A Two-Way Street for Art and Science

Toward an Integrated Vision of Meaningful STEAM

A report by

SCIENCE & SOCIETY
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EDITORS' NOTE

Throughout history, art and science have been deeply intertwined—inseparable, even.

From the Renaissance-age manuscripts contained in Leonardo da Vinci's *Codex Leicester* to the hundreds of 19th-century botanical diagrams created by pioneering botanist and painter Marianne North, it is easy to see why fluency in both disciplines is a prized ability.

However, there is a growing sense that present-day educational, career, and funding practices are leading the two fields to drift apart. While Science, Technology, Engineering, Arts, and Mathematics (STEAM) education is often seen as a way to integrate these disciplines, we have wondered: What defines meaningful STEAM? How can it move beyond surface-level connections to foster deeper collaboration? And what challenges must be addressed to ensure art and science collaborations are impactful and transformative?

To answer these and other questions, the Aspen Institute Science & Society Program invited practitioners working to make art–science engagement a two-way street to share their insights through a series of roundtable discussions throughout the summer and fall of 2024. Their expertise spans the sciences, arts, and beyond. Participants represented fields as varied as the life sciences, basic sciences, materials science, and social and behavioral sciences, alongside the visual, performance, and literary arts. Some were hybrid practitioners, such as scientists who are also visual artists or playwrights who collaborate with researchers. The group included conservation scientists, biologists, molecular and chemical biologists, engineers, chemists, and futurists, as well as museum directors, curators, data scientists, a game designer, and a theater director. Together, this interdisciplinary cohort illustrated how the shared foundations of art and science—rooted in observation, exploration, and creative problem-solving—can redefine discovery and drive transformative change.

Generated by convening experts whose personal and professional identities intersect, this report builds on prior efforts to integrate art and science, offering actionable recommendations (see page 27) to strengthen STEAM initiatives through interdisciplinary collaboration, innovative education, and meaningful public engagement. By integrating these disciplines, the recommendations illuminate how integrating art and science can reimagine their connections, inspire innovation, and approach pressing societal challenges with purpose and creativity.

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We thank 2023 Science & Society Interns in Civic Service **Rachel Edelstein** and **Davina Thompson**, who conceptualized this project and helped identify participants.

Participants

Our aim is to synthesize and share perspectives from the discussion as a whole rather than to attribute any quotations or viewpoints to specific individuals. Participants—with whom we engaged in roundtable discussions and individual conversations—are listed below (alphabetically by last name):

- **Sigrid Adriaenssens, Ph.D.** – Professor of Civil and Environmental Engineering and Director, Program in Mechanics, Materials and Structures, *Princeton University*
- **Devon M. Akmon, M.S.** – Director, *Michigan State University Museum*; Core Faculty, Arts, Cultural Management & Museum Studies, *Michigan State University*
- **Airan Berg, B.A.** – Circus Director, *Johannes Kepler Universität Linz*
- **Callie Rogers Chappell, Ph.D.** – National Science Foundation (NSF) Postdoctoral Fellow, *Department of Biology, Stanford University*; Visual Artist
- **Johann Diedrick, M.P.S.** – Just Tech Fellow, *Social Science Research Council*; 2023–24 Performance AIRspace Resident, *Abrons Art Center*; Adjunct Professor, *NYU Interactive Telecommunications Program*
- **Ni-Ka Ford, M.S., C.M.I.** – Founder and Medical Illustrator, *Enlight Visuals*; Visual Artist
- **Joyonna (Joy) Gamble-George, M.H.A., Ph.D.** – Associate Research Scientist, *Department of Social and Behavioral Sciences, Yale School of Public Health*; Research Education Institute for Diverse Scholars (REIDS) Fellow, *Yale Center for Interdisciplinary Research on AIDS (CIRA)*; Visual Artist
- **Michael John Gorman, Ph.D.** – Mark R. Epstein (Class of 1963) Director, *MIT Museum*; Professor of the Practice of Science, Technology and Society, *MIT*
- **Rudy Gostowski, Ph.D.** – Associate Professor of Chemistry, *Department of Life and Physical Sciences, Fisk University*
- **Lauren Gunderson, M.F.A.** – Playwright and Screenwriter
- **Assal Habibi, Ph.D.** – Associate Professor of Psychology (Research), *University of Southern California Brain and Creativity Institute*; Director, *University of Southern California Center for Music Brain and Society*
- **Daniel Jay, Ph.D.** – Dean, *Graduate School of Biomedical Sciences, Tufts University*; Professor of Developmental, Molecular and Chemical Biology, *Department of Developmental, Molecular and Chemical Biology, Tufts University School of Medicine*; Visual Artist
- **Kim Larkin, M.A.** – Founder and Principal, *MXD Arts*; Partner, *Applied Futures Lab*
- **Bim Majekodunmi Ali, M.E.T.** – Senior Program Manager, Strategy and Operations, *Sony PlayStation*
- **LaStarsha McGarity, M.A.** – Conservator and Co-Director, *Tuskegee University Legacy Museum*; Student, *University of Delaware*

- **Katharine Owens, Ph.D.** – Professor and Chair, *Department of Politics, Economics, and International Studies, University of Hartford*
- **Apoorva Panidapu, B.S.** – Keynote Speaker; Chief STEAM Advisor, *iTalent Digital*; Founder & Writer, *Gems in STEM*; Student, *Stanford University*; Visual Artist
- **Kenton Rambsy, Ph.D.** – Associate Professor of African American Literature, *Howard University*; Data Storytelling & Visualization Specialist, *Howard University Center for Applied Data Science and Analytics*
- **Catherine Riihimaki, Ph.D.** – Research Director, *2NDNATURE Software, Inc.*
- **Matthew Ritchie, B.F.A.** – Mentor Professor in the Graduate Visual Arts Program, *Columbia University*, New York; Dasha Zhukova Distinguished Visiting Artist in Residence, *MIT*; Visual Artist
- **Mark Rosin, Ph.D.** – Associate Professor of Physics and Director of STEAMplant Initiative, *Pratt Institute*; Director, *Guerilla Science*
- **Rebecca Rutstein, M.F.A.** – Multidisciplinary Artist
- **Jose Francisco Salgado, Ph.D.** – Founder and Executive Director, *KV 265*; Astronomer; Visual Artist/Photographer
- **Luke Shannon, B.S.** – Generative Visual Artist
- **Jamaal B. Sheats, M.F.A.** – Associate Provost of Art and Culture and Assistant Professor, *Fisk University*; Director and Curator, *Fisk University Galleries*; Visual Artist

Featured Artwork

Keeping with a vision for meaningful STEAM design, integration, and collaboration, the Aspen Institute Science & Society Program is proud to feature artwork throughout this report that represents participants' own contributions to bridging the art–science divide.

Front cover and page 19: Matthew Richie

Inside cover and page 28: Airan Berg

Headings and page 24: Daniel Jay

Page 9: Lauren Gunderson

Page 11: Jamaal B. Sheats

Page 12: Johann Diedrick

Page 15: Callie Rodgers Chappell

Page 17: Apoorva Panidapu

Page 20: Joyonna Gamble-George

Page 21 and back cover: Katharine Owens

Page 22: Sigrid Adriaenssens

Page 23: Ni-ka Ford

Page 24: Assal Habibi

Page 26: Kenton Rambsy

INTRODUCTION

Art and science are often treated as separate disciplines, but their shared foundational processes—including inquiry, problem-solving, and creativity—serve as catalysts for exploration, collaboration, ideation, and integration. These components are vital for addressing complex questions and fostering meaningful, real-world connections.

This report is organized into two broad themes: 1) Motivations and Values and 2) Transforming Ideas into Action. The first explores shared foundations of art and science, highlighting the value of interdisciplinary learning and emphasizing the importance of resisting hierarchies of knowledge. The second theme examines practical applications in classrooms and public spaces while considering equity, inclusivity, and opportunities to sustain and scale STEAM efforts. Together, these themes offer a comprehensive framework for understanding how the interconnected foundations of art and science—encompassing disciplines like visual and performance arts, playwriting, game design, generative art, and diverse scientific fields—can advance equitable, impactful STEAM integration and engagement.

MOTIVATIONS AND VALUES

Recognizing Shared Foundations

Although art and science are often seen as distinct and associated with radically different types of thinkers and professions, participants in the Aspen Institute Science & Society Program's 2024 roundtable discussions—representing a diverse range of artistic and scientific fields—quickly converged on the similarities between their work, describing their disciplines as "two sides of the same coin," with one participant adding that the coin is creativity and that, "to see the world, understand the world, and ask questions about it, you have to be creative in your approach."

This shared foundation of creativity underscores the deep intersections between art and science, even as they diverge in tools and techniques. Several participants reflected on this interplay, noting how their respective fields embody a similar spirit of exploration and inquiry despite working with vastly different mediums—whether electron microscopy or painting. One participant related this commonality to the work of biochemist and author Isaac Asimov, who wrote, "There's an art to science and a science in art; the two are not enemies, but different aspects of the whole."

