



APRIL 2023 VOL. 13, NO. 2

# In The Trenches

THE NEWS MAGAZINE OF THE NATIONAL ASSOCIATION OF GEOSCIENCE TEACHERS



**Diversity, Equity, Inclusion: Geoscience for Everyone**

# In The Trenches

**Editor in Chief:** Redina Finch

**Managing Editor:** Nancy Ashmore

**On the Cover:** Participants in a 2019 workshop on "Diversity, Equity, and Inclusion in the Earth and Environmental Sciences: Supporting the Success of All Students," held at the University of Illinois at Chicago [Photo by Mitchell Bender-Awalt, Carleton College, CC BY-NC-SA 3.0]

## **In The Trenches (ISSN 2372-1936)**

is a quarterly magazine of the National Association of Geoscience Teachers, a professional association that works to foster improvement in the teaching of the Earth Sciences at all levels of instruction, to emphasize the cultural significance of the Earth Sciences and to disseminate knowledge in this field to the general public.

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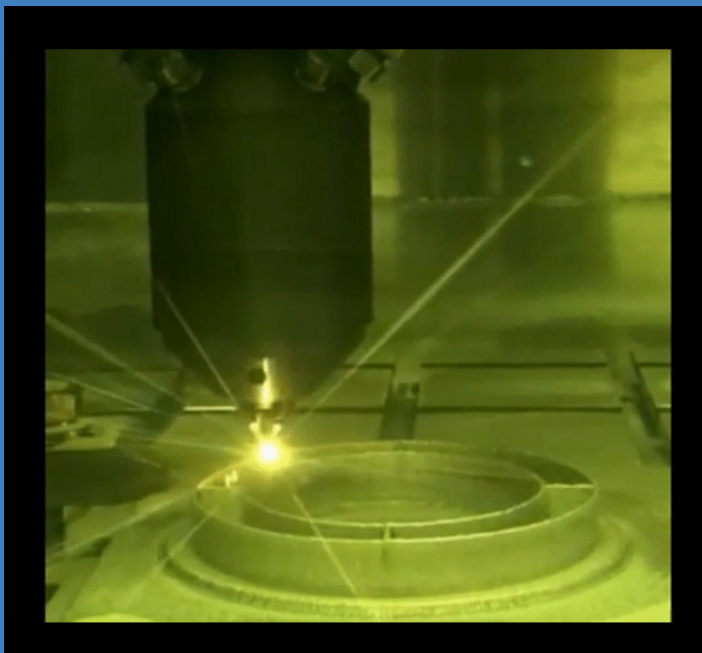
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3D modeling and printing offer many educational advantages. They're also being heavily used in the creation of tools, as shown here in this video from NASA's Mars Exploration website, <https://mars.nasa.gov/resources/25329/video-of-3d-printing-at-jpl/?site=msl>, which shows a 3D printing technique where a printer head scans over each layer of a part, blowing metal powder that is melted by a laser.



