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Editorials

Communication is the foundation of an impactful and resilient scientific community

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Scientific communities play a critical role in the structure and process of science. Creating and sustaining these communities relies on clear channels of communication to enable the effective and inclusive exchange of ideas, norms, and practices. "Science communication" is therefore a critical part of the overall research ecosystem, but one that is traditionally undervalued. While popular uses of the term primarily focus on communicating science to lay audiences, science communication among peers also plays a crucial role in the growth and maintenance of professional scientific communities, such as the Organization for Human Brain Mapping (OHBM). Based on our experiences as Chairs of the OHBM Communications Committee, we argue that effective science communication is critical to building and sustaining an impactful, inclusive, and resilient scientific community. We highlight how mediums including the OHBM podcast, blog, and newsletter support and strengthen its parent community, while also fostering connections with adjacent communities with overlapping specializations such as the International Society for Magnetic Resonance in Medicine (ISMRM) and field-wide neuroscience efforts such as The Transmitter. We argue that science communication extends well beyond traditional publications and improves the research process and outcomes, both for individual researchers as well as the field more broadly.

Popular depictions of scientific research in television and films—whether fictional, like Bruce Banner in Marvel's *The Hulk*, or biographical, like Alan Turing in *The Imitation Game*—typically center on the work of individual scientists, emphasizing personal characteristics and achievements.[1] However, this focus on the "lone genius" is increasingly critiqued[2] and indeed outdated as scientific fields—including our own field of human neuroimaging—increasingly rely on large-scale collaborative efforts to handle the growing sample sizes, analytical complexity, and data heterogeneity that dominate 21st century science.[1] Re-conceptualizing science as the work of *communities* rather than individual researchers is now necessary.

While the idea of scientific communities follows a rich intellectual history,[3] embracing this perspective requires evolving our ideas of scientific practice. Rather than solely focusing on the outputs of the scientific process such as publications, we need to surface the many interactions that drive science forward.[4] These collaborative interactions are a key form of "science communication" that is often overlooked but critical for exchanging and advancing scientific ideas (National Academies of Science, 2018).[1]

We specifically argue that collaborative science communication—beyond the traditional publication—is the foundation of an impactful and resilient scientific community, one that is ready to take on the next challenges facing broader society. We center this argument on our own experiences as chairs of the Communications Committee for the Organization for Human Brain Mapping (OHBM), a large scientific society within human neuroimaging. To structure our argument, we first consider how we can measure the health of a scientific community, before turning to how science communication increases the **"impact"** of scientific communities and how it improves their **"resilience,"** highlighting throughout our experiences within the OHBM community. We then take a broader lens, highlighting how

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1 Indeed, "communication" and "community" share word roots: Latin *communis*, or "common."

strong scientific communities are able to meet epistemic and social challenges. Finally, we make concrete suggestions for improving communication in scientific communities based on our own experiences leading the OHBM Communications Committee.

MEASURING SCIENTIFIC COMMUNITIES AND THEIR HEALTH

Defining the exact boundaries of scientific communities based on mutual influence is non-trivial.[5] Both formal and informal research networks shape scientific communities; for example, researchers may formally identify as members of a scientific society (such as OHBM) or informally participate in a community of practice (by, for instance, using the same modelling tools).

Regardless, communication plays a key role in shaping these scientific communities. This form of communication overlaps with and supports "community engagement"; that is, how members of a community engage with one another to share skills, resources, and information.[2] The value of community engagement is increasingly recognized via investment in dedicated community manager positions[6] and the institutionalization of best practices.[7] The supporting work of scientific communication, however, remains underrecognized by research institutions. To highlight the importance of scientific communication, we outline our own experiences as Chairs of the OHBM Communications Committee and the evolving roles that the committee has met within the organization.

