A JOURNAL BY SISSA MEDIALAB

ESSAY

Examining science and art collaborations through a social psychology lens reveals the need for Third Spaces

Karleigh Groves, Fanuel J. Muindi and Arianna Zuanazzi

Abstract

SciArt is an evolving field that seeks to bring together art and science. Numerous SciArt spaces and initiatives exist, bridging the gap between the two and fostering interdisciplinary collaborations. However, personal and interpersonal obstacles have been identified for both artists and scientists within the context of SciArt collaborations and environments. Here, we first introduce key concepts about SciArt and then leverage theories from social psychology in the study of group dynamics, including social and group identity, group norms, and minority dissent and influence, to examine artist-scientist collaborations and their challenges. Drawing on social psychology frameworks, our goal is to inform and encourage the creation of Third Spaces that identify common ground between practitioners, foster balanced interactions, build shared group identity and new group dynamics, and ultimately move beyond discipline-specific identities and institutionalized environments.

Keywords

Science and technology, art and literature

Received: 2nd March 2025
Accepted: 15th August 2025
Published: 29th September 2025

1 ▪ Background: science, art, SciArt

1.1 ▪ *The divide between science and art*

Science and art are both crucial for understanding the human condition and the everyday phenomena that we encounter. However, these two disciplines — and the people who practice these fields as professions and/or for personal interests (i.e., *artists and scientists*) — are frequently viewed as being opposite. While art and science were not seen as two siloed disciplines until the 19th century, a more explicit divide began to be promoted in the 20th century [Snow, 1959; Zhu & Goyal, 2019]. For instance, Roger Sperry — an American neuropsychologist and Nobel laureate — conducted research that inspired the popular notion that people are either *left-brain* or *right-brain* dominant, and this would impact crucial aspects of their personality, including their affinity for either logical pursuits or artistic ones [Sperry, 1984]. While this notion and other strong stances in support of this divide have been rejected and criticized [e.g., Nielsen et al., 2013], a division between artists and scientists is still ingrained into much public discourse [e.g., Benedetti, 2024; Berger, 2021; Buchter, 2023; Thresher, 2023]. More recently, the emergence of a field known as *SciArt* has aimed to bridge art and science by fostering interdisciplinary collaborations and bringing together practitioners from both disciplines (see Figure 1). The term *SciArt*, which represents the integration of science and art, was first introduced in the late 1960s by artist and physicist Bern Porter and reappeared around the year 2000, later followed by terms such as *ArtSci*, *Art/Science*, and *Science-Art* [Silveira, 2021; Sleigh & Craske, 2017].

1.2 ▪ *SciArt programs*

Although scientists working in the field of science (blue icons in blue circle in Figure 1) and artists working in the field of art (red icons in red circle in Figure 1) represent the most common social and professional realities, there are instances where individual identities and group dynamics intersect, creating complex and multifaceted configurations. Some individuals who identify as both scientists and artists (yellow icon in Figure 1) occupy science (blue circle in Figure 1) or art spaces (red circle in Figure 1). For instance, there are neuroscientists who also identify as visual artists and work in a lab. Similarly, there are artists working in art studios who also identify as scientists based on their educational background, e.g., in biology. Finally, people of different identities can occupy the same SciArt space (purple intersection in Figure 1 and see Table 1 for examples of SciArt initiatives). While SciArt spaces foster fruitful collaborations, they have historically developed as sub-spaces within institutional environments, where individuals with different identities are invited primarily for short-term engagements. As a result, SciArt spaces often maintain pre-existing group dynamics — including existing imbalances — such as artists-in-residence embedded within scientific labs (*SCIArt* spaces) or scientists serving as consultants in art studios (*sciART* spaces).

SciArt spaces may exhibit remarkable diversity in their structure, purpose, and approach to fostering interdisciplinary collaboration. This diversity reflects the varying goals, institutional contexts, and cultural environments in which these collaborations occur. Many of these spaces have been previously mapped and analyzed across different dimensions [e.g., Bennett & Dudo, 2024], cover a range of different purposes, and target different practitioners (see Table 1). For example, some spaces aim to bridge the gap between scientific communities

