SGCI

Science Gateways
Community Institute

Connecting People
Creating Solutions
Accelerating Discovery

Dear Reader,

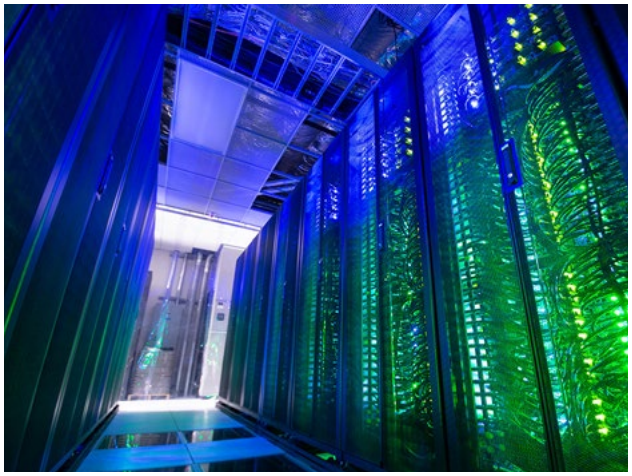
It is such a privilege to address you about the Science Gateways Community Institute. The SGCI was formed after a decade of work under the vision of Nancy Wilkins-Diehr, whose enthusiasm for this community was infectious. It was awesome to work with Nancy during the years leading up to the formation of the SGCI and for its first three years of operation, and a wonderful opportunity to assume SGCI leadership after those first three years.

In this time I've had the great experience of learning about so many of the efforts being undertaken in the humanities and sciences, all being facilitated by science gateways. I've watched people's expressions as they first learned that there was a community of people from vastly different disciplines and yet just like each other, all trying to solve the same problems of bringing their efforts online and building their own communities. I've also been amazed to be working with a great team that not only innovates in technology, but in management methods and service delivery.

It is impossible in a short letter to convey the breadth of activities and impact in which the SGCI has been fortunate to participate. Therefore, I hope you will enjoy browsing this collection of vignettes from SGCI client engagements and programs as much as the SGCI team enjoyed working with these community members to bring their dreams closer to realization.

I and the SGCI team look forward to seeing you again in person, discussing your latest thoughts on gateways, and continuing to serve this community as we pursue a sustainable institute. As always, please reach out any time you feel we can be of assistance.

Michael Zentner, Director
mzentner@ucsd.edu



The Science Gateways Community Institute

Connecting People, Creating Solutions, Accelerating Discovery.

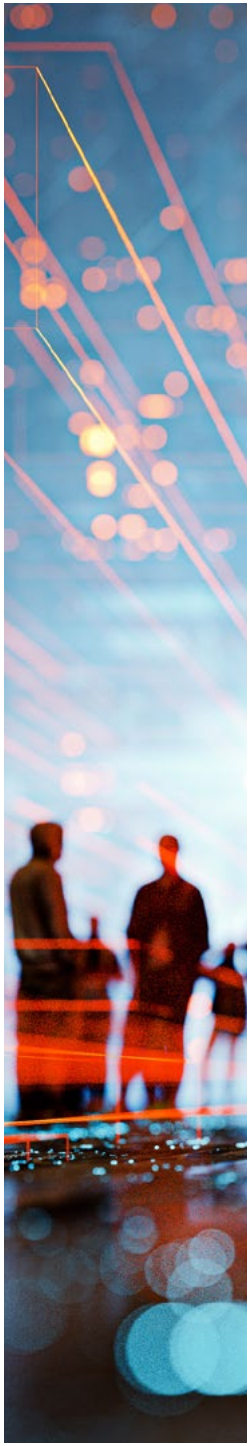
Science gateways significantly broaden access to advanced tools necessary for conducting science.

Gateways are online interfaces that give researchers, educators, and students easy access to shared resources that are otherwise inaccessible or unaffordable for a large segment of the scientific community.

While the use of gateways can significantly improve scientific productivity, the process of developing, operating, and sustaining a gateway can prove time-consuming and challenging.

The SGCI was founded to provide services and resources that advance the state of the art in science gateways, that help gateway creators use accepted practices in developing and operating gateways, and that catalyze the formation of a community that may be diverse in discipline but has a common need to advance science through gateways.

The SGCI has helped more than 150 gateways reach their goals. In this collection, we have compiled stories of individual gateway clients and how their engagements with SGCI contributed to their success. We also share stories about participants in our other programs, including sustainability training workshops, internships, hackathons, and annual conference.



About SGCI's Services & Resources

SGCI's offerings have been carefully designed within three major activity areas:

GATEWAY SERVICES

Our consulting services are tailored to meet the needs of gateway projects and have demonstrated an acceleration of gateway efforts, saving significantly on funds and time-to-science. We turn ideas into reality or enhance existing gateways. Our team consists of experts in all areas of gateway development, operations, and long-term sustainability.

Comprehensive Consulting Services

- Embedded technical support
- User experience design
- Usability
- Graphic design
- Cybersecurity
- Sustainability
- Marketing

EDUCATION & TRAINING

We offer a range of learning opportunities for the gateway community, from training events to skilled internships to a searchable database of resources and educational materials. The participants in our student-focused, workforce development programs have contributed actively to gateway projects and have gone on to start new careers.

Sustainability Training

- Gateway Focus Week
- Jumpstart Your Sustainability Plan

Student Programs

- Internships
- Hackathons
- Young Professionals Network

NETWORKING & COMMUNITY

With an annual conference, a variety of workshops and webinars, a community discussion forum, and a collaborators program, we have built a vibrant and engaging gateway community—and before the SGCI was founded, many members did not realize such a community existed.

Opportunities for Engagement

- Gateways annual conferences
- Workshops and webinars
- Community discussion forum
- Collaborators Program

Learn about client gateways in these disciplinary sections, or read about our other programs and opportunities.

1 **Multidisciplinary**

2 **Computer & Information Sciences**

3 **Engineering**

4 **Environmental Sciences**

5 **Life Sciences**

6 **Mathematical & Physical Sciences**

7 **Other Programs & Opportunities**

Featured Projects & Programs

MULTIDISCIPLINARY

COVID-19 Modeling Consortium
The Distant Reader
GenApp
HubICL
MonitoringResources.org
NMDC
QUBES
RDA-US
SeedMeLab
Social Media Macroscope
USD Gateway

COMPUTER & INFORMATION SCIENCES

CHEESE
CloudLaunch
Cyber Range
IPT Gateway
Open OnDemand

ENGINEERING

nanoHUB

ENVIRONMENTAL SCIENCES

Aquavit
Coastal Emergency Risks Assessment
CoMSES Network
CSDMS
Data Discovery Studio
DATAS
eODP
ESIP & ESIP Lab
GABBs/GeoEDF
Geoweaver
HydroShare
'Ike Wai
InterACTWEL
OpenTopography
SimCCS Gateway
StraboSpot
USGS CDI

LIFE SCIENCES

Brainlife
CoRIS
COSMIC^2
CyNeuro
ETAG
Magellon
PlantingScience
RCSB PDB & PDB-101
SaferWorldbyDesign
WHISPers

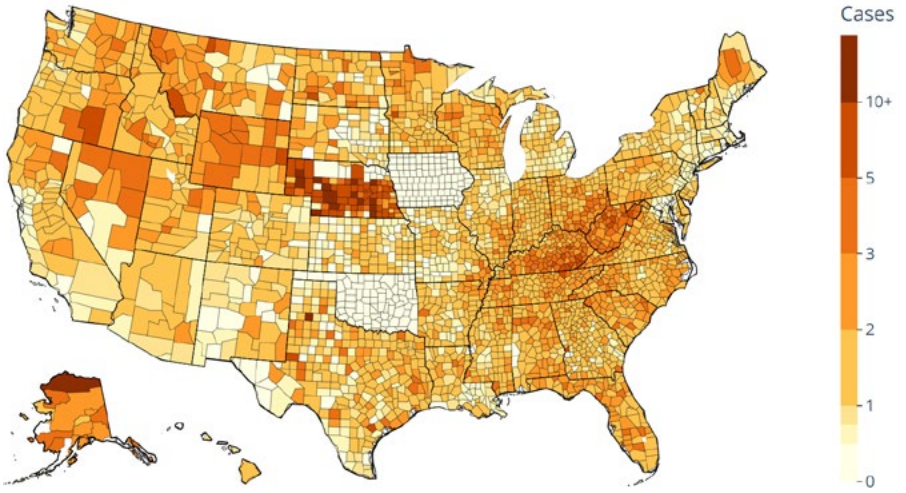
MATHEMATICAL & PHYSICAL SCIENCES

AMOS Gateway
Chem Compute
SIMIODE

OTHER PROGRAMS & OPPORTUNITIES

Sustainability Training: Focus Week & Jumpstart Your Sustainability Plan
Internships
Hackathons & Young Professionals Network
Annual Conference

Multidisciplinary



COVID-19 Modeling Consortium

EVERYTHING ABOUT THE COVID-19 PANDEMIC EVOLVED RAPIDLY, including the development of a gateway that would detect, project, and combat outbreaks. Getting decision-making tools in front of policymakers was a daunting proposition that differed significantly from running models as had been done traditionally in a research environment.

HOW WE HELPED

In the beginning, the team behind the COVID-19 Modeling Consortium worked with SGCI to quickly develop a gateway that provided modeling for the city of Austin, Texas. Soon after the gateway was developed, however, the team found that their user base of policymakers, decision-makers, and media outlets was growing rapidly and, with it, the need for broader modeling capabilities. SGCI next expanded the gateway to include modeling for all of Texas and then grew it to a national level.

PI Lauren Ancel Meyers explained that SGCI was essential to the early COVID-19 response. “The gateway allowed us to support critical decision making by government agencies, elected officials, and the public, while simultaneously advancing science.”

“We asked SGCI to help us design a user-friendly dashboard that clearly conveys risks, forecasts, and uncertainty. ***Seemingly overnight, our technical consultant had developed and launched beautiful, intuitive, and robust tools.*** *Her work allowed us to provide urgent situational awareness that informed COVID-19 policies and saved lives.”*

— Lauren Ancel Meyers

Website
covid-19.tacc.utexas.edu

Team Members
Lauren Ancel Meyers

Funding Sources
Tito’s
CDC
NIH
University of Texas at Austin (in-kind)
Texas Advanced Computing Center (in-kind)

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

MORE INFORMATION

How UT Austin COVID-19 Modeling Has Led During the Pandemic *(HPC Wire)*
https://qrgo.page.link/3WFtp

Does My County Have an Epidemic? Estimates Show Hidden Transmission *(New York Times)*
https://qrgo.page.link/gxRJG

"At the end of the day, you can have a great offering, but if you don't consider all of these things such as outreach, community building, usability, and so on, the project goes nowhere. ***Now I can articulate what Distant Reader can and cannot do, then communicate those ideas in a way that reaches a wider audience of people."***

— Eric Morgan

Website
distantreader.org

Team Members
Eric Morgan

Funding Sources
In-kind funding from the University of Notre Dame

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week, Hackathons

MORE INFORMATION

The Distant Reader—A Jetstream-Powered Assist for an Age-Old Process
https://qrgo.page.link/BXqWF

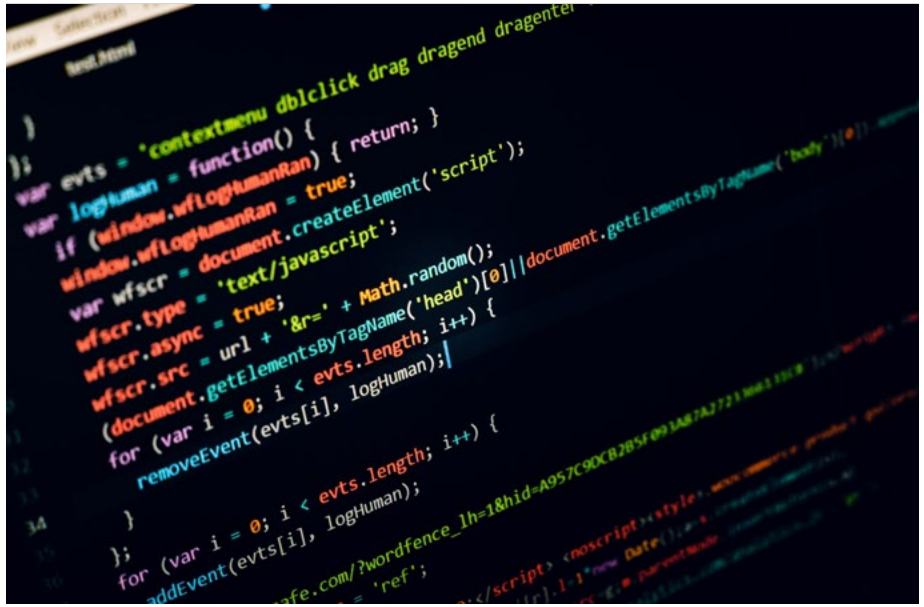
Analyzing and enhancing CORD-19 and additional Coronavirus-related sets
https://qrgo.page.link/z9pgc

The Distant Reader

IMAGINE READING 10,000 JOURNAL ARTICLES IN 30 MINUTES, or having the ability to download and analyze a couple of hundred books in 90 minutes. Since reading is something that researchers across disciplines have in common, and since the number of publications in all fields continues to grow at an exponential rate, the ability to efficiently extract relevant information has become more valuable than ever. The Distant Reader is a gateway that uses natural language processing (NLP) and text mining to scan and transform text, summarizing key takeaways and providing a big-picture understanding in minutes.

HOW WE HELPED

Beyond gateway conception and development, project leaders need to consider less obvious aspects of starting a gateway, too. It was the PI's participation in Focus Week that helped him realize the significance of such activities. "Your services have enlightened me in the depth and breadth required to have a successful project," said Eric Morgan.



