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Editorials

Some reflections on OHBM 2024

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In this commentary, I offer a personal account of major themes and trends of the 2024 meeting of the Organization for Human Brain Mapping (OHBM) in Seoul, Korea. I focus on the proliferation of approaches that combine human magnetic resonance imaging (MRI) with computational models and data acquired in other species using diverse imaging techniques. I propose that this integrative approach will help us overcome the measurement limitations of human MRI and open new scientific opportunities for the future.

I would like to begin this perspective with what I perceive to be an uncontroversial statement: OHBM 2024 was a smashing success.

Taking place against the spectacular backdrop of Seoul, the vibrant culture, delicious food, and warm hospitality of our hosts, combined with the excellent scientific content, ensured that the conference lived up to the high expectations set by Montreal in 2023.

Here, I offer my personal reflections on some salient themes of the meeting and thoughts on what they mean for the field of human brain mapping. The content that I discuss here represents a highly subjective selection from a much broader and richer scientific program at the 2024 meeting. My omission of any specific contribution does not reflect my opinion on its importance. My choices result from my own biases concerning the approaches that I find interesting or promising. These biases then shape my views on the major themes of the meeting and the trends that will shape the field in the coming years.

To provide some context, the first OHBM meeting that I attended took place nearly two decades ago in Florence in 2006, during the final year of my PhD. My attention at that time was focused on two topics. The first was my desire to learn the basics of fMRI analysis. My PhD relied on structural magnetic resonance imaging (MRI), but classical activation mapping based on general linear modelling dominated the field and I was keen to explore different ways of characterizing brain function. The second topic was brain connectivity, as I always had an interest in network models of the brain. Dynamic causal modelling had recently been introduced to the field,[1] the seminal paper by Sporns, Tononi, and Kötter[2] calling for a map of the human connectome had just been published, and approaches for brain-wide mapping of structural connectivity and functional coupling were on the horizon.[3-5]

The next OHBM meeting I attended was two years later, in my home city of Melbourne in 2008. Ironically, despite having spent most of my life in Melbourne, I was based in the UK at the time and had to fly back for the conference. Studies of resting-state functional coupling had exploded in popularity since the Florence meeting and I distinctly remember heated debates in Melbourne over the degree to which resting-state signals reflected fluctuations of neuronal activity or other physiological processes, as well as debates over the validity of pre-processing procedures such as global signal regression. Nearly 15 years later, these questions continue to haunt the field, as exemplified by the 2024 symposium entitled *To Regress or Not? An Update on the fMRI Global Signal Debate*. It was fascinating to hear how the work of Thomas Liu, Dmitri Van De Ville, Lucina Uddin, and Sepehr Mortaheb, is advancing the field's thoughts about this contentious issue.

I have been fortunate enough to attend most OHBM meetings since 2008. Each time, I notice how the popularity of different analytical or theoretical approaches grows. Eventually, each approach either becomes a staple of the neuroimager's toolkit or falls out of favour because it did not deliver on its initial promise. Examples of approaches that have emerged and persisted to this day which are salient in my memory include the rapid rise of connectomics (an area in which I have worked for most of my career); the widespread application of machine learning and other techniques from data science to understand links between neuroimaging and behavioural or clinical phenotypes; the growing appreciation and rapid uptake of open science, particularly with regards to data and code sharing; and, more recently, the rise of methods for personalized brain mapping, such as normative modelling and precision imaging, both of which featured strongly at the 2023 meeting.

A common thread that links these trends is a focus on developing new and improved ways of extracting the most information possible from human MRI data. At the 2024 meeting, I noticed a different focus; one that emphasized the integration of human MRI with computational models and data acquired using other imaging modalities and in other species. These approaches have existed since the inception of the field, but their increasingly widespread adop-

tion was, for me, a clear point of distinction at the Seoul conference.

This shift in focus was evident in Zarin Machanda's Talairach lecture on the evolutionary origins of leadership, which provided a fascinating insight into the biological correlates of social dynamics occurring within non-human primate communities. Her keynote was complemented by 4 of the 7 outstanding keynote lectures, which all considered how human MRI data could be combined with, or augmented by, computational modelling and/or measures acquired in different species or with different imaging modalities. We heard about Seong-Gi Kim's high-resolution fMRI work in animal models, Emma Burrows' research on behavioural assessments in preclinical research, Nicola Palomero-Gallagher's studies of the chemoarchitecture of human and non-human primate brains, and Mac Shine's biophysical modelling of diverse neurophysiological signals recorded in multiple species to understand relationships between cellular and macroscale neuronal dynamics. These lectures were accompanied by the wonderful keynotes of Emily Finn, Luis Concha, and Lucia Melloni, who respectively covered the imaging of subjective experience, network-based approaches to understanding epilepsy, and adversarial collaborations to investigate the neurobiology of consciousness.