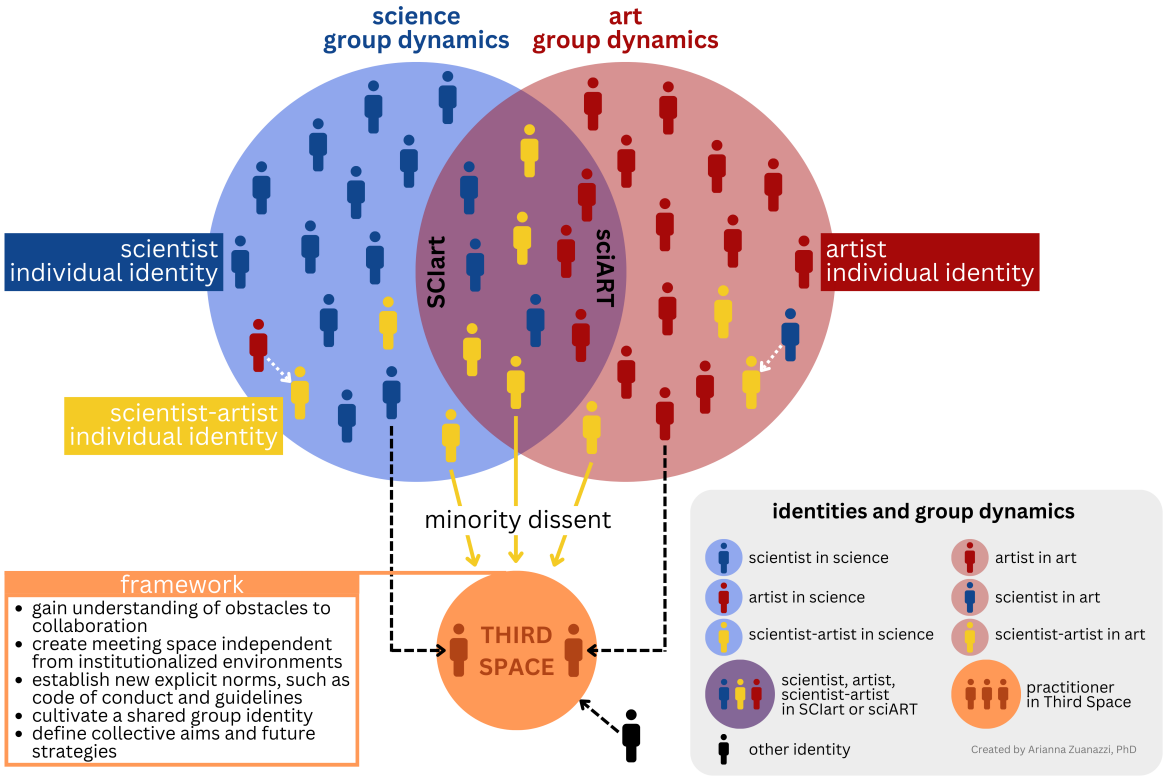

Figure 1. *Science and art identities, group dynamics, and Third Spaces*. In our framework, we consider both the individual identity (human icon) and the group or space in which specific social and professional dynamics occur (circles). An individual can identify as a scientist (e.g., a neuroscientist; blue icon), an artist (e.g., a visual artist; red icon), or a scientist-artist (e.g., a biomaterial practitioner; yellow icon). Each individual can belong to one or more social or professional dynamics, exhibited in science spaces (e.g., a lab; blue circle), art spaces (e.g., an art studio, red circle), or SciArt spaces (e.g., a community lab; purple intersection, see Table 1). Individual identities are fluid and shaped by a variety of factors, including the norms and expectations of the spaces that individuals occupy. For instance, an individual who identifies as a visual artist may work in a scientific laboratory as an artist in residence and, over time, their identity may evolve toward that of a scientist or scientist-artist (white dotted arrows). SciArt spaces (purple intersection) may be created and remain blends of the two pre-existing group dynamics (science and art) and thus inherit potential imbalanced relationships (*SCIart*, if science dynamics predominate; or *ARTsci*, if art dynamics predominate), rather than representing a balanced *Third Space*. Third Spaces (orange) are entirely new environments and transcend the institutional norms and identities of science and art. These spaces may be initiated by individuals with single identities (biologist, visual artist; blue and red icon) or multifaceted identities (e.g., biomaterial practitioners; yellow icon), who seek to move beyond conventional science, art, or intersectional spaces. Individuals who create Third Spaces are often driven by a sense of disagreement with existing dynamics (i.e., *minority dissent*, yellow arrows). Third Spaces require the establishment of new identities (orange icon) and group dynamics (orange circle), and are built upon shared goals and commonalities of the members (see framework box). Ultimately, Third Spaces welcome others to participate (i.e., *minority influence*, black dotted arrows), by establishing inclusive and synergistic dynamics.

and broader audiences through art-based experiences and community-driven initiatives, ranging from provocative events and calls for action, to impactful storytelling and the promotion of inclusive participation. Some SciArt initiatives focus on timely and impactful themes such as health, technology, biomaterials, and conservation, which are areas where

science and art intersect in dynamic and novel ways. Other virtual and physical SciArt spaces emphasize fostering interdisciplinary co-creation and mutual learning between scientists and artists, often through collaborations within structured, supportive environments. Together, these SciArt spaces and many others demonstrate how different institutional contexts, collaborative models, and cultural objectives shape their interdisciplinary practices. The diversity of SciArt spaces highlights their adaptability and potential to foster innovative dialogues at the intersection of science and art.

Table 1. Examples of existing initiatives that involve science and art, along with their practitioners, and their diverse purposes. See also https://mediaengagement.org/art-science-collaboration-database/ [Bennett & Dudo, 2024]

Initiatives	*Theme*	*Practitioners*	*Brief description*
Lifeology[1] *Science Ceilidh*[2] *SMASHFEST*[3]	Public Engagement	Practitioners across diverse backgrounds and affiliations, including grassroots groups, librarians, youth workers, and educators.	Develop multidisciplinary research and art initiatives to engage with the public and make scientific concepts accessible and inclusive.
Guerilla Science[4] *Earth. Art. Activism*[5]	Activism	Practitioners interested in public engagement with science including artists, activists, scientists, philosophers, and community advocates.	Train practitioners in public engagement and instruction with science and create provocative events that blend scientific content with art to advocate for and contribute to an environmentally conscious and life-affirming culture.
Science New Wave[6] *Art the Science*[7] *SciArt Exchange*[8] *ArtSciLab*[9] *Pioneer Works*[10] *STEAMPlant Initiative* at Pratt[11] *The Triangle Program* at the Simons Foundation[12] *The SciArt Initiative*[13] *Arts@CERN*[14] *Xerox PARC's PAIR*[15] *Wellcome Hub Award*[16]	Co-Creation	Practitioners across disciplines in both art and science.	Promote interdisciplinary projects, R&D, and educational programs that merge scientific inquiry with artistic exploration, emphasizing co-creation and experiential learning, informing artistic approaches through scientific discoveries, and challenging scientific paradigms through artistic inquiry.

[1] https://lifeology.io/
[2] https://www.scienceceilidh.com/
[3] https://www.gre.ac.uk/research/activity/las/smash-fest
[4] https://guerillascience.org/
[5] https://www.mollymurfee.com/earth-art-activism
[6] https://www.sciencenewwave.com/
[7] https://artthescience.com/
[8] https://www.sciartex.net/
[9] https://artscilab.utdallas.edu/
[10] https://pioneerworks.org/
[11] https://www.pratt.edu/liberal-arts-and-sciences/math-and-science/steamplant-initiative/
[12] https://www.simonsfoundation.org/science-society-culture/grantmaking/the-triangle-program/
[13] http://www.sciartinitiative.org/
[14] https://arts.cern/
[15] https://doi.org/10.7551/mitpress/1390.001.0001
[16] https://wellcome.org/research-funding/schemes/hub-award

Continued on the next page.

Continued from the previous page.