A CASE STUDY: EVOLVING ROLES FOR THE OHBM COMMUNICATIONS COMMITTEE

The brain mapping community has a long history of openness and communication. For example, the original Statistical Parametric Mapping (SPM) software was released in 1991, and in "the spirit of open science, it was then distributed to collaborators and other interested units around the world".[8] Capitalizing on this spirit, the OHBM Communications Committee (ohbm-com.com) was established in 2016 with two core charges: (1) supporting communication between OHBM's members and (2) sharing the organization's work with the broader scientific community and general public.

While the two roles are synergistic, the public-facing role is perhaps more visible, producing publications in lay media outlets such as the Huffington Post[9] and public lectures accompanying the annual OHBM meeting. Our time as Chairs, however, also highlighted the critical work of intra-OHBM communication, particularly as OHBM transitioned from an annual meeting to a scientific society in 2018. Today, the Communications Committee maintains a range of initiatives to meet this need, including the OHBM Blog, the *Neurosalience* podcast, and the OHBMonthly newsletter. We are also involved in *ad hoc* initiatives to improve the dissemination of OHBM-generated materials, including recent work on OHBM Time Machine, our ongoing effort to publicly share previous Annual Meeting presentations.[10]

These initiatives have significantly expanded in scope as the organization has grown. For example, initial work from the Communications Committee helped to establish the main organization website and social media presence; the Committee's initial efforts were also heavily influenced by other successful communication efforts, such as the MRM Highlights from the International Society for Magnetic Resonance in Medicine (ISMRM). Today, we provide year-round content across four main platforms: blog, podcast, newsletter, and lay media. This evolution has mirrored and supported the growth of OHBM as a scientific society, creating more channels of communication for members year-round, and often directly affecting internal change. For instance, a 2019 OHBM Blog post by Hiromasa Takemura asked "Why do so few Japanese members give talks at OHBM?" and quantified the discrepancy between Japanese poster and oral presentations. This post was influential throughout the community, contributing to Program and Education Committees including geographic diversity as a key metric by which to assess the inclusivity of the annual meeting[11] and inspired other sub-teams, such as the Open Science Special Interest Group, to highlight inclusivity in the design of their online meetings.[12]

While our focus on the OHBM Communications Committee has been—by its very nature—tightly centered on a single society, the insights we have drawn from this work can be generalized across scientific communities. Specifically, we argue that effective science communication within a scientific community increases its impact and its resilience. We consider each of these features in turn.

IMPACT: HOW SCIENTIFIC COMMUNITIES INTERFACE WITH A BROADER CONTEXT

Scientific communities do not exist in isolation but within a broader context, which includes both their own researchers as well as other (non-)overlapping scientific communities and society at-large. Here, we consider how a scientific community interfaces with and effects change on these other groups to be its "impact".[3] Science communication

2 This definition aligns with the Center for Scientific Collaboration and Community Engagement (CSCCE) and is distinct from "public engagement," in which researchers engage with key stakeholders from the broader non-scientific community. We note that these forms of engagement are nonetheless complementary.

3 As an aside, while "research impact" is actively studied in bibliometrics, we note that our definition is not tied to any specific metrics of the societal impact of research.[13,14]

increases opportunities for community impact at multiple scales, from raising awareness among colleagues to creating new opportunities for funding or collaboration.

Within the OHBM community, we have seen repeated examples of how communication supports impact. For example, 2022 Open Science Award recipient Russell Poldrack has pointed towards his team's public conversations on the social media platform X, formerly known as Twitter, as instrumental in securing philanthropic support (https://osf.io/ha8gx) for the early development of the Brain Imaging Data Structure (BIDS).[15] Underscoring the impact of this initial connection, BIDS now represents a global standard in data curation, facilitating streamlined development and shared tooling across groups. We have also seen how scientific impact can be limited by existing network structures within a community. For example, analysis of Twitter data from 2010–2021, including around the OHBM conference, found that researchers from East Asia were significantly underrepresented in social media interactions around international scientific conferences.[16] This example highlights the multiscale nature of scientific communities and the associated challenges of creating impact across scales: from local (e.g., departmental or geographical) to global (e.g., international conferences) to inter-disciplinary (e.g., lay media or funding) networks.