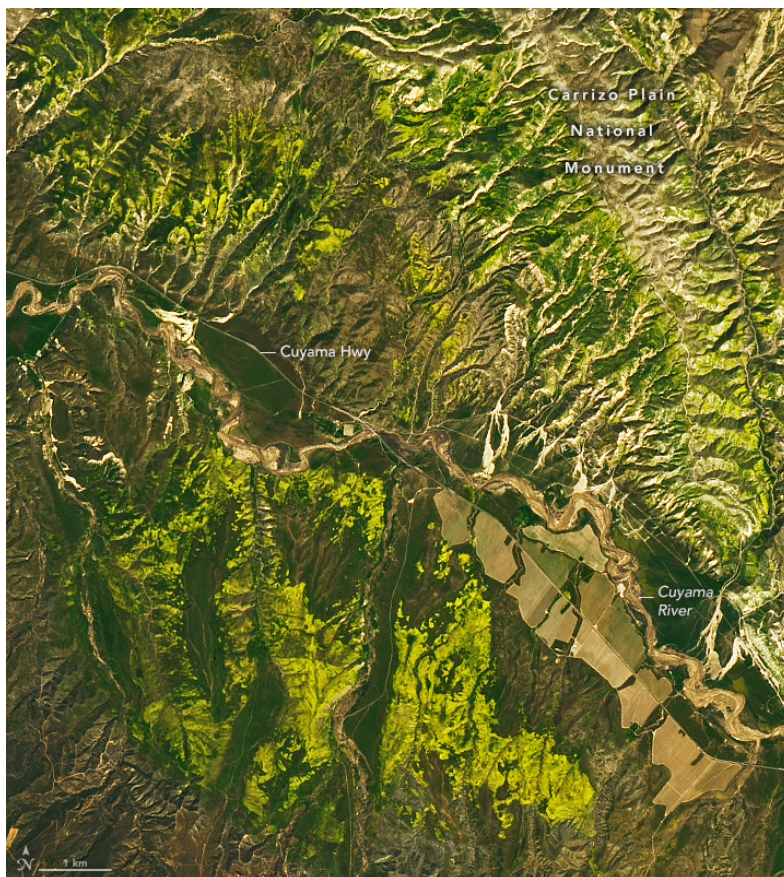
## From the Editor

# Spring Has Sprung... A Deluge of Floods and Flowers

**H**i, everyone, and welcome to spring! Finally... or not yet, depending on where you are. California has had a wild ride this fall-spring as far as weather goes. Multiple atmospheric rivers brought unprecedented rainfall to central and southern California during the winter of 2022-23. The state went from a drought to having way too much water in just a few months. More than 20 state parks and one national park (Redwood National Park) were closed due to flooding in January. As a result of all the rain and warmer spring temperatures, California had an amazing superbloom in April. The seasonal spectacle was visible from space. [The NASA image at right](#), acquired by the Operational Land Imager-2 (OLI-2) on Landsat 9, shows the desert blooming in Carrizo Plain National Monument on April 6.

In this edition of ITT, we have an update from the DEI (Diversity, Equity and Inclusivity) Committee exploring activities and online resources. They've been busy! There will also be a special edition of JGE (Journal of Geoscience Education) on DEI in June 2023. We also explore the world of 3D modeling and 3D printing in the classroom. Two more of our Outstanding Teach-

ing Assistant awardees sharing their stories. Happy Spring! — Redina



## NAGT Seeks a New Editor-in-Chief for *JGE*

- ▶ Do you enjoy learning about research that is happening across the geoscience education community?
- ▶ Are you interested in broadening access to education research and elevating the work of researchers?
- ▶ Do you have high standards and a willingness to support editors and authors in meeting those standards?

***If you answered yes to these questions, then you might be a good fit for Editor-in-Chief of JGE!***

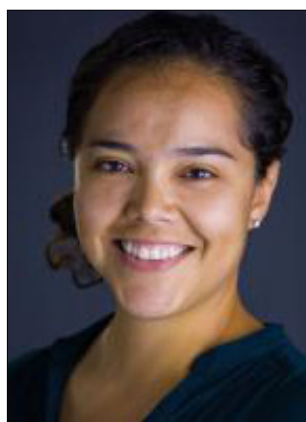
The *Journal of Geoscience Education* (*JGE*) seeks an Editor-in-Chief who will work with NAGT to maintain and increase the journal's impact and reach while also upholding an editorial ethos that encourages and supports new authors in their development.



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# Making Geoscience for Everyone: Three Years of the NAGT DEI Committee



DEI Committee Members: (top row, left to right) Samuel Cornelius Nyarko, Indiana University – Purdue University Indianapolis (chair), Meghan Cook, Purdue University Northwest, Yadira Ibarra, San Francisco State University, and Susan Meabh Kelly, University of Connecticut; (bottom row, left to right) Anika Knight, EarthScope Consortium, Dana Thomas, The University of Texas at Austin(ex-officio), and Amy Weislogel, West Virginia University

**N**AGT has long served as a champion for improving educational outcomes in the geosciences for all students. Since its inception 85 years ago, NAGT has developed a robust suite of programming and products that promote and disseminate evidence-based instructional methods. Throughout this work, NAGT has dedicated efforts to grow and support diverse geoscience education practitioners and researchers as well as the students they reach. In recent years, scrutiny of demographic indicators within the geosciences have laid bare the lack of diverse representation resulting from persistent barriers to BeAJEDI (belonging, accessibility,

justice, diversity, equity and inclusion). NAGT clearly recognized explicit action was necessary to close these gaps in the organization itself as well as in the geoscience community more broadly.

The NAGT Diversity, Equity, and Inclusion (DEI) committee was established by executive committee approval in 2020 in order to increase the ability of NAGT and its members to address these disparities and the resulting lack of representation across the geosciences. The NAGT executive committee charged the DEI committee to establish metrics for and assess progress towards diversity goals, recommend activities to promote and increase membership, support participation of underrepresented groups, broaden award nominations, and provide expertise on inclusive practices. With both an outward and inward

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**SAMUEL NYARKO** ([snyarko@iu.edu](mailto:snyarko@iu.edu)) and the NAGT DEI Committee ([nagt-diversitycommittee@serc.carleton.edu](mailto:nagt-diversitycommittee@serc.carleton.edu)).



focus, the DEI committee actively works to impact not only the lack of diversity in the geoscience education system, but to inform the organization regarding best practices, processes and fundamental structures.

The committee convened its first meeting on May 19, 2020. Less than one week later, George Floyd was brutally murdered by police officers in Minnesota. A national reckoning arose from this horrific event, intensified by other similar tragedies before and since, that centered an urgent imperative to achieve racial justice for members of historically marginalized identities and foster greater BeAJEDI across the US. This was particularly exigent in the geosciences, leading Dr. Hendratta Ali and colleagues to issue a call to dismantle structural racism in the geosciences. This call provided a formative focus for the DEI committee that has guided its early and on-going efforts.