Initiatives	*Theme*	*Practitioners*	*Brief description*
Fred Hutch Public Art and Community Dialogue[17] The *MIT Center for Art, Science & Technology (CAST)*[18] *ArsTechne*[19] *Australia Network for Art and Technology (ANAT)*[20]	Health & Technology	Practitioners across diverse backgrounds and affiliations in art and science.	Integrate public art with community engagement initiatives, creating platforms for discourse around health, technology, biomedical research, and societal issues, and novel forms of science communication that appeal to diverse audiences.
Art+Bio Collaborative[21] *BioBAT Art Space*[22] *Genspace*[23]	Biology & Life Sciences	Practitioners across disciplines in art and science, with a focus on biology and life sciences.	Foster the integration of biology and life sciences with art through innovative collaborations, public engagement, education, and research.
Genestreaming[24] *PAST & All from One*[25] *Ayatana's Biophilium: Science School for Artists*[26]	Conservation	Practitioners across disciplines in art and science, with a focus on community members and individuals who identify as indigenous or from the region.	Programs, funding opportunities, and educational opportunities to engage artists and scientists in collaboration with local community members to support conservation efforts in the local area.

[17] https://www.fredhutch.org/en/news/center-news/2022/03/public-art-community-dialogue-unveiled.html
[18] https://arts.mit.edu/cast/
[19] https://arstechne.net/en/
[20] https://www.anat.org.au/#home-main
[21] https://www.artbiocollaborative.com/
[22] https://www.biobatartspace.com/
[23] https://www.genspace.org/
[24] https://www.genestreaming.com/
[25] https://past.org.za/
[26] https://www.artayatana.com/

1.3 ▪ *Challenges for artists and scientists*

Scientists and artists often approach interdisciplinary collaboration with distinct methods and goals, which can create challenges for effective partnership. Scientists typically strive for precision and clarity, whereas artists may be open to greater flexibility:

> "*I think what they're aiming for and what we're aiming for are slightly different things… [for us] things have to be precise and unambiguous whereas I think they're happier to live with the ambiguity of things and just to pose questions whereas I suppose we're trying to resolve questions. (S6 [scientist interviewee])*" [Dowell & Weitkamp, 2012].

The overarching goals of SciArt are often explored and defined in relation to science engagement, education, and research dissemination/communication [Borghesani et al., 2022; Dowell & Weitkamp, 2012; Halpern & Rogers, 2021; Marizzi & Bartar, 2021; Segarra et al., 2018; Sleigh & Craske, 2017; Wilkinson & Weitkamp, 2016] but, in fact, SciArt has the potential to hold much broader significance, variability, and scope. A study interviewing 131 artists and creators practicing SciArt showed that only one-third considers communicating science a goal when practicing SciArt [Fleerackers et al., 2022]. This suggests that a key challenge of SciArt as a field is that artists' goals are often not fully understood [Fleerackers et al., 2022]. Thus, although many SciArt programs aim to

communicate science and engage broader audiences, viewing SciArt solely as a form of science promotion is a fundamentally biased approach, which assumes that SciArt should uphold the notion that science is (1) the dominant discipline, (2) an absolute truth, (3) complex and difficult to understand, and (4) holding a primary role, whereas art is seen as ancillary. The artist's quote below exemplifies possible consequences of this assumption:

> "*Often when I go to a scientist, I'm not going on an equal footing, as I may know virtually nothing about their field initially. So I arrive with my ears open, don't demand too much of their time, and try to outline for them how such a project might develop. I certainly don't demand that a scientist gives me any kind of respect right from the outset: I hope to earn that through the course of the project.*" [Hawkins, 2014]

Evidence supporting these biases includes inherent differences in group identity (see *Group Identity* section below), observed power imbalances within SciArt groups, and the asymmetrical relationship between science and art, with science occupying the dominant position ['Collaborations with artists go beyond communicating the science', 2021; Sleigh & Craske, 2017; Hawkins, 2014]. Those power dynamics can depend on how spaces are defined, with more laboratories hosting "artists in residence" than art studios hosting "scientists in residence". Artists are seen as assistants to scientists who can learn from scientists and should not misrepresent science, and funding is unevenly distributed between art and science practitioners [Dowell & Weitkamp, 2012; Sleigh & Craske, 2017; Hawkins, 2014]. While scientists might view SciArt as a branch of science outreach, aimed at simplifying and making scientific facts more accessible while keeping them accurate, artists have emphasized different goals for SciArt, such as critiquing and questioning scientific discoveries and processes, placing scientific information in a social or political context, exploring alternative research approaches, making science surprising, and raising awareness, while noting that these objectives are often deprioritized [Adler & Rock, 2022; Dowell & Weitkamp, 2012; Fleerackers et al., 2022; Sleigh & Craske, 2017; Schnugg, 2019; Schnugg & Song, 2020].

While stereotypes and biases significantly affect artists in the SciArt field, scientists also face challenges when attempting to engage in interdisciplinary collaborations or initiatives like SciArt. Some examples include: lack of knowledge about opportunities, lack of professional incentive, fear that engaging in non-traditional academic activities could undermine their research performance, and being seen as competent but not particularly warm or trustworthy [Andrews et al., 2005; Bennett & Dudo, 2024; Chappell & Muglia, 2023; Ecklund et al., 2012; Fiske & Dupree, 2014; Fleerackers et al., 2022; Kassab, 2019; Ramchandani, 2018; Roberts, 2006; Segal & Meroz, 2023; Woitowich et al., 2022]. While the field of science communication is a rapidly developing field [e.g., see Baram-Tsabari & Lewenstein, 2017; Bennett et al., 2025; Davies et al., 2019; Fähnrich et al., 2021; Guenther & Joubert, 2017], historically, scientists who engage with the public are perceived as less effective academics or researchers compared to those who do not engage with the public [Martinez-Conde, 2016]. Since SciArt often aims to engage with non-academic audiences and promote interdisciplinary collaborations, the participation of scientists in SciArt is significantly hindered by this stereotype, as described in the scientist's quote below from 2016:

> "*If one has received a Nobel Prize, then communication with the public is acceptable, even expected. But when one begins to speak about one's science to the public early in one's career, I think there might well be some punishment from the field. This of course should not be, if the work is solid and the applications are appropriate. But I suspect that it's a price junior people unfortunately have to pay.*" [Martinez-Conde, 2016]

While this experience may be less pronounced in contexts where science is also oriented toward impact, the lack of institutional support for science engagement (whether in funding, training, or career advancement) makes meaningful interaction with other practitioners or the general public difficult and deprioritized, and highlights the need for more intentional engagement opportunities [e.g., Muindi & Luray, 2023].