GenApp

WHILE RESEARCH SCIENTISTS HAVE A DEEP UNDERSTANDING of their domain, they aren't necessarily trained in web development or computationally savvy. This can present challenges and roadblocks to advancing their research goals. The GenApp gateway was developed to help researchers by providing a framework to rapidly produce science gateways. Their team attended Focus Week to craft a plan for sustainability as they looked to the future of their growing gateway. What they learned at Focus Week set them on a path that would result in a number of engagements with SGCI.

HOW WE HELPED

The GenApp team worked with usability consultants to make their interface more user-friendly and modern. Working with technical consultants allowed them to integrate new technologies that make it easier for them to maintain and update the gateway on their own. They also hosted three summer interns funded by SGCI, which resulted in the development of new gateways that are being used in academic courses.

"Working with SGCI has been very useful, and I appreciated how professional all my interactions were with their team. ***By thinking things through and articulating them into a work plan prior to diving into the work, we were able to move our project forward and achieve our goals."***

— Emre Brookes

Website
genapp.rocks

Funding Sources
NSF

Team Members
Emre Brookes
Joseph E. Curtis
Susan Krueger
David Fushman

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Gateway Focus Week, Internship Program

Networking & Community: Gateways Conference

MORE INFORMATION

GenApp's User Interface Modernized Thanks to Successful Engagements with SGCI
https://qrgo.page.link/SUtU3

From biochemistry to bioinformatics: A doctoral career transformed by an internship *(Science Node)*
https://qrgo.page.link/q3THV

"I know what it feels like to be unsupported, so ***to have a team of people taking care of things I don't know how to take care of is amazing.*** *Supportive, kind, and patient people holding my hand every step of the way."*

— Annette Benson

Website
hubicl.org

Team Members
Annette Benson

Funding Sources
Purdue University

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

Photo credit: Intercultural Life at Lafayette College on Flickr

HubICL

IN AN INCREASINGLY GLOBAL WORLD, the importance of intercultural competence has grown exponentially. The **Intercultural Learning Hub (HubICL)** is an online space for those who mentor others—educators, coaches, trainers, facilitators—in intercultural competence, global learning, multiculturalism, diversity and inclusion, social justice, international education, or study abroad. Looking to make HubICL sustainable and available to a growing audience, the team attended Focus Week and worked with SGCI's usability and technical consultants to help meet their goals.

HOW WE HELPED

The HubICL team walked away with takeaways from each of their engagements with SGCI, such as an understanding of their core audience and how Google Analytics can be used to make important decisions. Ultimately, it was the feeling of knowing that they had support in areas that were out of their own expertise that was especially valuable to them.

MonitoringResources.org

TIMELY AND RELIABLE DATA IS IMPORTANT to natural resource managers who make decisions regarding the Pacific Northwest's aquatic resources. The Pacific Northwest Aquatic Monitoring Partnership (PNAMP; pnamp.org) offers a network of coordinated, multi-jurisdictional activities for monitoring natural resources coupled with an information system that promotes sharing of data and knowledge among organizations and with the public.

HOW WE HELPED

The project's team worked with SGCI to improve the user experience of their gateway. As a result of the engagement, they were able to plan improvements to navigation and changes to a mapping tool that will allow users to find the information they need much faster.

Rebecca Scully remarked, "The consultants had goals and benchmarks so it was always clear where we were headed and when. At the end of the engagement, we received a cohesive feedback report based on user interviews and were given ranked solutions so **we knew what needed to be fixed immediately and what could wait."**

"We're biologists, not specialists in website design, and we were limited on time and resources, so getting low-cost support was critical to being able to make improvements. ***The results of our usability engagement with SGCI were above and beyond what we expected,*** *and the fact that we didn't need to do much work was great."*

— Rebecca Scully

Website
monitoringresources.org

Team Members
Jen Bayer
Rebecca Scully

Funding Sources
USGS
Bonneville Power Administration
US Department of Interior Bureau of Land Management
Bureau of Reclamation

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

"I definitely had lots of insights that I'm going to use to do my analysis of the survey. *The survey data is exploratory, and it's a ton of data, and I was overwhelmed as to how to take a look at that. I really liked their recommendation of a hypothesis-driven approach and seeing if the data supports it."*

— Pajau Vangay

Website
microbiomedata.org

Team Members
Kjiersten Fagnan
Pajau Vangay

Funding Sources
Department of Energy

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

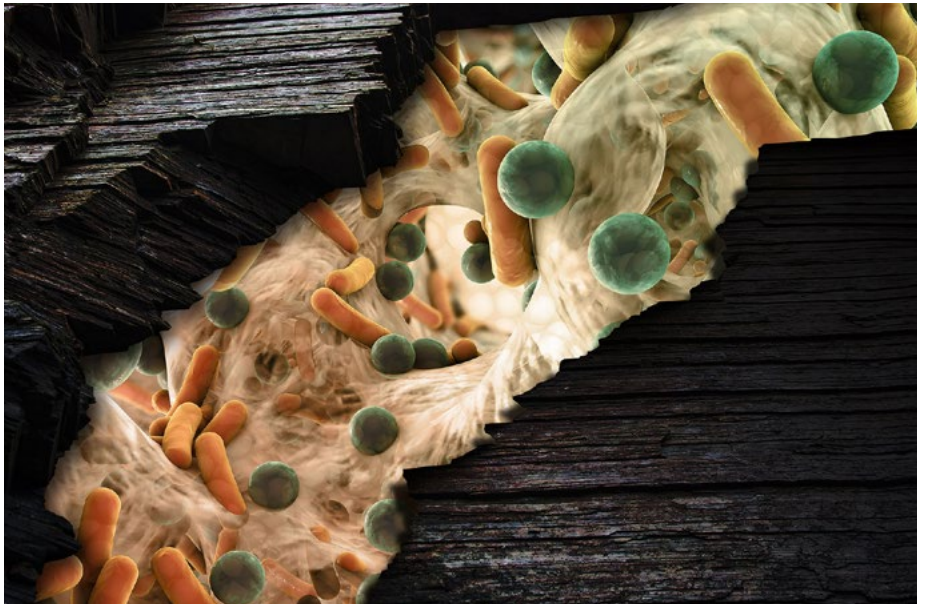


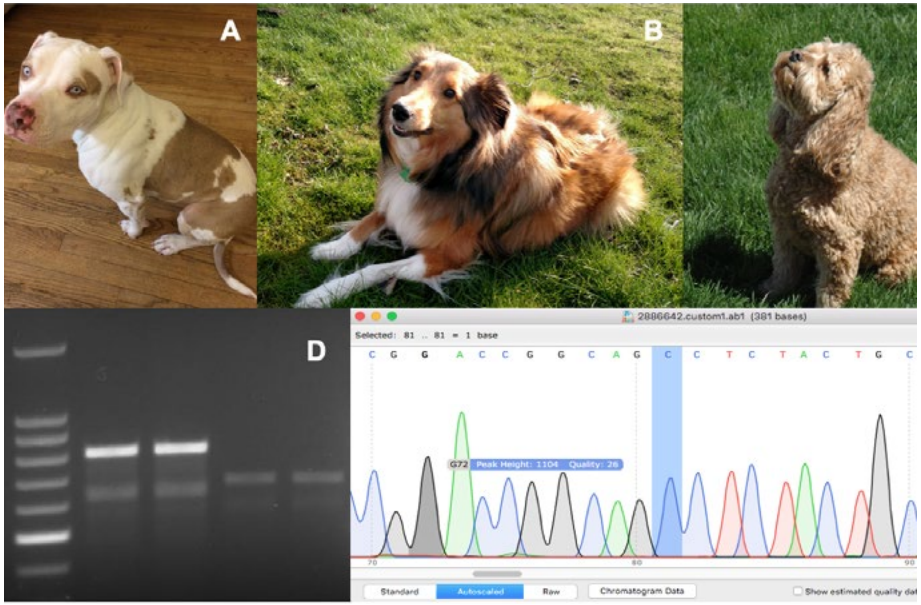
Photo credit: Courtesy of Pacific Northwest National Laboratory

NMDC

MOLECULAR BIOLOGY HAS SEEN AN EXPLOSION in the quantity of omics data available to explain microbiomes—ecosystems that can be found inside or outside organisms. With that growth, numerous databases, multiple data standards, and thousands of software tools complicate interdisciplinary research to examine plant, agriculture, soil, water, or human microbiomes. Thus, the **National Microbiome Data Collaborative (NMDC)** seeks to develop a community-driven, integrative, data science ecosystem that would simplify search, retrieval, and analysis. This infrastructure would also improve workflows, accessibility, and reproducibility.

HOW WE HELPED

The forward-facing, data-discovery gateway needed to be responsive to the changing needs of the users, so community engagement was essential. The team requested a usability consultation. This included heuristic evaluation, survey analysis, task flow visualizations, and mockups. The team found the detailed presentations to be tremendously helpful and learned a great deal from talking with the consultants. Moreover, the reports reinforced that the system was on track to be user friendly. A year later, the gateway had blossomed to include 25 TB of omics and organic matter data.



QUBES

WITH DISCOVERIES BEING MADE DAILY, biological sciences are ever-evolving. Quantitative biology—and predictive modeling in particular—provides a way to keep pace with the study of living organisms and predict future outcomes using mathematical, statistical, or computational techniques. The **Quantitative Undergraduate Biology Education and Synthesis (QUBES) gateway** promotes the teaching of quantitative biology by offering the cyberinfrastructure and associated social components needed to support collaborations.

HOW WE HELPED

The QUBES team has engaged with SGCI in every way possible: they have received consulting services, hosted an intern, and participated in Gateways conferences and Focus Week. They even consider themselves a "mini SGCI" for the quantitative biology community, as they have mirrored SGCI's offerings and activities in their own gateway, which serves as an umbrella for multiple partner projects. "We especially appreciate that SGCI isn't a top-down organization; they are all about building the community of people who are doing this work and always invite people to be collaborators and participants," said Drew LaMar.

"Engaging with SGCI has made a huge impact on our educational community. We have carried a continued engagement with SGCI over the course of several years and, for us, ***the value is in the continued conversations and relationships we've built with SGCI.*** *This has kept us accountable and always moving forward."*

— Drew LaMar

Website
qubeshub.org

Team Members
Drew LaMar
Sam Donovan

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Gateway Focus Week, Internship Program

Networking & Community: Gateways Conference

MORE INFORMATION

Case Study: Gateway Expertise When You Need It—Growing QUBES by Working with the SGCI
https://qrgo.page.link/1L5m9

"Nowadays, every funded project is asked to create a plan for sustainability, and ***SGCI is the only organization that offers the opportunity to learn how to do this.*** *This is incredibly valuable to a project like ours."*

— Rebecca Koskela

Website
rd-alliance.org/groups/rda-us

Funding Sources
NSF

Team Members
Rebecca Koskela
Mary Uhlmansiek
Meghan Underwood

SGCI SERVICES USED

Education & Training: Virtual Focus Week

RDA-US

DATA-SHARING IS ESSENTIAL TO ACCELERATING RESEARCH, and there's a clear need for a cohesive data community that can integrate contributions across domains and geographical boundaries. The **Research Data Alliance (RDA)** is an international, community-driven organization that's working to build the social and technical infrastructure needed to enable data sharing.

HOW WE HELPED

Like many gateway projects, the RDA-US team wants to achieve sustainability. Participating in Virtual Focus Week gave them a chance to work through exercises that got them thinking about what's possible for the future of their organization.

As Rebecca Koskela explained, "Focus Week was incredibly informative and gave us a lot of great things to think about as we're going through strategic planning for RDA-US. Funding is a big part of the planning, so it was really helpful to learn about some of the tools and approaches, such as landscape analysis, as well as learning about what other teams have done."

SeedMeLab

DATA MANAGEMENT IS COMPLEX ON MANY LEVELS, especially when working as part of a distributed team. Fragmented information can disrupt productivity and obscure discovery, which is why it's important to find a way to keep data organized and make it easily accessible and usable. SeedMeLab is a scientific-data management system that offers these capabilities to researchers, with file-sharing services that have the ability to add descriptions, discussions, and visualizations for any data items.

HOW WE HELPED

Engagements with SGCI inspired the SeedMeLab team members to start thinking about their project from a business perspective, including how to reach and engage a wider audience. "For example, as a result of working with marketing consultants and considering our value proposition, **we understand how to convey our message efficiently and concisely and are now putting that into practice,"** said Amit Chourasia. This resulted in the creation of a business model and the launch of a subscription fee for research groups.

"Participating in Focus Week and receiving multiple consultations with SGCI experts helped us break things down into manageable chunks and gave us some structure as we thought about sustainability. We started to think in more of an entrepreneurial way and began planning for the project beyond grants. From each of our consultations, ***we gained knowledge and insights that have had a measurable impact on our project."***

— Amit Chourasia

Website
seedmelab.org

Team Members
Amit Chourasia

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability, Sustainability, Marketing, & Cybersecurity Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference, Collaborators Program

MORE INFORMATION

Webinar: SeedMeLab data platform for research groups and science gateways
https://qrgo.page.link/nnMCk

R&D 100 winner of the day: SeedMeLab – A branded data repository for teams *(R&D World Online)*
https://qrgo.page.link/c7Fvv

"In addition, the consultations I received from SGCI were integral to the development of this gateway. In theory, I could have asked the IT group at my university to do this work, but since they are not specialized in building gateways, it would have been an inefficient process. ***SGCI's experts knew exactly what to do.*** *As an added bonus, I'm now a part of this great community of gateway developers and enthusiasts."*

— Joseph Yun

Website
socialmediamacroscope.org

Team Members
Joseph Yun

Funding Sources
University of Illinois Urbana-Champaign

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Gateway Focus Week, Internship Program, Young Professionals Network

Networking & Community: Gateways Conference

MORE INFORMATION

Staying ahead of the data tsunami *(Science Node)*
https://qrgo.page.link/CgpXi

Need help with your science gateway? SGCI Focus Week teaches best practices *(Science Node)*
https://qrgo.page.link/8ktZE

Social Media Macroscope

ENGAGEMENT WITH SOCIAL MEDIA PLATFORMS IS AT AN ALL-TIME HIGH. With that comes a growing set of questions regarding privacy and, in particular, concerns over how personal data is stored and used. The Social Media Macroscope wants to help answer these and many other social media questions by offering an open-source analytics platform for social research that gives researchers and students easy access to data, analytics, and visualization tools for social media.

