

Title: Indigenizing Science and Biomimicing Nature

Project Description:

Biomimicry, an emerging STEM field of nature-inspired design, and Traditional Ecological Knowledge (TEK), or Indigenous Knowledge Systems both have roots in nature and a deep respect for natural processes. However, the two fields primarily practiced in different worldviews: biomimicry is oriented from a western science perspective while TEK emerges from Indigenous, spiritual and cosmological worldviews. With a common source of inspiration—the natural world, professionals in both fields recognize the potential for collaboration, yet no formal efforts or conversations in this realm have occurred to date (Nelson 2014, Yang and Young 2019). With this project, we aim to create such a dialogue between practitioners in biomimicry and elders, practitioners, and Indigenous scholars in the form of podcast conversations.

Biomimicry is the practice of learning from nature to emulate it in sustainable design (Benyus, 1997). Three elements are needed to practice biomimicry, emulate—a design thinking process of mimicking the strategies of nature’s forms, processes or systems, ethos—a philosophical foundation that aspires to apply biomimicry in life-supporting ethically oriented practices, and (re)connect—a practice of learning from nature *in nature* and a reminder that we are part of nature and must acknowledge and embrace our inherent connection to the natural world.

Indigenous communities possess a rich storehouse of nature-inspired knowledge encoded in cultural practices, that is part of their TEK. It guides and results from the community members’ close relationships with and responsibilities towards the landscapes, waterscapes, plants, and animals that are vital to the flourishing of indigenous cultures. These ways of knowing and living have been accrued over thousands of years of experience, observation, relationships, and upheld responsibilities towards other living beings and places (CTKW 2014). These knowledges are rooted in generations of understanding and participation with the natural world and passing this information down through communities (Nelson and Shilling 2018). Although nature is a common thread, many distinctions exist, and our conversations are an attempt to explore these intersections.

Our team is composed of Indigenous sustainability professor Melissa Nelson (ASU), co-director of The Biomimicry Center, Sara El-Sayed (ASU) and Visiting Instructor for biomimicry at Pratt Institute and host of the Learning From Nature podcast Lily Urmann. Melissa’s background as an Indigenous ecologist and an environmental humanist gives her the ability to truly navigate these two fields. She is immersed in life as an Indigenous woman who is Anishinaabe, Cree, Métis, and a member of the Turtle Mountain Band of Chippewa Indians; she is an expert ecologist and has a deep understanding of science based biological systems. Melissa is producer and host of [Native Seed Pod](#), a podcast dedicated to “Indigenous sciences and the physical and poetic seeds needed to renew the health of the Earth at this critical time in history.”

Sara's Ph.D. dissertation enabled her to learn from traditional communities in the Southwest USA and develop a framework for regenerative food systems, inspired by Indigenous knowledge systems and Life's Principles, a framework developed in biomimicry. Sara also developed a series of podcasts that she co-produced with four undergraduate students who she mentored. Lily is a graduate of ASU's MS in Biomimicry and an educator in the biomimicry ecosystem. Lily is the creator and host of [Learning from Nature](#), a podcast dedicated to sharing how to practice biomimicry, what is possible in the biomimicry application space, and showcasing biomimics globally.

We hope to bring together scholars and practitioners in the two fields for face to face and voice to voice conversations about their worlds in relation to the themes chosen. The purpose is to explore the similarities, differences and intersections, in the hope that both fields can learn from each other, but also to create new synergies. We envision creating a series of five episodes that will be aired on both podcasts (Native Seed Pod and Learning from Nature), as a special series. The podcasts will feature conversations between people immersed in Indigenous knowledge and scholarship with people immersed in biomimicry thinking and practices, and will center on five themes: regenerative systems, food systems, shelter and dwellings, spirituality and cosmology, and women and nature connection. For each theme we will identify people to share a perspective on this topic in the form of a conversation with another person. The interviews will be facilitated by Melissa, Lily and/or Sara depending on the topic.

The podcast will offer an exploratory medium at the intersection of Indigenous knowledge systems and biomimicry, and as such will be a wonderful learning opportunity for students. We will recruit two Barrett Honors students to participate in selecting the guest speakers, in the formulation of the questions and episodes, in the interview process, as well as coaching the students in the process of editing a podcast episode.