Multi-scale, multi-modal, and multi-species approaches were also heavily featured in the symposia. I had the pleasure of co-organizing one session with James Pang called *In the Light of Evolution: Principles of Brain Organization Deduced from Cross-species Neuroimaging,* which featured exciting new contributions from Martijn van den Heuvel, Ting Xu, Nicole Eichert, and James, himself. This work demonstrated how comparative studies can shed light on fundamental aspects of brain structure and function. A similarly themed symposium entitled *Multi-scale, Multi-species Neuroimaging: Translational Perspectives for Neuroscience,* featured the excellent work by Silvia Gini, Mallar Chakravaty, Gemma Modinos, and Tomoko Sakai demonstrating how analyses across scales, modalities, and species can enhance classical human MRI research in health and disease. The symposium entitled *Advances in Network Neuroscience: Towards Connectome-based Predictions and Mechanisms* provided further compelling examples of the power of such integrative approaches from Jacob Vogel, Arianna Menardi, Caio Seguin, and Sepideh Sadhaghiani.

On a more personal note, I was privileged to once again participate in the Mentor's Lunch organized by the Student and Postdoc Special Interest Group (SP-SIG). The volunteers comprising the SP-SIG should be congratulated for their hard work on improving the opportunities and experiences of early career researchers (ECR). The lunch offers a wonderful way to connect with ECRs, learn about the challenges they face, and help develop strategies for overcoming potential obstacles. It is one of my favourite events of the OHBM Schedule.

I was deeply grateful to receive the OHBM Mentor Award. Throughout my career, I have been blessed with the good fortune to work with an extraordinary team of students and postdocs who have taught me more than I have taught them. Their passion, dedication, resilience, and ingenuity make each day in the lab a joy, and the Award is really a recognition of their efforts. It was an incredible honour to accept it on their behalf and to share the stage with the exceptional scientists receiving other awards at the 2024 meeting, such as Vince Calhoun (Glass Brain Award), Bratislav Misic (Early Career Investigator Award), Adriana Di Martino (Open Science Award), Rosanna Olsen (Diversity and Inclusivity Champion Award), Ariel Rokem (Education in Neuroimaging Award), Odile Feys (Karl Zilles Award), Helmet Karim (Replication Award), Samira Maria Epp (Sustainability Award), and the new OHBM Fellows Anqi Qiu, Thomas Yeo, and Arno Villringer.

In my opinion, the emphasis on multi-scale, multi-modal, and multi-species approaches at the 2024 meeting is a sign that our young field is coming of age. As a community, we have developed a broad array of conceptual and analytic tools for mapping the human brain and have made considerable progress in understanding their strengths and limitations. We have realized that reliance on classical cross-sectional correlations and related approaches will have limited value for understanding causal mechanisms. Faced with the limitations of our measurement tools, we are forced to develop alternative strategies to gain mechanistic insights. We are now starting to look beyond MRI in the hope that such insights might be provided by mathematical models or other experimental designs where the limitations of human MRI do not apply. Armed with a rapidly developing infrastructure for sharing analysis code and data, developed both within our community and the broader field of neuroscience, we are now able to exploit the potential gains offered by these models, diverse imaging modalities and experimental techniques, and comparative multi-species analyses. In the years to come, this expansive and integrative approach will only expand the horizon of research questions that we can tackle as a field. The future looks bright.

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CONFLICTS OF INTEREST

AF has no conflicts to declare.

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REFERENCES

1. Friston KJ, Harrison L, Penny W. Dynamic causal modelling. *NeuroImage*. 2003;19:1273-1302. doi:10.1016/S1053-8119(03)00202-7

2. Sporns O, Tononi G, Kötter R. The human connectome: A structural description of the human brain. *PLoS Comput Biol*. 2005;1:e42. doi:10.1371/journal.pcbi.0010042. PMID:16201007

3. Hagmann P et al. Mapping human whole-brain structural networks with diffusion MRI. *PLoS One*. 2007;2:e597. doi:10.1371/journal.pone.0000597. PMID:17611629

4. Salvador R et al. Neurophysiological architecture of functional magnetic resonance images of human brain. *Cereb Cortex*. 2005;15:1332-1342. doi:10.1093/cercor/bhi016

5. Achard S, Salvador R, Whitcher B, Suckling J, Bullmore E. A resilient, low-frequency, small-world human brain functional network with highly connected association cortical hubs. *J Neurosci*. 2006;26:63-72. doi:10.1523/JNEUROSCI.3874-05.2006. PMID:16399673