For instance, both artists and scientists share an "intense observational bias," bringing an added level of scrutiny to the world around them through which they notice and latch onto details that

differ from what they are told to believe is true. At the level of procedure, these forms of curiosity involve what one participant described as "fundamental questions," or those which a person continues to ask until they feel they have hit the bottom of the question chain; along the way, artists and scientists follow nonlinear steps of experimentation, failure, and iteration. At the level of goals, scientists identify gaps in the literature or problems yet to be solved, and artists explore parallel gaps in the cultural conversation. In other words, both investigate phenomena through their chosen mediums and societal contexts. "One of the roles of contemporary art now is as a foil to the dominant culture. Similarly, science is unafraid to be falsified," one participant summarized.

Another participant, with a background in engineering, framed the separation between disciplines as a modern and unnatural challenge, encouraging others to reflect on how people are born as neither pure artists nor pure scientists but are instead forced to choose a path through the education system.

When these shared foundations are intentionally harnessed, they enable both disciplines to break free from traditional silos, thereby presenting opportunities for collaboration and transformative innovation.

Value of Interdisciplinary Learning

Participants stressed that interdisciplinary tools and modes of thinking represent our best chance at experimenting and progressing around so-called "wicked problems"* and provided examples such as antimicrobial resistance, surveillance in society, and the future of democracy.

Artists at the roundtable expressed an appreciation for the way science produces new materials they can make art with, while also revealing new understandings of human cognition and perception that they can speak to through their work. For instance, one participant's approach to teaching general chemistry involves leading groups through the process of developing paints—involving a precipitation reaction, pigment mulling, and vacuum filtration—which then culminates in a "self expression" experience where students bring their newly created materials to life on the canvas.

Conversations with artists, who may bring moving poetry or stimulating images with them, can help scientists reflect on their work in new ways, whether at the scope of fine details or a meta-level. "Narratives about how artistic we are or how good we are at STEM are self-reinforcing, so these collaborations open doors by increasing exposure to doors we thought were closed," explained one participant. Others added that these moments of exchange present opportunities for students and professionals in the arts and sciences to experience the varied strengths of being a novice in each other's field, a time when disciplinary rules and norms do not yet constrain their worldviews.

An engineer at the roundtable stated that "artists push you more into domains where your discipline normally may not go," illustrating how their research on nets and bridges has benefited significantly from playful exploration with dance choreographers, who encourage movement in ways that are often "forbidden" in traditional structural design. Another participant, drawing on their dual training

* Wicked problems are inherently complex, ill-defined societal challenges characterized by competing values, incomplete or contradictory information, and a lack of clear solutions.

in art and science, shared how their ability to think from a highly visual perspective allowed them to imagine sitting on a protein and watching the system around them change, ultimately leading them to a new theory of interactions between lasers and proteins in living cells. A third participant described a dance performance about cilia—the tiny little hairs in our lungs—where five dancers collaborated with lung experts at their university's school of medicine to create choreography that mirrors the rhythmic movement of cilia clearing mucus and debris from the lungs. These examples underscore how the interplay of artistic and scientific perspectives and expertise fosters innovation by breaking traditional boundaries and encouraging unconventional exploration.

Historical examples also attest to the value of such interdisciplinary learning. For instance, biologist Donald Ingber's model of cellular mechanics—which explains how cells maintain their shape and respond to mechanical forces— was inspired by an art class. In the art class, Ingber was introduced to the tensegrity building system (a combination of "tension" and "integrity") developed by architect Buckminster Fuller and sculptor Kenneth Snelson. Their approach helped Ingber reimagine cellular structures, demonstrating how artistic and architectural concepts can transform scientific understanding and innovation.

Lauren Gunderson. Silent Sky. *The true story of 19th-century astronomer Henrietta Leavitt explores a woman's place in society during a time of immense scientific and heart-bound discoveries. With music and math bursting forth onstage, Henrietta and her female peers change the way we understand both the heavens and Earth. This two-act play is one of many productions by Lauren Gunderson that explore the stories of women in science through a creative and emotional lens.*

Beyond innovation, collaborations between artists and scientists can help address both internal and external stereotypes about these disciplines. A participant noted that, whereas scientists are often portrayed as "intellectual and unemotional," co-creation with artists can help add a level of emotionality to their work. "What excites me in collaborating or making work produced from a kind of scientific or technological basis is igniting curiosity. And I pair that with wonder, and I also pair that with joy. As artists and as designers, we have this toolkit to present science and produce affectation—feeling and emotion—around the experience of discovery or knowledge," remarked one participant who explores artificial intelligence from multiple perspectives.

Artists working alongside scientists also bring valuable skills to collaborative projects. For example, a theatrical director might contribute their keen ability to create a shared vision, using language that fosters each team member's creativity while driving them toward a common purpose. In turn, such collaborations can help scientists balance rigorous analysis with purposeful, free-flowing emotion, enriching both their work's process and outcomes. The work of a visual artist at the roundtable exemplifies this potential through a collaborative process involving architects, physicists, engineers, and the artist. They designed a structure that physically models the interconnectedness of the universe. The artist's creative vision and ability to translate complex scientific concepts into an immersive, aesthetic experience complemented the scientists' and engineers' technical expertise and also led to the development of a new architectural system, demonstrating the transformative potential of interdisciplinary collaboration.

These insights demonstrate that truly interdisciplinary learning in STEAM drives innovation and nurtures deeper mutual respect between and across disciplines. It creates an environment for creative solutions, novel understandings, and transformative concepts while broadening the experiences and perspectives of both artists and scientists.

Resisting Hierarchies of Knowledge

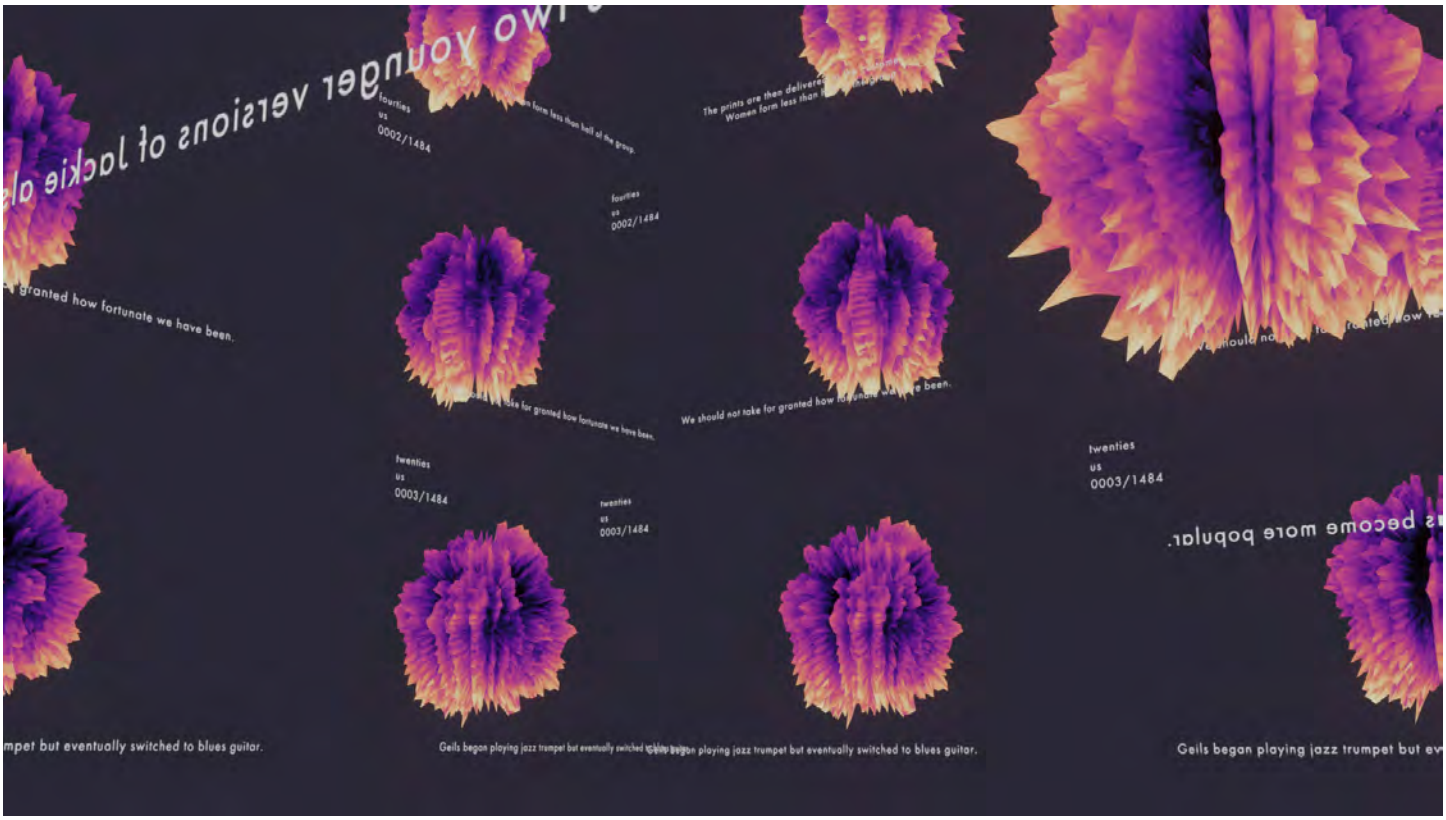
The integration of the arts into science, technology, engineering, and mathematics (STEM) spaces is not a new concept, though it has gained formal recognition in recent years under the term "STEAM," which was coined in 2006 by Georgette Yakman and further championed at local, state, and national levels by the Rhode Island School of Design. However, some roundtable participants were cautious of this formulation, suggesting that it operates as a "one-way street" that disproportionately privileges scientific knowledge over artistic perspectives. In response, a visual artist at the discussion reflected on UCLA professor Victoria Vesna's "reconfigured pedagogy," which expresses STEAM through the lens of "science, technology, ecology, arts + mindfulness." A more holistic perspective, Vesna's integration challenges the view that one (art versus. science) has dominance over the other and illuminates the need for a more balanced and interdisciplinary approach to resist hierarchies.