1.4 ▪ *Language and communication barriers*

Even if SciArt collaborations were incentivized, balanced, free from stereotypes, with aligned goals and methods between artists and scientists, communication or language barriers would still persist. Since both artists and scientists are specialists, it can be difficult for them to compartmentalize their unique abilities and limitations when working with others; in the same vein, there is no default, readily available common language between scientists and artists, and developing such a common language and communication style requires extended periods of mutual trust and respect between the two groups [Dowell & Weitkamp, 2012; Ellison & Borden, 2022; Ramchandani, 2018]. Though many of these issues are part of larger structural issues in society, higher education, or politics, barriers like goal setting, power dynamics, and communication challenges are interpersonal issues that can be addressed by looking at SciArt collaboration through the lens of group dynamics, a field in social psychology.

In the following paragraphs, we clarify interpersonal barriers in the SciArt collaboration space by applying a social psychology framework. We focus on three major concepts from social psychology research in group dynamics: (1) group identity, (2) group norms, and (3) minority dissent and influence. As an effective approach to art-science collaborations, we emphasize the need for the creation of new groups and spaces as *Third Spaces* [Bennett & Dudo, 2024; Ellison & Borden, 2022; Muller et al., 2015, 2020], as emergent spaces in their own right, rather than intersections of science and art. A Third Space emerges as a fluid and in-between space where new collaborations, interests, and values are negotiated [Bhabha, 2012]. Practitioners in those spaces share the same newly-formed individual and group identity and, differently from more traditional SciArt spaces, aim to follow norms intentionally created for the space, rather than adopting those of existing contexts (see orange icon and circle in Figure 1). Overall, by applying social psychology findings and ideas, we aim to contribute to clarifying some of the most common issues within the space of SciArt that emerge as part of institutionalized spaces, help to improve SciArt collaborations between practitioners within the field of science or art, and promote the creation of Third Spaces.

2 ▪ Approach: examining science and art collaborations through a social psychology lens

2.1 ▪ *Group identity*

Social identity theory is one of the most widely applied theories in social psychology and describes how people align themselves with social groups based on a common, shared identity [e.g., gender identity, political affiliation; Tajfel & Turner, 1979]. Here, we apply a key component of social identity theory called *affiliative motives* [Blader et al., 2017] to evaluate how artists and scientists align themselves with their own group identity.

People who identify with a group (e.g., "I belong to the scientist group", "I belong to the artist group") exhibit the characteristics and prototypes that are associated with that group [Blader et al., 2017]. In this particular case, widely held cultural and social prototypes may portray the scientist as an older white man in a lab coat, performing experiments in a clean laboratory [e.g., Ferguson & Lezotte, 2020], and the artist as an extravagant white man in a smock, creating art in a studio [e.g., Borowiecki & Dahl, 2021; Lingo & Tepper, 2013; Topaz et al., 2022]. These representations do not reflect the diversity of people who actually work in these fields. Each scientist and artist makes this judgment, too — *am I as much an artist/scientist as what I think an artist/scientist is believed to be?* This often leads to generalizations about all of the members of a group, societal biases, and it promotes stereotyping of each group.

Stereotypes can make collaborations difficult, together with social and group identities, which can affect when and why artists and scientists hit roadblocks. There are certain qualities that artists view as making them artists and that scientists view as making them scientists, which leads to the idea that the other does not share, or even understand, their same values and behaviors. As an example, scientists like engineers and artists like musicians both show about the same levels of creativity [Charyton & Snelbecker, 2007], but they might label it with different terms to align with how creativity is traditionally described within the group they identify with, thus missing the opportunity for fruitful collaborations.

In summary, this alignment with either being an "artist" or a "scientist" can have effects on how artists and scientists view the same values and seek partnerships. Programs (i.e., organized activities or designated physical spaces) developed as Third Spaces should aim to overcome these differences in group identity. They should look to position artists and scientists on equal footing by stressing shared group attributes that are abstracted away from the specific discipline and identity, while still emphasizing the unique aspects that artists and scientists contribute and the importance of these individual identities in a group setting. Those programs can look to create a cohesive group identity and emphasize similarities between art and science practitioners instead of looking at group divides. For instance, they can focus on how both disciplines are based on creativity, process, experimentation, discovery, invention, engagement, documentation, and progress, among other commonalities. Removing programs from being directly tied to a specific institution or environment (e.g., laboratories, art schools) could remove stereotypes as it removes scientists and artists from their more traditional spaces, making these divides in identity less prevalent and their identity as a "scientist" or "artist" less salient, or perceivable, to them [Chappell & Muglia, 2023, see Figure 1].

2.2 ▪ *Group norms*

In a space that is designed explicitly for SciArt collaborations, establishing new group norms for artists and scientists can help achieve shared goals. Group norms find their basis in the concept of group identity that we mentioned above. The same affiliative motives that drive people to align themselves based on their identity with a social group also motivate them to behave in certain ways. Some general examples of group norms we all might have experienced are: being a good neighbor, treating others the way you want to be treated, not littering, or waiting your turn in line. While we do not typically associate these with a specific group, such as being a part of a certain political party, these are general group norms that can be applied to a variety of groups in society, or just being a part of human communities.

Because people create social groups based on shared identities, they also either explicitly or implicitly create norms in these groups for how people should behave based on shared values [Van Bavel et al., 2022]. Most often, we think about group norms being implicit ones: we often do not have to state what they are, but we expect ourselves and the other members of our group to follow them. Norms guide our behavior by being the (often unspoken) rules that tell us how we should behave in a group or community; they also have an impact on how we judge other people's behaviors and how we expect that they will judge ours [UNICEF, 2021].

How does this apply in the case of SciArt? For scientists, communication style is typically considered a group norm [Gastel & Day, 2022]. For instance, scientists follow a specific line of written communication when they present their work, often starting with background information which then leads to a hypothesis, followed by a description of an investigation (e.g., an experiment, literature review), results of the investigation, and a discussion about the implications of those results [American Psychological Association, 2020]. Another example is that group norms in science promote to a lesser degree collaborations outside of their field [Xie et al., 2018]. Conversely, artists are more likely to explore diverse communication formats, forms of collaborations, and workspaces [Bruce, 2023]. As a result, breakdowns in communication between artists and scientists due to different group norms can create conflict or misunderstandings. They can also undermine trust between the two groups and building trust between and within groups is necessary for social cohesion [Packer & Ungson, 2024].