HOW WE HELPED

PI Joseph Yun had an "aha" moment while attending Focus Week in 2017. He realized that the project he was working on was, indeed, a gateway and that what SGCI had to offer was exactly what he needed to get the project off the ground. **"The pitch deck that I developed during Focus Week has propelled this project forward,"** said Yun. "I have used it over 100 times and can say with confidence that it has helped me secure funding." Four years later, the gateway was fully funded and being used by more than 80 institutions worldwide.

USD Gateway

PRIOR TO THE DEVELOPMENT OF THE USD GATEWAY, researchers and students at the University of South Dakota had limited access to advanced digital resources and cyberinfrastructure. The gateway was developed to lower the barrier to entry for running complex, scientific applications in a high-performance computing environment, thus giving researchers and students the opportunity to run quicker and larger jobs.

HOW WE HELPED

Built by SGCI's technical consultants, the USD Gateway provides four of the most commonly used applications in bioinformatics and materials chemistry, paired with authentication that allows users to log in with their existing campus credentials.

"Without support from SGCI, the USD Gateway could never have launched. *This gateway is making an impact for researchers and students on our campus because it builds awareness and literacy of the concepts surrounding advanced computing while at the same time providing a platform for accelerated research."*

— Doug Jennewein

Website
sciencegateway.usd.edu

Team Members
Doug Jennewein

Funding Sources
NSF
NIH
University of South Dakota

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

MORE INFORMATION

New Gateway Brings Advanced Computing Resources to the University of South Dakota
https://qrgo.page.link/AaAx6

Computer & Information Sciences

2

CHEESE

NEW CYBERSECURITY ISSUES EMERGE DAILY, and cybersecurity professionals face the monumental task of keeping up with emerging trends and recently discovered security attacks. Envisioned as a one-stop shop for training and resources, the **Cyber Human Ecosystem of Engaged Security Education (CHEESE)** gateway provides a learning ecosystem that's continually updated to keep pace with the constantly evolving needs of the community.

With a goal of engaging a broad audience ranging from high school students to practitioners, CHEESE provides materials that can be used in training workshops and in classroom instruction. Users are also invited to contribute to the gateway's cybersecurity resources.

HOW WE HELPED

PI Justin Yang realized that usability was a key factor in making CHEESE successful and pursued a usability consultation with SGCI. Yang now recognizes the importance of considering the user interface early in the development process. Still, he implemented about 50% of the recommendations and feels that the gateway benefited greatly.

"I really appreciated the opportunity to have usability feedback and support from SGCI, and ***I wish that more projects could have the opportunity to receive this type of help.*** *Our gateway benefited greatly from the changes that were made as a result of the usability engagement, and it's my belief that all gateway projects should have access to the critical services that SGCI offers."*

— Baijian (Justin) Yang,

Website
docs.cheesehub.org

Team Members
Baijian (Justin) Yang

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week, Jumpstart Your Sustainability Plan

"Working with an SGCI developer... we had set clear objectives, milestones, and scoped them to the available time. As an emerging science gateway, ***these were critical management tasks that helped deliver a functional gateway within a minimal timeframe.*** *Our consultant was able to get up to speed on our project quickly and immediately started making substantial contributions."*

— Enis Afgan

Website
Retired

Team Members
Enis Afgan

Funding Sources
Galaxy Project
(which is funded by NIH)

SGCI SERVICES USED

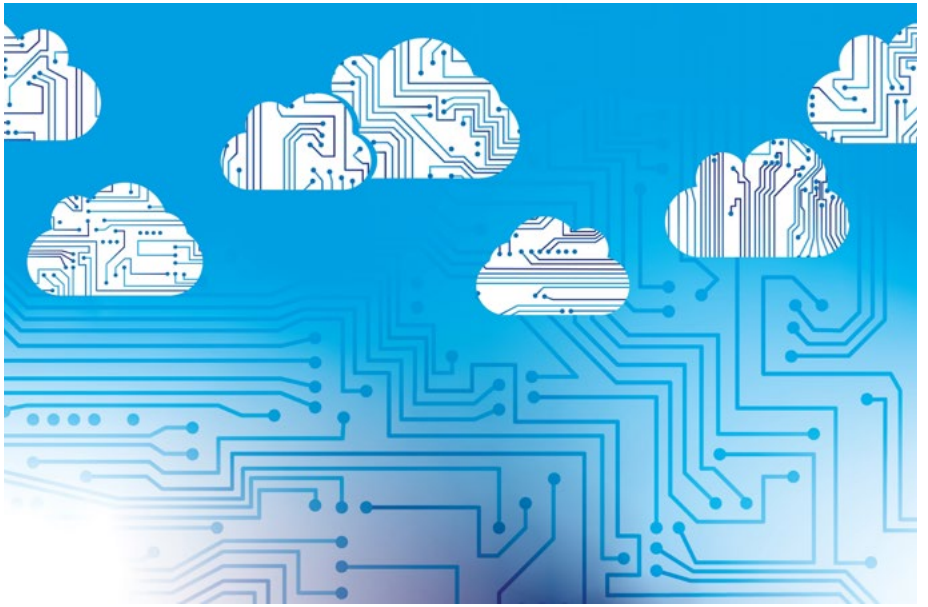
Gateway Services: Embedded Technical Support, Usability Consulting

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI Consultation Allows CloudLaunch to Benefit Researchers Across a Wide Variety of Fields
https://qrgo.page.link/iS5ci

Sunsetting the CloudLaunch service
https://bit.ly/3rgp0pQ



CloudLaunch

CUSTOMIZING A GATEWAY WORKSPACE CAN BE CHALLENGING for researchers. With CloudLaunch, researchers can create a personalized workspace without the hassle of installing and configuring complex stacks of software. In its first phase, CloudLaunch was built to facilitate the launching of just one application in the cloud. With support from SGCI, CloudLaunch developed a platform that could do much more, supporting Amazon Web Services, OpenStack, Google Cloud, and Microsoft Azure.

HOW WE HELPED

Making CloudLaunch more useful and flexible for users was a key goal of the team's engagement with SGCI in 2017. Together with our consultants, they developed an improved version of the gateway that allowed users to manage applications post-launch, gain access to multiple cloud providers, and improve the discovery of applications. Over time, CloudLaunch supported about 2,000 distinct users running approximately 25,000 launches. It also enabled hundreds of people to have access to cloud infrastructure for training purposes. Near the end of 2021, as cloud alternatives became more accessible, CloudLaunch retired its service.

Cyber Range

FOR THE BEST DEFENSE AGAINST CYBERATTACKS, future cybersecurity professionals need practice detecting and responding correctly to increasingly clever threats. The Mizzou Cyber Range is an educational gateway that realistically simulates critical information infrastructures and complex computer systems in a fully controlled, monitored virtual environment on a cloud platform. The creators envisioned its use for courses, competitions, training, and research. To give students experience on a portable, commercial cloud system, the team applied for a Cloudify Gateways award, giving them Google Cloud Platform credits and support from SGCI collaborator CloudyCluster.

HOW WE HELPED

As they dove further into development, the team realized that they needed a more effective user interface. They enlisted the help of SGCI's usability team to refine the student experience in the learning modules. The usability team gave them prioritized advice and mockups of the visual hierarchy and navigation. Subsequently, the project team also participated in the virtual Jumpstart Your Sustainability Plan and virtual Focus Week workshops, which helped them better understand the business side of their gateway and reorganize their pitch.

"The usability group provided a lot of help. Their recommendations helped us to work on the platform and improve all the pages and logic seen there. ***We have been updating our web platform based on their feedback, so now this platform looks much, much better."***

— Songjie Wang

Website
mizzoucyberrange.net

Team Members
Prasad Calyam
Songjie Wang

Funding Sources
University of Missouri
Cloudify Gateways Award
(from CloudyCluster & Google Cloud Platform)
National Security Agency (NSA)

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Jumpstart Your Sustainability Plan, Virtual Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

How a University of Missouri Gateway Team Made the Most of SGCI's Services and Community
https://bit.ly/3LKnfe1

"SGCI helped our project meet important goals, but ***our engagements also had the unexpected benefit of opening my mind to using tools that I hadn't considered before,*** *such as Google Analytics and Docker. Not only did this help me progress and learn but* ***I also developed enough new knowledge to develop curriculum and teach other people*** *in cloud computing classes."*

— Ritu Arora

Website
github.com/ritua2/IPT

Team Members
Ritu Arora

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

Education & Training: Internship Program

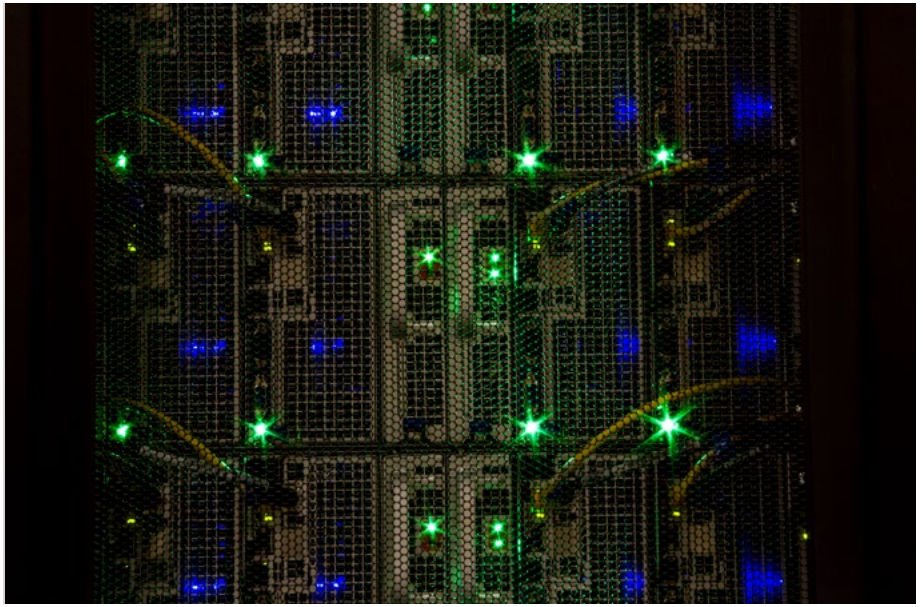


Photo credit: Texas Advanced Computing Center

IPT Gateway

SCIENTISTS, ENGINEERS, AND STUDENTS TRADITIONALLY CODE their computational experiments to run sequentially, but serial processing is inefficient for use on high-performance computing. Converting applications or software to simultaneous—also known as parallel—processing is a challenge. The **Interactive Parallelization Tool (IPT) gateway** was developed to help new HPC users in any domain generate and test parallel code through a convenient web portal, allowing them to learn or teach parallel programming.

HOW WE HELPED

As the gateway approached its first milestone using the Agave language for implementation, the team found themselves without the original expert budgeted for the project, so they turned to SGCI. During the engagement, they not only worked with a technical consultant but also included two SGCI interns, Tatyana Matthews and Thomas Johnson III. PI Ritu Arora said about the interns, "It was a pleasure to work with them. They learned and at the same time they contributed, not just to the IPT project, but to [another] project as well." Ultimately, the team was able to deliver a working gateway which today lives on as the product "Gateway-in-a-Box."

Open OnDemand

OPEN ONDEMAND IS AN NSF-FUNDED, OPEN-SOURCE PORTAL that eases access to HPC by providing a plugin-free web experience, easy file management, command-line shell access, job monitoring, and graphical desktop environments and desktop applications.

HOW WE HELPED

The Open OnDemand team has engaged with SGCI by receiving usability consulting, participating in Focus Week and Gateways conferences, and hosting summer interns. (One was so good that they offered him a job!) Through SGCI, they've gained access to a community with connections that have helped them to expand their reach and impact.

Alan Chalker shared one experience: "I was in one of the sessions of the Gateways conference where someone was discussing an OnDemand-like interface from another country, and at least one or two people raised their hands and said, 'Hey, have you talked to the Open OnDemand folks?' And I was able to say, 'I'm here, let's have a chat!' This led to a series of calls, a visit, then eventually we gained a client in Australia. This was a direct benefit of attending the conference, and it's just one example of many."

"The breadth of SGCI offerings is very valuable to us, and ***it's amazing how many different threads of interaction that we've been able to initiate*** *as a result of participating in this community."*

— Alan Chalker

Website
openondemand.org

Team Members
Alan Chalker

Funding Sources
NSF

SGCI SERVICES USED

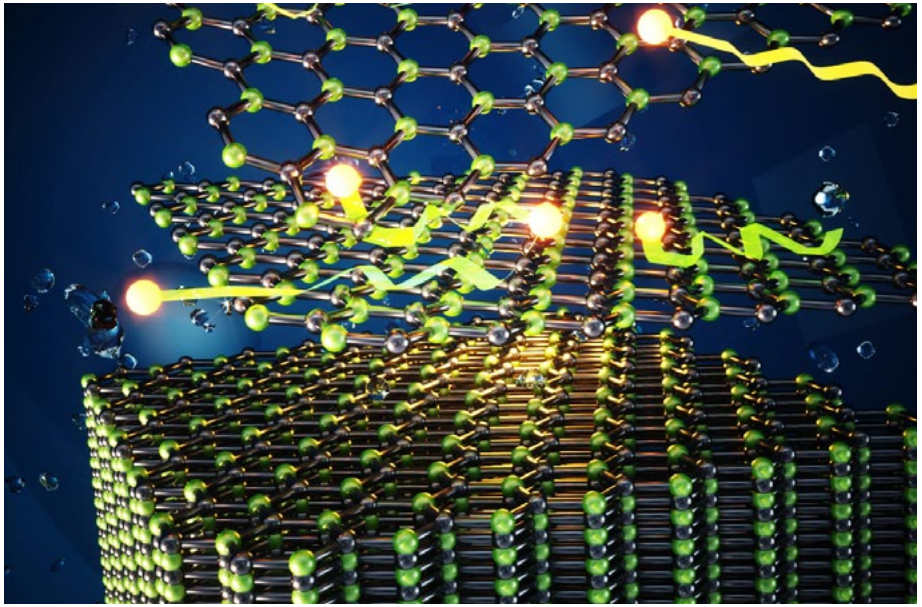
Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week, Internship Program

Networking & Community: Gateways Conference, Collaborators Program

Engineering

3



nanoHUB

NANOTECHNOLOGY IS THE STUDY OF EXTREMELY SMALL THINGS, with the ability to manipulate and control something as small as atoms and molecules. With the right tools, nanotechnology has the potential to solve complex issues ranging from renewable energy production to efficient cancer treatments. The nanoHUB gateway is built for computational research, education, and collaboration in nanotechnology and related fields. The free and open site hosts a wide range of simulation tools that run in the cloud and also provides courses, animations, presentations, teaching materials, workspaces, user groups, and more.