Through the last three years, the committee's past and immediate past chairs, Drs. Laura Rademacher and Amy Weislogel initiated the committee, recruited members, and increased exposure of the committee amongst the NAGT community at-large. So far, twelve people (seven current and five past) have served on the committee. Important elements of their early work included bolstering the efforts by regional sections and topical division within NAGT and amplifying the amazing work being done in the geosciences by identity-based societies and organizations and by individuals and groups of geoscientists from historically marginalized backgrounds. This has resulted in two "cross-NAGT" DEI virtual meetings that were so fruitful that we plan to turn them into a recurring biannual event each May and November. If you might be interested in participating in the next one be on the lookout for an announcement after GSA this year! DEI committee members also serve as liaisons to the AGU interdisciplinary DEI committee and on the Earth Educators' Rendezvous (EER) organizing committee, which is helping to grow a network of people engaged in DEI work in the geosciences.

With much work remaining to move NAGT and the greater geoscience education community toward this goal, the current committee chair, Dr. Sammy Nyarko, is committed to spurring continued conversations around BeAJEDI amongst NAGT members and to inspire ideas and actions that can help NAGT advance the crucial pursuit of improving representation in the geosciences. In this article, we are eager to

take an opportunity to share lessons from our early incremental successes, to describe some of our major accomplishments and to outline our plans to keep moving forward. We hope readers who are similarly committed to improving BeAJEDI in the geosciences will consider how their time and talents could be brought to bear in helping NAGT and the committee in this regard.

### **NAGT Excellence in JEDI Award**

A premier component of the DEI committee's purview is the NAGT Excellence in Justice, Equity, Diversity and Inclusion (JEDI) Award. This award recognizes colleagues who have made significant contributions to these areas, either as an individual or as part of a group, through mentorship, communications/programming, and/or scholarly contributions. The JEDI awardee receives a complimentary one-year membership to NAGT, a ticket to the NAGT luncheon at the GSA Annual Meeting, and an invitation to present their relevant work to the membership at a DEI committee-sponsored event. To date, two recipients have been selected to receive this award. The DEI committee was truly blown away by the accomplishments of all the nominees for this award. It was a privilege to learn about the amazing people and the work they are doing.

The inaugural winner, Dr. Raquel Bryant, was selected in 2021. She is currently an assistant professor of paleoceanography and micropaleontology at Wesleyan University, Middletown, CT. Dr. Bryant is a co-PI on NSF-funded All-ABOARD, which creates a unique professional development experience for inter-generational teams of geoscience leaders, providing them with the tools they need to advance the JEDI goals on their home campuses. She is also co-PI and convener for the AGU-funded Chapman Second National Conference on DEI in the geosciences that brought together about 100 geoscientists to create DEI documents and policies for the next 50 years.

In 2022, the committee selected Dr. Vashan Wright. He is currently an assistant professor at Scripps Institution of Oceanography, University of California San Diego. Dr. Wright studies tectonics, earthquake physics, and geoscience education and is an outspoken voice for improving belonging, accessibility, justice, equity, diversity, and inclusion in Geosci-



Participants in a 2019 workshop at Tennessee State University, Nashville, TN, focused on documenting programs and strategies for preparing teachers to teach Earth science at HBCUs (Historically Black Colleges and Universities) and providing strategies and materials for teaching Earth science and improving Earth literacy among pre-service teachers.

ence. He is a co-PI on the popular URGE (Unlearning Racism in Geoscience, <https://urgeoscience.org/>) project that developed and deployed an anti-racism curriculum that provided thousands of geoscientists with critical training. Wright has worked in other Geoscience education and JEDI programs including FYRES (First-Year Research in Earth Science), GeoFORCE Texas, and R2GEO (Representation and Retention in Geoscience). We are delighted that he will be giving a plenary entitled “Because We Are Scientists” on July 13 at the Earth Educator Rendezvous 2023.

Nominations for the 2023 Excellence in JEDI award are now being accepted through an online form available on the NAGT website: <https://nagt.org/nagt/awards/JEDI.html>. Nominations for the awards will be kept under consideration for three years; the committee will reach out to the nominators to update nominee information each year. Anyone from the geoscience community is eligible for this award. We encourage you nominate an individual or group you know has been devoting significant time and energy to BeAJEDI work in the geosciences to be considered for this award.

### NAGT DEI Website

The committee curated a selection of resources to help NAGT members learn more about DEI issues in the geosciences and how to address them. These resources, including links to science organizations, peer-reviewed literature, and teaching resources, are hosted on the NAGT DEI website, <https://nagt.org/nagt/dei/resources.html>, and have been revised and updated thanks to Kim Hannula, Anne Egger, and Steven Mattox.