Similarly, the Engine for Art, Democracy, and Justice (EADJ) at Vanderbilt University provides a trans-institutional platform for exploring creative collaboration and knowledge creation approaches. Founded by Dr. María Magdalena Campos-Pons, EADJ brings together Fisk University, the Frist Art Museum, Millions of Conversations, and Vanderbilt University to engage with "cultural interconnections, historical entanglements," and democratic possibilities. EADJ demonstrates how interdisciplinary initiatives can challenge traditional boundaries, promote justice, and inspire transformative

Jamaal B. Sheats. Structure 1 from "Point of Entry" installation. *One of three doors in the Point of Entry series, this 7x5-foot repoussé metal door, displayed at Tufts University's School of the Museum, serves as both a metaphorical and physical entryway into interdisciplinary inquiry. The door features intricate patterns of maps spanning from 610 BC to present-day Google Maps, interwoven with binary code sequences of 1s and 0s, symbolizing the evolution of cartography from ancient techniques to modern digital methodologies. References to iPhone photography further illustrate how time and space are documented in contemporary culture. Behind this first door lies a passageway filled with books dating from 1936 to 2011, inviting viewers to reflect on shifting worldviews and cultural perspectives across decades. By translating human experiences into physical forms, Sheats' repoussé and installations embody complex narratives and provoke inquiry into societal questions. The Point of Entry series aligns with art–science integration, emphasizing how both fields provide frameworks for understanding the human condition and engaging audiences in transformative ways. Learn more here.*

practices across disciplines by centering visual representation and inclusive dialogue. By questioning the dominance of one field over another, these initiatives act as a pathway to more equitable and transformative collaborations. However, participants noted that this imbalance is still evident in practice, with artists often feeling undervalued within art–science collaborations where artistic perspectives are viewed as supplemental rather than integral.

Specifically, formally trained artists and scientists at the roundtable noted a sense of inequality resulting from science "being imposed" onto supposed art–science collaborations. Such an approach pigeonholes the role of art as merely a communication tool rather than recognizing it as a medium for stimulating new ideas and perspectives. This epistemic injustice represents a profound loss, as "artists can be seismographs of the future, and can confront us with new questions and new challenges rather than just communicate science." For example, speculative design—confronting people with different possible futures by bringing together science and design—can spark new conversations about equity, ethics, and innovation.



Johann Diedrick. Dark Matters. *Dark Matters is an interactive web experience, installation, and video art work that exposes the absence of Black speech in the datasets used to train voice interface systems in consumer artificial intelligence products such as Alexa and Siri. Visitors get to take the seat as a machine learning researcher encountering a large speech dataset for the first time. As you move around inside the environment, you encounter something you've never heard before… Utilizing 3D modeling, sound, and storytelling, the project challenges our communities to grapple with racism and inequity through speech and the spoken word, and how AI systems underserve Black communities. The project reveals the exclusion and code switching that results from interacting with these systems. Through a three-dimensional visualization of major speech datasets, viewers come into contact with vacuums of space representing these data voids. Intertwined are narratives attesting to the resilient and resistive qualities of Black speech, suggesting how we might create more equitable futures.*

Participants also called attention to the need to consider inclusivity within schools of thought, adding that clear hierarchies exist within the arts. Several words and phrases emerged throughout the discussions to describe ideal art and science partnerships, reflecting their aspirations for more balanced and impactful collaborations (see box below).

A Vision for Art and Science Collaborations

- Thinking together
- Equitable and generous exchange
- Cross-disciplinary collaboration
- Critical dialogue
- Co-generation
- Back-and-forth
- Exposure and inspiration
- Talking from a place of humility to reach transformative creativity
- Learning with expertise on both sides

To create a "full circle of conversation" where art informs science and science informs art instead of "one decorating the other," participants advocated for initiating collaborations early in the creative process. As one participant with a background in museum curation explained, programs like artist residencies demonstrate the value of involving artists in the conversation during exploratory phases, when the scientists are still thinking through a problem, rather than waiting until the end stages of a project, like preparing for an exhibition.

A multimedia artist shared their experiences working with scientists at sea, explaining that these month-long expeditions provided a unique opportunity for immersion that enabled their research team to reach a true two-way exchange of ideas. In addition to fostering co-generation—for instance, art inspired by data collected aboard the ship along with microbiology research inspired by the artist's interest in fractal surfaces—the artist noted that their presence on the research vessels helped scientists from different disciplines learn from one another in more meaningful and deeper ways.

"I think one of the most important things is to get people out of their silos of research…. I've worked with a number of different scientists [where] we're all at sea together, but they're all kind of doing their singular area of research. They're very laser-focused on what they're doing. And so I'm sort of looking more broadly at what everybody's doing [and helping everybody with] thinking more broadly together," the artist emphasized, adding that these efforts are critical to addressing multidimensional challenges such as climate change. Though differences in perspective can feel frustrating in the moment, participants agreed that such tensions in collaboration breed innovation and lead to creative breakthroughs.

TRANSFORMING IDEAS INTO ACTION

In the Classroom

Integrating art and science begins with cultivating awe and wonder—traits that are often extinguished at an early age. One participant reflected on early experiences growing up in rural Michigan, where they were surrounded by artists and explored the natural world by drawing trees and painting landscapes. Only later in life, after completing a doctorate in ecology, did they realize the essential traits of being a "good" scientist—listening, observing, and being curious, were nurtured through their early artistic practices. This experience speaks to the role and power of artistic expression in shaping how we see and engage in the world. It also echoes David Ingber's abovementioned scientific breakthrough and how a single art class changed his career trajectory and the field. A long-time educator in the basic sciences expounded on their academic trajectory, adding, "I keep thinking of how liberal education encouraged exploration. However, the focus on careers has become such a focus, to the exclusion of exploration."

Additionally, as younger generations move through the education system, the siloed nature of classes allows them to avoid altogether the disciplines they perceive themselves to be weaker in, further entrenching limited models for understanding the world. "People are multi-dimensional and have many strengths, but are also really good at steering away from their weaknesses," observed another educator. Therefore, the path to bringing together art and science will involve guiding students as they grow through the discomfort of occupying new spaces and approaches.

Roundtable participants with experience in academic settings highlighted a disconnect between the work scientists perform in the lab and community—which is usually highly curious and creative—versus the "rote" classroom training scientists receive in memorizing formulas, equations, and definitions. It is imperative that scientists are *treated creatively* and given opportunities to jump from knowing facts to being generative, particularly in their formative years. As one participant explained, "Science isn't just a collection of facts and a solid body of knowledge that can be taught badly, which I think is a lot of people's school experiences… But it's a way of understanding the world, intersecting with cultural production and the arts. Sometimes, you need to instrumentally use the arts to show people how science can be relevant for their lives." This perspective highlights the need for theoretically grounded STEAM practices emphasizing creativity and wonder.

Meijas and colleagues' epistemic framework highlights essential components of STEAM programs. It provides a pathway to address this disconnect by integrating practices like deep noticing (careful observation of patterns and details), exploring materiality (engaging with the physical properties of materials), and engaging multiple modalities (using diverse forms of expression like visual, auditory, and tactile methods) alongside scientific approaches like modeling and data analysis. It also emphasizes hybrid practices like "hacking" (repurposing tools and ideas creatively) and "critical historicity" (examining connections between past and present works). These elements and hybrid practices encourage learners to bridge disciplines and move beyond rote memorization, fostering creativity and critical thinking essential for generative work and problem-solving.

Callie Rodgers Chappell. IndiGROW. *Bioengineered yeast producing an indigo-like substance, indigoidine. Exhibited as part of Fathomer's Emergence. Nasa Sinnott-Armstrong and Callie Chappell (2024).*

A survey of introductory science students at one participant's university reaffirmed this gap. Positive responses to the question "Are you creative in your science or engineering class?" were lowest among students majoring in the sciences. At the same university, a course co-taught between a science lab and the art museum revealed that scientists and engineers were decidedly uncomfortable in the museum space, perhaps even more so than their peers in the arts and humanities felt in the lab space. The participant concluded that experiences of discomfort in unfamiliar spaces foster empathy, encouraging self-reflection on the challenges others face when they feel they don't belong.