HOW WE HELPED

With more than 3,500 contributors from 172 countries, nanoHUB enables the cutting edge of nanotechnology. The project has been attracting more users, so the team decided it would be beneficial to revisit the website's design and navigation. Working with SGCI usability consultants gave them valuable input and suggestions on how to make adjustments based on user needs.

"Working with SGCI usability consultants helped open our eyes to website issues that we had overlooked. They pointed out some inconsistencies and the changes that could be made to better serve our users. ***The report we received that summarized the usability study was well-organized and it's a document that we continue to revisit as we make improvements."***

— Lynn Zentner

Website
nanohub.org

Funding Sources
NSF

Team Members
Lynn Zentner
Gerhard Klimeck

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

Environmental Sciences

4

Aquavit

THE AQUAVIT GATEWAY WAS BUILT AS A COLLABORATION PORTAL for researchers involved in water quality monitoring, sensor development, watershed modeling, and related activities. Initially targeted as the Appalachian Freshwater Initiative (AFI), it eventually expanded to other water-research projects.

HOW WE HELPED

The Aquavit team's first engagement with SGCI was at the very first Focus Week offered in 2017. From there, they received embedded technical support to build upon the Aquavit gateway that was providing water quality data to the EPA. Eventually, the EPA developed a REST API that fulfilled Aquavit's role, but becoming an active member of the SGCI community opened new doors for PI Jack Smith, including an opportunity to integrate much of Aquavit's work into the GeoEDF project, for which he is a co-PI. The NSF award of $4.5 million allows the team to build a "plug and play" platform to give researchers the ability to easily access and process geospatial data.

"The SGCI community has provided me with many opportunities for networking and advancement. *I've enjoyed attending the Gateways conferences and being selected as a Science Ambassador. Both opportunities allowed me to meet people and make connections that have helped me redefine my career in retirement."*

— Jack Smith

Website
Future home at mygeohub.org/groups/geoedf

Team Members
Jack Smith

Funding Sources
NSF (EPSCoR, SENSE)

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

Education & Training: Gateway Focus Week, Internship Program

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI congratulates Focus Week alumni on their recent $4.5 million NSF award
https://qrgo.page.link/Jcz1e

*"**We're so grateful for Focus Week** because it is exactly the right thing for people who want to expand, broaden, and capitalize on their gateways. You can't do any of that without the training and resources provided by Focus Week. It was such an eye-opening experience for us and **it remains, behind the scenes, what keeps us from going over a cliff.**"*

— Jason Fleming

Website
cera.coastalrisk.live

Team Members
Jason Fleming
Carola Kaiser

Funding Sources
Louisiana Sea Grant
Department of Homeland Security
Louisiana State University

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Focus Week

MORE INFORMATION

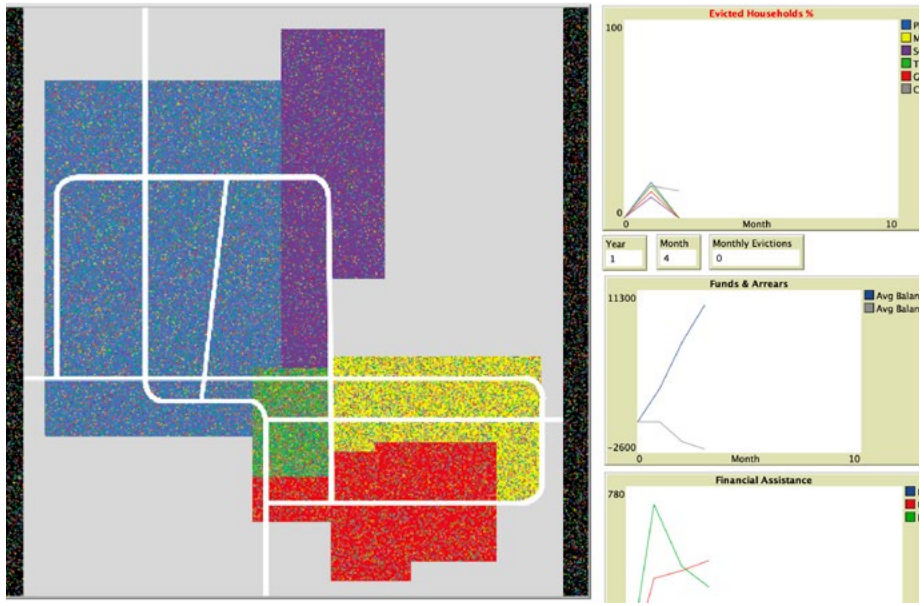
LSU Partnerships Improve Hurricane Storm Surge Forecasts for Louisiana, Nation
http://bit.ly/30lpew6

Coastal Emergency Risks Assessment

CLIMATE CHANGE HAS BROUGHT INCREASINGLY THREATENING hurricane seasons, solidifying the need for reliable and efficient storm tracking systems. The **Coastal Emergency Risks Assessment (CERA) gateway** was developed to be used not by scientists but by high-level decision-makers who are tasked with making life-saving decisions.

HOW WE HELPED

When the CERA team members attended Focus Week, they knew that they wanted to build a gateway that provided tools for visualizing hurricane data by way of interactive maps. They also knew that their users would need a user-friendly and approachable platform. Beyond that, they weren't sure where to begin. Working with the Focus Week instructors and receiving consultations from SGCI technical and usability consultants allowed Fleming and his team to make a plan to build and grow CERA. A few years on, the gateway is now being used by the White House Situation Room, U.S. Central Command, and the Department of Defense in preparation for storm surges.



CoMSES Network

CREATING AN OPEN COMMUNITY of researchers, educators, and professionals is integral to promoting the FAIR principles for data and software. The **Network for Computational Modeling in Social and Ecological Sciences,** or CoMSES Net, began as a bottom-up, community-driven initiative to support transparency, reusability, reproducibility, and other good practices for computational modeling in the social and ecological sciences. It has grown into an international network of more than 3000 members.

HOW WE HELPED

As more and more users began to entrust the CoMSES network with their data, the team behind the gateway felt a responsibility to identify pathways to sustainability. Participating in Focus Week helped the CoMSES team to start thinking about their gateway from a business perspective and to tackle big, long-term questions about operations, budgets, and value to users. The CoMSES team also worked with SGCI usability consultants to receive an evaluation that provided clear targets and action items for improving the user experience.

*"Participating in **Focus Week fundamentally transformed our way of thinking** and has changed how we approach operations and how we assess impact. We now have a clear conceptual model for how to think about and address sustainability."*

— Michael Barton

Website
comses.net

Funding Sources
NSF
Arizona State University

Team Members
Michael Barton
Sean Bergin
Ken Buetow
Marco Janssen
Allen Lee
Christine Nguyen
Calvin Pritchard
Manuela Vanega-Ferros

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

"One big lesson we have learned is that, even though you're giving scientists what's essentially free, you still have to market to them and make things look nice. ***It was incredibly valuable to us to be able to work with a marketing consultant to develop a deliberate plan for outreach and branding.*** *We're grateful that SGCI exists and can support projects like ours."*

— Greg Tucker

Website
csdms.colorado.edu

Team Members
Greg Tucker

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Usability, Marketing, & Graphic Design Consulting

Education & Training: Gateway Focus Week

CSDMS

EARTH'S SURFACE IS ALWAYS CHANGING AND REARRANGING. The **Community Surface Dynamics Modeling System (CSDMS)** supports scientific research into the Earth-surface processes by focusing on the development and applications of computer models that help researchers and other professionals understand these processes and their potential impacts.

HOW WE HELPED

The CSDMS team participated in Focus Week to gain a better understanding of how to achieve sustainability for the project. With the lessons learned, the team was able to successfully secure funding before moving to one-on-one engagements with SGCI consultants. They advanced their mission by developing branding, communications, and marketing strategies. The result has helped them not only to retain community members but also to attract and engage new ones.

Data Discovery Studio

ACCESS TO DATA IS ONE THING, but giving scientists the ability to streamline workflows from data discovery to data utilization is another. Data Discovery Studio was created to allow geoscience researchers to search and filter through more than 1.6 million records that then link directly to software and workbenches for analyzing and visualizing their work.

HOW WE HELPED

Data Discovery Studio's multi-faceted engagement with SGCI helped the team to realize that scientists sometimes have to step out of their comfort zones to achieve success with gateway projects. Their team received guidance in usability, cybersecurity, graphic design, and marketing, as well as support from technical consultants who implemented new technologies. All this work helped them to expand their offering significantly and to learn new skills that helped improve the gateway's reach. Now, they regularly encourage other EarthCube projects to pursue engagements with SGCI as well.

"Although gateway project leaders aren't trained in community building, that's essentially what they are doing, so ***it is absolutely fundamental for them to be able to think through how to conduct outreach efforts and to understand the basics of marketing,*** *for example. SGCI helped us design a logo, an eye-catching and succinct flyer, and gave us the tools needed to grow and support our community."*

— Ilya Zaslavsky

Website
datadiscoverystudio.org

Funding Sources
NSF (EarthCube)

Team Members
Ilya Zaslavsky
Ouida Meier
Stephen Richard
David Valentine
Karen Stocks

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Marketing, Cybersecurity, Usability, & Graphic Design Consulting

Education & Training: Jumpstart Your Sustainability Plan

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI Helped Grow Data Discovery Studio...
https://qrgo.page.link/LGxr8

*"**Getting a logo from SGCI was the easiest thing ever.** We had one meeting, we chatted, he sent me some ideas, I sent some comments, and voilà, I had the coolest looking logo ever. Prior to that, I'd tried to engage graphic design students on campus and never heard back from anybody, so I wouldn't have known what to do until SGCI gave me access to an expert designer."*

— Elizabeth Barnes

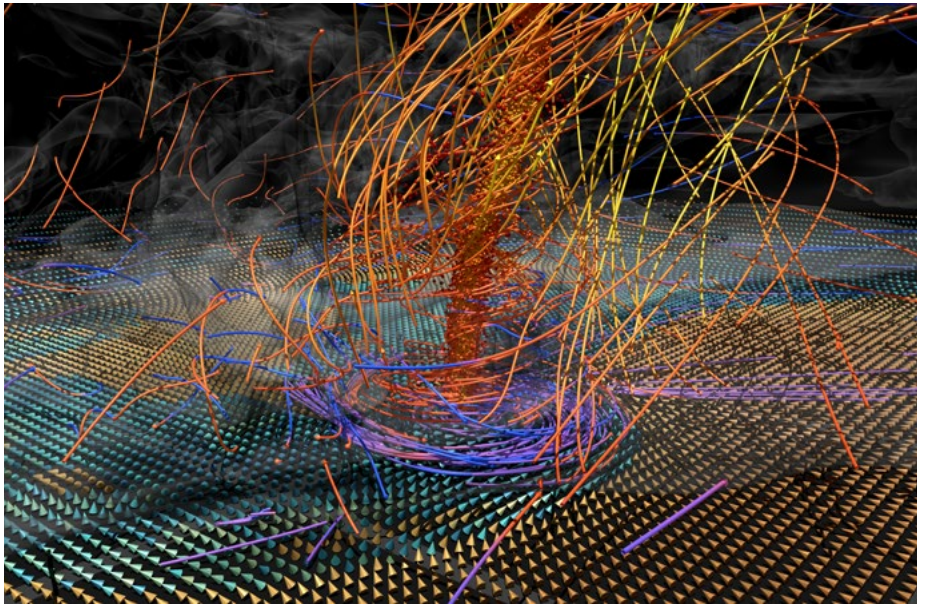
Website
datasgateway.colostate.edu

Team Members
Elizabeth Barnes

Funding Sources
NSF

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Graphic Design Consulting



DATAS

THE RAPID RATE OF CLIMATE CHANGE IN RECENT YEARS has spurred accelerated research in the field of atmospheric science. The resulting reality is that the amount of climate data and the complexity of earth-system models is only increasing, which means that atmospheric scientists need to be equipped with the skills necessary to analyze data and make novel and robust discoveries. The **Data Analysis Tools for the Atmospheric Sciences (DATAS)** gateway was developed to supplement these skills by collecting, in one place, accessible explanations and coded examples of the data analysis tools needed by scientists.

HOW WE HELPED

The DATAS team came to SGCI for technical support in order to get the gateway up and running, but they also wanted help with creating an eye-catching logo to visually represent the gateway. Stepping away from the more complex and time-consuming process of developing the gateway in order to work on a logo with an SGCI graphic design consultant proved to be an enjoyable, efficient, and satisfying endeavor.

eODP

FOR SCIENTISTS, THE AVAILABILITY OF DATA DOESN'T ALWAYS GUARANTEE ACCESSIBILITY. This is why the group of marine geologists and climatologists behind the **Extending Ocean Drilling Pursuits (eODP)** project set out to collect the enormous amount of scientific ocean drilling data from the past 50 years into existing and well-supported databases. They know that doing so will allow full search capabilities and, thus, large-scale studies.