As part of these resources, the DEI committee established a Diversity Stories Collection. This collection provides a platform for NAGT members to share their personal stories and elevate diverse voices, experiences, and perspectives. This collection, initiated by the committee, has clear submission guidelines and currently includes eight insightful stories at [https://nagt.org/nagt/dei/diversity\\_stories.html](https://nagt.org/nagt/dei/diversity_stories.html). We are interested in growing this resource and welcome anyone who might like to assist in reviewing or making contributions to reach out to the committee.

## Community Webinars

Our committee has aimed to hold one webinar open to the NAGT community each year. Our first webinar, “Recent and Ongoing Efforts of the NAGT Diversity, Equity, and Inclusion Committee,” was held on the one-year anniversary of the committee. We were thrilled to have thirty-five people join this conversation and gained a lot of insight about on-going activities, particularly among NAGT Regional Sections. We also learned from participants about what activities they were interested in seeing with respect to BeAJEDI. Most of the suggestions were related to providing more networking activities (e.g., events that coincide with GSA, DEI-focused webinar series, mentorship programming, open committee hours). This feedback shaped the committee’s priorities in the following years.

In 2022, we developed a webinar, “Community Efforts to Broaden Conference Participation in the Geosciences.” Inspired by fallout from the COVID pandemic, the webinar focused on the impact of meeting modality on participation and lessons learned during COVID. Panelists included Megan Plenge (EER 2023 Conference Planning Chair); Rebecca Fazzari (Director of Meetings & Events, Geological Society of America), and Tramond Baisden (President, National Association of Black Geoscientists). We heard from members and meeting organizers about how meeting modality impacts experiences and participation at professional meetings and discussed ideas on how meeting modality can support inclusivity in the geosciences. Suggestions that emanated from the webinar included:

- Evaluate EER demographics for online versus in-person meetings over the last few years. This information was not available from any of the panelists.
- Record EER presentations for later access. This may be an inexpensive option that could be used by EER for future meetings.

The DEI committee liaison to the EER planning committee relayed these points to the EER planning committee, and we will continue to work on improving access to the EER as NAGT’s marquee event.

In January 2023, the committee hosted a NAGT Awards and Nomination Process Information Session that included members of NAGT awards commit-

tees (Katherine Ryker, Meghan Cook, Don Haas) to provide an overview of NAGT awards, the nomination and selection process, and assist people directly with questions regarding a nomination(s) they wished to submit. The committee also compiled a lot of great feedback regarding best practices, including:

- Provide explicit tips on nominating
- Making criteria explicit by posting how nominees are evaluated
- Broadening the reach of award nomination information by finding key constituencies to get diverse nominees
- Considering a nominee’s career stage

We plan to make this information session a routine part of the DEI committee’s programming, to be held annually after the call for nominations comes out.

## EER Contributions

Each year, the committee has worked to bring additional DEI-focused elements to the Earth Educator Rendezvous program. We have done this by selecting one member to serve as part of the organizing committee (from 2021) and hosting workshops and roundtables at the main events.

### 2021

- Workshop on Developing Strategies for Inclusive Teaching practices: The committee recruited and assisted Dr. Blair Schneider (Kansas Geological Survey) and Dr. Angel Garcia (James Madison University) in developing a workshop that would introduce and engage participants in discussions around inclusive teaching practices, with an emphasis on how to integrate culturally-relevant material when teaching. Nearly fifty participants in this three-day workshop engaged in activities and exercises around identity, intersectionality, and implicit biases. In addition, a portion of the workshop was dedicated to discussion of strategies on how to gather, organize, and introduce curricula material for the development of inclusive teaching in geosciences.
- Evening Activity: Featured Stories in Diversity: Personal narratives of overcoming obstacles to inclusion and implications for the Geosciences:

The committee debuted the NAGT Diversity Stories - a collection of lived experiences and lessons learned from within our community relating to the broad themes of diversity, equity, and inclusion. The webinar provided an opportunity for panelists, Pranoti (American Geophysical Union), Wendy Bohon (IRIS), Samuel Cornelius Nyarko (Western Michigan University) and Blair Schneider (Kansas Geological Survey) to share their stories and the implications of how these experiences impact our personal and professional lives and actions for moving forward.

## 2022

- Community Conversation on NAGT Initiatives in Diversity Equity and Inclusion: This roundtable discussion brought together members of our community to discuss initiatives that the DEI committee can/should implement to broaden the diversity of our community. It was thrilling to be able to meet face to face with those who joined in the discussion. Each participant shared their experiences and knowledge about engaging diverse audiences and promoting BeAJEDI, and we gained an extensive library of informal identity groups operating on social media. We also learned about the strong desire to see NAGT invest specifically in its DEI activities. Also, and importantly, it was clear the participants were highly interested in holding NAGT and its DEI committee accountable for its actions (and lack thereof) as its efforts continued. For work that is difficult and draining, with results that can seem few and far between, hearing the community express first-hand the importance they place on BeAJEDI work was a great source of encouragement.

