameter optimization.

MRMH: What do you hope readers take away most from this paper?

Claudia: We hope readers take away not only the proposed method but also the importance of each part of the pipeline, since several of the methods we use could be adapted to other quantitative MRI problems. For related applications, our sequence framework could be directly tested, including extension of this approach to 3D T1 mapping in other organs at low field. More broadly, our simulation- and phantom-based parameter optimization strategy may serve as a reference for acquisitions operating under lower sensitivity or targeting other quantitative parameters. ■

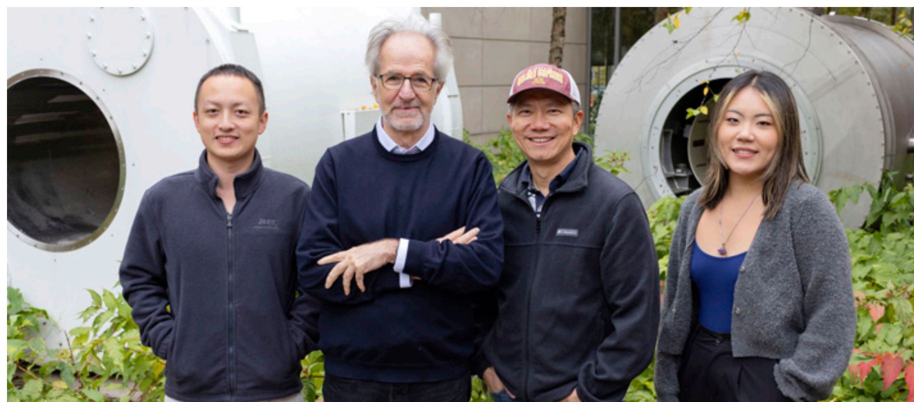
Advancing whole-brain BOLD functional MRI in humans at 10.5T with motion-robust 3D echo-planar imaging, parallel transmission, and high-density radiofrequency receive coils

INTERVIEW BY **MARIA EUGENIA CALIGIURI**

EDITOR'S PICK FOR FEBRUARY 2026

Dr Shuxian Qu is a second-year postdoctoral trainee at the Center for Magnetic Resonance Research (CMRR), Department of Radiology, Medical School, University of Minnesota–Twin Cities. She earned her PhD in 2024 from Zhejiang University, China, and specializes in MRI data acquisition, image reconstruction, and functional MRI (fMRI) analysis. **Dr Xiaoping Wu** is an Associate Professor with tenure at CMRR. With over two decades in ultra-high field MRI, he collaborates to advance the field through innovations. Recently, he has focused on techniques for human neuroimaging using magnetic susceptibility contrast at 7T and above, leveraging ultra-high field SNR and contrast gains. In this interview, they guided us through their recent work on BOLD imaging at ultra-high field.

Shuxian Qu



Wu Lab

MRMH: What motivated you to pursue this particular problem, and why is it timely for the MRI community?

Xiaoping Wu: Collaborating with partners, we began by acquiring motion-robust T2*-weighted anatomic images of the whole human brain at 10.5T, achieving high-quality multiple gradient-echo (GRE) images at 0.5 mm isotropic resolution for mesoscale R2* and susceptibility mapping. We then accelerated this with a 3D EPI protocol (EPI factor of 3) to achieve higher resolution without extending scan time. Increasing the EPI factor naturally led to a motion-robust BOLD fMRI protocol, aligning with our NIH-funded goals. Developing robust fMRI at 10.5T is timely amid rising interest in ultra-high field MRI for research and clinical use, enabling detailed brain studies.

MRMH: What problem or limitation in current MRI practice does your paper aim to address?

https://onlinelibrary.wiley.com/doi/10.1002/mrm.70110

Shuxian Qu: The paper addresses achieving high-quality whole-brain BOLD fMRI in humans at 10.5T amid challenges like field inhomogeneities, RF non-uniformity, and motion.