HOW WE HELPED

Aside from planning for the big work of migrating datasets, the eODP team realized that they'd require some basic components to represent the datasets they sought to consolidate. One priority was a custom logo. Since logo design wasn't something they'd thought to budget into their funding proposal, the team turned to SGCI for graphic design support.

"The SGCI consultant listened carefully to everything that we wanted and just knocked it out of the park. The whole process went a lot more quickly than I was anticipating and I was really happy with all my interactions with SGCI. ***Everyone I worked with was really professional, responsive, fast, and the end product was just amazing."***

— Leah LeVay

Website
eodp.github.io

Funding Sources
NSF (EarthCube)

Team Members
Leah LeVay
Andy Fraass
Jocelyn Sessa

SGCI SERVICES USED

Gateway Services: Graphic Design & Usability Consulting

Education & Training: Virtual Focus Week

MORE INFORMATION

From in-person to online: Successes from the first virtual Focus Week
https://qrgo.page.link/AF7Tx

"ESIP Lab has funded over 20 projects since we attended Focus Week, and ***I'm able to take the tools that I learned and just use that language and pass it on to those projects. It gave me a mindset to continually evaluate and re-evaluate the Lab, too****—Is our value proposition the same? What's our niche?"*

— Annie Burgess

Website
esipfed.org
esipfed.org/lab

Funding Sources
NASA
NOAA
USGS

Team Members
Annie Burgess,
Lab Director
Susan Shingledecker,
Current Executive Director
Erin Robinson,
Previous Executive Director

SGCI SERVICES USED

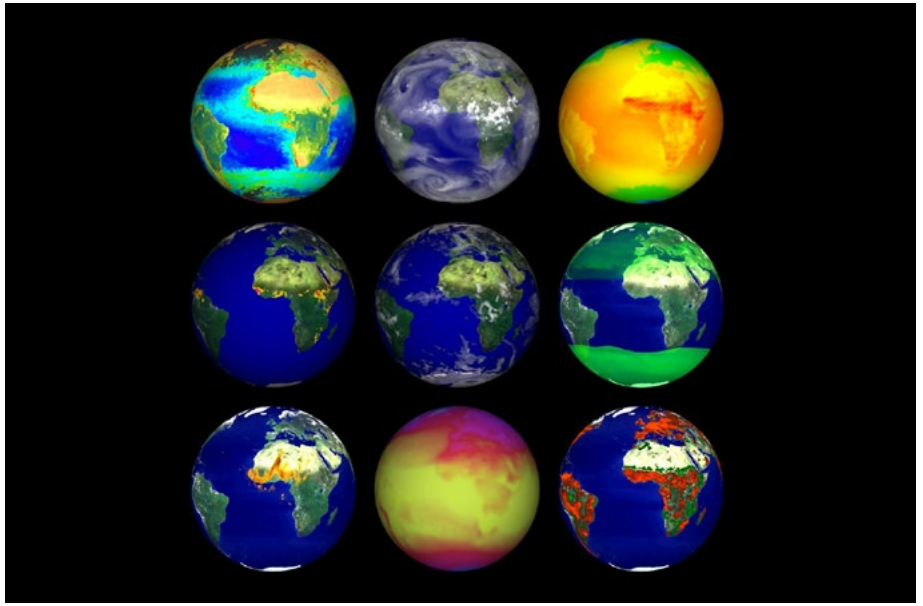
Education & Training: Gateway Focus Week, Custom Focus Week for ESIP Projects, Internship Program

Networking & Community: Collaborators Program

MORE INFORMATION

"Aha" Moments Abound at ESIP's Custom Bootcamp [now Gateway Focus Week] and Beyond
https://bit.ly/3SzLnIN

SGCI and ESIP Discuss Bootcamp and Partnership Possibilities
https://bit.ly/3LMIEEm

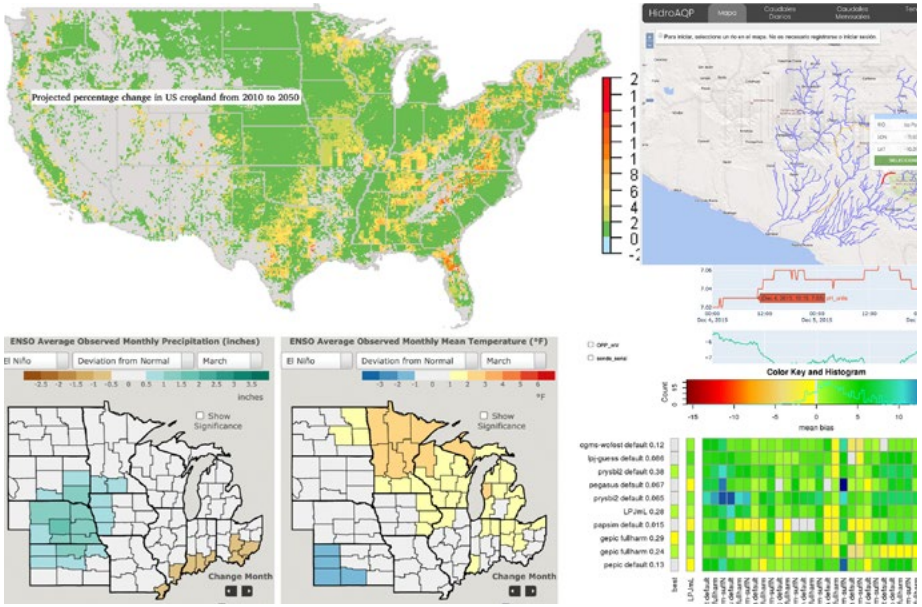


ESIP & ESIP Lab

IF THERE'S ONE CERTAINTY ABOUT EARTH SCIENCE DATA, it is that no single entity collects or controls all the data needed for advancing research. Coordination among stakeholders is essential. **Earth Science Information Partners (ESIP)** is a nonprofit scientific and education organization supporting this global community through community-driven collaboration and interaction across boundaries. One of its vibrant programs is the ESIP Lab, which provides small grants to help innovators explore and advance their technical skills or demonstrate proof of concept, while showcasing their work.

HOW WE HELPED

An ESIP team attended Focus Week, and they relished the time for thinking strategically about their project while interacting with others facing similar challenges. The experience was so valuable that the Executive Director returned with the Lab Director for another Focus Week. After that, they sponsored a customized Focus Week for ESIP projects. Lab projects have used what they learned to attract greater funding and reach. Burgess said, "I want to send every funded project through Focus Week because it is really valuable learning this skill set that they would not otherwise have run into."



GABBs/GeoEDF

THE TEAM HAD BUILT A POWERFUL WEB-BASED SYSTEM. Using **Geospatial Data Analysis Building Blocks (GABBs),** researchers worldwide could manage, curate, share, analyze, and visualize geospatial data for purposes ranging from predicting damaging floods to projecting the effects of climate change on the poor. Recognizing the value that GABBs offered researchers, the team decided it was time to think about how the project could grow.

HOW WE HELPED

Participating in Focus Week gave them a jump start on thinking through issues in project sustainability. It also helped them gain a better understanding of the market and identify gaps that a new and improved GABBs could fill. The lessons learned helped guide the team toward a $4.5 million award for the new phase of their project called **GeoEDF (Extensible Geospatial Data Framework).** The grant will allow the team to build a "plug and play" platform that gives researchers the ability to easily access and process geospatial data from distributed sources and make their research products more findable, accessible, interoperable, and reusable (FAIR). As of 2021, the gateway supports about 10,000 users each year.

"We recognized that taking the conversations we had during Focus Week back to our team would help us plan for the next vision more effectively and efficiently. This gave us structure and helped us to all start speaking in similar languages. ***Being on the same page with everyone on the team helped us achieve our goals and secure funding for the new phase of our project, GeoEDF."***

— Carol Song

Website
mygeohub.org

Team Members
Carol Song

Funding Sources
NSF

SGCI SERVICES USED

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI congratulates Focus Week alumni on their recent $4.5 million NSF award
https://bit.ly/3t1Mtf1

"Working with SGCI was an amazing experience, and I'd recommend that anyone who needs help with a gateway work with them. When I'm working on proposals, I always think back to what I've learned from SGCI consultants. ***Ultimately, all the things I've learned from SGCI have helped me advance my project and to win funding and the prestigious NASA ACCESS award."***

— Ziheng Sun

Website
esipfed.github.io/Geoweaver

Team Members
Ziheng Sun

Funding Sources
NSF
ESIPLab
NASA

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Sustainability & Usability Consulting

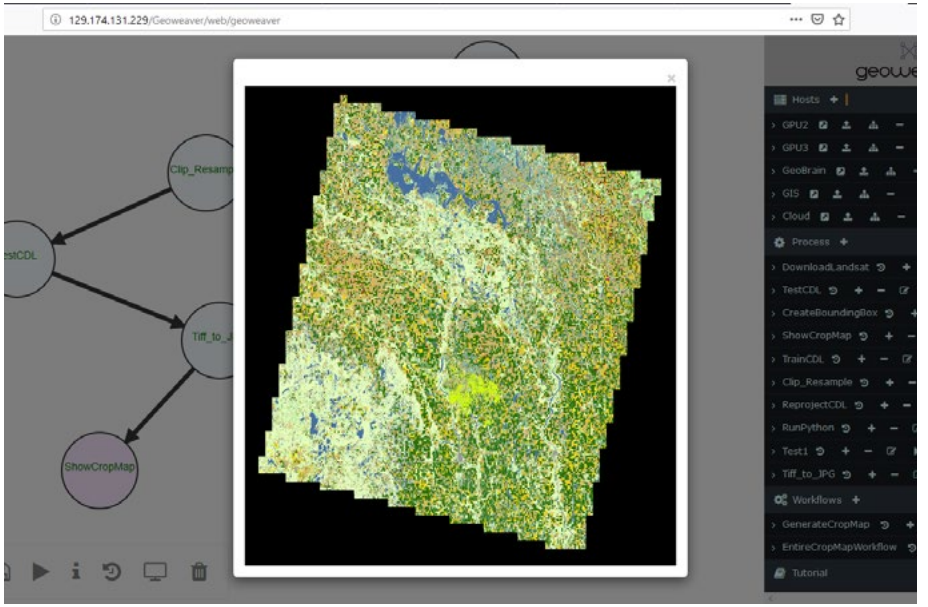
Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

Geoweaver: From Incubator Project to a Broader Audience Scope
https://qrgo.page.link/xqnvU

Geoweaver: Building An Open-Source Platform for... NASA Earth Data-Driven Hybrid AI Workflows
https://qrgo.page.link/7wU6c



Geoweaver

ADVANCES IN ARTIFICIAL INTELLIGENCE (AI) AND MACHINE LEARNING (ML) present exciting prospects and new challenges for researchers. Geoweaver is a science gateway that was designed to manage AI/ML research in Earth science by allowing researchers to compose, execute, and manage full-stack, deep-learning workflows by pulling together hybrid computing resources. After participating in Focus Week, the Geoweaver team came to the realization that their project could serve a much broader audience than initially planned and, in doing so, provide greater impact in the geosciences.

HOW WE HELPED

After Focus Week, the Geoweaver team engaged with SGCI to receive consulting in sustainability, usability, and embedded technical support. They credit these engagements with advancing the project goals significantly, specifically by helping to understand their audience, giving the user interface a major upgrade, and creating a custom capability that builds a bridge between the gateway and Jupyter notebooks.

HydroShare

EARTH'S WATER SYSTEM IS COMPLEX, and so too can be the process for collecting, analyzing, sharing, and publishing hydrologic data. The HydroShare gateway offers a solution that includes data management and publication, collaboration tools, and access to apps for visualizing, analyzing, and running models through several cloud services. HydroShare is operated by the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), and the development team enlisted help through several SGCI services, including technical support and a cybersecurity evaluation in 2018–2019 and a summer intern in 2020.

HOW WE HELPED

A priority was to enhance the user experience. To simplify the often cumbersome transfer of data—particularly for novices—an SGCI developer created a capability for transferring data stored in HydroShare to the Jupyter environment, making HydroShare computing functionality accessible to a broader audience. A cybersecurity audit provided recommendations for best practices, and finally, in Summer 2020, an SGCI intern further enhanced session and synchronization capabilities.

"Working with an SGCI developer added a really important part to our gateway that is time saving as well as making the platform accessible to a broader community of people *with not as many skills. It makes a lot of the work possible for people for whom otherwise it would be really hard."*

— David Tarboton

Website
hydroshare.org

Funding Sources
NSF

Team Members
David Tarboton
Anthony Castronova
Martin Seul
Zhiyu (Drew) Li

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Cybersecurity Consulting

Education & Training: Internship Program

MORE INFORMATION

Toward open and reproducible environmental modeling... *(Environmental Modelling & Software)*
https://bit.ly/3DYBhqA

"Becoming involved with the SGCI community has been great for our team since ***you're like the glue between a bunch of gateways projects.*** *This community has been identifying and setting standards that folks can leverage, which is so valuable to researchers who set out to build or operate a gateway."*

— Sean Cleveland

Website
ikewai.org

Funding Sources
NSF (EPSCoR)

Team Members
Sean B. Cleveland
Jennifer Gies
Jared McLean
Gwen A. Jacobs

SGCI SERVICES USED

Gateway Services: Usability & Cybersecurity Consulting

Education & Training: Gateway Focus Week, Young Professionals Network

Networking & Community: Gateways Conference

MORE INFORMATION

Hawai'i H2O *(Science Node)*
https://qrgo.page.link/CKYov

Gateways 2018 Student Blog:
Travel Award Recipient Jared McLean
https://qrgo.page.link/Xs58b

'Ike Wai

'IKE WAI, FROM THE HAWAIIAN WORDS FOR "KNOWLEDGE" AND "WATER," is a project addressing challenges to water sustainability from climate variability, population demands, and various forms of contamination. A cross-disciplinary project, the gateway aims to increase overall understanding of Hawaiian island hydrology to provide the necessary data for decision-making tools that can address these issues.