In 2023, the committee is pleased to be hosting another roundtable community discussion “Advancing JEDI across NAGT” on Friday July 14. We hope many of you reading this will be there to participate and share your thoughts!

## Metrics & Membership

An essential part of accountability for the DEI committee is evaluating the impact on representation in membership at large, but also in its award recipients and the participants engaged in the Earth Educator Rendezvous. The single biggest challenge in the committee’s early years has been acquiring the data needed for this evaluation. We continue to work to assess the identities of people NAGT reaches through its programming. To this end, the committee encourages all NAGT members to update their demographic information to assist in the efforts of assessing our membership representation. We hope our next update will be able to provide a baseline from which we can begin to determine how well we are achieving our BeAJEDI goals.

## Looking Ahead

Going forward, the committee plans to continue to ensure that NAGT holds itself accountable for its progress in achieving its diversity, equity, and inclusion goals by regularly assessing and reporting on its progress, engaging in dialogue with stakeholders, and continuously seeking feedback to improve practices and programs. We will provide pathways to the executive committee in the provision of support and resources for faculty and students from marginalized communities to attend NAGT organized events. Finally, we plan to continue our collaboration with the American Geoscience Institute’s (AGI) interdisciplinary committee on DEI and expand collaborations to other geoscience organizations such as National Association of Black Geoscientists (NABG), GeoLatinas, Geoscience Alliance, and the Asian Americans and Pacific Islanders in Geosciences (AAPiG). We also hope to increase the visibility of NAGT to marginalized communities in order to increase the diversity of our membership.

## Acknowledgement

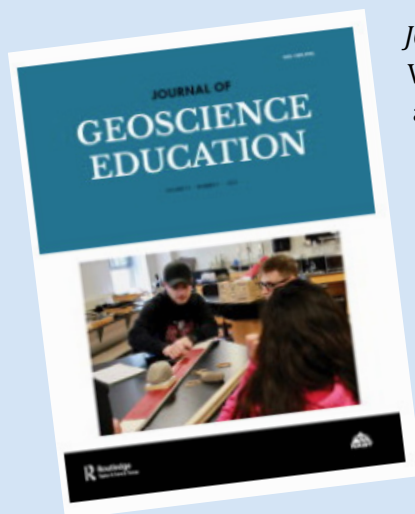
We would like to acknowledge past members of the committee: Laura Rademacher, Steven Mattox, Danielle Sumy, Leah Courtland, and Miriam Fuhrman.

## Contacting Us

You can contact the committee through [nagt-diversitycommittee@serc.carleton.edu](mailto:nagt-diversitycommittee@serc.carleton.edu).



## DEI in the *Journal of Geoscience Education*, Issue 3 (June 2023)



*JGE*'s third issue of 2023 will be a theme issue entitled "In Our VOICES: Voices Integrating Culture in the Earth Sciences." The issue will showcase authentic voices of diverse geoscientists and geoscience educators, highlighting scholars from historically marginalized communities. The thirteen papers include research on career retention in the ocean sciences, a study of students' use of agency as they navigate educational programs, a test of culturally relevant communication styles in weather videos for Hispanic and Latinx adults, a Māori and non-Māori collaboration to create a virtual volcanic hazards field trip, and several commentaries covering perspectives on working with administrators, personal narratives about recruitment and retention from BIPOC scientists, and recommendations for best practices to support Native American, LGBTQ+, and other marginalized geoscientists.

Kimberly Hannula ([jge-editor@nagt.org](mailto:jge-editor@nagt.org)), editor, *Journal of Geoscience Education*

- ▶ **Revising your curriculum?**
- ▶ **Preparing for a program review?**
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- ▶ **Improving support for all students?**

### **NAGT's Traveling Workshops Program**



**brings leaders in Earth education and events designed to strengthen departments, programs, and curricula to you!**

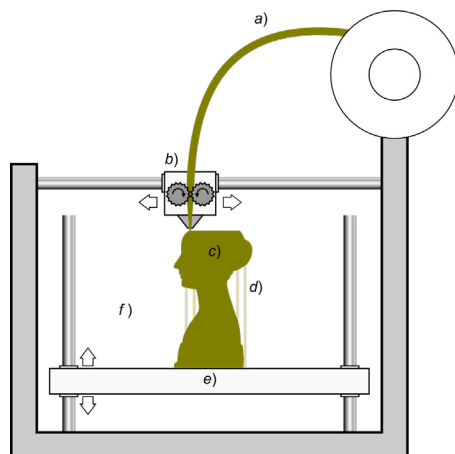
**Apply for a Fall/Winter Traveling Workshop by June 15**

**<https://nagt.org/nagt/profdev/twp>**

# See It, Touch It, Know It, Own It: The Educational

Three-dimensional models enable students to go from 2D images in a textbook to something they can handle and manipulate, improving student engagement and classroom learning. When students design and create models out of simple materials or with a 3D printer, they control the creation from concept to completion, gaining a deeper understanding of subject content and strengthening problem-solving skills. The act of creating their models can also increase their ownership of the knowledge.