Methodology:

In the spirit of Norris et.al 2012 duoethnography, we plan to use dialogic podcast episodes, that bring two or more researchers together juxtaposing their life histories in order to provide multiple understandings of the intersection between biomimicry and Indigenous knowledge systems. The dialogues will create vignettes around specific topics. To achieve this, we propose four phases that take inspiration from Indigenous methodologies that center one's positionality as well as storytelling .

Phase 1: Consensus building - The core team of Melissa, Sara and Lily will start by discussing the themes and come to a consensus on the most suitable speakers and angles to approach the topics. Respecting Indigenous research practices, the team will establish an accepted code of conduct (Smith, 199) to invite, interview and edit the episodes. The team will also go through the processing of vetting and hiring two students to be part of the team.

Phase 2: Planning - The team will then begin outreaching to the various speakers and secure a recording time. Concurrently we will be working on obtaining IRB approval. Questions

to be asked for each interview will be decided and the various tools used for recording will be evaluated and decided.

Phase 3: Recording and Editing - Recording of the episodes will occur with all the planning group and then the editing will be done by the students, under Sara's and Melissa's supervision. The recording will be conducted virtually to ensure a large outreach to global scholars. Using advanced software including venvastra, studio quality can be obtained for recordings.

Phase 4: Publishing - The various vignettes created in the podcasts will also be turned to different sections of a paper, framing the case for bringing these two disciplines together and will be part of a co-authored publication. The podcasts will be broadcast as a special series on both podcasts.

Impact Statement:

Short term- By co-producing and launching five public facing podcasts using Indigenous methodologies as a framework, we believe these conversations will shed light on a new understanding of how these fields intersect. Because the podcasts will be launched in the Native Seed Pod — 33,519 shows listened and 55,000 page views— and Learning from Nature —4000 downloads since 2022— shows that already have their own listenership we increase the awareness of the intersections in each community. The synthesis of these dialogue sessions will be published further making the case for the value of bringing the two disciplines of biomimicry and Indigenous knowledge systems together, particularly with respect to the various thematics. We aim to submit the article to one of the following peer-reviewed journals, Biomimetics, Humanities, Transactions on Ecology and the Environment, or Sustainability Journal. These are journals that have published articles in either biomimicry or Indigenous systems or both.

Long term- These conversations are the beginning of bridging these fields, and offer a possible vehicle to give deeper legitimacy to both fields in academia. Although biomimicry is a recognized STEM field, it is still in its infancy stage, and how the field is defined is still not universal, there are only a handful of universities offering biomimicry courses. It is therefore, a great opportunity of learning from Indigenous ways of knowing, to tune the biomimicry STEM field to be more culturally relevant and more in alignment with Indigenous practices that are ultimately closer to biomimicry's ethos. Indigenous knowledge systems are gaining momentum in academia, but are still considered on the fringes, and being able to showcase their value in strengthening a STEM field, will be a benefit to bolster their standing in academic spaces. We also hope that ultimately weaving biomimicry with Indigenous knowledge systems, might increase participation of people of color, that often don't identify with STEM fields, might broaden participation. Broadened participation is part of NSF's INCLUDES grants, whose aim is to support programs that result in a STEM workforce that reflects the diversity of the Nation's population, which we aim to submit for a larger grant. Reviews of previous funding attempts in this realm encouraged more initial investment in the intersection prior to large funding. This proposal seeks to meet that recommendation.

ASU Resources Statement:

ASU offers many different resources such as free software and free studio spaces. We plan to conduct most of the interviewees virtually using zencast, however if the opportunity arises to interview people in person, we plan to use the ASU Hayden library Makerspace podcast studio spaces. Using the podcast space offers the opportunity to interact with the Makerspace team who is involved heavily in creative outputs. The two Co-Pi Sara El-Sayed and Melissa Nelson, have been engaging in these conversations about the intersection of biomimicry and TEK for a couple of years, as a result we also have many potential interviewees in mind. Melissa runs Indigenous Knowledges Community Dialogues, which is hosted by the Global Futures Laboratory and both Sara and Melissa are part of various Humanities organizations, Sara is part of Humanities for the Environment and Melissa is part of the Environmental Humanities group. We hope to engage the following networks for suggestions for speakers for the podcast conversations.