Despite this discomfort, participants from across institutions noted that many students have underlying interests in both art and science but are met with difficulty finding an academic "home" for this appetite.

Some historically Black universities are taking bold steps to integrate art and science across disciplines. At Fisk University, the arts are embedded in academic programs, connecting basic, life, and social sciences to featured exhibitions in their campus-based museum. One participant from the university shared an example of a physics professor leading students on a tour of the Alfred Stieglitz Collection, examining it through the lens of light refraction and wave theory. This approach demonstrated how scientific principles can deepen understanding of artistic techniques and the natural phenomena depicted in the works. From the perspective of a conservationist, staff provide tours highlighting scientific techniques used to both preserve and understand art, further enriching students' learning experiences. Building on this, another roundtable participant's university took an innovative approach to support faculty in aligning with the institution's three foundational pillars: teaching, research, and "communicating science to society." Although this third pillar is often undervalued, they shared that the university prioritized it by constructing a theater to foster collaborations between scientists and independent artists. To convey the need to simplify their research for broader audiences, he argued a sentiment from Einstein: "If you can't explain it to a six-year-old, you don't understand it yourself."

These institutional efforts are mirrored in classroom practices, highlighting art's technical and cognitive contributions to science education. From fostering multimedia skills to enhancing executive functions, art offers tools scientists can adapt to succeed in labs and research. For example, one participant drew on the example of co-founder and former Apple CEO Steve Jobs, who took a calligraphy class that inspired the technology company's now-famous elegant design interface. Other artistic activities like learning music can support executive functions such as inhibition and impulse control, which translates well to classroom and lab settings to help people be successful scientists. For example, one participant's research uses dynamic brain imaging to show how listening to music, such as a Chopin nocturne, activates neural pathways across the brain. This work could inspire classroom activities where students explore the science of music's impact on the brain, using neural visualizations to understand connections between art, cognition, and scientific processes.

Co-taught classes, such as one participant's "Music, Mind, and Society" course led by an artist and a scientist, provide an ideal model for meaningful art–science integration. These courses offer numerous pedagogical benefits, enabling students from different disciplines to collaborate directly while seeding a deeper appreciation for interdisciplinary connections. For example, one project from the course involved the development of an app that detects physiological signals and suggests music based on a user's desired emotional outcome. This model of course design creates opportunities for

Apoorva Panidapu. Forsaken. *As an expressive painter, I love thinking about the construction and deconstruction of shapes. How much of something can you take away before it is unrecognizable? How much structure can you preserve with as little information as possible? In both my art and science practices, I try to push the boundaries of constraints and asking: how does chaos interplay with truth? In this portrait, I painted the first layer from observation, trying to replicate reality as much as I could. Then, with each subsequent layer, I deconstructed it with big, vibrant brushstrokes. Building upon the underlying structure while simultaneously fragmenting it, I came upon a different way of understanding it.*

students to collaborate directly and feel valued in each other's fields. Crucially, these courses must be open for enrollment by students of all majors.

When sustained co-teaching is not possible, guest lectures can provide a resource-efficient alternative for art–science engagements. One artist shared how teaching a class on drawing and design for medical students helped them improve study habits by integrating visual techniques into their note-taking, illustrating how even brief exposure to artistic methods can leave lasting impacts. Including diverse perspectives within medical illustration also highlights the broader value of art–science integration. At the roundtable, a participant specializing in "medical, biological, and conceptual illustrations for journal articles, presentations, and textbooks" stressed the need for inclusive and diverse representation in science materials, pointing to how art can challenge narratives and promote equity in science and medical education.

The benefits of representation and inclusivity extend beyond the classroom—laying the foundation for interdisciplinary collaborations in community or public spaces.

In Public Spaces

Exhibiting the fruits of meaningful art and science collaborations in public spaces allows for the democratization of knowledge while also helping this information stick with audiences long after the initial encounter. "When science becomes something you can touch, interact with, or see, it moves from abstract to personal. That's when people start asking questions and seeing their connections to it," explained one participant.

For this reason, public events should seek to engage all or as many senses as possible. Theater, for example, provides an outlet for actors and audiences to inhabit stories about science, producing a dynamic of "emotional heroes" that is fundamentally different from witnessing the evolution of scientific knowledge from a distance. A participant explained that in addition to "separating [science] from the intellectual and then making it body and breath and emotion," each theatrical production functions as a "resurrection" of the story that resonates with theater-goers in distinct ways. "Storytelling is a medium that is accessible by all of humanity," added a participant from the video game industry. Their work highlights that public spaces are not restricted to physical structures or locations. Rather, digital or conceptual realms uniquely enable users to create immersive environments and explore diverse perspectives.

The type of space is a central consideration when sharing art and science collaborations with the public. In particular, artists and scientists at the roundtable emphasized the importance of non-traditional and informal spaces, such as nightclubs and music concerts. "That very kind of that stark contrast of showing work of this kind in spaces where people are not expecting it, and then to have that really be this salient, poignant moment where they are encountering science…can be a really powerful one," shared an artist who creates participatory pieces about the future of technology. Even in more explicitly scientific settings, such as conference facilities, artists can help draw out concepts as they present, helping connect the visual dots between ideas.

Even small-scale, informal spaces can be transformative. One participant shared about the Lil Lab Network, which they described as "little free libraries, but for science" located all over the world.

Matthew Richie. The Arguments. *This installation includes ten loosely connected films Matthew Ritchie created between 2008 and today, each with its own musical element, narrative, and symbolism. The group is titled The Arguments, a nod to John Milton's Paradise Lost, in which each book begins with a philosophical premise or declaration. The films take us on a journey through deep time, soaring and dipping through scenes of fires and floods, riots and ruins, worlds microscopic and macrocosmic. More than fantastic visual phenomena, they involve musical collaborators that add a level of meaning and sensation to the films. Ritchie writes, "In the same way that everything we see and make is all part of one universe (but not necessarily a unified one), these films and songs are part of one fragmented story: my effort to build a garden of images out of a flood of music in an ongoing conversation with musicians and composers." This is the first time all ten films have been exhibited together.*

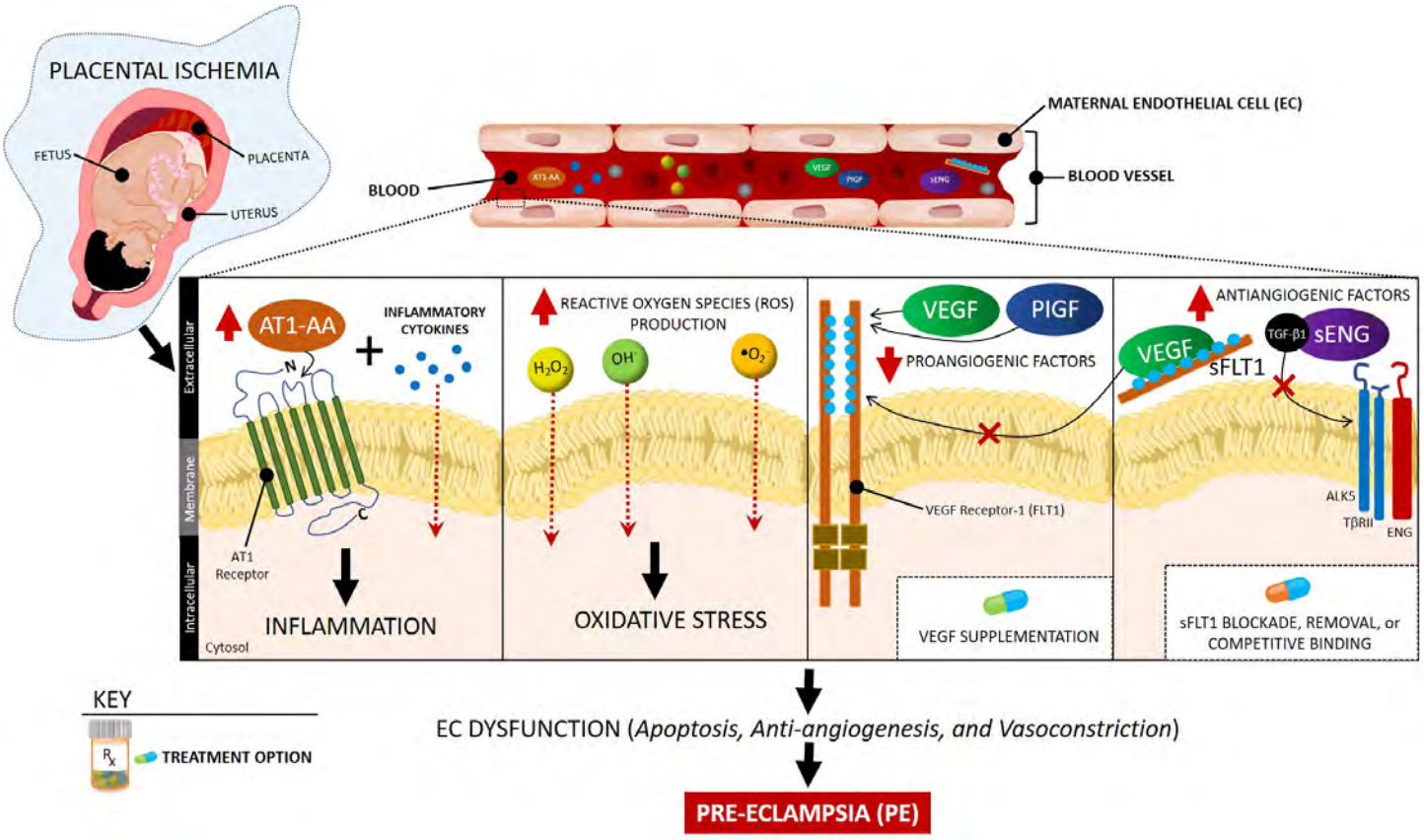
The most recent film, commissioned for this exhibition, is named 'Telmun' after a place near the Persian Gulf once postulated to have been the site of the Garden of Eden. The soundtrack was composed by Hanna Benn, with lyrics by Ritchie and features the song "A Garden in the Flood," performed by Nashville's Fisk Jubilee Singers, directed by Dr. Paul T. Kwami, whose generous spirit and curiosity made this collaboration possible.