HOW WE HELPED

The 'Ike Wai team has engaged with SGCI in various ways, from receiving consulting services and hosting interns to participating in events such as Focus Week and the Gateways conference series. The resources and guidance have allowed them to improve and grow their gateway, but there was an additional unexpected and welcome benefit of working with SGCI: the opportunity to connect with a broad community of gateway developers.

InterACTWEL

ALL LIVING CREATURES depend upon the Earth's physical resources and natural systems for basic needs such as food, energy, and water. With these resources under increasing stress, it is more important than ever to empower communities to coordinate planning efforts to face future challenges. The **Interactive Adaptation and Collaboration Tool for managing Water, Energy and Land (InterACTWEL)** is a secure and intelligent, computer-aided, decision-support tool to aid adaptation planning of agriculture and natural resources in rural communities. Using scientific models and interactive interfaces, community members and natural-resource managers can use the platform to plan for resilience to environmental disturbances and to changes in agricultural or environmental policies.

HOW WE HELPED

Since InterACTWEL serves a wide range of stakeholder end-users, such as farmers, policymakers, government agencies, municipalities, tribes, dam operators, and environmentalists, making the gateway user-friendly was imperative. Working with our usability consultants allowed the InterACTWEL team to offer a gateway with a low barrier to entry.

"We aim to change the culture of decision-makers by offering a data-driven platform. We wanted to work with SGCI's consultants to make sure the gateway is user-friendly and approachable. ***The SGCI consultants worked directly with our users and used what they learned from them to generate practical and tailored recommendations."***

— Meghna Babbar-Sebens

Website
interactwel.org

Funding Sources
NSF
USDA

Team Members
Meghna Babbar-Sebens
Samuel J. Rivera

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Gateway Focus Week

"Focus Week was very useful for us. We were able to think about sustainability in a detailed way, and thought of avenues that we hadn't thought of before. ***The work we did during Focus Week helped to shape our thinking about a sustainability plan that, eventually, we set forth in our current funding proposal."***

— Vishu Nandigam

Website
opentopography.org

Team Members
Vishu Nandigam
Chris Crosby

Funding Sources
NSF

SGCI SERVICES USED

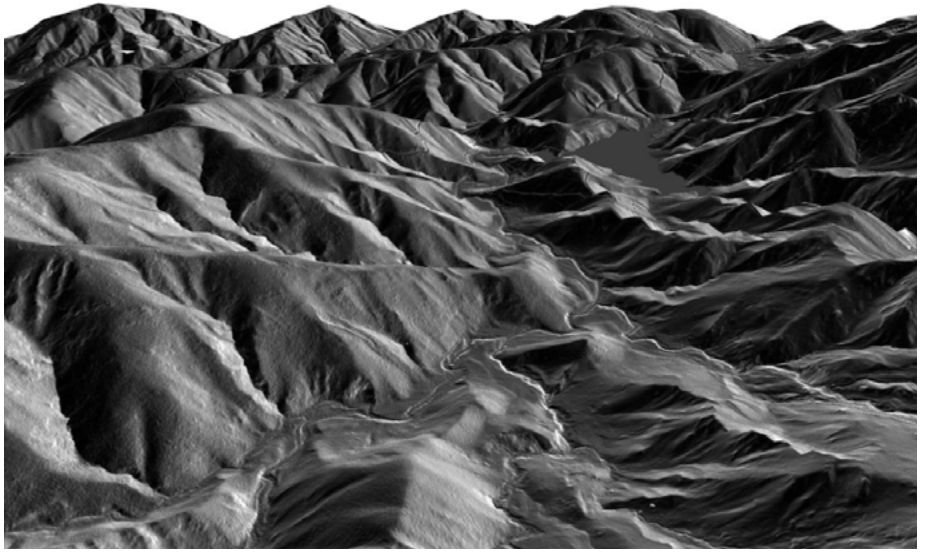
Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

OpenTopography: Demonstrating Impact Through Audience Engagement (Case Study)
https://qrgo.page.link/8aJno



OpenTopography

THE OPENTOPOGRAPHY GATEWAY AIMS TO DEMOCRATIZE ACCESS to high-resolution, topographic data. There has been a dramatic growth of such data for scientific, environmental, and engineering purposes over the last decade, and the richness of the data sets makes them worthy of preservation and distribution. Their large volumes and accompanying technical challenges, however, require software and computing services not readily available to many users. OpenTopography fills this gap by providing data and cloud computing at no cost on a user-friendly platform.

HOW WE HELPED

Participating in SGCI's Focus Week allowed the OpenTopography team to expand their thinking about the future of their growing project. With their eyes set on becoming sustainable, Focus Week helped the team to identify what it takes to get there.

SimCCS Gateway

Many scientists believe that one way to mitigate climate change quickly and effectively is to use carbon capture, utilization, and storage technologies (CCUS), which have the potential to lower emissions of carbon dioxide (CO_2) to the atmosphere. The SimCCS Gateway was developed to offer capabilities for decision support and design of CCUS on a massive scale. Using high performance computing resources, the gateway optimizes designs of the systems needed to capture, transport, and sequester CO_2 that is generated by power plants and other critical industries.

HOW WE HELPED

Participating in Focus Week helped the team create a plan for gateway development. They realized that working with SGCI experts would both execute and accelerate their plan, so the team requested an engagement. Project Lead Kevin Ellett remarked, "I can't say enough good things about our work with SGCI. The first phase of work with their developers took us from zero to a fully functioning version 1.0." The gateway was the first to offer analytical functionality for CCUS design in an online platform. In 2019, the SimCCS project won an R&D 100 Award, widely known as the "Oscar of Invention," which is considered one of the most prestigious honors for innovation in the US.

"Engaging with SGCI for this initial development saved us months of spinning-wheels time and accelerated our ability to get a functioning gateway. *This all happened in time for a meeting with stakeholders and potential funders, where we were able to make a big splash and easily convey the value our gateway offers for broad and impactful research."*

— Kevin Ellett

Website
simccs.org

Team Members
Kevin Ellett

Funding Sources
Department of Energy
U.S-China Clean Energy Research Center
(Led by West Virginia University)

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

Education & Training: Focus Week

MORE INFORMATION

SGCI Support Paves the Way for the SimCCS Gateway to Tackle Climate Change Mitigation
https://bit.ly/3LKrjLj

Cohort Four Reflects on the Value of Science Gateways Bootcamp [now Gateway Focus Week]
https://bit.ly/3dLg5JN

"A usability assessment was something we wanted to have done, but we were really not capable of figuring out. I know the UI has gotten better and has gotten really good reviews by geologists, but I just know there's so much more we could do. ***Now that we know the group, we'd like to keep that involvement going just to know what we should be doing."***

— Doug Walker

Website
strabospot.org

Funding Sources
NSF (Geoinformatics, Earthcube)

Team Members
Doug Walker
Nathan Novak
Jessica Novak
Jason Ash
Nick Roberts

SGCI SERVICES USED

Gateway Services: Usability Consulting

MORE INFORMATION

StraboSpot data system for structural geology *(Geosphere)*
https://bit.ly/3SDSt8U

Bringing sedimentology and stratigraphy into the StraboSpot data management system *(Geosphere)*
https://bit.ly/3BRSejN

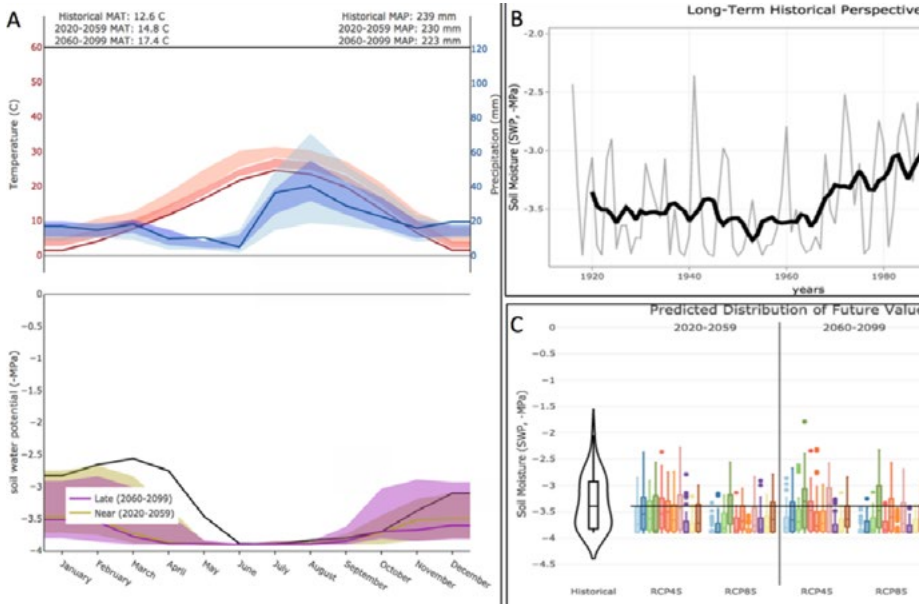
Photo credit: Andy White, University of Kansas Marketing

StraboSpot

TO UNDERSTAND EARTH'S HISTORY, scientists have used spatial and temporal data that ranges in magnitude from very small to tremendously large, much of it stored in field notebooks or published literature. The field of structural geology and tectonics has been hindered by the lack of a digital system that could capture, organize, archive, and share such data among scientists. Moreover, these data were not standardized in a way that would make it accessible to the broader community. In response, the StraboSpot digital field notebook and data management system was released in 2017 as a mobile app to enable high-level data collection for research, teaching, and public use.

HOW WE HELPED

The team had always thought that user experience was important, but they hadn't found a way to get usability help. Consequently, they jumped at the opportunity to have SGCI's usability consultants conduct a rigorous examination of their interface with day-to-day users. From this process, they learned how to improve clumsy features, and they validated the direction of features under development. They were so delighted at this service that they wrote SGCI's usability team into two new proposals for expanding the software!



USGS CDI

SINCE 2010, the **US Geological Survey's (USGS) Community for Data Integration (CDI)** has funded projects that promote data integration for interdisciplinary research, innovative data management, and the demonstration of new technology. CDI leadership supports these project leaders by offering them the opportunity to learn how to work effectively toward project sustainability.

HOW WE HELPED

Attending sessions led by SGCI Focus Week instructors at a conference made the CDI team realize that the sustainability tools and strategies being taught were exactly what their funded project leaders needed. This inspired them to work with SGCI on designing custom workshops to help advance CDI projects.

The team was delighted with the results. Team member Leslie Hsu remarked, "After hosting these custom workshops, we realized, wow, these projects are doing a really good job of communicating their results. Why could that be? **We realized that those projects were better prepared to communicate because they'd gone through and thought of this stuff with the SGCI instructors."**

"As an organization, CDI has also modified our instructions for projects based on what we learned from SGCI. ***We strongly believe that these sustainability skills need to become common knowledge for people working on digital projects, which makes the work that SGCI does extremely important."***

— Leslie Hsu

Website
www.usgs.gov/centers/cdi

Funding Sources
USGS

Team Members
Leslie Hsu
Madison Langseth
Viv Hutchison

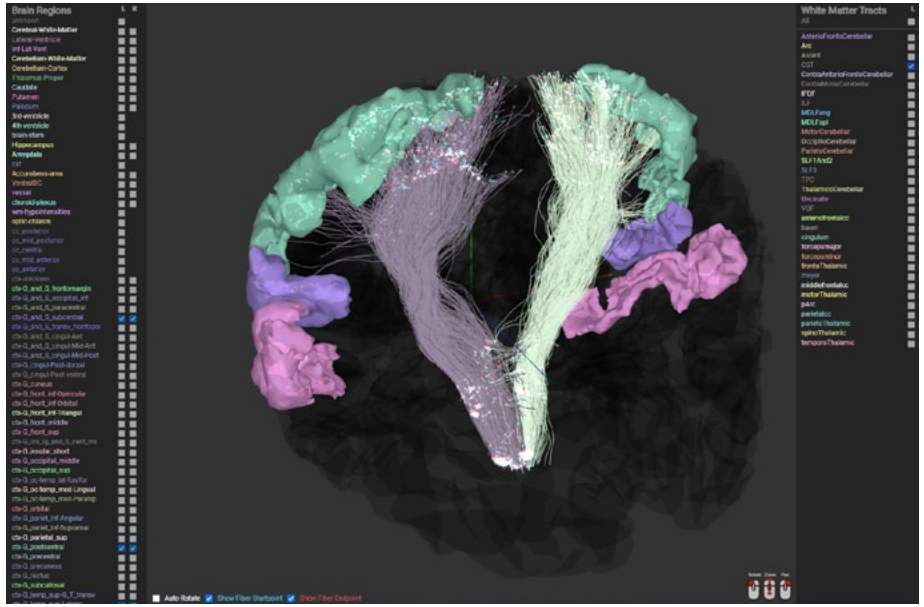
SGCI SERVICES USED

Education & Training: Gateway Focus Week (custom)

Networking & Community: Gateways Conference

Life Sciences

5



Brainlife

IN SCIENTIFIC RESEARCH, REPRODUCIBILITY IS THE KEY to demonstrating that findings are trustworthy. The Brainlife gateway was developed to advance neuroscience by giving researchers a community-based, online platform for reproducible neuroscience. A free cloud platform that promotes open-source software and data sharing, the gateway provides secure access to neuroscience data analysis.

HOW WE HELPED

When the Brainlife team participated in Focus Week, they realized that they had spent a great deal of time on the software development aspect of their gateway, and not so much on fostering their community of users. The tools and strategies they acquired in Focus Week allowed them to take steps toward building and growing the community. Project Director Franco Pestilli explained, "We hired someone to implement the outreach-related things we'd learned at Focus Week. This included starting a newsletter, preparing a survey of our users, and being active on social media."