Suggested guest speakers based on themes:

Regenerative systems theme will be hosted by Sara, with invited speakers Janine Benyus and Robin Wall Kimmerer. Food Systems theme will be hosted by Melissa and we hope to invite Paul Hawken or Wes Jackson and Vandana Shiva. Home and dwelling theme will be hosted by Sara and the speakers will be Maibritt Pederson and Lillian Hill or Wanda Dalla Costa. We are still deciding the main speakers for the Spirituality and nature connection themes.

Project Timeline and Activities:

Activity	Q1	Q2	Q3	Q4
Team meeting and discussing students to hire and identify speakers	Jan/Feb			
Hire student workers	Feb			
Train students on using various podcasting softwares	Feb/Mar	Apr/may		
Developing topics and questions and outreach to speakers	Feb/mar	apr/may/jun		
Record interviews		may/jun	jul/aug/sept	
IRB approval	Feb			
Working on case studies		June	July/aug/sept	Oct
Writing and applying for grant			Aug/sep	Oct
Editing podcast			Aug/Sept	Oct/Nov
Launch podcast as a special issue in the two podcasts				Oct/Nov

Writing paper			Sept	Oct/nov/Dec
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Key activities:

- The first quarter will be the planning phase, that includes the team creating the framework and hiring students, as well as applying for IRB approval.
- In the second quarter students will be trained and outreach to the speakers will take place. We will begin the process of recording interviews, and concurrently the case studies from the transcripts will be developed for the published paper.
- Quarter three will include the bulk of the recording of interviews, and continued work on the case studies until the final production of multi-authored paper. During August and September the bulk of the podcast editing will take place. Given that the NSF INCLUDES grant application is typically due in October, the team will also be working on the grant during this period.
- The grant will be submitted by October during the last quarter, and all other elements will also be finalized, such as final edits of podcast and launching the episodes on the two platforms.

Budget:

Category	Item	Amount	Cost	Total
Personnel	Co-PI - Melissa Nelson			1800
	Co-PI - Sara El-Sayed			1500
	Student workers (14/hour)	2	14*100	2800
Public Engagement	Honoraria for speakers	10	250	2500
Consultants	Lily Urman			1500
Operations	Podcast editing software membership			200
	Publication cost - open source			700
			Sub TOTAL	11000
Administrative cost				935
			TOTAL	11935

Sara El-Sayed - Curriculum Vitae

EDUCATION

2019 - 2021	Ph.D. School of Sustainability, Arizona State University (ASU)
2016	M.S. in Biomimicry, ASU
2011 -2014	Biomimicry Professional Program, Biomimicry 3.8
1997- 2002	B.S. Biology, B.A Cultural Anthropology, AUC in Cairo, magna cum laude

EXPERIENCE

2022 - Present	Co-Director of The Biomimicry Center and Assistant Research Professor at the Swette Center for Sustainable Food Systems, ASU
2021 – 2022	Post-Doctoral Scholar in Public Interest Technology, SFIS
2017 – 2022	Project Manager and Researcher, The Biomimicry Center, ASU
2016– Present	Consultant Biomimicry 3.8 November
2019 – 2021	Research Assistant, Sensory Labor(atory), (ASU)
2017- 2020	Partner in Clayola LLC, clayolaegypt.com
2011– Present	Co-Founder Nawaya Social Enterprise, nawayaegypt.org
2011- Present	Co-Founder, Dayma LLC, http://dayma.org/
2011-2012	Project Manager International Union for the Conservation of Nature IUCN
2005-2011	Senior School Coordinator, Wadi Environmental Science Center
2005	Eco-Guide at Wadi El Gemal National Park

TEACHING EXPERIENCE

2019– 2020	Teacher Assistant and Instructor in Biomimicry, (ASU)
2018- 2020	Instructor – Master Program at the University of Gastronomic Sciences
2017 - Present	Fellow at Cairo Liberal Arts and Natural Science Institute
2013	Guest Lecturer at Heliopolis University
2006- 2011	Senior School Coordinator WESC
2002-2005	Science Coordinator at Misr Language School