The visual elements include images of the current Fisk Jubilee Singers and alumni Angel Adams, combined with digitally processed diagrams from W. E. B. Du Bois's data portraits (sociological diagrams of Black American culture in 1900), the Steiglitz collection at Fisk University and aerial images of flooding in Tennessee.

Each film was originally presented separately, with music by different composers, including Aaron and Bryce Dessner, Shara Nova, Hector Parra, and Evan Ziporyn.

Composed of, for example, recycled cabinets, Lil Labs are placed in neighborhoods and stocked with culturally relevant materials such as art supplies, native seeds, water testing kits, and health or medical supplies, to NARCAN (treats narcotic overdose in an emergency situation). Teenage Guatemalan girls are building and painting Lil Labs that have STEAM kits in them—embedding STEAM into everyday environments. Public-facing initiatives like Lil Labs and pay-as-you-are-able ticketing models, as recommended by one participant, exemplify how STEAM can prioritize accessibility. Whether offering free materials in hyper-local settings or reducing financial barriers to larger events, these approaches facilitate meaningful engagement with art and science across diverse audiences and avoids elitism.

In addition to the type of space selected, participants emphasized the importance of keeping in mind that, to the public, it is largely irrelevant if information is coming from an artist or a scientist. What matters to audiences is the relatability and accessibility of the communication, which requires consideration of inclusivity and how to best center community voices to prevent superficial or exploitative practices.



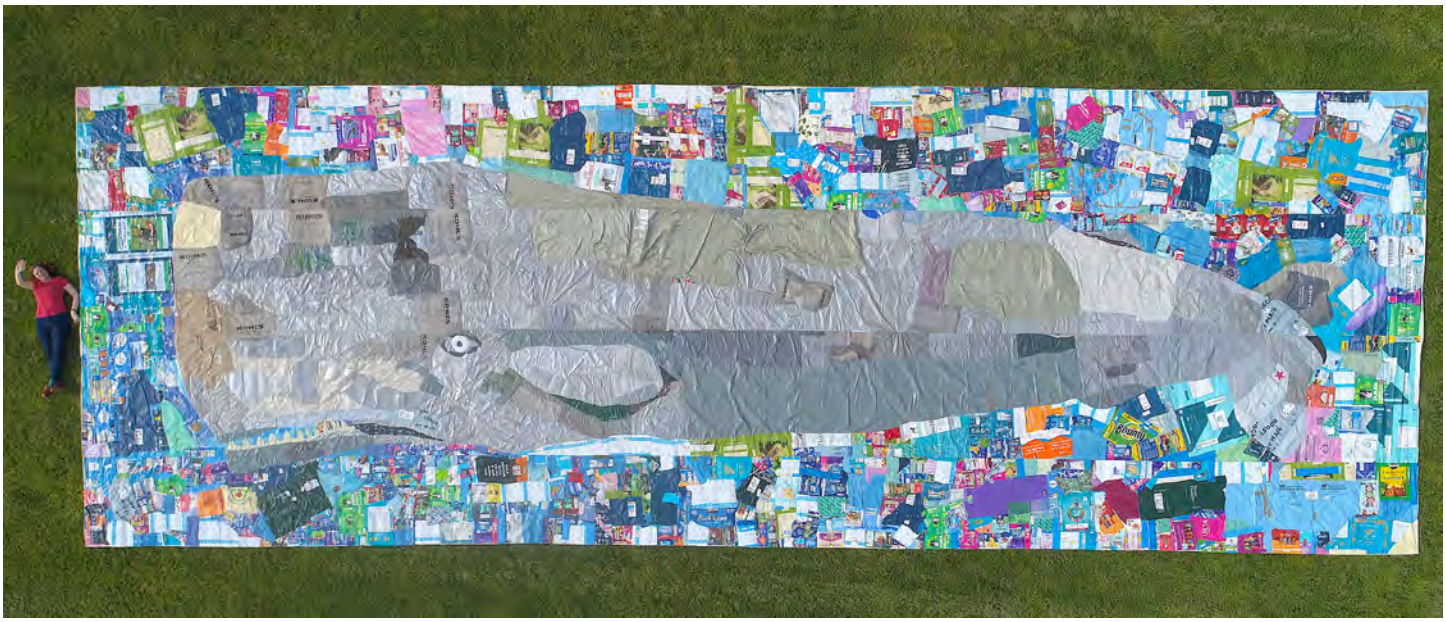
Joyonna Gamble-George. Placental Ischemia and Preeclampsia. *The artwork titled "Placental Ischemia and Preeclampsia" visually represents the complex interplay of biological factors leading to preeclampsia, a significant pregnancy complication. This illustration combines clear, informative diagrams with aesthetic balance, highlighting key pathways such as inflammation, oxidative stress, and the role of different biomolecules and receptors involved. By artistically rendering these processes, the piece not only educates but also engages viewers, making the science accessible and compelling. This piece exemplifies my approach to integrating art and science—making complex scientific information visually appealing and easier to understand. This piece was published as part of a manuscript in a peer-reviewed article in Journal of Women's Health.*

Participants critiqued traditional STEAM frameworks for failing to fully address issues of equity and inclusion, particularly the imbalance between art and science. They emphasized the importance of embracing community expertise and lived experiences as integral to interdisciplinary collaborations. This approach aligns with the principles of civic science, which seeks to empower communities to co-create knowledge and solutions rather than merely acting as passive recipients of information.

One participant spoke about the need for STEAM to challenge "colonial narratives" and use art as a tool to uplift marginalized voices—not as a superficial strategy to "increase trust" in science. They argued that impactful STEAM initiatives must address root causes of distrust, such as systemic inequities and exclusionary practices, to build authentic relationships. "People are smart. We need to get them with us, not following us," stated another participant. Otherwise, science risks becoming "a more efficient way to clean up the mess it made."

Participants also emphasized the importance of avoiding transactional relationships in these collaborations, cautioning against bringing art and science together merely for good publicity or funding. "There's always a risk of artists or scientists bringing in culture or art to serve as propaganda to make people like science," one scientist-artist warned. "That's a misuse of art. What we really need is systemic transformation, a 'big tent' approach where science benefits everyone—not just some."

Communities must not only be included in data collection but also in creative processes, such as engagement with citizens' assemblies, a participatory democratic process commonly commonly used in many countries across the world. These assemblies bring together a representative group of citizens to deliberate on specific issues and provide informed recommendations to policymakers. In one