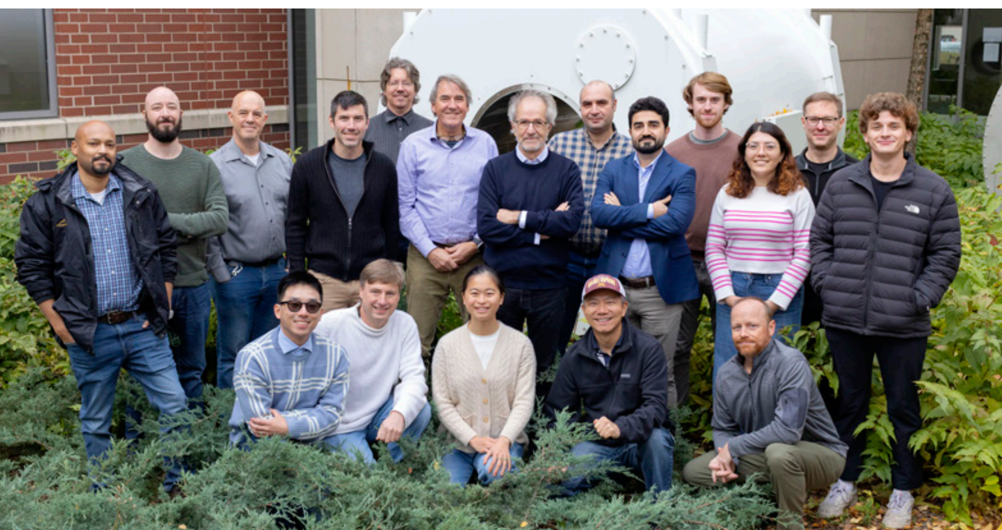
MRMH: Why is this problem important — scientifically, clinically, or methodologically?

Shuxian: Solving it drives novel methods for ultra-high field fMRI with superior spatiotemporal resolution and robustness, potentially advancing human neuroscience.

MRMH: Can you summarize the main idea of your paper in accessible terms for a broad MR audience? What distinguishes your approach from previous work in this area?

Shuxian: The paper demonstrates high-quality whole-brain BOLD fMRI in humans at 10.5T by synergistically combining advanced imaging technologies.

Xiaoping: We integrate three key techniques — motion-robust 3D GRE EPI, parallel transmission, and high-density RF array design — to eliminate RF shading while enabling highly accelerated, high-resolution,



The CMRR Engineering group, University of Minnesota

motion-robust whole-brain BOLD fMRI.

MRMH: What are the key technical or conceptual innovations introduced in this work?

Xiaoping: The key conceptual innovation is showing that synergistic combination of: (1) motion-robust 3D GRE-EPI; (2) dynamic parallel transmission pulse design; and (3) a 16-channel transmit 80-channel receive RF array enables high-quality BOLD fMRI of the entire adult brain at 10.5T.

MRMH: What were the biggest challenges you encountered during this research? How did you overcome these, either technically or practically?

Shuxian: Challenges included: (1) upgrading the pulse sequence to support parallel-transmit workflows with dynamic water-selective excitation pulses; and (2) creating a practical 3D GRE-EPI protocol suitable for fMRI. We overcame them through close collaboration with experts at NINDS (NIH) and UT Southwestern Medical Center.

MRMH: How did you validate your method or findings, and what gave you confidence in the results?

Shuxian: We validated using resting-state fMRI data, evaluating temporal SNR, amplitude of low-frequency fluctuation, and regional homogeneity. Confidence stemmed from using established, open-source BIDS-based pipelines.

MRMH: Were there any results that surprised you or changed how you think about the problem?

Xiaoping: We initially planned to compare functional connectivity in eyes-open vs eyes-closed resting states to show motion correction benefits. However, our small sample size (five participants) yielded unexpected results versus literature. We shifted to eyes-open data for quality demonstration, publishing accordingly, and shared eyes-closed data publicly.

MRMH: How could this work be used or extended by other researchers or clinicians? What are the main barriers to broader adoption or implementation?

Xiaoping: While applicable to 7T fMRI, barriers include: (1) our implementation used a Siemens-only parallel-transmit pulse sequence; and (2) there is expertise needed for a successful parallel transmit workflow. Solutions are vendor-agnostic sequences (e.g., Pulseq) and universal pulses for plug-and-play parallel transmit.

MRMH: Let's talk about aspects of reproducibility and Open Science: are data, code, sequences, or tools from this study publicly available?

Shuxian: Yes, data, code, and tools are public per the paper. The sequence is available via Siemens C2P or Dr Jeff Duyn's group at NINDS (NIH).

MRMH: How do you see your method integrating with other emerging MRI techniques or frameworks? What are the next steps you are most excited about?

Xiaoping: We are currently pursuing integration with: (1) advanced reconstruction for static/high-order dynamic field corrections to reduce artifacts/distortion; and (2) universal pulse design for user-friendly plug-and-play parallel transmission.

Shuxian: The next steps are applying our method at 10.5T for task fMRI with motion-prone tasks, submillimeter resting-state fMRI, and mesoscale partial-brain fMRI for layer-specific activation analysis, advancing neuroscience.

MRMH: If you could give any advice to researchers — especially early-career scientists — interested in this area, what would it be?

Xiaoping: Build strong collaborations, prioritize open science, and focus on synergistic integration of complementary techniques. Collaboration was essential to carry out this study. CMRR's Engineering group built the 16Tx/80Rx RF array. Partners at UT Southwestern (Dr Jiaen Liu) and NINDS (Dr Jeff Duyn's group, including Jacco de Zwart and Peter van Gelderen) developed the pulse sequence and image reconstruction for motion-robust fMRI.