Creating positive impact requires scientists to be aware of and to effectively use existing communication channels. For individual researchers, the need for this awareness is especially acute when existing communication platforms undergo a major shift, as evidenced by the outward migration of "science Twitter" to alternative platforms.[17,18] Even without explicit awareness, social media platforms still powerfully shape opportunities for impact.[19] As the social media landscape evolves, the research community will need to continue to evolve with it—not only to reach out to non-scientists, but also to meet members of our own community where they already are. In addition to "traditional" mediums like X/Twitter, Bluesky, and LinkedIn, OHBM has taken steps to broaden its social media presence, including regular visual-forward posts to the OHBM Instagram account. Future efforts could include short-form video such as TikTok, YouTube Shorts, and Instagram Reels, capitalizing on OHBM's large and growing video content on YouTube (linked in Table 1).

Many other media types, beyond social media, have been especially successful at creating impact along different scales. Specifically, both (1) longform written media such as blogging and newsletters, as well as audiovisual or audio-only media such as (2) videos and (3) podcasts, have successfully shaped field dialogue and practice. We highlight a few influential examples of each media type, including our own efforts from the OHBM Communications Committee, in *Table 1*. These mediums have also seen significant change over the past decade. Blogging, for example, seemed to be supplanted by social media (at one point termed "microblogging") through the 2010s. Recent changes to the social media landscape have reversed this trend. Now, as researchers re-think content ownership[20]—and readers re-appreciate insights longer than 280 characters—new long-form mediums have emerged, such as Substack newsletters.

LIMITED COMMUNICATION CHALLENGES COMMUNITY IMPACT

Critically, all of the above examples of impact arise from open and collaborative communication between scientists sharing knowledge, techniques, and resources. As readers may be aware, however, the current academic system does not directly support this exchange, instead favoring journal publications as the main currency of academic output.[4] Scientists who wholly subscribe to this mindset—publishing journal papers without participating in exchanges across any other media—opt out of these opportunities for impact. This undercuts the exchange of ideas throughout the scientific process, yielding downstream negative effects: over time, these effects can compound to yield field-wide challenges, like the replication crisis in the field of Psychology (discussed further below). Fortunately, many of the solutions can be found through open communication of issues and community-led initiatives.[21] In particular, by allowing for more voices to engage in research throughout the scientific process, we expect that the resulting science will create more positive impacts across communities. To sustain these impacts, however, requires "resilience."

RESILIENCE: HOW SCIENTIFIC COMMUNITIES SUSTAIN THEMSELVES OVER TIME

Science communication builds awareness within a community, allowing members to construct and maintain the necessary supports to address issues—whether they come from internal or external sources—both argumentatively as well as adaptively.

Successful, long-standing scientific communities often share many similar features, so communication across these groups facilitates adaptation to rapidly changing scientific and social landscapes. Indeed, seemingly distinct fields often encounter similar technical issues: for instance, a session at the 2024 ISMRM Annual Meeting highlighted methodological similarities between imaging in medicine vs astrophysics (such as the use of k-space). The shared issues can also be social, such as mass resignation of the *NeuroImage* editorial board to *Imaging Neuroscience* in protest of publication fees,[22] which largely mirrored the resignation of the *Machine Learning Journal* editorial board in favor of the *Journal of Machine Learning Research* (https://www.jmlr.org/statement.html). We note that the success of the move to *Imaging Neuroscience* critically de-

4 We note that many initiatives (e.g., SF DORA; https://sfdora.org/read/) continue to promote other, alternative forms of scientific output, though adoption is still limited.