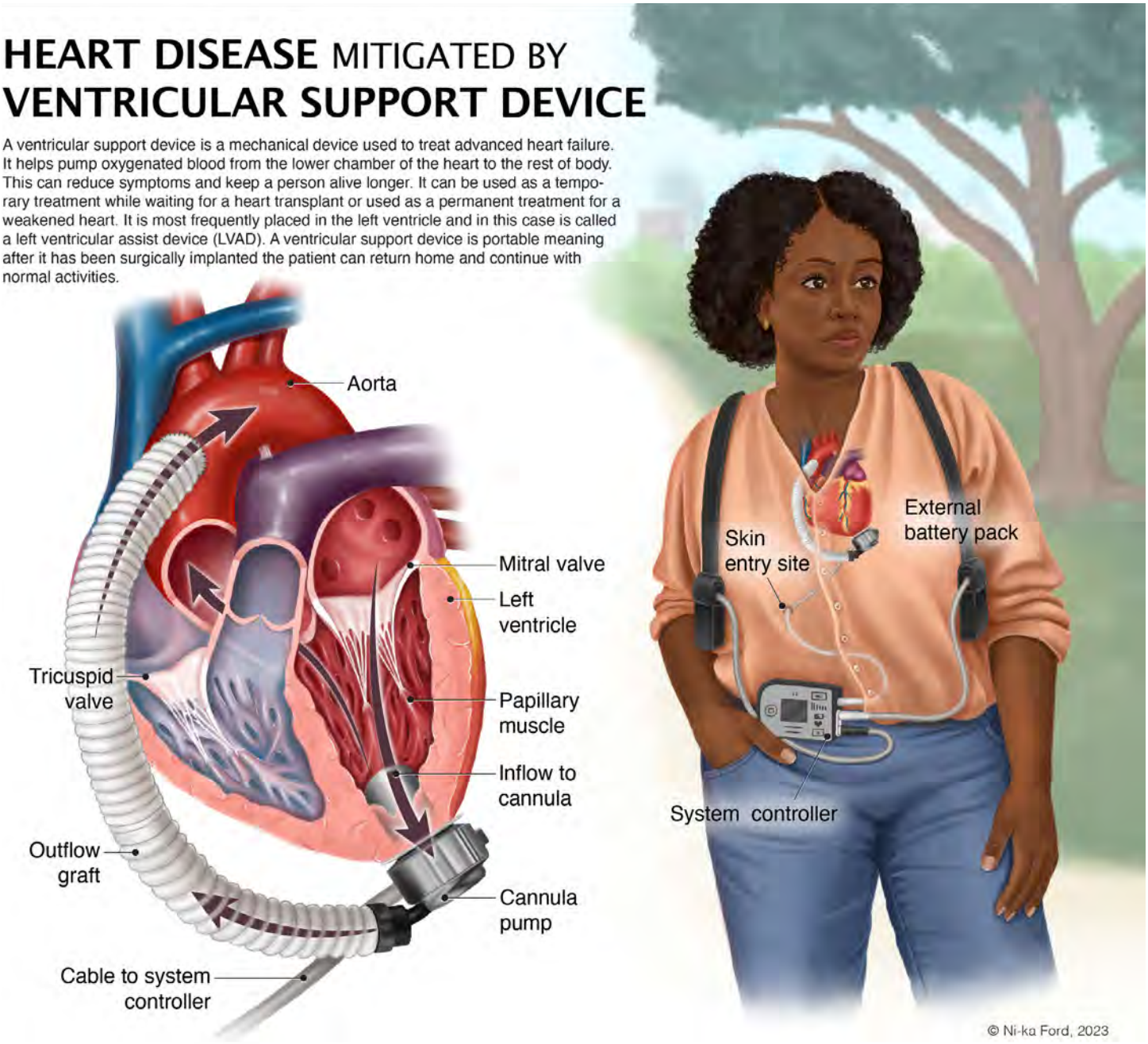
Katherine Owens. The Sperm Whale from the first Entangled and Ingested series. *These pieces are colorful, bright, life-sized portraits of animals made from plastic packaging. Why plastic? 95% of plastic packaging is not recycled and 90.5% of all plastic ever made has never been recycled. These pieces are a reminder that the global North has not solved the problem of plastic: we are simply better at hiding it. Our waste is thrown away—a euphemism for landfilling, incineration, or minimal recycling. Entangled and Ingested uses scientific data to inform artistic practice, asking the viewer to grapple with the impact plastic pollution has on a wide array of animals.*

participant's work with schools serving high proportions of students from vulnerable backgrounds, a co-creative chemistry project transformed the periodic table into songs and dances. This approach resulted in all students passing their exams—an outcome described as "rare." Reflecting on the impact, a student voiced, "We learned that we also have good ideas." This example highlights how integrating art and movement into STEM can break down barriers in learning, boost academic outcomes, and build confidence in students who might feel excluded from traditional science education.

While speaking to historical barriers to representation in art and science, participants also expressed hope that interdisciplinary collaborations can help advance representation in new ways. For exam-

Sigrid Adriaenssens. NODES (Net tOpologies and Dance Explorations). *Over recent years, choreographer Rebecca Lazier and I, alongside various collaborators including the fiber artist Janet Echelman and the structural engineer Bill Baker, have investigated how net structures behave under dynamic loads through dance. Our work, conducted in courses at the University of Washington and Princeton, uncovered that nets change stiffness in response to human movement, with different net configurations demonstrating varied properties. This discovery led to the development of research using large-scale prototypes and experiments, integrating artistic and engineering perspectives. Our collaboration reveals how adaptive net stiffness can enhance structural resilience and transform both performance art and structural engineering. This innovative approach pushes the boundaries of conventional design, blending choreography with engineering to create dynamic, responsive structures.*

ple, scientific visualization can be a project of health equity, bringing together illustrative artists and medical professionals who can together include Black and brown bodies in provider- and patient-facing materials. Normalizing a wider range of bodies is critical on two fronts. First, without exposure to diverse visuals in their training, providers are prone to misdiagnose or underdiagnose conditions in



Ni-ka Ford. Heart Disease Mitigated by Ventricular Support Device. *This illustration Heart Disease Mitigated by Ventricular Support Device is meant to be used for educators for training purposes and patient education. It exemplifies my approach to merging art and science by capturing the complexity of a medical device used to treat heart failure and portraying it within a person's body so the viewer can understand how the device is oriented on the heart and integrated for daily use. What makes my approach unique is that I focus on human diversity and representation in my work and realism. This piece not only educates viewers about cutting-edge cardiac technology but also underscores the universal relevance of healthcare across diverse populations.*

people of color and may instead act on implicit biases and stereotypes. Second, representation can help patients feel more respected in clinical settings, making them more inclined to receive information and encouraging better communication and engagement with care.

When combined with history, art and science provide additional opportunities to challenge systemic inequities and amplify underrepresented voices. For example, at one participant's institution, technical research into materials used in artwork has allowed them to challenge the provenance of paintings and demonstrate their creation by women. "We can prove who it was when previously that person would have been completely written out of history. So we've been able to give back some agency to female artists who had to fight harder because they would not have been recognized as artists in their own time," they specified. These efforts align with the broader goals of STEAM to not only highlight overlooked contributions but also to make these stories accessible to all. Looking ahead, another participant cited the need to 'activate art archives.' By making collections publicly accessible, digitized, and modernized, institutions can ensure that groups historically marginalized in artistic

Daniel Jay. Hypercube #3. *Unpacking the Vessel is my most recent series that describes the stages of my life. They are made from my own published papers cut into shapes such as hypercubes, superimposed onto abstract patterns of biological stains from my own lab, reagents that are no longer used in biomedical labs. CALI Hypercube #3 is composed with cutouts of the first page of my most important paper describing CALI, a technique I developed (1988). This makes light of work that I once viewed with such importance when I built my scientific career but can now let go along my spiritual journey.*

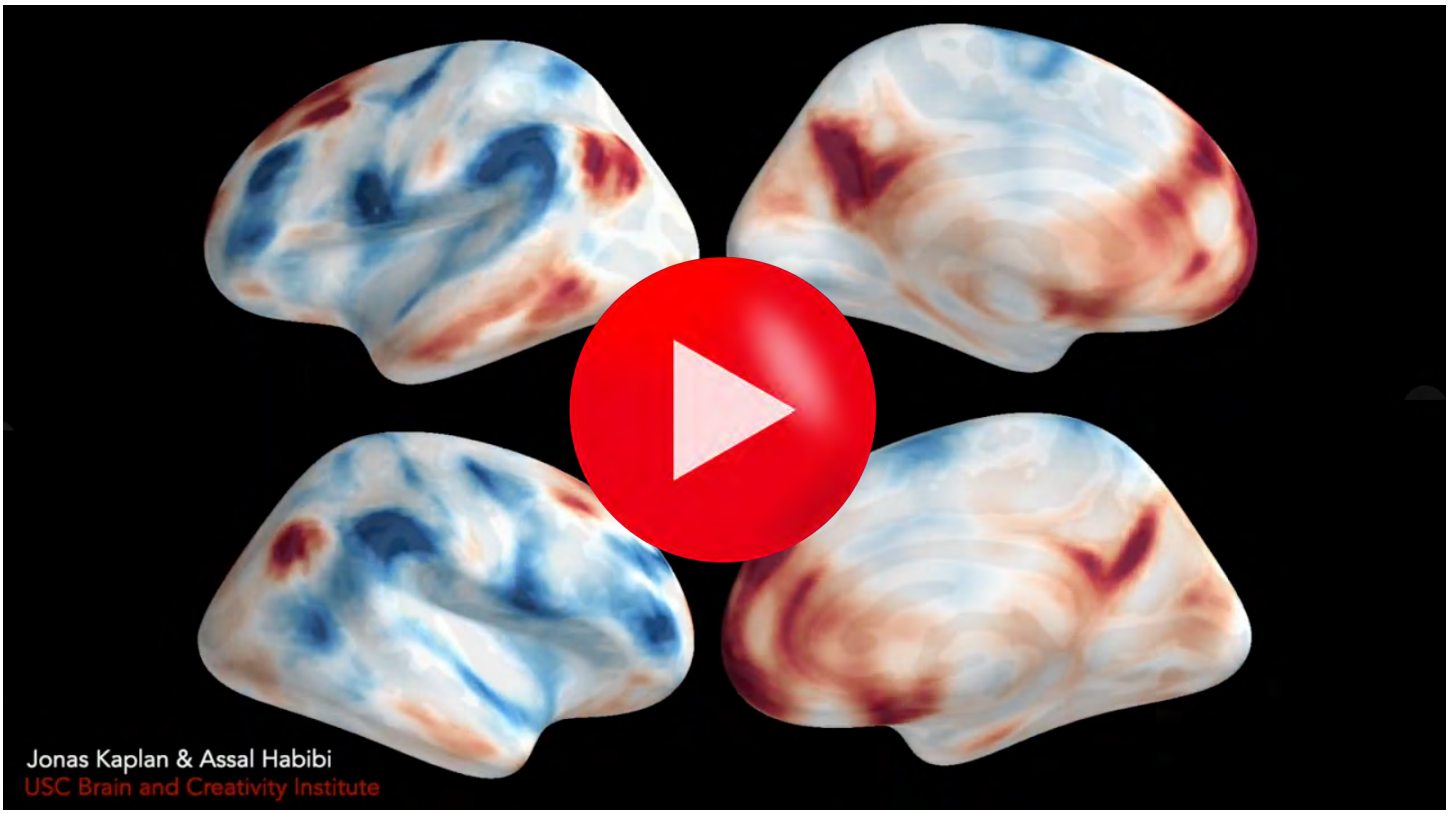
and scientific narratives are no longer excluded or overlooked by processes such as AI mining. These strategies underscore how art–science collaborations can create pathways for equitable recognition and representation.