MRMH: What do you hope readers take away most from this paper?

Xiaoping: High-quality, motion-robust whole-brain BOLD fMRI at 10.5T is achievable today through thoughtful combination of state-of-the-art tools.

MRMH: Finally, what do you enjoy doing outside of your research and work in MRI?

Shuxian: I enjoy tennis, strength training, baking, and cooking for mental reset and balance. ■

CONTRIBUTORS

Maria Eugenia Caligiuri

***Magnetic Resonance in Medicine Highlights* Magazine Editor**

Maria Eugenia is an Associate Professor in Physics for Life Sciences at Magna Graecia University in Catanzaro, Italy. She completed her PhD and part of her post-doctoral experience working at the Institute of Molecular Bioimaging and Physiology of the National Research Council. Her work focuses on advanced methods for multimodal MRI fusion and on their application in the field of neurological disorders and healthy brain aging. Maria Eugenia is the proud mom of Federico and Michelangelo (tiny humans) and Pulce (a not-so-tiny cat), and in her free time enjoys listening to music, binge-watching TV series with her husband, and being a crazy-cat-lady.

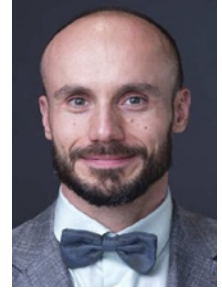
Anaïs Artiges

After completing her PhD at Paris-Saclay University (NeuroSpin, France), Anaïs joined New York University (U.S.A) for her first postdoctoral position, followed by a second postdoc at King's College London (UK). Her research focuses on making MRI technology more accessible by contributing to open-source pulse sequence development with tools such as GinkgoSequence and mtrk, as well as studying ultra-low-field MRI systems. She is enthusiastic about open science and open-source MRI initiatives. In her free time, she likes to practice Aikido, go on hikes, and cook for her friends.

Malathy Elumalai

Malathy Elumalai is an Associate in Research at the National High Magnetic Field Laboratory (NHMFL,Tallahassee, USA), specializing in the development of MRI probes for pre-clinical imaging at 21.1T. Following the completion of her MS in Electrical Engineering, she has focused on designing and building MRI probe instrumentation, optimizing coil designs, and troubleshooting NMR/MRI electronics. In her spare time, she enjoys reading books and gardening. She is also passionate about STEM education and participates in outreach programs to inspire K-12 students.

Francesco Giganti



Francesco is Associate Professor of Radiology at University College London, UK, and Consultant Radiologist at University College London Hospital. He obtained his PhD in prostate MRI at University College London. Francesco's main area of expertise is genitourinary imaging, with a specific interest in prostate MRI during active surveillance (PRECISE score), prostate image quality (PI-QUAL score) and prostate MRI after focal treatment (PI-FAB score). He is an expert in teaching prostate MRI to radiologists and urologists, and part of the team commissioned by the European Association of Urology to deliver Europe-wide training courses. He is currently the chair of the ESUR Prostate MRI working group, a member of the PI-RADS steering committee and a Junior Fellow of the ISMRM.

Tom Griesler

Tom is a PhD candidate in Biomedical Engineering at the University of Michigan, Ann Arbor. His research focuses on MR Fingerprinting sequence design and reconstruction to enable quantitative body MRI beyond conventional T1 and T2 mapping. He is also interested in cross-vendor sequence development using Pulseq for advancing quantitative MRI standardization and reproducibility. Outside the lab, Tom enjoys exploring Michigan on long-distance bike trips, baking sourdough bread, and reading.

Julius Heidenreich

Julius is a radiologist at University Hospital Würzburg, Germany, a research fellow at the University of Wisconsin–Madison and a Junior Fellow of the ISMRM. His work focuses on quantitative MRI of the liver, heart, and lungs, with the aim of bridging the gap between methodological innovation and clinical implementation. Outside of academic radiology, he enjoys spending time with his family and friends.

Diego Hernando

Diego is Associate Professor of Radiology and Medical Physics at the University of Wisconsin-Madison. Diego's research is focused on the development and translational validation of quantitative imaging biomarkers for MRI of the body. He has particular interest in the quantification of chronic liver disease, and diffusion MRI of the abdomen. Diego is a Fellow of the ISMRM, and also enjoys cooking and playing soccer.