New group norms can emerge when new groups are formed within Third Spaces, whether implicitly or explicitly, for instance through adherence to widely accepted societal norms or the gradual adoption of new group norms from both artists and scientists [Ehrhart & Naumann, 2004; Feldman, 1984]. Applied social psychological theories of group norms in organizations and management studies demonstrate that a variety of factors can contribute to creating group norms in new spaces, but they are likely to develop over time through explicit statements, such as those given by a code of conduct or shared guidelines, or recommendations given by leaders [Feldman, 1984]. However, it is important to highlight that group norms are inherently a collective feature of groups and the individuals that are a part of them, which means that, as much as group norms can affect individuals, individuals also affect group norms [Ehrhart & Naumann, 2004]. New group norms in Third Spaces can be developed by following the example of other group settings (e.g., workplaces), where leaders and members work together to create and reinforce shared norms based on their values and goals. Gradually, these norms can then be implicitly shifted and molded as the Third Space changes and grows in different ways. Norms can then be integrated with other

frameworks used in the development of SciArt initiatives, such as community building frameworks (i.e., structured approaches for creating and nurturing effective communities) and knowledge building frameworks (i.e., structured approaches for creating and nurturing knowledge across and within groups of individuals), to further mold Third Spaces to the goals and needs of the practitioners involved [Browne, 2024; Scardamalia & Bereiter, 2010].

If artists and scientists can align themselves with a new group identity that is part of a collective group identity, they might be able to adopt new group norms to inform behaviors, build trust within the SciArt group more easily, and have more fruitful collaborations. These outcomes are possible because of the dynamic nature of individual and group identity, and previous research has demonstrated that people can adapt their identities to new social contexts and environments [Packer & Van Bavel, 2015]. Though we often think of group norms and identity as being relatively constant over time, we can transcend our personal and social identities (for instance, being an artist or a scientist) by developing a new group identity within Third Spaces.

2.3 ▪ *Minority dissent*

Generating group identities and norms in newly created Third Spaces can substantially change the way we think of SciArt. While this implies a structural change of entire groups of people, individual members play a crucial role in initiating those changes and in affecting group dynamics. *Minority dissent* occurs when one or a few members go against the rest of their group and the group's norms. This can turn into *minority influence*, where one or a few members of a group enact larger change for the entire group. For instance, the women's rights movements worldwide, such as the women's suffrage movement in New Zealand, which was the first self-governing country to grant all women the right to vote in national elections, stand as powerful examples. A small group of citizens took issue with women being unable to vote and dissented from that norm, which was shared by many other countries at the time, and was able to influence a larger societal impact.

This example illustrates how minority dissent can occur as a result of normative conflict, or conflict that happens when members of a group disagree with a group norm or set of norms [Packer, 2008, 2011]. Can minority dissent be applied to the case of SciArt? Considering the normative conflict model developed by Packer and Miners [2014], there could be group norms that artists or scientists disagree with that could motivate them to disagree with their specific group and promote change, including change that can make their group more receptive to collaboration with the other group. A minority of scientists, artists, or scientists-artists might not agree with the field's communication style, collaboration format, time allocations, public interest, and professional incentives, to name a few. This minority ignites an institutional change and leads to the creation of new spaces, or Third Spaces [Ellison & Borden, 2022, see yellow arrows in Figure 1], and eventually welcome others to participate (see black dotted arrows in Figure 1).

3 ▪ A framework for rethinking SciArt spaces and building Third Spaces

Understanding both historical and emerging issues in the interaction between scientists and artists, and recognizing that interdisciplinary collaboration can benefit from established

social psychological dynamics observed in other group interactions, provides a foundation for practitioners to rethink SciArt spaces and foster the creation of Third Spaces. Our conception of Third Spaces here can be understood to connect to its initial usage [Bhabha, 2012] and describes a physical or abstract space that extends beyond the simple intersection of art and science.

First, practitioners should look to identify fellow artists, scientists, scientists-artists, or other interested parties who are experiencing normative conflict with their respective disciplines when engaging in interdisciplinary interactions. These individuals will be more likely to engage in minority dissent to then help in the development of a Third Space. They can be engaged at interdisciplinary conferences, through connections with existing SciArt initiatives (e.g., see Table 1), or within institutionalized spaces. Engaging with local communities and individuals outside institutional settings can also be valuable for attracting new participants and enriching the diversity of the space. In some cases, individuals may seek out these types of flexible spaces by themselves.

Practitioners may then gain a deep understanding of the obstacles to collaboration, which can vary depending on the discipline, specific context, and individual goals, to name a few. This process can involve surveys, focus groups, interviews, or other forms of collaborative engagement to ensure that diverse perspectives are heard. Clarifying previously encountered obstacles and their impact on interdisciplinary collaborations can provide a foundation for fostering new group dynamics and cultivating new identities within a Third Space (e.g., see *Science Ceilidh* in Table 1).

Once individuals are identified as being interested in building or joining a Third Space, practitioners should attempt to remove barriers for their Third Space by looking to host their collaboration in a physical (or digital) space that is independent from the affiliations of the individuals involved. This could include community spaces, private rental spaces, or even digital environments (e.g., see *Genspace* in Table 1). Outfitting the new collaborative space as a group, shaping not only its appearance, but also its shared rituals and the ways in which each individual contributes, can foster a stronger sense of belonging.

Once individuals are invited to join the Third Space, and they begin to come together as a newly created and cohesive group, social psychology principles outlined above should be leveraged to establish new explicit norms (e.g., see *ArsTechne* in Table 1). Code of conduct and guidelines for collaborations should transcend the specific discipline and should be informed by existing knowledge and community-building frameworks, rather than relying on the practices of traditional science and art spaces [e.g., Browne, 2024; Scardamalia & Bereiter, 2010]. The development of a code of conduct or guidelines can also serve as an additional community-building exercise for practitioners in the Third Space, before they engage in collaborative work. For instance, practitioners could introduce an explicit norm and method (e.g., a "talking token") for respecting others' space and time when presenting new ideas, encouraging mindful communication among all participants.

