Strategic Plan

Materials Genome Foundation

Oct 17, 2023

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MGF Vision

Advance open materials science innovation by providing community services that increase access to open materials software, data, and research.

View the current draft PDF of the Materials Genome Foundation Strategic Plan.

Part I

Introduction

CHAPTER

ONE

EXECUTIVE SUMMARY

MGF Vision

Advance open, collaborative materials science innovation through community leadership, content, and training that increase open materials software, data, and research literacies.

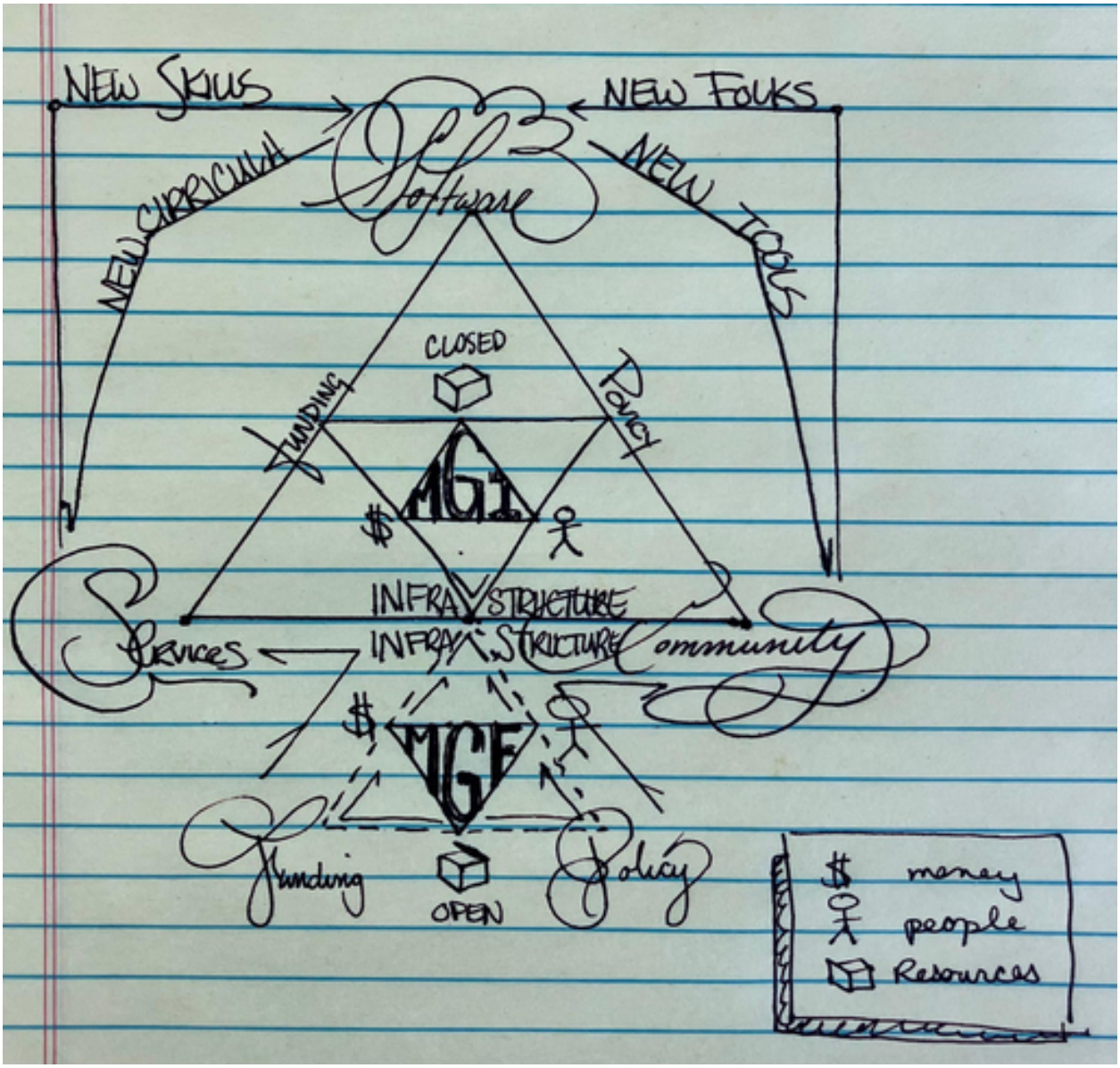
The Materials Genome Foundation MGF is established - with funding through **Pathways to Enable Open-Source Ecosystems** NSF-POSE #2229690 - to increase access to materials science and manufacturing literacy. It builds off the open source successes of endorsed projects stemming from the [PyCalphad] ecosystem including [Kawin] and [ESPEI]. Materials science and manufacturing are facing increasingly complex engineering challenges that outpace traditional modes of research and development. Our proposed initiatives provide tools that support a diverse, inclusive materials communities practicing open science to address emerging, interdisciplinary engineering problems.