PUBLICATIONS: Refereed Journal Articles

- 2022 El-Sayed, S., & Cloutier, S. (2022). Weaving disciplines to conceptualize a regenerative food system. *Journal of Agriculture, Food Systems and Community Development*, 1–29. <https://doi.org/https://doi.org/10.5304/jafscd.2022.112.003>
- 2022 El-Sayed, S., & Spackman, C. (2022). Follow the Ferments: Inclusive Food Governance in Arizona. *Gastronmica: The Journal of Food and Culture*, 22(1), 20–33. <https://doi.org/10.1525/gfc.2022.22.1.20.from>
- 2022 Borah, P., Spackman, C., & El-Sayed, S. The impact of temporary COVID-19 legislative moves on the ability of food enterprises to pivot in Arizona the ability of food enterprises to pivot in Arizona. *Journal of Foodservice Business Research*, 1–22. <https://doi.org/10.1080/15378020.2022.2063620>
- 2021 Giraud, E. G.; El-Sayed, S. Gardening for Food Well-Being in the COVID-19 Era. *Sustainability* 13, 9687. <https://doi.org/10.3390/su13179687>

2021 Kitch, S.; McGregor, J.; Mejía, G.M.; El-Sayed, S.; Spackman, C.; Vitullo, J. Gendered and Racial Injustices in American Food Systems and Cultures. *Humanities* 10, 66.

<https://doi.org/10.3390/h10020066>

2016 Pozzi, S., El-Sayed, S. Where Is Our Baladi Food? *Cairo Papers in Social Science*, Volume 34(No4)

Books

2022 Cloutier, S., El-Sayed, S. Ross, A., Weaver, M. Linking Sustainability and Happiness: Theoretical and Applied Perspectives. Springer Nature.

<https://doi.org/https://doi.org/10.1007/978-3-030-89559-4>.

Book Review

2021 El-Sayed, S. Power to the Public: The Promise of Public Interest Technology: By Tara Dawson McGuinness and Hana Schank, Princeton University Press, Princeton, 2021, Pp. 187, \$19.95. *Journal of Responsible Innovation*. 1–4.

<https://doi.org/10.1080/23299460.2021.1989797>.

2019 El-Sayed, S. (2020). Review of Florentine Frentz, The Pursuit of Food Well-Being: The Mechanism Behind Consumers' Food Well-Being, and their Relevance for Food Retailing and Marketing, (Springer 2020), Pages 220, Cost 83,19 €. *Int. Journal of Com. WB*

<https://doi.org/10.1007/s42413-020-00095-2>

Web-based Publications

2021 El-Sayed, S. Slow Food Youth Network Podcast. Jan 13, 2021. [Regenerative Preservation Practices](#).

AWARDS AND HONORS

2021 Faculty Women's Association

2020 MAXQDA "ResearchforChange" grant (\$1550)

2020 COOR Scholarship for community engagement (\$3000)

2019 Neely Foundation Food and Agriculture Sustainability Research Grant, ASU

INVITED TALKS/CONFERENCES

2021 El-Sayed, Urman. Enhancing Sustainability Education through Biomimicry. October 12th. The Association for the Advancement of Sustainability in Higher Education.

2021 El-Sayed, Giruad, Opejin June 14th. Food Well Being and Happiness in the Era of Covid-19. ASFS - Just Food: Because It Is Never Just Food – June 9-15.

2020 El-Sayed, Spackman. 2020. Speculative Future of Food.... Beyond Contamination". ASFS/AFHVS Twitter Conference. Virtual conference. July 23-25

COMMUNITY INVOLVEMENT AND OUTREACH: Slow Food board member, Happy Hood neighbourhood project, Volunteer at Egyptian national parks

LANGUAGES: Fluent in Arabic, English, and Italian and Beginner French

Melissa K. Nelson, Ph.D.
Abbreviated Curriculum Vitae

EDUCATION

2000 Doctor of Philosophy (Ecology Graduate Group with Designated Emphasis in Native American Studies), University of California, Davis

1991 Bachelors of Arts (Integrated Ecology [Biology, Environmental Studies, and Religious Studies]), University of California, Santa Cruz

ACADEMIC APPOINTMENTS

2020 to present Professor of Indigenous Sustainability School of Sustainability, College of Global Futures Arizona State University, Tempe, Arizona

2019 – 2020 Professor American Department of Indian Studies, College of Ethnic Studies San Francisco State University, San Francisco, California

2008 – 2019 Associate Professor American Department of Indian Studies, College of Ethnic Studies San Francisco State University, San Francisco, California