Within this new space, individuals should then learn how to cultivate a shared group identity that is separate from their identities as scientists, artists, or any other previously defined identity, and learn how those identities can coexist. Individuals should also be encouraged to share their expertise with each other and equally provide training and background information when required (e.g., see *SciArt Initiative* in Table 1). New identities should be based on commonalities between participants' interests, methodologies, and goals. These

can be fostered through intentional conversations, community-building activities, and shared experiences beyond the collaborative work, which help surface personal values and deepen connections.

Finally, throughout this process, both general and specific aims should be collaboratively established and shared by all individuals participating in the Third Space. These aims may range from conveying scientific concepts through unconventional means, to inspiring reflection and dialogue, and even challenging the traditional methods and outputs of both science and art. Clearly defined, shared goals will not only guide the methodologies employed but also shape funding strategies, potentially leading to the development of new funding models and opportunities to showcase work that move beyond traditional formats which often privilege one discipline over the other [see Muindi, 2025].

By developing a solid, well-tested framework for Third Spaces (see framework box in Figure 1), practitioners can inspire the creation of new environments and programs that enable transformative experiences in the development of inter- and transdisciplinary knowledge.

4 ▪ Conclusions

Though SciArt spaces are still growing (see Table 1), the existing programs and collaborations that have been developed so far have faced barriers. While some of these barriers require larger structural changes, through our discussion considering social psychological concepts and approaches, we hope to have provided SciArt practitioners with a framework to utilize as they develop new programs and collaborations, to overcome interpersonal barriers that may present. Third Spaces are best positioned to move beyond the specific language and discipline prioritization of institutionalized spaces, thus creating an inclusive environment where diverse perspectives can coexist to foster innovation and mutual growth (see Figure 1).

Acknowledgments

We want to thank Jiin Jung, Dominic Packer, and Matteo Farinella for their helpful and kind feedback and suggestions. KG and AZ were supported by the Civic Science Media Lab.

References

Adler, S., & Rock, J. (2022). Intentionality in engagement: understanding the motivations of SciArt practitioners. *Scope (Art & Design)*, *23*, 68–72. https://doi.org/10.34074/scop.1023012

American Psychological Association. (2020). *Publication Manual of the American Psychological Association: the official guide to APA style* (7th ed.). American Psychological Association. https://doi.org/10.1037/0000165-000

Andrews, E., Weaver, A., Hanley, D., Shamatha, J., & Melton, G. (2005). Scientists and public outreach: participation, motivations, and impediments. *Journal of Geoscience Education*, *53*(3), 281–293. https://doi.org/10.5408/1089-9995-53.3.281

Baram-Tsabari, A., & Lewenstein, B. V. (2017). Science communication training: what are we trying to teach? *International Journal of Science Education, Part B*, *7*(3), 285–300. https://doi.org/10.1080/21548455.2017.1303756

Benedetti, L. (2024). Art in science: a gateway to public engagement. *ASCB: an International Forum for Cell Biology*. https://www.ascb.org/science-outreach/art-in-science-a-gateway-to-public-engagement/

Bennett, N., & Dudo, A. (2024). *The landscape of art-science collaboration programs*. Center for Media Engagement, The University of Texas at Austin. https://mediaengagement.org/research/landscape-of-art-sciencecollaboration-programs

Bennett, N., Dudo, A., & Besley, J. (2025). Science communication spaces as "pockets of belonging": inviting in a plurality of science identities for scientists-in-training. *Science Communication*, *47*(2), 250–275. https://doi.org/10.1177/10755470241268587

Berger, K. (2021). Who said science and art were two cultures? Revisiting C.P. Snow's infamous thesis. *Nautilus*. https://nautil.us/who-said-science-and-art-were-two-cultures-238351/

Bhabha, H. K. (2012). *The location of culture*. Routledge. https://doi.org/10.4324/9780203820551

Blader, S. L., Patil, S., & Packer, D. J. (2017). Organizational identification and workplace behavior: more than meets the eye. *Research in Organizational Behavior*, *37*, 19–34. https://doi.org/10.1016/j.riob.2017.09.001

Borghesani, V., Nagy, Z., Lussier, D., Xu, T., Chauvin, R. J., Brovkin, A., Kochunov, P., Dagher, A., Narayanan, S., & Badhwar, A. (2022). A stage for neuroscience and art: the OHBM BrainArt SIG perspective. *Aperture Neuro*, *2*, 1–11. https://doi.org/10.52294/apertureneuro.2022.2.jgpx9164

Borowiecki, K. J., & Dahl, C. M. (2021). What makes an artist? The evolution and clustering of creative activity in the US since 1850. *Regional Science and Urban Economics*, *86*, 103614. https://doi.org/10.1016/j.regsciurbeco.2020.103614

Browne, G. R. (2024). An *evidence cycle* framework for community development initiatives. *Community Development Journal*, *59*(1), 30–48. https://doi.org/10.1093/cdj/bsac011

Bruce, D. (2023). The role of collaboration: exploring the benefits and challenges of working with other artists. *Art Business News*. https://artbusinessnews.com/2023/08/the-role-of-collaboration-exploring-the-benefits-and-challenges-of-working-with-other-artists/

Buchter, A. (2023). The visceral meets the objective: how can art and science complement each other? *Whitman Wire*. https://whitmanwire.com/science-environment/2023/11/09/the-visceral-meets-the-objective-how-can-art-and-science-complement-each-other/

Chappell, C. R., & Muglia, L. J. (2023). Fostering science-art collaborations: a toolbox of resources. *PLoS Biology*, *21*(2), e3001992. https://doi.org/10.1371/journal.pbio.3001992

Charyton, C., & Snelbecker, G. E. (2007). General, artistic and scientific creativity attributes of engineering and music students. *Creativity Research Journal*, *19*(2–3), 213–225. https://doi.org/10.1080/10400410701397271

Collaborations with artists go beyond communicating the science. (2021). *Nature*, *590*(7847), 528. https://doi.org/10.1038/d41586-021-00469-2

Davies, S. R., Halpern, M., Horst, M., Kirby, D., & Lewenstein, B. (2019). Science stories as culture: experience, identity, narrative and emotion in public communication of science. *JCOM*, *18*(05), A01. https://doi.org/10.22323/2.18050201

Dowell, E., & Weitkamp, E. (2012). An exploration of the collaborative processes of making theatre inspired by science. *Public Understanding of Science*, *21*(7), 891–901. https://doi.org/10.1177/0963662510394278