The open science movement has demonstrated power in fostering collaborations, reproducibility, and equity. These successes are exemplified by programs like NASA-TOPS & LIGO while institutions like the NIH and USGS champion their own collaborative successes. Open science is becoming part of US federal policy with multi agency cooperation and mandates from OSTP for updated public access policies

> Today, the White House Office of Science and Technology Policy (OSTP) updated U.S. policy guidance to make the results of taxpayer-supported research immediately available to the American public at no cost.

August 25, 2022 - White House Office of Science and Technology Policy STP Issues Guidance to Make Federally Funded Research Freely Available Without Delay

The Materials Genome Initiative ushers in a new open information economy for materials science. Successful programs like the Materials Data Facility, the Materials Project, and PRISMS demonstrate the efficacy of open data in materials science. This culture shift indicates that the time is right for open collaboration in materials science. The MGF exists to support materials scientists with the tools and literacies required to practice open science. Our plan encourages a new culture that broadly disseminate materials software, data, experience, models, and research.



The Materials Genome Foundation will serve a complementary role relative to established funding, policy, and infrastructure efforts. The MGF augments traditional funding pathways with open science funding, and the culture will be develop through open governance and rigorous community management. We'll build tools and infrastructure that connect the community and promote inclusive, diverse, open materials science.

The Materials Genome Foundation is prioritizing three goals to promote open materials science:

1. Fostering an Open Materials Science Community and Culture
2. Advancing the quality of open materials science tools
3. Provide training neceesary for an open materials science economy

More specifically, these goals are reflected in on-going MGF initiatives that include:

1. Community activities that increase the frequency of materials scientists meeting.
2. Technical support and management of endorsed open source materials science software.
3. Develop workshops that increase software literacies in materials science practice.

4. Create new texts for the next generation workface that align closer to modern roles.

These goals and initiatives will be acheived through a radically open approach to materials science that aligns more with open source software collaboration. These goals are designed to impact early career researchers that will operate in rapid, open, interdisciplinary research. The Materials Genome Foundation believes that a transparent, open approach will permit sustainable growth; it can adapt to the rapidly changing technical landscape of science.

CHAPTER

TWO

ABOUT THE STRATEGIC PLAN

This strategic plan is an open living document. Currently, it is a work in progress as we prepare to release a 2024 strategic plan.

2.1 About the Materials Genome Foundation

2.2 About this Document

An enduring Materials Genome Foundation will remain aware of the needs of the next generation workforce. A sustainable plan can adapt as goals are met or cultural needs in the open materials science ecosystem shift.

The MGF begins their commitment to openness by making their strategic plan an open, living document that can adapt to a rapidly changing technology landscape. New visions, goals, and objectives can be adopted as past objectives are met. Calendar versioning will be used to distribute the strategic plans as software packages containing:

- The markdown source contents
- An exported PDF version of the document.
- Tooling to build the strategic plan.

More information in the developer documents.

2.3 Acknowledgements

The initial drafting of the living MGF strategic plan in funded by **Pathways to Enable Open-Source Ecosystems** NSF-POSE #2229690.

Part II

MGF Goals

CHAPTER

THREE

FOSTERING AN OPEN MATERIALS SCIENCE COMMUNITY

Important: The MGF will grow online communities of materials scientists across generations, disciplines and expertise.

Open science practices overlap with the open source movement and provide us with valuable to build a more inclusive science from. Drupal's motto - Come for the Software, Stay for the Community - teaches us a lesson that tireless community work supports successful open communities.

The Materials Genome Foundation understands the need for diverse communities of experts. Community is a primary goal. The MGF understands that the quality of our sponsored software projects and services all depend on an equitable community. These goals motivate our demo day and digital community initiatives.

Open community objectives

- *Establish an online community of practice for open materials scientists*
- *Host immersive, hands-on open materials science software workshops*
- *Generate new media to represent materials science*
- *conferences*

3.1 Establish an online community of practice for open materials scientists

Open science is a commitment to more frequent interactions with other experts. Work will be shared more freque

We want to increase the frequency that materials researchers commune. Increasing synchronous and asynchronous interactions propels

Open science is spread across infrastructure

> wide-scale adoption of OS practices requires a culture change that leads to normalization among members of the scientific community. https://watermark.silverchair.com/scab039.pdf

- increase access to the materials science community
- Online Discord community
- Demo Days
- Create more opportunities to practice communication

3.2 Host immersive, hands-on open materials science software workshops

- Design and host immersive virtual workshops using JupyterHub

3.3 Generate new media to represent materials science

- future materials scientists will discover the discipline through alternative media channels than those presently supported.
- catering to publications and print media limits participation in the field.
- the mgf will encourage and amplify new ways of representing complex simulations and observations about materials.
- recently, stsci has been lauded for accessible alt text descriptions for public images captured by the james webb space telescope.
- scientific python communities are active on tiktok.

3.4 conferences

CHAPTER

FOUR

ADVANCE THE QUALITY OF OPEN MATERIALS SCIENCE SOFTWARE TOOLS

Important: The MGF will nurture sustainable open source software projects that increase access to quality materials data, theory, and models.