Table 1. Examples of impactful science communication efforts across multiple media types. Here we provide direct links to efforts from the OHBM Communications Committee across these mediums, as well as a small number of other prominent examples in the field of human brain mapping. Note that this table is not intended to be exhaustive; we provide an updating AirTable instance here for a more comprehensive listing: https://airtable.com/apph5y3vIowpY0o7e/shre8reoL4WqaBHWX

Media Type	Example	Link
Written (i.e., blogs, newsletters)	*OHBM Blog*	ohbm-com.com/blog
	Andy's Brain Blog by Andrew Jahn	andysbrainblog.com
	The NeuroAI Archive by Patrick Mineault	neuroai.science
	practiCalfMRI	practicalfmri.blogspot.com
Videos	*OHBM Time Machine*	youtube.com/c/organizationforhumanbrainmapping
	Layer fMRI by Renzo Huber and Faruk Gulban	layerfmri.com
	Mumford Brain Stats by Jeanette Mumford	youtube.com/c/mumfordbrainstats
	Neuroccino by Stephanie Forkel	stephanieforkel.com/neuroccino
Podcasts	*Neurosalience* by Peter Bandettini	ohbm-com.com/podcast
	Brain Inspired by Paul Middlebrooks	braininspired.co
	Building Up the Nerve by NINDS	ninds.buzzsprout.com
	Language Neuroscience by Stephen Wilson	langneurosci.org/podcast

pended on a cohesive network of strong in-community communication—from editors meeting at OHBM to wide community support over social media.

Interactions with adjacent communities also build the reputation and expertise of a given community. It can enable new frameworks that include the community, perhaps even centrally. For instance, Finn et al. (2023)[23] argue that brain mapping (in this case, fMRI) can serve as a hub that brings together computational, clinical, systems-level, and cognitive neuroscience into an integrated neuroscience. Together, these examples reinforce that fields should be distinct only insofar as it facilitates efficient field-specific progression, but should stand together on shared issues and broader goals. This balance can only be achieved with regular communication between fields through both formal and informal mediums.

While we can imagine concrete actions we can take to improve our community's resilience, we can just as easily imagine—or remember—instances of community fragility, unfortunately facilitated by poor communication practices. For instance, decades of work in the field of psychology maintained traditional experimental and analytical approaches, despite early calls to enhance the robustness of best practices.[24] Rather than **self-policing**, the field engaged in **self-protection**—leading to significant damage to the reputation of the field once it became clear that the commonly used experimental and statistical practices were falling far short of robustness.[25] Fortunately, the community opened itself to internal and external critique in order to improve its practices, turning the field into a testing ground of scientific and statistical best practices.[26,27]

CHALLENGES TO RESILIENCE

Resilience can help a community survive challenges from multiple fronts. For instance, when a community is pressured by external forces (whether they be a pandemic, natural disaster, or funding uncertainty), having multiple forms of expertise and areas of investigation can help the community stay active. For evidence of this, we only have to look back a few years to the COVID-19 pandemic: Although new brain imaging data collection was severely disrupted, the community had fortunately built up a large collection of open datasets and expertise in accessing and using them, allowing PhD students and others to continue their research, albeit with a modified approach. Taking this methodological diversity further, an openness to new techniques allows a scientific community to evolve over time as research needs (and, perhaps, funding priorities) shift. An easy example of this comes from the brain imaging community: functional imaging was dominated by PET imaging in the late 1980s and early 1990s, but thanks to pioneering work from within the community, functional MRI was not only developed but embraced, allowing brain mapping to grow and thrive beyond its previous, PET-defined borders.[28]

Securing access to funding has been a mainstay of scientific challenges throughout the history of scientific achieve-

ment, though there are occasions where shifting governing policies or economic events acutely augment such struggles. In such cases, the strength of collaborative networks—particularly with institutions or groups less affected by a given stressor—can be crucial to a community's resilience. For example, where funding for students and staff becomes scarce, strong international collaborations may facilitate the mobility of researchers between groups. This not only supports individuals who might otherwise face uncertain prospects, but also enriches science more broadly through the exchange of diverse ideas and expertise.

An essential aspect of a resilient community (or indeed any resilient system, cf. natural ecosystems), is diversity. Diversity in methodologies, ideas and problem-solving approaches arise from the varied expertise, educational backgrounds, and cultural perspectives of its members. In this way, the resilience of a scientific community arises in large part from the diversity of the people of whom it is composed. By actively promoting inclusivity and broad representation across multiple domains, we make the field more accessible to historically underrepresented groups and strengthen the scientific enterprise as a whole.