Ecklund, E. H., James, S. A., & Lincoln, A. E. (2012). How academic biologists and physicists view science outreach. *PLoS ONE*, *7*(5), e36240. https://doi.org/10.1371/journal.pone.0036240

Ehrhart, M. G., & Naumann, S. E. (2004). Organizational citizenship behavior in work groups: a group norms approach. *Journal of Applied Psychology*, *89*(6), 960–974. https://doi.org/10.1037/0021-9010.89.6.960

Ellison, A. M., & Borden, D. B. (2022). Constructive friction creates a third space for art/science collaborations. *Leonardo*, *55*(3), 283–288. https://doi.org/10.1162/leon_a_02200

Fähnrich, B., Wilkinson, C., Weitkamp, E., Heintz, L., Ridgway, A., & Milani, E. (2021). RETHINKING science communication education and training: towards a competence model for science communication. *Frontiers in Communication*, *6*, 795198. https://doi.org/10.3389/fcomm.2021.795198

Feldman, D. C. (1984). The development and enforcement of group norms. *The Academy of Management Review*, *9*(1), 47–53. https://doi.org/10.2307/258231

Ferguson, S. L., & Lezotte, S. M. (2020). Exploring the state of science stereotypes: systematic review and meta-analysis of the Draw-A-Scientist Checklist. *School Science and Mathematics*, *120*(1), 55–65. https://doi.org/10.1111/ssm.12382

Fiske, S. T., & Dupree, C. (2014). Gaining trust as well as respect in communicating to motivated audiences about science topics. *Proceedings of the National Academy of Sciences*, *111*(supplement_4), 13593–13597. https://doi.org/10.1073/pnas.1317505111

Fleerackers, A., Brown Jarreau, P., & Krolik, J. (2022). Why create SciArt? An investigation into science artists' goals and professional journeys. *JCOM*, *21*(06), A05. https://doi.org/10.22323/2.21060205

Gastel, B., & Day, R. A. (2022). *How to write and publish a scientific paper*. Greenwood. https://doi.org/10.5040/9798400666933

Guenther, L., & Joubert, M. (2017). Science communication as a field of research: identifying trends, challenges and gaps by analysing research papers. *JCOM*, *16*(02), A02. https://doi.org/10.22323/2.16020202

Halpern, M. K., & Rogers, H. S. (2021). Art-science collaborations, complexities and challenges. In M. Bucchi & B. Trench (Eds.), *Routledge handbook of public communication of science and technology* (3rd ed.). Routledge. https://doi.org/10.4324/9781003039242

Hawkins, B. (2014). Conversations with ArtScience practitioners. In B. Wilson, B. Hawkins & S. Sim (Eds.), *Art, science, and cultural understanding* (pp. 154–171). Common Ground Research Networks. https://doi.org/10.18848/978-1-61229-487-2/CGP

Kassab, O. (2019). Does public outreach impede research performance? Exploring the 'researcher's dilemma' in a sustainability research center. *Science and Public Policy*, *46*(5), 710–720. https://doi.org/10.1093/scipol/scz024

Lingo, E. L., & Tepper, S. J. (2013). Looking back, looking forward: arts-based careers and creative work. *Work and Occupations*, *40*(4), 337–363. https://doi.org/10.1177/0730888413505229

Marizzi, C., & Bartar, P. (2021). Art in science and science in art — reflections through the lense of citizen science. *PoS*, *ACSC2020*, 022. https://doi.org/10.22323/1.393.0022

Martinez-Conde, S. (2016). Has contemporary academia outgrown the Carl Sagan Effect? *The Journal of Neuroscience*, *36*(7), 2077–2082. https://doi.org/10.1523/jneurosci.0086-16.2016

Muindi, F. J. (2025). Mapping the funding landscape for public engagement with science. *Trends in Cell Biology*, *35*(6), 453–455. https://doi.org/10.1016/j.tcb.2025.04.001

Muindi, F. J., & Luray, J. (2023). *Visualizing the landscape of training initiatives for scientists in public engagement in the United States*. Research!America. https://www.researchamerica.org/wp-content/uploads/2023/11/Visualizing-the-Landscape-of-Training-Initiatives-for-Scienitists-in-Public-Engagement-in-the-U.S._-Nov-2023.pdf

Muller, L., Bennett, J., Froggett, L., & Bartlett, V. (2015). Understanding third space: evaluating art-science collaboration. *ISEA2015: Proceedings of the 21st International Symposium on Electronic Art*. https://www.isea-symposium-archives.org/presentation/understanding-third-space-evaluating-art-science-collaboration/

Muller, L., Froggett, L., & Bennett, J. (2020). Emergent knowledge in the third space of art-science. *Leonardo*, *53*(3), 321–326. https://doi.org/10.1162/leon_a_01690

Nielsen, J. A., Zielinski, B. A., Ferguson, M. A., Lainhart, J. E., & Anderson, J. S. (2013). An evaluation of the left-brain vs. right-brain hypothesis with resting state functional connectivity magnetic resonance imaging. *PLoS ONE*, *8*(8), e71275. https://doi.org/10.1371/journal.pone.0071275

Packer, D. J. (2008). On being both with us and against us: a normative conflict model of dissent in social groups. *Personality and Social Psychology Review*, *12*(1), 50–72. https://doi.org/10.1177/1088868307309606

Packer, D. J. (2011). The dissenter's dilemma, and a social identity solution. In J. Jetten & M. J. Hornsey (Eds.), *Rebels in groups: dissent, deviance, difference, and defiance* (pp. 281–301). Wiley-Blackwell. https://doi.org/10.1002/9781444390841.ch15

Packer, D. J., & Miners, C. T. H. (2014). Tough love: the normative conflict model and a goal system approach to dissent decisions. *Social and Personality Psychology Compass*, *8*(7), 354–373. https://doi.org/10.1111/spc3.12114

Packer, D. J., & Ungson, N. D. (2024). Psychology and social cohesion. *Translational Issues in Psychological Science*, *10*(1), 3–6. https://doi.org/10.1037/tps0000397

Packer, D. J., & Van Bavel, J. J. (2015). The dynamic nature of identity: from the brain to behavior. In K. J. Reynolds & N. R. Branscombe (Eds.), *Psychology of change: life contexts, experiences, and identities* (pp. 225–245). Psychology Press. https://doi.org/10.4324/9781315735160