- open-source is a core value of the MGF that will increase access to a materials science identities.
- the MGF will align materials research with open software goverance to increase the scope of materials science work and those that can participate.
  - reducing geographical boundaries to materials science research is critical the development of advanced materials manufacturing.
- shepherd a culture of opening closed software. pycalphad is a success story in making a block box technical a community good.

Open source objectives

- *Grow a porfolio of endorsed open materials science software projects*
- *Provide open software and documentation that brings best practices to open materials research software engineering*
- *Improve software bill of materials quality for materials science research software*

4.1 Grow a porfolio of endorsed open materials science software projects

Endorsed MGF projects are open source scientific python tools that:[1]

- have approved OSI licenses
- have public documentation
- have public source code
- have tests
- MGF endorsed projects
  - have a maintainer

[1] this list was adapted from the pyopensci editor in chief checks

  - have a way to communicate with their community
  - have tests, documentation, continuous integration
  - are not expected to survive in perpetuity
- Existing: PyCalphad, Kawin
- Use existing CHAOSS metrics to understand the qualities of materials science projects.[2]

4.2 Provide open software and documentation that brings best practices to open materials research software engineering

- the MGF will own open software projects themselves.
  - documentation projects build community and increase the potential contributor base.
  - MGF projects provide sandboxes for community management and project planning.
- nurture and support early materials research in their earliest open source community efforts

4.3 Improve software bill of materials quality for materials science research software

- increase access to open standards that manage supply chain levels for software artifacts and software bill of materials for early research artifacts.
- improve quality assurance and supply chain risk management in materials manufacturing
- most materials science software we remain small in scale with few contributors. SBOM and SLSA
- there is a frightening speed that materials science desire to develop new materials. SBOM and SLSA provide ways to safe gaurd research supply chains.

[2] CHAOSS is a Linux Foundation project focused on creating metrics, metrics models, and software to better understand open source community health on a global scale.

CHAPTER

FIVE

OPEN MATERIALS SCIENCE SERVICES

Important: The MGF will establish **services** that diversify materials science education, training, and collaboration.

Service objectives

- *Hire Post Doctoral Research Software Engineers*
- *Hire Masters Research Software Engineers*
- *Maintain resources to support community events and workshops*

- Expand the scope of materials science work
- Growing the definition of materials science jobs
- Expand the scope of software

5.1 Hire Post Doctoral Research Software Engineers

-

5.2 Hire Masters Research Software Engineers

- MSI hire
- Provide open leadership training opportunities.
- Part-time?
- is this rse? check the rse history.
- MSI
- hire non materials science leadership from business schools and library sciences.

5.3 Maintain resources to support community events and workshops

- Provide community resources to a jupyterhub, build users and charge institutions.
-

Part III

MGF Initiatives

CHAPTER

SIX

MATERIALS GENOME INITIATIVE

CHAPTER

SEVEN

ESTABLISHING AN OPEN MATERIALS SCIENCE COMMUNITY

A primary objective of the earliest Materials Genome Foundation will be to connect communities working at the intersections of materials science, artificial intelliegence, and research software engineering. Materials and manufacturing still rely on costly and infrequent in-person community meetups. Closed science practices serve the existing community by creating barriers for new members to join.

The Materials Genome Foundation will contribute the growth of an online materials science community. These efforts will increase access to open materials science events.

has identified community and community development as a critical need for the open materials science movement.

The Materials Genome Foundation recognizes that open source code seeds community. The MGF desires to serve a diverse community of multi generational and interdisciplinary researchers cooperatively sharing research, data, and code.

7.1 Open workshops

The Materials Genome Foundation demonstrates a commitment to open science by providing access to their workshop materials.

Early in 2023, with support from the POSE program, the Materials Genome Foundation hosted a one day workshop on pySIPFENN, an MGF endorsed projects.

7.2 Demo Day

The Materials Genome Foundation will increase opportunites for scientific communication. An open community format. MGF-RSE's will help with coordinate things

There is a lack of opportunity for up-and-coming materials scientists to practice scientific communication.

7.3 A Discord Community for Materials Science and Manufacturing

Not Open

The Open Materials and Manufacturing Discord is an initiative to sustain a community of materials and manufacturing researchers. The Materials Genome Foundation supports this initiative to increase access to materials science community and accelerate open knowledge sharing. The Discord community will serve as a place for interdisciplinary, multi-generation research discussions at the boundaries of materials science and open source.

stages:

- spend time supporting our immediate sponsored projects.

- spend time supporting other folks in the long term

CHAPTER

EIGHT

SUPPORT OPEN SOURCE MATERIALS SCIENCE SOFTWARE

8.1 MGF Developer meetings

CHAPTER

NINE

DELIVER OPEN SOURCE MATERIALS SCIENCE WORKSHOPS

9.1 Deliver reusable courses and workshops

Using open technologies novel hands on experiences

CHAPTER

TEN

OPEN SOURCE MATERIALS SCIENCE TEXTBOOKS