Opportunities for Institutional and Stakeholder Support

As the group reflected on the future of engagements between art and science, one participant stated, "I think it's very important to know that there's always space for exactly who you are, no less. If you work at an intersection or in multiple fields, you're not defined by just one of them."

Despite this ideal, participants identified several current barriers to collaboration. At the most basic level, artists and scientists expressed difficulty getting funders—external or within their home academic institutions—to see the value of co-created projects. Procedurally, few funding opportunities currently exist that recognize interdisciplinary work. "I struggle with being a little too artsy for science grants and a little too science-y for art grants," noted a professor focused on water policy.

When artists and scientists attempt to push these projects through existing channels, their work is often misunderstood or characterized as "risky" by grant officers, leading to it being passed over. One

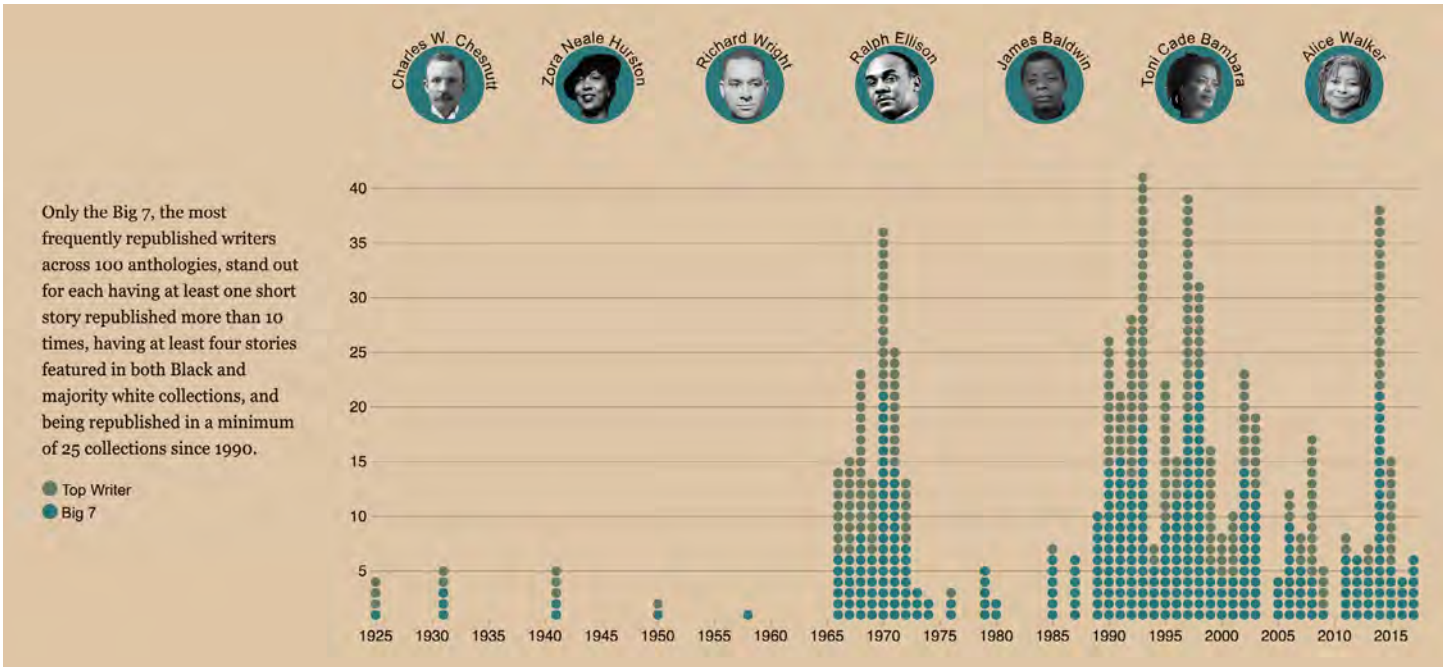


Assal Habibi. Brain scan listening to a piece by Chopin. *The video shows four brain views (left, right, medial, and lateral) of a musician listening to a recording of a Chopin nocturne. It highlights neural activation, with increases depicted in red and decreases in blue, across different brain regions during the listening session. Although the scientific value is limited by having only one participant, the video offers a dynamic visualization of how the brain responds to music. It provides insight into the neural processes involved in music engagement, which is the focus of my research—understanding how activities like listening or learning music support cognitive and brain function throughout life.*

participant suggested that the so-called "I don't get it" pile of proposals contains the projects that truly need funding. To combat this misunderstanding, a participant called for funders to prioritize including interdisciplinary practitioners on review panels.

To prompt a cultural shift toward integrating art and science, investment in resources like physical spaces, journals, and conferences that actively celebrate interdisciplinary collaboration will be needed. "These are not just small-term or individual projects we're working on. But we need institutional support to sustain community engagement around these particular topics," a participating data scientist noted. Another speaker added that due to limited institutional opportunities, artists and scientists may end up accepting grant funding from donors they do not feel ethically aligned with. In these cases, candor, humility, and transparency with community audiences are particularly important for trust.

Slowly but surely, opportunities for interdisciplinary collaboration are growing in number and recognition. Visionary leadership plays a crucial role in driving systemic change and creating pathways for new, transformative projects. For example, the National Institutes of Health (NIH) launched the Sound Health initiative, which earmarked $20 million for music neuroscience research and grant opportunities. This initiative was spearheaded by soprano Renee Fleming in collaboration with the now former National Institutes of Health Director, Dr. Francis Collins. Their vision has allowed researchers to study the intersections of music and neuroscience without having to reduce music to "complex auditory stimuli" to qualify for funding. It also laid the groundwork for the NeuroArts



Kenton Rambsy. Locating the Big 7 in 100 Anthologies. *This visualization offers an in-depth look at African American literary history by analyzing 100 anthologies published between 1925 and 2017. It highlights how seven Black writers became the most frequently anthologized short story authors, showcasing the role of editors in shaping literary canons. Through reprint tallies, the visualization uncovers patterns in how these authors' works were curated over time. Moving beyond traditional bibliographies, this tool uses data to enhance our understanding of Black literary production, providing a quantitative perspective on the publication histories of influential African American short fiction.*

Blueprint: Advancing the Science of Arts, Health, and Wellbeing, a partnership between Aspen Institute's Health, Medicine, and Society Program and Johns Hopkins International Arts + Mind (IAM) Lab Center for Applied Neuroaesthetics, chaired by Fleming.

Another example, the Ocean Memory Project funded by the National Academy of Science / Keck Futures Initiative, brought together people ranging from professors emerita to undergraduate students to collaborate on equal footing over five years. Rather than scientists dictating a question from the outset, the transdisciplinary group made a joint decision to "investigate how the ocean and its inhabitants are an interconnected system with agency and memory, where environmental changes are encoded within living things and within the dynamic processes of the ocean structure itself."

Similarly, the Simons Foundation's Symmetry: A Call for Artists, Scientists, and Arts Organizations initiative exemplifies a robust STEAM funding opportunity through its expanded Triangle Program.

Airan Berg. Fascination Octopus, Circus of Knowledge at Johannes Kepler University (JKU) Linz. *Book by Michael Stavaric, Illustrations by Michelle Ganser, Directed by Christine Maria Krenn/Helix Projects, Photo: Nick Mangafas. Fascination Octopus is the first part of a trilogy connected to the miracles of the sea. The original illustrations from the book were integrated in a dance–theater piece, which was devised by director/choreographer Christine Maria Krenn with 80 children and teenagers. When the production is performed for schools and the children in the piece are not available, the performer brings on groups of spectators and teaches them the choreography as part of the piece. The Circus of Knowledge connects arts and science with society and creates interdisciplinary, participatory and inclusive theatrical projects. Fascination Octopus was created in collaboration with Helix Projects and the JKU School of Education – Department of STEM Education – Biology.*

In 2025, 15 teams—composed of an artist, a scientist, and a curator or arts producer—will receive grant funding for a seven-month collaboration centered on the theme of "symmetry." By prioritizing open-ended exploration and allowing participants to shape their partnerships without mandated outcomes, the program fosters innovation and inquiry at the intersection of art and science.