In my undergraduate meteorology courses, we make paper 3D models of the atmosphere at the freshman-level (Image 1) and add details to the model again at the senior-level (Image 2). Not only has content understanding increased tremendously since I started using these models, but students also brag about “arts and crafts time” in their vector calculus-based synoptic meteorology class!



Schematic representation of the 3D printing technique known as Fused Filament Fabrication. A filament a) of plastic material is fed through a heated moving head b) that melts and extrudes it, depositing it, layer after layer, in the desired shape c). A moving platform e) lowers after each layer is deposited. [CC BY-SA 4.0; Scopigno R., Cignoni P., Pietroni N., Callieri M., Dellepiane M. (2017). “Digital Fabrication Techniques for Cultural Heritage: A Survey”. *Computer Graphics Forum* 36 (1): 6–21. DOI:10.1111/cgf.12781]

Printing 3D models, an increasingly simple and affordable process, encourages active learning. To create a 3D printed model, first you have to design the model you want to build using a computer-aided design (CAD) program. Once your design is complete you transfer your digital design to the printer. The printer creates the model layer by layer using material (e.g., resin or plastic) until the model is complete.

The benefits of 3D printing go beyond the classroom to societal benefits. There are now 3D printing weather station designs online, creating a cheaper way (~\$500 for the full setup) to gather weather data than a traditional ready-made weather station (\$100,000.) As noted in [this article](#) on the website of the National Center for

Atmospheric Research, 3D-printed weather stations are now being used in developing countries to gather vital data and provide educational opportunities.

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**REDINA FINCH** (rl-finch@wiu.edu), editor in chief of *In the Trenches*, is a professor in the Department of Earth, Atmospheric and GISciences at Western Illinois University, Macomb, IL.

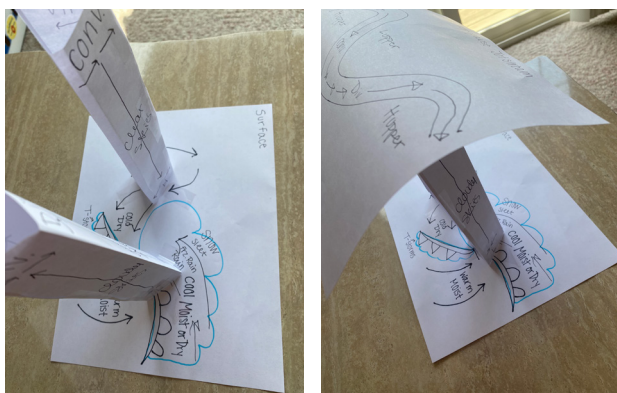


Image 1: Two-layer model of Earth's atmospheric motion, showing surface pressure systems, the upper-level jet stream and a simplified motion between the two. (Photo credit: Redina Finch)

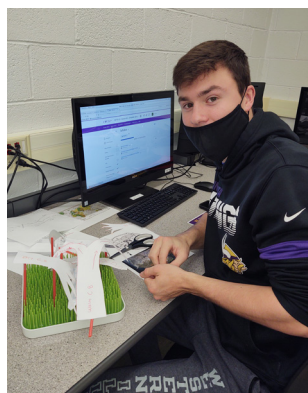
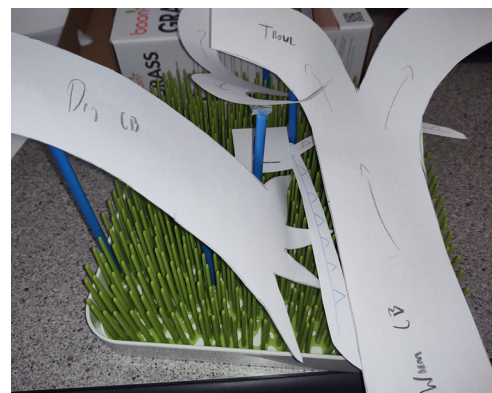


Image 2: Conveyor belt model of Earth's atmospheric motion, showing the motion of warm, cool and cold air in a more realistic way than the two-layer model. (Photo credit: Redina Finch)





# Benefits of 3D Modeling and Printing

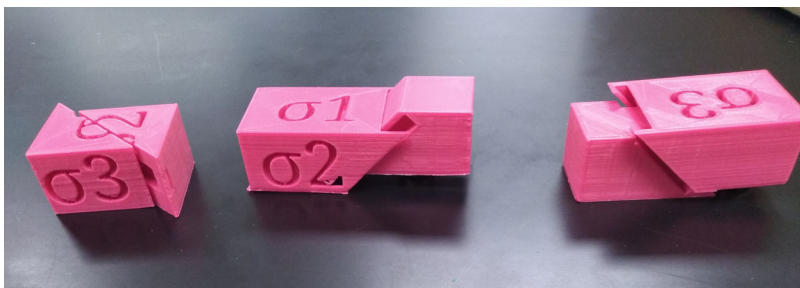
In teaching Earth science, I am always striving to have models for my students to see and touch. After purchasing a 3D printer, I found that not only could I make the models, but I could also have the students make the models, online and physically.