CONTRIBUTORS

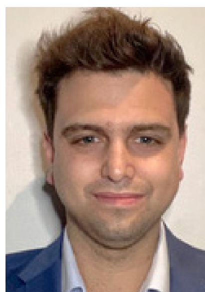
Andrada Ianuş

Andrada is a Lecturer in Healthcare Engineering at King's College London, UK. Her research focuses on the development of advanced MRI techniques for mapping tissue microstructure, with applications ranging from neurodegenerative diseases to oncology. She has a particular interest in the theoretical modeling of diffusion MRI and its translational implementation in both preclinical and clinical settings. In addition to her research, Andrada is an active member of the ISMRM community, currently serving as Vice-Chair of the ISMRM Iberian Chapter, and is dedicated to mentoring the next generation of imaging scientists.

Christian Langkammer

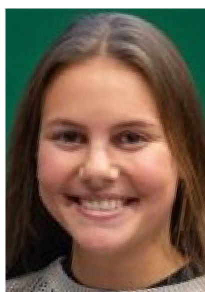
Christian works at the Medical University of Graz, Austria, and his research focuses on iron and myelin in the brain, with a particular interest in post-mortem MRI and quantitative susceptibility mapping. Also, in his free time, those wonderful 1H protons are his favorite things in the world, in all their glorious states of matter: snow, ice, and water hold a special place in his heart.

Cristian Montalba



Cristian Montalba is a Medical Technologist who obtained his Master's degree from the Pontifical Catholic University of Chile. He has been actively involved in the global MRI community as a member of ISMRM (since 2016) and ISMRT (since 2021). He also contributes to initiatives of ESMRMB, including MRI Together and CAMERA (Consortium for Advancement of MRI Education and Research in Africa). His research focuses on advancing MRI technology, particularly in brain imaging and the integration of artificial intelligence into clinical practice. His work promotes international collaboration and aims to strengthen the impact of MRI in both research and healthcare. Outside of academia, Cristian enjoys extreme sports, swimming, going to the beach, watching TV series, and traveling.

Elisa Saks



Elisa is a PhD student at the Technical University of Munich, Germany. She works on the optimization and clinical translation of various quantitative MRI techniques in the brain and spinal cord for multiple sclerosis imaging. Her previous projects have focused on contrast-agent-free perfusion imaging of the brain. In her free time, she enjoys weightlifting, taking long walks, and cooking.

Sophie Schauman

Sophie is a postdoctoral researcher at the Karolinska Institutet in Stockholm, Sweden. She completed her PhD at the University of Oxford, before spending some time at Stanford University broadening and deepening her expertise in advanced MRI acquisition and reconstruction methods. Now, her focus is on developing motion-robust imaging methods in the interface between methods development and clinical translation. She also has a strong interest in spreading reproducible research and open science practices. Outside the lab she enjoys Brazilian jiu-jitsu, spending time outdoors, and exploring new places.

Utsav Shrestha

Utsav is a Scientist at the University of Wisconsin–Madison, where his work focuses on quantitative MRI, particularly relaxometry techniques for abdominal and cardiac imaging, with an emphasis on translational research. Additionally, his research interests encompass image processing, simulation, and machine-learning and deep-learning. In his free time, he enjoys hiking, camping, and visiting national parks.

Daiki Tamada

Daiki is a Scientist at the University of Wisconsin–Madison. His research focuses on the development of novel quantitative MRI methods, including T1 and T2 mapping, fat quantification, and diffusion-weighted imaging. His research interests include pulse sequence development, Bloch equation simulations, and the application of deep learning for quantitative analysis. In his personal time, he enjoys DIY projects and spending time with his family and two cats.

Kexin Wang

Kexin recently began a postdoctoral position at Cedars-Sinai Medical Center, Los Angeles, after completing her PhD in Biomedical Engineering at Johns Hopkins University. Her research focuses on technical development and clinical application of Chemical Exchange Saturation Transfer (CEST) MRI. Following her PhD work on brain CEST, she has begun expanding her investigations to other body regions. Kexin is actively involved in ISMRM, and serves as the trainee representative of the ISMRM CEST Study Group. In her spare time, she loves swimming, playing tennis, and cooking.

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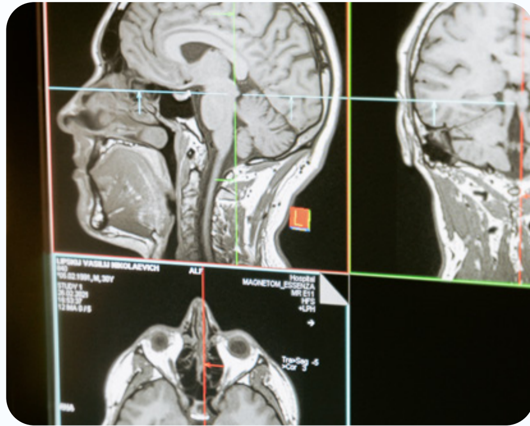

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