*"We gained tools during Focus Week that we were able to implement and use to grow our gateway's reach... **In less than a year, we went from 400 registered users to around 1500 users.** More than one effort contributed to our growth, but the lessons we learned at Focus Week about community engagement played a big part."*

— Franco Pestilli

Website
brainlife.io

Team Members
Franco Pestilli
Soichi Hayashi

Funding Sources
NSF
DOD
NIH

SGCI SERVICES USED

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

Leading neuroscientist relies on XSEDE resources for Brainlife.io platform *(XSEDE News)*
https://bit.ly/3LO8uXE

*"The **Focus Week was honestly one of the most relevant and beneficial training workshops** that I've participated in in the 17 years that I've been affiliated with NOAA. Again and again, we continue to go back and reference the materials that we were given and that we personalized over the five days."*

— Sarah O'Connor

Website
coris.noaa.gov

Team Members
Sarah O'Connor

Funding Sources
NOAA

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

CoRIS

CORAL REEFS, EARTH'S MOST ANCIENT AND DIVERSE ECOSYSTEM, face multiple endangering threats. In the rush to save these complex systems, access to coral reef information and data products is essential. The **Coral Reef Information System (CoRIS)** provides access for the purposes of mapping, monitoring, assessment, modeling, outreach, education, and more.

HOW WE HELPED

When the CoRIS team signed up for Focus Week, they didn't know that the lessons they'd learn would have a lasting impact on their work. Key areas of growth for the team were refining and updating their value proposition statement, implementing new strategies for sales and marketing, and conducting an effort analysis that resulted in an increase in staff.

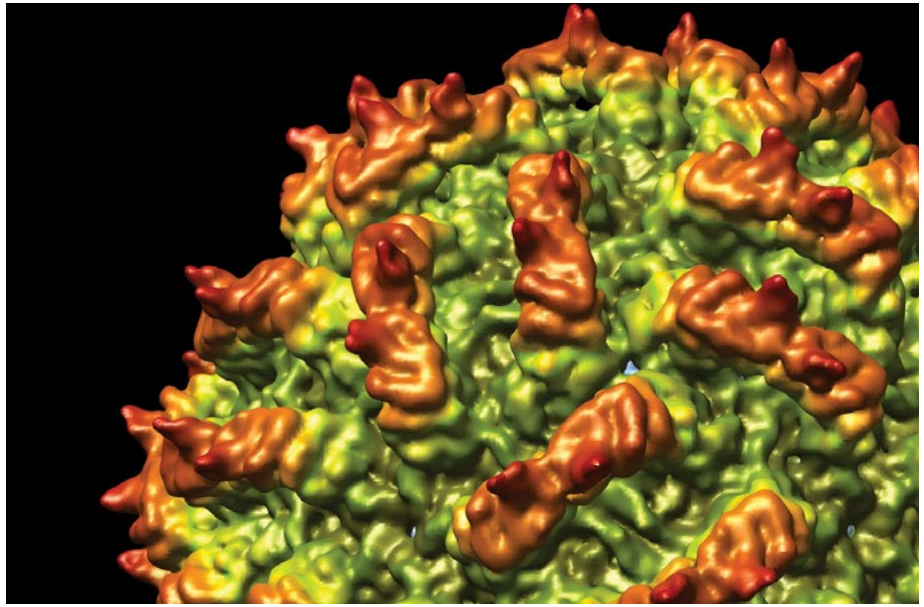


Photo credit: W.F. Ochoa, UC San Diego; Source: San Diego Supercomputer Center

COSMIC²

CRYOGENIC ELECTRON MICROSCOPY (CRYO-EM) HAS UNDERGONE REVOLUTIONARY ADVANCEMENTS that allow researchers to determine biomolecular structures at near-atomic resolution. The method advances structural biology research significantly. So much so, that the Nobel Prize in Chemistry 2017 was awarded to three scientists for their work with cryo-EM. But users face many obstacles, as they are collecting and analyzing unprecedented amounts of data along with managing and submitting jobs to HPC resources. By providing an easy, web-based platform, the **Cryo-EM Open Source Multiplatform Infrastructure for Cloud Computing (COSMIC²)** science gateway aims to reduce barriers.

HOW WE HELPED

PI Michael Cianfrocco knew that there was no simple turnkey solution to developing COSMIC². SGCI provided him with comprehensive assistance in developing the gateway, rather than piecemeal services. Technical consultants helped him build a gateway that could handle large data transfers, asynchronous transfers, multiple file uploads, and more. Now that it's up and running, the gateway gains around 140 users every month.

"We knew that the need was there for a cryo-EM gateway, and having the experts at SGCI available made the gateway development process much more efficient since they have the starting technologies to work with and they know how to solve the unique problems facing gateway developers. ***Having experienced gateway developers provides a significant advantage."***

— Michael Cianfrocco

Website
cosmic-cryoem.org

Funding Sources
NSF

Team Members
Michael Cianfrocco

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Cybersecurity, & Sustainability Consulting

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI Client COSMIC² and Its Use of Globus
https://qrgo.page.link/KGUDt

SGCI Client Update: COSMIC² Receives Funding to Grow Gateway
https://qrgo.page.link/ogQ7r

"To get more stakeholders to give us use cases and tell us how this gateway could be useful for research and education, we did two workshops. ***The SGCI helped us create lots of technology demonstrations to recruit some of these stakeholders to do pilots, so that was definitely a very beneficial part of the collaboration."***

— Prasad Calyam

Website
cyneuro.org

Funding Sources
NSF

Team Members
Prasad Calyam
Songjie Wang
Satish Nair

SGCI SERVICES USED

Gateway Services: Embedded Technical Support

Networking & Community: Gateways Conference

MORE INFORMATION

Experiences from a Multi-disciplinary Course Sequence Development... *(Gateways 2018)*
https://bit.ly/3dTBYGR

Chatbot Guided Domain-science Knowledge Discovery... *(Gateways 2019)*
https://bit.ly/3dHSsC8

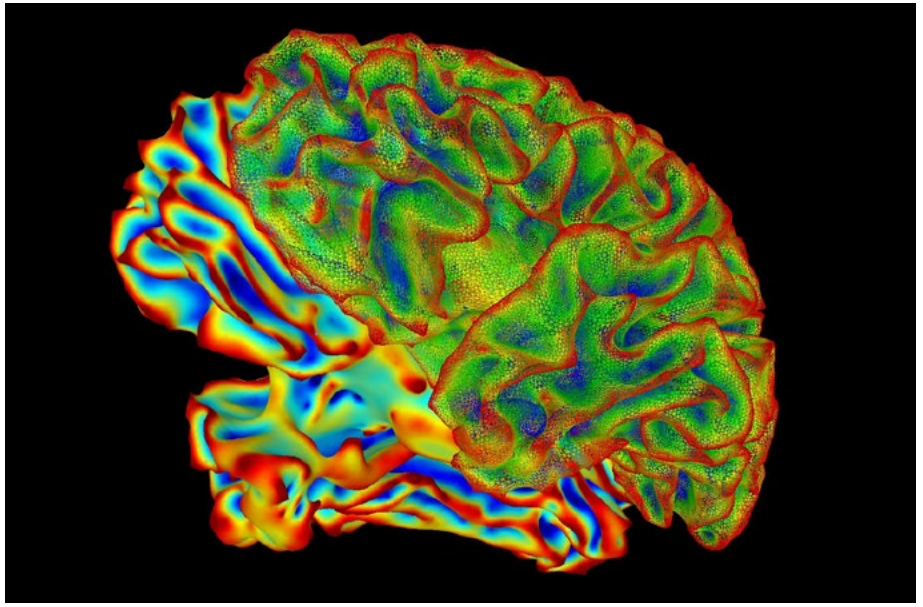


Photo credit: National Institute of Mental Health, National Institutes of Health

CyNeuro

LIMITED TRAINING AND SKILL DEVELOPMENT for using high-performance computing and big data analysis was hampering research productivity and interdisciplinary collaboration in the neuroscience community. Researchers at the University of Missouri developed the CyNeuro science gateway platform to combine their local, institutional and national, high-end cyberinfrastructure resources in order to integrate data, analysis and visualization tools, computing, and automation. As they began to develop their gateway, they recognized that they needed support with the gateway implementation as well as enlisting input from their target community.

HOW WE HELPED

The team worked with two SGCI technical consultants to integrate both the CIPRES Workbench and JupyterHub as easy-to-access interface systems for their community, particularly for use with undergraduate, graduate, and teacher training. They could use the new system as a demonstration tool to recruit stakeholders and elicit use cases. Additionally, this collaboration helped them produce multiple research papers to share at the Gateways conferences and obtain a subsequent grant. The PIs were also pleased that a master's student produced a thesis from this work.

ETAG

ARE BIRD MIGRATION PATTERNS CHANGING due to climate change? What is the impact of habitat loss on sloths? How far do wolf packs travel? These are the types of questions that scientists can answer by using wirelessly readable tags and Radio Frequency Identification (RFID) technology. The **Electronic Transponder Analysis Gateway (ETAG)** is a web tool that allows scientists to collect and share data for animal behavior in near real-time. The gateway provides a central store for researchers to upload data that can allow for collaboration and visualizations when tracking individual animals.

HOW WE HELPED

The ETAG team worked with a variety of SGCI specialists, starting with technical consultants who built a gateway that displays RFID reader data on a map interface and also enables users to filter the data by readers, species, time, and more. From the usability team, they received guidance on how to make the front end of the gateway more user friendly. And through SGCI's internship program, they hired an intern to work on front-end development.

"SGCI was a lifesaver for us. Not only did we get our gateway set up, but ***we walked away from the experience with an entirely new skill set: project management.*** *This was an unexpected outcome of our engagement, but one that we'll carry with us to future projects."*

— Claire Curry

Website
osf.io/9j7ax/

Funding Sources
NSF

Team Members
Claire Curry
Eli Bridge
Tyler Pearson

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability Consulting

Education & Training: Internship Program

MORE INFORMATION

ETAG Gateway Reaches Goals Thanks to Engagement with SGCI
https://qrgo.page.link/6AfdK

"Importantly, the UX for most software in our field is very poor. ***Our discussions and mock-up are going to be critical for us moving forward in our software development and will help us to make software that is intuitive."***

— Michael Cianfrocco

Website
In process

Funding Sources
NIH

Team Members
Michael Cianfrocco
Gabriel Lander
Scott Stagg

SGCI SERVICES USED

Gateway Services: Usability Consulting

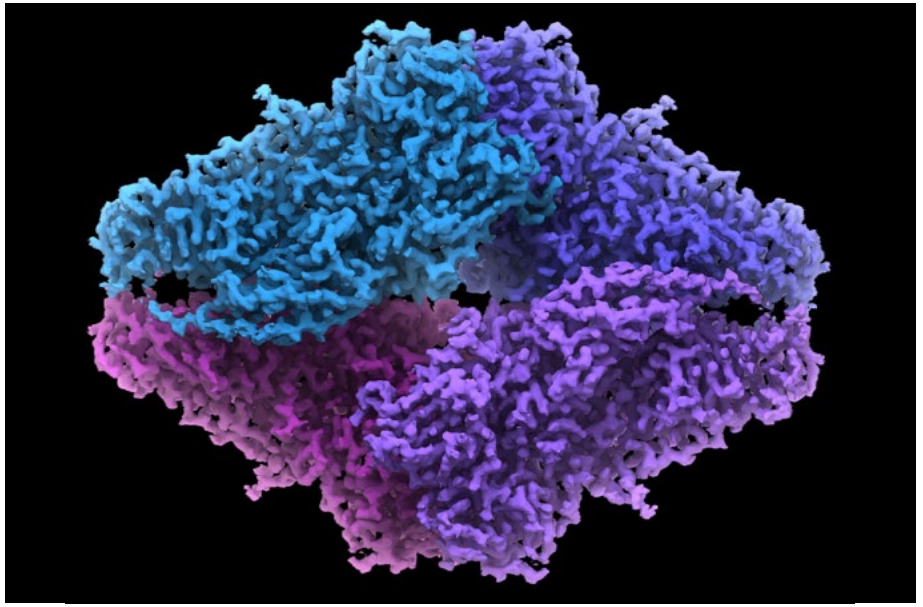


Photo credit: Veronica Falconieri, Sriram Subramaniam, National Cancer Institute, National Institutes of Health

Magellon

TO BETTER UNDERSTAND FUNDAMENTAL BIOLOGICAL PROCESSES such as viral infections or protein function, scientists use cryo-electron microscopy (cryo-EM) to visualize the structure of these molecules in 3D at atomic resolution. Although NIH invested in cryo-EM centers to provide free access to biologists across the country, variations in image quality complicates analysis, interpretation, and use of the results. The Magellon gateway is designed to automate the collection, processing, assessment, and transfer of these high-resolution images and corresponding volumes of data by developing second-generation software through a web interface.

HOW WE HELPED

Part of simplifying this process required a clear design for the interactive tools, live updates, management interfaces, and data storage systems to be controlled in real-time. SGCI's usability team developed a task flow based on interviews with Magellon's developers and insights from software with similar image capture and visualization goals. Next, they created a mock-up to show how the flow would operate. The developers appreciated the usability team's attention to detail and responsiveness to the needs of the bespoke scientific workflow.

Photo credit: Sterling College on Flickr

PlantingScience

THE KEY TO FOSTERING YOUNG SCIENTISTS IS TO BRING SCIENCE TO LIFE. PlantingScience is a gateway that does this for middle- and high-school teachers and their students by providing online mentoring support and a host of online resources for student-led, plant-science investigations. The gateway also enables small teams of students to work with scientist mentors on student-led projects.

HOW WE HELPED

The PlantingScience team was well into the first year of working on their gateway when they participated in Focus Week. They had already seen significant growth and were serving more than 500 student teams and about 2,000 students each session. The growth hadn't come easily, as the gateway's design required the team to do a great deal of back-end administrative setup and monitoring. By working with SGCI usability consultants, they were able to improve both the back-end processes as well as the user experiences of teachers and scientist mentors. **They saw their community size double after this engagement,** and have enjoyed steady growth since, having now served about 2,000 teams and more than 7,000 students.