Building an inclusive community can take place in many ways, including education, advocacy, and accessibility. OHBM has been a leader in this regard, with a long-standing education program at the annual meeting that provides an entry point for newcomers to the field of brain mapping. Additionally, satellite workshops and hackathons built around the OHBM Annual Meeting have been instrumental in spreading best practices in data collection and analysis. In terms of advocacy, OHBM established a dedicated Diversity and Inclusion Committee to build support for current members and to grow our community more broadly. Among many accomplishments, this committee has published Best Practices for fostering inclusive environments,[11] creating diverse data sets,[29] and supporting multilingual neuroscience education.[30] More recently, the OHBM Time Machine project has significantly expanded access to brain mapping research by releasing a decade of past annual meeting content on YouTube—educational and research material that were previously accessible only to active (paying) members of the organization.[10] The Communications Committee previously published tutorials integrating video content from across OHBM presentations in an effort led by previous committee chair Ilona Lipp (https://www.ohbm-brainmappingblog.com/tutorials.html). However, the videos themselves were locked behind the membership paywall. Now, the Time Machine initiative enhances accessibility of brain mapping research for OHBM members unable to attend a given annual meeting in person and opens the field to adjacent disciplines and the broader public. A final example is the newly introduced 'public lecture' that now accompanies each annual meeting. The public lecture invites local members of the community in which the annual meeting is being held to share in the exchange of knowledge facilitated by the meeting.

By sharing our work more openly, we invite a wider range of perspectives and critiques—an essential ingredient in building long-term resilience.

HEALTHY SCIENTIFIC COMMUNITIES ARE READY TO TAKE ON THE NEXT CHALLENGES FACING BROADER SOCIETY

TACKLING CHALLENGES TO SCIENTIFIC METHODS AND IDEAS

An impactful and resilient scientific community can effectively address new challenges to its field of study, its members, or larger society. For instance, in 2016, Anders Eklund, Thomas Nichols, and Hans Knutsson published an immediately influential paper that questioned the statistical validity of thousands of fMRI studies.[31] The influential nature of the "Cluster Failure" paper meant it was covered beyond the neuroimaging community, with articles appearing in *The New York Times*[32] among other global media. While the original paper prompted the field to re-interrogate its standard practices, some of the public media coverage framed this not as the mark of a healthy scientific community but instead as a critique of ongoing and future fMRI work.

Fortunately, the neuroimaging community—in particular, the OHBM community—was prepared: the Committee on Best Practice in Data Analysis and Sharing (COBIDAS) had released its report on "Best Practices in Data Analysis and Sharing in Neuroimaging using MRI"[33] at roughly the same time that the "Cluster Failure" paper was published. Then, just a few weeks later, Jeanette Mumford led an OHBM Brain Mapping Blog post directly addressing the findings of Eklund and colleagues, encouraging the brain mapping community to "Keep Calm and Scan On".[34] Indeed, by facilitating conversations around best practices in fMRI, the OHBM community was ready to address critiques about the field by demonstrating how to solve real problems in data analysis and promoting methodological best practices.

More recently, this same spirit of engagement has allowed us to make connections with other field-wide initiatives such as The Transmitter from the Simons Foundation. This collaboration has so far taken the form of a quarterly newsletter to both communities but may expand to other mediums in the future. The collaboration represents a novel opportunity for OHBM to reach researchers across the broader field of neuroscience.