These examples highlight the importance of institutional leadership and targeted funding in fostering meaningful art–science collaborations. Building supportive frameworks, ensuring sustained stakeholder engagement, and prioritizing intentional infrastructure over one-off initiatives can drive systemic change—engaging communities across generations.

CONCLUSION

STEAM leverages the distinct yet complementary strengths of art and science, reimagining how we approach societal challenges. At its core, meaningful STEAM integrates art and science as equal contributors, moving beyond surface-level connections to foster deeper collaboration that inspires equity, creativity, and transformative problem-solving. By addressing challenges such as access and limited interdisciplinary funding, STEAM creates opportunities for impactful, systemic change.

Participants at the Aspen Institute's 2024 roundtable defined successful integration as more than just collaboration—it's about "illuminating the hidden" and inspiring discovery, encouraging audiences to engage deeply with the world around them. Efforts like these build on the foundation laid by initiatives such as the ENFOLD SCI-ART symposium, supported by the Burroughs Wellcome Fund, like this Aspen Institute report, reflecting a shared commitment to advancing art and science integration.

"It's not science for the sake of science or art for the sake of art," concluded one participant. STEAM transcends traditional boundaries, inspiring transformative solutions to the challenges of today and those yet to come.

Paving The Way: Recommendations for a Two-Way Street in STEAM

This set of recommendations, clustered into three categories, aims to strengthen the impact of STEAM initiatives by fostering interdisciplinary collaboration, transforming educational approaches, and enhancing public engagement to create meaningful connections between art and science.

1. Fostering Interdisciplinary Collaboration

- Promote the union of art and science by emphasizing shared values of observation, inquiry, and creativity to inspire bold, generative solutions.
- Encourage meaningful cross-talk between artists and scientists to expand what is traditionally possible within their fields and challenge disciplinary silos.
- Reimagine STEAM collaborations as co-created efforts, ensuring art and science are equal partners from the early stages of idea development.
- Elevate diverse voices in art–science collaborations, prioritizing equity and representation to foster authentic partnerships and broader community engagement.

2. Transforming STEAM Education

- Design education programs that go beyond knowledge transfer to cultivate creativity, curiosity, and resilience through hybrid practices like critical historicity and creative hacking.
- Inspire students to navigate discomfort and cross-disciplinary boundaries by embracing new ways of thinking through co-taught or guest-led experiences.
- Implement dynamic frameworks, such as those integrating materiality, deep noticing, and multimodal approaches, to bridge artistic and scientific methodologies in the classroom.
- Create inclusive educational spaces where students can collaborate on generative projects, connect across disciplines, and envision themselves as contributors to both art and science.

3. Enhancing Public Engagement and Support

- Leverage unconventional, accessible spaces to share STEAM initiatives with the public, using creative formats that evoke wonder and make scientific concepts relatable.
- Foster trust and inclusivity by amplifying underrepresented voices and grounding STEAM efforts in community expertise and co-creation.
- Prioritize audience relatability in works, regardless of whether artists or scientists create them.
- Invest in infrastructure—such as interdisciplinary funding, platforms for co-generation, and support for hybrid practices—that empower innovative art–science initiatives to thrive.
- Prioritize including interdisciplinary practitioners during the development of requests for proposals (RFPs) for grants and on review panels.
- Reframe public-facing STEAM work to emphasize connection and storytelling, ensuring audiences engage meaningfully with the outcomes of art–science partnerships.

RESOURCE LIST

Meaningful STEAM Initiatives

- **Anthropology** – A moving exploration of family, technology, and loss, Lauren Gunderson's Anthropology follows a software engineer recreating her missing sister as a chatbot.
- **Applied Futures Lab** – A platform exploring future-focused interdisciplinary research, bridging science, art, and technology for innovation.
- **Art on the Mind** – Highlights Dr. Joyonna Gamble-George's artistic contributions, emphasizing her role in connecting artistic expression with scientific narratives.
- **Beyond Collaboration at the CoLab Studio Arts** – A set of exhibitions at the Michigan State University Museum showcasing interdisciplinary partnerships between scientists and artists, highlighting collaborative processes and impactful outcomes.
- **Circus of Knowledge** – A performing arts group combining art and education to inspire learning through all-ages performances and interactive experiences.

- **Dope Labs Podcast** – A Spotify podcast discussing science in current events and issues of public trust in science.
- **Enfold SciArt** and **The Landscape of Art–Science Collaboration Programs** – A 2023 symposium and proceedings exploring the establishment of a Science–Art Institute for Transformative Creativity, blending disciplines to inspire innovation.
- **Engine for Art, Democracy, and Justice** – A trans-institutional initiative founded by Dr. María Magdalena Campos-Pons, providing a platform for creative collaborations and inclusive dialogues at the intersection of art and society to address social injustices and promote democratic futures.
- **Entangled and Ingested** – A 2021–2024 art project by artist Dr. Kat Owens featuring life-sized portraits of marine life harmed by entanglement and ingestion of marine debris.
- **Festival der Möglichkeiten: Zirkus des Wissens @ JKU Linz** (in German) – A documentary on the Festival der Möglichkeiten performed by The Circus of Knowledge at Johannes Kepler University Linz in Austria.
- **The Half-Life of Marie Curie** – An audiobook dramatizing the story of Marie Curie's life and achievements, blending historical storytelling and scientific inspiration.
- **IF/THEN Exhibit** – An inspiring collection of exhibits aimed at empowering young women in STEM through stories of women scientists and engineers.
- **KV265: Bridging Science and Art** – An organization creating multimedia performances that blend scientific themes with artistic expression, aiming to inspire curiosity and understanding.
- **Leonardo Music Journal, Vol. 29** – A journal published by the MIT Press featuring articles by composers, artists, and scientists who incorporate new technologies into music and sound art.
- **Lil Lab Network** – "Little Free Libraries" for science focusing on playful learning approaches to enhance science, art, and technology education.
- **Locating the Big 7 in 100 Anthologies** – A data visualization showcasing anthologies with a focus on diversity and representation in literature and storytelling.
- **Moonrise in Delaware, Ohio** – A stunning photograph by Dr. José Francisco Salgado capturing a symphonic performance, blending art and science to inspire wonder and curiosity.
- **Polyfield Magazine** – A digital magazine exploring the intersection of science and art through interviews and innovative featured projects.
- **Revolutionary Women: A Lauren Gunderson Play Collection** – A collection of plays spotlighting women's contributions to science, history, and society through compelling narratives.
- **SciVizNYC 2019** – A curated playlist featuring videos on art–science integration projects, interviews, and discussions from the SciVizNYC 2019 conference for visual science communicators and researchers.

- **SciVizNYC 2020** – Video presentations from the 2020 SciVizNYC conference exploring creative approaches to bridging scientific inquiry and artistic practice.
- **SciVizNYC 2022** – Video presentations from the 2022 SciVizNYC conference featuring experts sharing stories about integrating science and art.
- **Sparkling Science 2.0: Artistic Research in Schools** – A citizen-science initiative integrating artists and educators to engage school students in creative and scientific exploration.
- **Stanford Bio4E** – A Stanford University initiative promoting equity-focused biology education through innovative teaching practices and science-based curriculum development.

Secondary Literature

- **Art is Science is Art: Strengthening Connections between Entomology and the Arts** – An article by Dr. Brenna L. Decker *et al.* exploring art–science intersections in the field of entomology.
- **Art Meets Science at the Circus** – A feature article from Cosmos Magazine discussing the Circus of Knowledge and its innovative approach to blending science and performance art.
- **Citizen Science - a new field for the arts?** An article by Pamela Bartar exploring the potential impacts of citizen science projects on bridging arts-based research and collaborative action, research, and learning.
- **Creatively connecting science, society and the sea: a mini-review of academic literature focusing on art–science collaborations and the ocean** – A scholarly literature review by Dr. Geraint Rhys Whittaker of art–science collaborations intersecting with marine science research.
- **Creative Tension: How a Choreographer and an Engineer Innovate Together** – An essay by Dr. Sigrid Adriaenssens describing the NODES project, in which Adriaenssens worked with choreographer Rebecca Lazier to create dance works that helped engineers understand the movement of different net structures.
- **Doubling Down on Wicked Problems: Ocean ArtScience Collaborations for a Sustainable Future** – An academic paper by Julia Jung *et al.* reviewing the potential impact of ArtScience collaborations on achieving sustainability goals set by the UN Decade of Ocean Science for Sustainable Development.
- **Fostering science–art collaborations: A toolbox of resources** – A resource toolbox by Dr. Callie R. Chappell and Dr. Louis J. Muglia for fostering collaborations between scientists and artists to drive innovative approaches in scientific storytelling and communication.
- **The trouble with STEAM and why we use it anyway** – A scholarly article by Dr. Sam Mejias *et al.* exploring the pedagogical implementation of STEAM in education and the potential for learning in settings that equally prioritize arts and STEM.

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