I started with [Thingiverse.com](https://thingiverse.com), a website that has model patterns available that can be downloaded and printed. I found a number of models there to use in my classroom, including models of the different types of fault boundaries (Picture 1). By manipulating the models, students can feel the direction of forces needed to make the pieces move. This further reinforces the relationship between the type of boundary and the type of fault. By using models of the planets, students have the opportunity to see some of the details on the planets, as well as the different sizes related to each planet.

[Tinkercad.com](https://tinkercad.com) is a website that allows you to create your own models. There is a teacher account feature where you can create your own classroom. Students can then sign in, and you can see all their models. There are short lessons on the website so that students can learn the basics of how to use the website, and they tend to pick it up quickly. I have begun having the students create models with the website, such as models of plate boundaries that show the features that would be created at each type of boundary (Picture 2).

After starting with plate boundaries, during the volcano unit the students went to <https://jthatch.com/Terrain2STL> to zoom in on their volcano. They were then able to copy the topographic data of their volcano and import it into Tinkercad for final editing. We then printed their volcanoes on the 3D printer so they had a model to enhance their presentation (Picture 3).

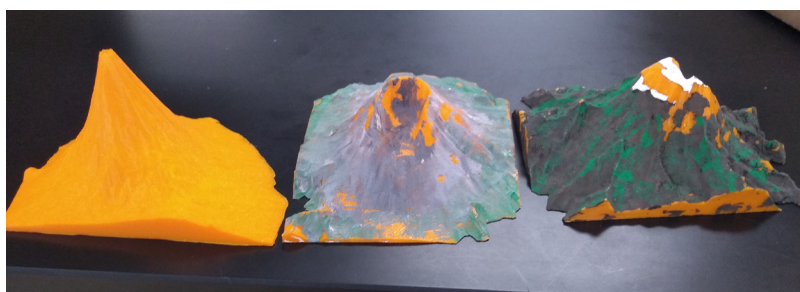
You do not have to have a 3D printer to reap the benefits of 3D modeling. At the Tinkercad website, students can create their models, look at them online



Picture 1: Models of different types of fault boundaries [Photos provided by the author]



Picture 2: Features that would be created at each type of boundary



Picture 3: Student models of different volcanoes

from all directions, and consider parts of their models that they may not have thought of before. I have found 3D modeling to be a valuable asset in my classroom.

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**BETH ALLCOX** ([ballcox@nhsd.k12.wi.us](mailto:ballcox@nhsd.k12.wi.us)) teaches Earth science at New Holstein High School, New Holstein, WI. She is a winner of a 2022 Outstanding Earth Science Teacher Award.

# Tales of Two More Outstanding Teaching Assistants

The Outstanding Teaching Assistant Award is presented in June and January each year to students who exemplify what it means to be a teaching assistant. The award is given to up to 30 TAs a year, half to undergraduate and half to graduate students. Award winners receive a one-year membership in NAGT, which includes an online subscription to the *Journal of Geoscience Education* and our *In The Trenches* quarterly magazine. The undergraduate student awards are the gift of Thomas Hendrix, Grand Valley State University, the recipient of the 1994 Neil Miner award and former president of NAGT and former editor of the *Journal of Geoscience Education*. The graduate student awards are funded by NAGT (your membership and donation dollars at work!). To nominate someone for an Outstanding TA Award (next deadline: June 15), visit <https://nagt.org/nagt/awards/ta.html>. We asked recent winners to answer several questions about their success, including what they liked most about being a TA and what unique things they thought they brought to their classes. Here are two of their stories.

## **Katharine Izzo, Northeastern Illinois University, Chicago, IL**

As a recipient of the Outstanding TA award, it is an honor to be acknowledged for the work and dedication I have given to my peers to help them succeed in their Earth Science courses. Being recognized as “outstanding” in anything is always WOW, but when it comes from professors you respect, the feeling is amplified.

Every person, student, and peer are unique, and they bring with them their own life and learning experiences. Being a part of a Hispanic-serving institution (HSI), many of our students are first-generation college students, like myself. This gives me a shared perspective, and through many laughs and much empathy, has allowed me to create a safe space for them to come ask whatever questions they have, be it from intro level or major core classes, or peer advising on all the “what do you plan to do next?” questions. It is rewarding to connect with them on a personal and academic level, helping them understand their individual learning style, which in turn can help them succeed in their academic and professional careers.