FACING THE PUBLIC: BUILDING A KNOWLEDGEABLE SOCIETY

In the face of unstable political climates, a healthy scientific community is capable of responding to threats to the scientific enterprise that have society-wide implications such as scientific disinformation; i.e., unchecked sensationalist "information" that can spread rapidly on social media and in conversation.[35] It is thus critical for researchers to stay engaged with the broader communities their work can impact. Indeed, knowing and connecting with one's community is critical to fight for meaningful policy improvements (such as CFC phase-outs; https://nvdatabase.swarthmore.edu/content/greenpeace-pushes-global-ban-cfcs-1986-1995) as well as to mount large-scale

impactful resistance to potential and actual damaging policy changes, evidenced by the 2017 March for Science and the Stand Up For Science 2025 movement.[36] Active lines of communication enable rapid responses to social and political challenges, speaking to the value of science communication detailed earlier in this piece.

The impact of the community to broader society—whether through clinical applications, economic contributions, or intellectual discoveries—can take the forefront in discussions about the role of science in society. While beyond the scope of this article, regular conversations about our own work and science more generally with non-scientific audiences—whether with members of one's family or friend group, social or religious organization, or elsewhere—demystifies the scientific enterprise, demonstrating the human faces behind scientific advances.

LET'S BUILD AN IMPACTFUL AND RESILIENT COMMUNITY TOGETHER

A scientific community is built by its members while also supporting the growth of its community members as individuals. Within a community, communication is key for healthy interactions and facing new intra- and inter-community challenges.

By improving scientific practice, communication builds more **impactful** science, capable of providing more definitive answers about our environments and ourselves. By sustaining awareness within a community, communication supports the community's **resilience** in building the necessary structural supports to address the issues. Critically, an impactful and resilient community facilitates the sharing of ideas by individuals with diverse backgrounds, perspectives, and voices, generating new scientific insights while also providing more opportunities for individuals to learn from and contribute to the scientific enterprise.[11,37]

CREATING YOUR OWN COMMUNICATIONS COMMITTEE

Within the neuroscience community, OHBM's Communications Committee connects brain mappers—across career stages and around the globe—to strengthen our community in the face of rapid methodological, societal, and political changes. We hope that the success of this effort encourages other communities to create or reinvest in their own Communications Committees. Based on our experiences, we provide a few concrete suggestions for getting started:

First, ensure that you have the active support of leaders in the organization and at least one champion who will advocate for improving communication in your community. Establishing clear channels of communication means being able to work across an organization; having the support of existing leaders is critical for this.

Second, recruit members widely. For one example from our own experience in the Communications Committee, the *Neurosalience* podcast's distinctive tone and impact emerged from Peter Bandettini's unique expertise and stature in neuroimaging. At the same time, other ideas—such as the transition to video podcasts on YouTube and the cross-posting to foreign-language streaming services—came from team members across many different demographics and career states.

Third, create as you can. The OHBM Communications Committee was instrumental in launching and maintaining multiple social media accounts for the organization (Twitter/X, Instagram, and YouTube), providing natural platforms for regular outreach. Former Chair Nils Mulhert noted that, during his term, the committee published 52 blog posts in 52 weeks covering a variety of topics related to the brain mapping community.[38] This regular outreach requires no small amount of work, but it is necessary to raise and maintain awareness within the community across a range of issues, from upcoming organizational events to shared challenges. Additionally, it provides team members with training opportunities to improve their writing and communication abilities, skills that are useful throughout a scientific career.

Finally, build on the community's strengths. One of the greatest challenges for an organization is to avoid silos, in which members are only aware of what is ongoing within their own subgroups. By sharing wins across multiple levels of the organization (e.g., local chapters, committees, or special interest groups), members can be aware of both ongoing efforts as well as potential opportunities for collaboration. The OHBM Communications Committee regularly recaps events hosted by other OHBM committees and special interest groups, and we actively solicit contributions from those groups to highlight the impressive work being done by individuals across the brain mapping community.

CONCLUSION

As scientific researchers, each of us is a member of our scientific community, just as we are each members of global society. Communication strengthens the impact and resilience of our scientific communities, building a stronger scientific enterprise. We encourage readers to broaden their own communication efforts—beyond scientific publications—and to consider getting involved with or establishing their own organizations' communications committees to further the impact and resilience of their scientific communities.

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CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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