2010 Acting Chair American Indian Studies, College of Ethnic Studies San Francisco State University, San Francisco, California

2002 – 2008 Assistant Professor American Department of Indian Studies, College of Ethnic Studies San Francisco State University, San Francisco, California

1993 – 2021 Chief Executive Officer The Cultural Conservancy San Francisco, California

PUBLICATIONS: Refereed Journal Articles

1. Orlove, Ben, Dawson, Neil, Sherpa, Pasang, Adelekan, Ibidun, Alangui, Wilfredo, Carmona, Rosario, Coen, Deborah, **Nelson, Melissa**, Reyes-García, Victoria, Rubis, Jennifer, Sanago, Gideon and Andrew Wilson. (2022) *ICSM CHC White Paper I: Intangible cultural heritage, diverse knowledge systems and climate change. Contribution of Knowledge Systems Group I to the International Co-Sponsored Meeting on Culture, Heritage and Climate Change*. Discussion Paper. ICOMOS & ISCM CHC, Charenton-le-Pont, France & Paris, France, 103p. ISBN 978-2-918086-71-0.

2. Beth Rose Middleton, Corrina Gould, Johnella LaRose, **Melissa K. Nelson**, Joanne Barker, Darcie Houck, and Michelle Grace Steinberg. (In Press) A Place to Belong: Creating an Urban, Indian, Women-Led Land Trust in the San Francisco Bay Area. *Ecology and Society*, editor Sybil Diver.
3. Nelson, Melissa K. (2022). Global Futures must be rooted in ancient pasts and Indigenous futures thinking. *Global Futures: Futurecast*, Vol. 2, Spring, pp. 12 – 15.
4. Nelson, Melissa K. (2019). Wrestling with Fire: Indigenous Women's Resistance and Resurgence. *The American Indian Culture and Research Journal*, 43:3, 2019. Editor, Joanne Barker.
5. Nelson, Melissa K. (2018). Back in our Tracks: Embodying Kinship as if the Future Mattered. *Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability*. Edited by Melissa K. Nelson and Dan Shilling. Cambridge, UK: Cambridge University Press.

AWARDS & HONORS

2022 - 2025: Interdisciplinary, Immersive, Identity-based Team Science Experiences, National Science Foundation, Equity in STEM Grant, \$1, 599,000.

2022 – 2023: NDN Collective Changemaker Fellowship, NDN Collective, \$75,000.

2019: Advocate of Social Justice Award, "Ecological Farming Association

2017: Pamela Wright Lloyd Environmental Stewardship Award, Conservation Corps, North Bay

2014: Exemplary Practices/Practitioner Award for Experiential Education, Association of Experiential Education

2010 – 2011: School for Advanced Research of the Human Experience \$75,000
Anne Ray Resident Scholar

LILY URMANN

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EDUCATION

Scientists Teaching Science Course Completion, New York Academy of Sciences
(August 2022)

M.S., Biomimicry, Arizona State University (May 2020)

B.A., Environmental Studies, University of California, Santa Cruz (June 2016)

EMPLOYMENT

Education Mentor - Learn Biomimicry (July 2022-Present)

- Reviews all phases of work submitted by participants in the Educator Practitioner program (established August 2022).
- Plans activities and hosts check in sessions for participants to better understand the process of biomimicry and how to apply it to their project or challenge.

Program Manager, Curriculum Advisor Biomimicry Frontiers (January 2022-Present)

- Coordinates and supports all cohort classes for virtual “Biomimicry Mastermind”.
- Meets with Jamie Miller regularly to plan the evolution of courses and how to best advise participants throughout their learning journey.
- Reviews and updates curriculum for self-paced online and cohort courses, integrates of additional nature-based learning sequences and biomimicry content that guides participants through the process in a clear and engaging way

Visiting Instructor for Mathematics and Science Department Pratt Institute (January 2022-Present)

- Designed and developed course curriculum for “Biology for Biomimicry”, currently facilitating weekly classes and grading all student work throughout the semester.
- AskNature and Life’s Principles for integration into campus-wide classes.

Program Manager, Instructor The Kiva Center (October 2021-Present)

- Created curriculum for after-school program for Denver elementary school that focuses on nature connection, learning from organisms around us, appreciating the natural world and our community, and building self-awareness and reflection.
- Instructed weekly programming for 2nd-5th graders from 2021-2022 school year.