Not only have I been able to aid my peers through the understanding of materials, but I have also gained insight into myself. I have



Katharine Izzo [Photo provided by author]

learned how to better adapt to different personalities and ways of thinking to grow my own learning processes. Through helping others with their academic endeavors, it has continued to validate my goals of gaining a PhD towards becoming a professor.



**Steve Adams, University of Oklahoma,  
Norman, OK**

I most enjoy the process of identifying concepts students have trouble with and creating a new way to teach them that concept. Even within the same course, every year requires new ways of explaining the fundamentals; this process deepens my own understanding of subject matter. As a graduate student, I've learned a great deal through teaching and it has benefited my academic career greatly. It is always rewarding to figure out a new way of presenting material so a student better understands a subject they are struggling with.

Over the years, one unique approach I've used to aid students in learning is to create new physical and digital tools and visual aids to explain a concept. These tools and props help explain concepts that many students don't grasp when only presented with two dimensional slides or diagrams, even though these are generally low-tech and made with things from around the office or from a trip to the local hardware store. For example, I use an inflatable exercise ball and drawings on the surface of it to teach magnetic declination, which many students can remember the rules for, but don't really understand what it means. I also developed a 360-degree geology focused protractor for mapping and making cross sections. This simple analog tool, which can be 3D printed or made from wood or circuit board, increases the volume of data students record on their maps and increases their confidence with plotting data and making cross sections.

Recently I've found students have responded positively to the idea that they can start a business with the skills they learn in geology courses. This

encourages them to master the material presented in courses and appreciate the skills they are learning. I've had early success with a startup I founded in late 2021 and I hope more geologists will consider this route as a career option. I encourage students to consider creating traditional businesses associated with earth science, but also things one might not connect to geoscience but that build on their expertise. Additionally, I emphasize that there are unlimited possibilities in new realms of business and services that are waiting to be pioneered and invented. From the rapidly growing carbon market to the futuristic realm of asteroid mining, geoscience and new ventures are foundational to the prosperity of humanity.



Steve Adams [Photo provided by author]

# Earth Educators' Rendezvous 2023: May 3 Early Registration Deadline

Registration and abstract submissions are open for the ninth annual Earth Educators' Rendezvous, taking place in Pasadena, California, from July 10-14, 2023! Register by Wednesday, May 3, for the best rates. NAGT members receive \$100 off registration. If you're not a member, you can join today!

The Rendezvous program features a combination of workshops, contributed talks and posters, round table discussions, plenary sessions, and working groups discussing a rich mix of topics. This year's Rendezvous provides special opportunities for:

- Interactive multi-day workshops, featuring strategies for supporting all students, education research, curriculum design, and more
- Half-day mini-workshops, featuring a variety of topics, teaching methods, professional development, career resources, and more
- A contributed program to share your work and learn from the community, including oral and poster sessions, teaching demonstrations, and Share-a-thon
- Plenary talks, forums, and roundtable discussions

Check out the Rendezvous website and Participant Info for more details. We hope to see you there!

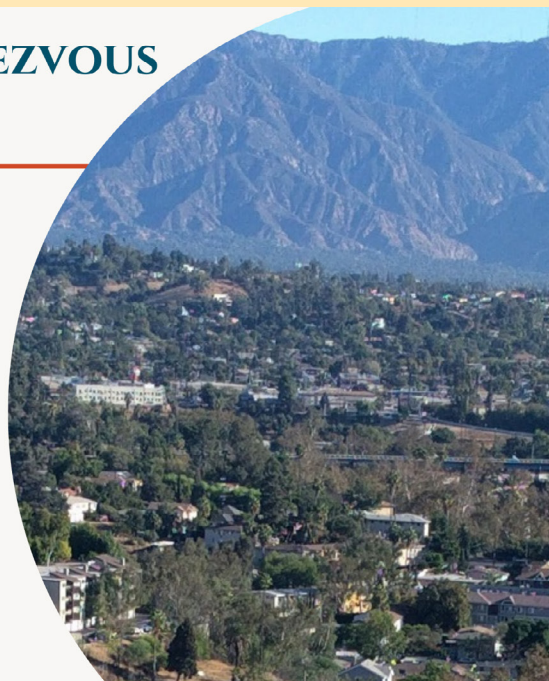


**EARTH EDUCATORS' RENDEZVOUS**  
PASADENA, CA | JULY 10-14, 2023

- ▶ **Early registration deadline: May 3**
- ▶ **Review camp applications: May 3**
- ▶ **Late poster/Share-a-thon deadline: May 17**



To register, visit  
<https://serc.carleton.edu/262099>



**NAGT members receive \$100 off registration!**