Ramchandani, J. (2018, July 19). Artists and scientists: why collaborate? *Medium. We Learn, We Grow*. https://medium.com/we-learn-we-grow/artists-and-scientists-same-same-but-different-d0ed943d7fec

Roberts, K. (2006). Art and science: Sci-Art: what are the problems? *The Biochemist*, *28*(6), 7–11. https://doi.org/10.1042/bio02806007

Scardamalia, M., & Bereiter, C. (2010). A brief history of knowledge building. *Canadian Journal of Learning and Technology / La Revue Canadienne de l'Apprentissage et de la Technologie*, *36*(1). https://doi.org/10.21432/t2859m

Schnugg, C. (2019). *Creating ArtScience collaboration: bringing value to organizations*. Palgrave Macmillan. https://doi.org/10.1007/978-3-030-04549-4

Schnugg, C., & Song, B. (2020). An organizational perspective on ArtScience collaboration: opportunities and challenges of platforms to collaborate with artists. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(1), 6. https://doi.org/10.3390/joitmc6010006

Segal, L., & Meroz, Y. (2023). Art-science collaborations: generators of new ideas and serendipitous events. *Quantitative Plant Biology*, *4*, e9. https://doi.org/10.1017/qpb.2023.7

Segarra, V. A., Natalizio, B., Falkenberg, C. V., Pulford, S., & Holmes, R. M. (2018). STEAM: using the arts to train well-rounded and creative scientists. *Journal of Microbiology & Biology Education*, *19*(1). https://doi.org/10.1128/jmbe.v19i1.1360

Silveira, J. (2021). Artscience, STEAM, SciArt, SEAD and much more: multiple names for a complex and transdisciplinary research field. *Preprints*. https://doi.org/10.20944/preprints202108.0046.v1

Sleigh, C., & Craske, S. (2017). Art and science in the UK: a brief history and critical reflection. *Interdisciplinary Science Reviews*, *42*(4), 313–330. https://doi.org/10.1080/03080188.2017.1381223

Snow, C. P. (1959). *The two cultures and the scientific revolution*. Cambridge University Press.

Sperry, R. (1984). Consciousness, personal identity and the divided brain. *Neuropsychologia*, *22*(6), 661–673. https://doi.org/10.1016/0028-3932(84)90093-9

Tajfel, H., & Turner, J. C. (1979). An integrative theory of intergroup conflict. In W. G. Austin & S. Worchel (Eds.), *The social psychology of intergroup relations* (pp. 33–37). Brooks/Cole.

Thresher, A. C. (2023). The divide between art and science is a mistake: adding creativity into the method. *IAI News*. https://iai.tv/articles/the-divide-between-art-and-science-is-a-mistake-auid-2660

Topaz, C. M., Higdon, J., Epps-Darling, A., Siau, E., Kerkhoff, H., Mendiratta, S., & Young, E. (2022). Race- and gender-based under-representation of creative contributors: art, fashion, film, and music. *Humanities and Social Sciences Communications*, *9*, 221. https://doi.org/10.1057/s41599-022-01239-9

UNICEF. (2021). *Defining social norms and related concepts*. United Nations Children's Fund. https://www.unicef.org/media/111061/file/Social-norms-definitions-2021.pdf

Van Bavel, J. J., Pärnamets, P., Reinero, D. A., & Packer, D. (2022). How neurons, norms, and institutions shape group cooperation. *Advances in Experimental Social Psychology*, *66*, 59–105. https://doi.org/10.1016/bs.aesp.2022.04.004

Wilkinson, C., & Weitkamp, E. (2016). *Creative research communication: theory and practice*. Manchester University Press. https://manchesteruniversitypress.co.uk/9780719096518/

Woitowich, N. C., Hunt, G. C., Muhammad, L. N., & Garbarino, J. (2022). Assessing motivations and barriers to science outreach within academic science research settings: a mixed-methods survey. *Frontiers in Communication*, *7*, 907762. https://doi.org/10.3389/fcomm.2022.907762

Xie, Z., Li, M., Li, J., Duan, X., & Ouyang, Z. (2018). Feature analysis of multidisciplinary scientific collaboration patterns based on PNAS. *EPJ Data Science*, *7*, 5. https://doi.org/10.1140/epjds/s13688-018-0134-z

Zhu, L., & Goyal, Y. (2019). Art and science: intersections of art and science through time and paths forward. *EMBO reports*, *20*(2), e47061. https://doi.org/10.15252/embr.201847061

About the authors

Karleigh Groves, M.A. is a social psychology Ph.D. student in the Department of Psychology at Lehigh University. Her research interests are broadly in identity and group dynamics, with a focus in multiple identities, identity flexibility and fluidity, and how identity dynamics influence intergroup relations.

kgroves@lehigh.edu @karleighgroves

Fanuel Muindi, Ph.D. is a Professor of the Practice in the Department of Communication Studies in the College of Arts, Media and Design at Northeastern University where he serves as Founder and Director of the Civic Science Media Lab. Dr. Muindi is a former neuroscientist turned civic science entrepreneur and ethnographer. He received his Bachelor's degree in Biology from Morehouse College, Ph.D. in Organismal Biology from Stanford University, and completed his postdoctoral training in the Department of Brain and Cognitive Sciences at MIT.

f.muindi@northeastern.edu

Arianna Zuanazzi, Ph.D. is a cognitive neuroscientist who leads open science initiatives, data-sharing efforts, and research collaborations at the Child Mind Institute. Dr. Zuanazzi holds a B.A. and M.A. in Linguistics, and an M.Sc. and Ph.D. in Cognitive Neuroscience, and

completed her postdoctoral training at New York University. Her research combines behavioral and neuroimaging methods to investigate how the human brain processes language and music. Dr. Zuanazzi is also a Resident Scholar in the Civic Science Media Lab's Sai Resident Collective, where she researches the space between science and art and fosters SciArt collaborations.

azuanazzi@saicollective.org @ariannazuanazzi

How to cite

Groves, K., Muindi, F. and Zuanazzi, A. (2025). 'Examining science and art collaborations through a social psychology lens reveals the need for Third Spaces'. *JCOM* 24(05), Y01. https://doi.org/10.22323/145620250815082846.

ISSN 1824-2049. Published by SISSA Medialab. jcom.sissa.it