The Biomimicry Center, Arizona State University (August 2018 - August 2021)

- Oversaw all programs for The Biomimicry Center including undergraduate certificate, Center education workshops, guest lectures, community workshops, and partner events.
- Developed course content and curriculum for three undergraduate biomimicry certificate core courses, and co-taught “The Practice of Biomimicry”.
- Grant writer for all foundation and federal research applications. Won 2019 Women and Philanthropy \$75,000 grant for Project BioConnect.
- Managed Project BioConnect, including a team of 3 graduate students and external collaborators at the Phoenix Zoo and The Biomimicry Institute, to co-create comprehensive in-depth and hands-on biomimicry curriculum for middle school students.
- Managed advising for all biomimicry certificate undergraduate students: approved academic plan and served on student biomimicry thesis committees to provide feedback on biomimicry-application ideas/designs.
- Managed the integration of Biomimicry MS Digication effort: worked with graduate faculty to embed Digication platform into online courses and support students throughout the program.

San Francisco Conservation Corps (April 2017 - May 2018)

- Lead writer on all grant proposals: analyzed potential funding opportunities and provided guidance on pursuing RFP’s; ensured alignment with SFCC priorities and strategic plan.
- Program management and oversight for specific City and County of San Francisco grants and contracts such as the Office of Economic and Workforce Development and the Mayor’s Office of Housing and Community Development.
- Secured over \$2M in grants and city contracts, including REDF, Wells Fargo Foundation, GAP Foundation, SF Department of Children, Youth, and their Families, and SF Public Utilities Commission for SFCC’s Youth Workforce Development Program.
- Designed and built new organizational website, developed brand strategy for 35th anniversary, coordinated SFCC’s first #GivingTuesday event to increase donor engagement and retention, organized annual Year-End Giving Campaign 2017.

Bibliography

Benyus, J. (1997). *Biomimicry: Innovation inspired by nature*. New York: Perennial.

[CTKW], Climate and Traditional Knowledges Workgroup. 2014. Guidelines for Considering Traditional Knowledges in Climate Change Initiatives. <https://climatetkw.wordpress.com> (accessed 3-5-21)

Shilling, D. (2018). Introduction: The Soul of Sustainability. In M. K. Nelson & D. Shilling (Eds.), *Traditional Ecological Knowledge: Learning from Indigenous Practices for Environmental Sustainability* (pp. 3–14). UK: Cambridge University Press.

Smith, L. T. (1999). *Decolonizing Methodologies: Research and Indigenous Peoples* (1st ed.). London: Zed Books Ltd.

Nelson, M. (2014). Indigenous science and traditional ecological knowledge: Persistence in place. In *The World of Indigenous North America* (pp. 188–214). <https://doi.org/https://doi.org/10.4324/9780203122280-21>

Norris, J., Sawyer, R. D., & Lund, D. E. (2012). Duoethnography: Dialogic Methods for Social, Health and Educational Research (J. Norris, R. D. Sawyer, & D. E. Lund, eds.). <https://doi.org/10.13140/2.1.2184.8644>

Yang, B., & Young, R. F. (2019). *Ecological Wisdom: Theory and Practice*. Singapore: Springer, Singapore.

Potential External Funding

Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES)

PROGRAM SOLICITATION - NSF 22-622

[https://www.nsf.gov/pubs/2022/nsf22622/nsf22622.htm#:~:text=NSF%20INCLUDES%20is%20a%20comprehensive,for%20Fiscal%20Years%20\(FY\)%202022](https://www.nsf.gov/pubs/2022/nsf22622/nsf22622.htm#:~:text=NSF%20INCLUDES%20is%20a%20comprehensive,for%20Fiscal%20Years%20(FY)%202022)

The vision of NSF INCLUDES is to catalyze the STEM enterprise to work collaboratively for inclusive change, resulting in a STEM workforce that reflects the diversity of the Nation's population. More specifically, NSF INCLUDES seeks to motivate and accelerate collaborative infrastructure building to advance equity and sustain systemic change to broaden participation in STEM fields at scale. Significant advancement in the inclusion of groups that have historically been excluded from or under-served in STEM will result in a new generation of STEM talent and leadership to secure the Nation's future and long-term economic competitiveness.