"In the nearly five years since we participated in Focus Week and received usability consulting, the PlantingScience gateway has continued to grow and reach more and more students. ***We learned some lessons from SGCI that we use regularly, such as collecting feedback about usability from users.*** *On the whole, we're getting very positive feedback and know that students are having great learning experiences as well."*

— Catrina Adams

Website
plantingscience.org

Funding Sources
NSF

Team Members
Catrina Adams
Jodi Creasap Gee

SGCI SERVICES USED

Gateway Services: Usability Consulting

Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

PlantingScience Community Doubles in Size After Consultation With SGCI
https://qrgo.page.link/QEgLV

"By working with an SGCI intern, we were able to develop a tool that tracks how many times particular resources are downloaded from our gateway. This helps us understand what's useful to our users. ***So this internship wasn't just busy work, there were real-world outcomes as a result of working with the intern."***

— Christine Zardecki

Website
pdb101.rcsb.org

Team Members
Christine Zardecki

Funding Sources
NSF
NIH
DOE

SGCI SERVICES USED

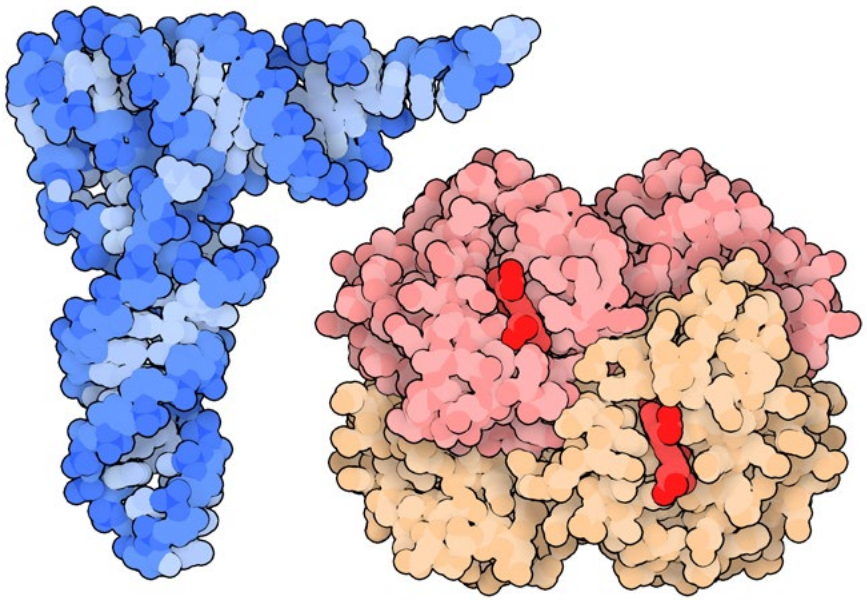
Gateway Services: Sustainability Consulting

Education & Training: Internship Program

Networking & Community: Gateways Conference

MORE INFORMATION

2019 Summer Internship Reports:
Andrea Dumalagan
https://qrgo.page.link/Nuspm



RCSB PDB & PDB-101

UNDERSTANDING THE 3D STRUCTURE OF A BIOLOGICAL MACROMOLECULE can answer a vast range of questions relating to the health of humans and animals; the production of plants, food, and energy; and other topics related to global prosperity and sustainability. Founded in 1971, the **Research Collaboratory for Structural Bioinformatics Protein Data Bank (RCSB PDB) gateway** enables access to data about the 3D structure, function, and evolution of macromolecules to contribute to the expansion of our understanding of fundamental biology, biomedicine, and biotechnology.

HOW WE HELPED

After receiving a sustainability consultation, the RCSB PDB team members subscribed to the SGCI newsletter and learned that they could host an intern to work on their gateway, specifically the **PDB-101 portal that provides educational content for newcomers.** Doing so allowed them to develop a tool that continues to be used years later.

SaferWorldbyDesign

WHEN NEW PRODUCTS COME TO MARKET, their safety and risk to human body systems and to the environment must be assessed. Having worked to grow the open-science community around predictive toxicology, Barry Hardy recognized the opportunity to benefit industry and consumers by integrating the multiple—but often separate—approaches to assessment and the organizations that provide them. SaferWorldbyDesign was developed as an international community that would bring together expertise in toxicology, biology, chemistry, risk assessment, and computer science as a one-stop-shop for locating testing and assessment services.

HOW WE HELPED

With many years of experience building knowledge management and community platforms in Europe, Hardy thought that Virtual Focus Week could accelerate the launch of SaferWorldbyDesign. Completing the program helped him in the first phase of the project, which included the recruitment of thirty partners, construction of a content management system, and production of several dozen webinars. True to his goals, the successful promotion of the platform led to the community's first international collaboration among several partners to serve industry!

"I thought the Virtual Focus Week worked quite well in that it wasn't too heavy, but it gave you enough time to develop your ideas a little bit more, make them concrete, and present or discuss them. *At an earlier stage, having experiences like that are helpful. You get some clarity and maybe think about other things you didn't think about, or maybe you look at what somebody else is doing and say, 'Oh, I could learn from that!'"*
— Barry Hardy

Website
saferworldbydesign.com

Team Members
Barry Hardy

Funding Sources
Edelweiss Connect and SaferWorldbyDesign Partners
EU-ToxRisk
RISK-HUNT3R

SGCI SERVICES USED

Education & Training: Virtual Focus Week

"We had a great experience with the SGCI developer who worked on our project. All our goals were met, and ***we were impressed by the developer's wide range of capabilities.*** *It was an added bonus that he was easy to collaborate with because all the work was well-documented and organized."*

— Neil Baertlein

Website
whispers.usgs.gov

Team Members
Neil Baertlein
Ali Rahama
Jenny Chipault
Kim Miller

Funding Sources
USGS National Wildlife Health Center
US Department of Homeland Security

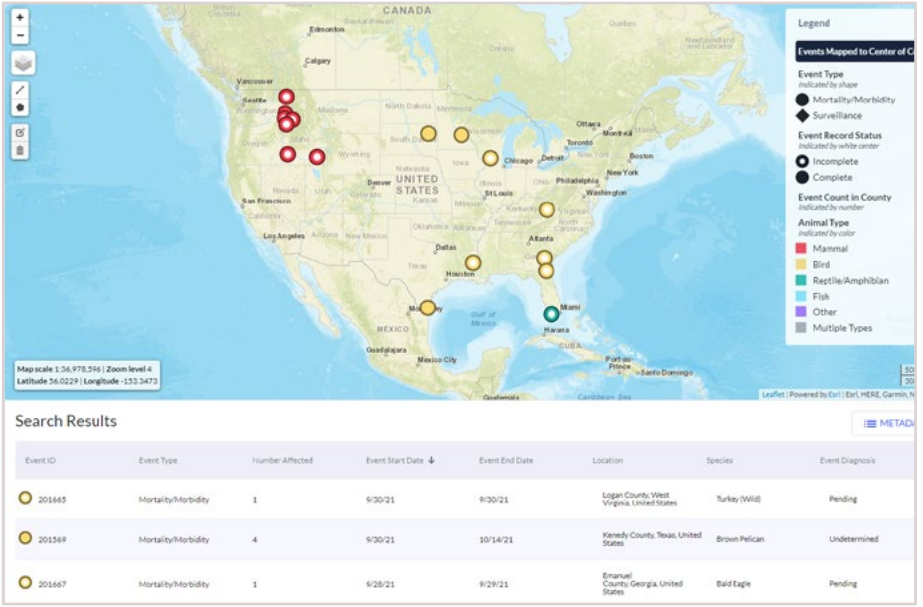
SGCI SERVICES USED

Gateway Services: Embedded Technical Support

Education & Training: Jumpstart Your Sustainability Plan

MORE INFORMATION

New enhancements to WHISPers made possible by partnership with SGCI *(USGS News)*
https://qrgo.page.link/gH2LC



WHISPers

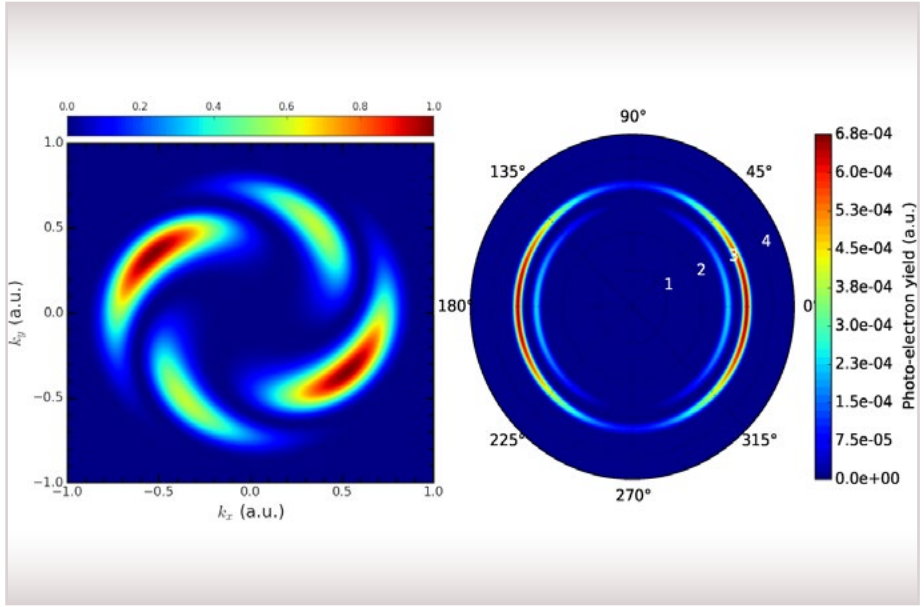
TIME IS OF THE ESSENCE when it comes to making decisions about widespread disease and death events in wildlife. Natural-resource managers need access to accurate, timely information to make plans for appropriate interventions that help change the course and save lives. The **Wildlife Health Information Sharing Partnership-event reporting system (WHISPers)** is a partner-driven gateway for sharing information about historic and ongoing wildlife mortality and morbidity events. The reporting structure of WHISPers allows state, federal, Tribal, and Indigenous managers of natural resources to input information and search by multiple parameters.

HOW WE HELPED

The WHISPers team had collected user feedback since the project's launch, and it was clear that the offering was useful but that the interface could be made more user-friendly. Based on detailed suggestions from SGCI's usability review, the SGCI technical consultant improved the gateway, building in search functionality and streamlining the secure signup and onboarding process. The development environment was set up to allow the WHISPers team to make necessary bug fixes and other maintenance code changes themselves in the future.

Mathematical & Physical Sciences

6



AMOS Gateway

WHILE THEORETICAL ATOMIC, MOLECULAR, AND OPTICAL SCIENCE is a fundamental discipline for understanding the properties of matter, its discoveries contribute to research in astrophysics and fusion, as well as other applied sciences. Over many decades, researchers have developed computational tools enabling simulation of these systems; the codes were typically confined to single research groups and difficult for others to use. In 2018, community members gathered to discuss how to collect these codes and make them accessible to each other and to a broader community, leading to the **Atomic, Molecular, and Optical Science (AMOS) Gateway.**

HOW WE HELPED

PI Barry Schneider recognized the challenge of developing a platform where even novice users would easily be able to set up the input data via graphical user interfaces, run the codes, and analyze and compare the results. SGCI's usability team evaluated Armin Scrinzi's tRecX software, with the goal of identifying a generalizable design that could be extended to the growing set of codes on the gateway. Their recommendations were ideal for soliciting further funding, and the AMOS team is implementing the changes through internal funds as it pursues new grants.

"I think it was useful to have the interaction. ***It was an interactive process. I mean, we went back and forth on things, we learned something, we got some help."***

— Barry Schneider

Website
amosgateway.org

Funding Sources
NSF
XSEDE
NIST

Team Members
Barry Schneider
Sudhakar Pamidighantam
Armin Scrinzi

SGCI SERVICES USED

Gateway Services: Usability Consulting

"The best thing about SGCI was having the opportunity to interface with experts. When I first started, I was all alone and was doing everything wrong. ***Getting outside opinions and knowing the correct way to do things is incredibly valuable.*** *These are all services that I wouldn't have been available to afford."*

— Mark Perri

Website
chemcompute.org

Team Members
Mark Perri

Funding Sources
Sonoma State University,
XSEDE

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability, & Cybersecurity Consulting

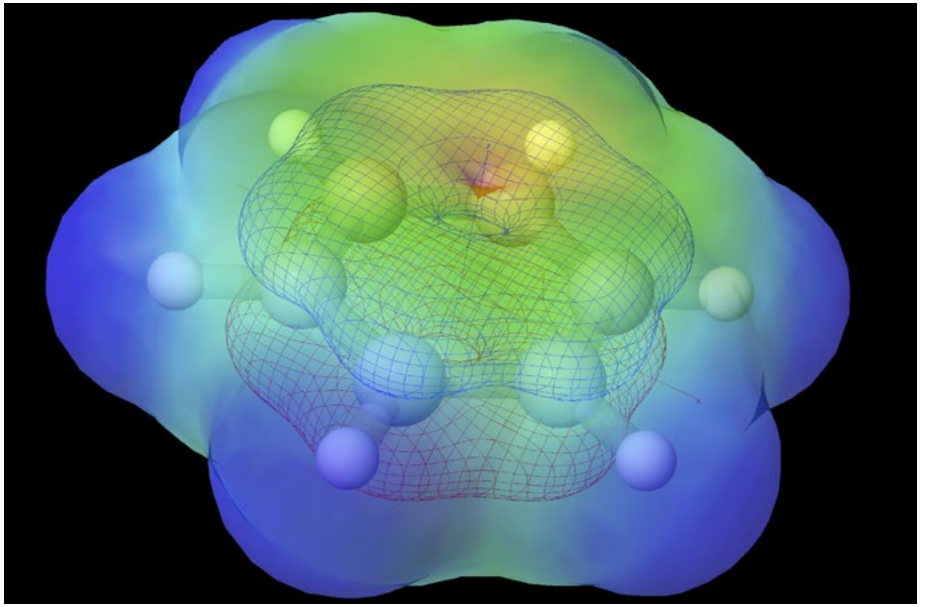
Education & Training: Gateway Focus Week

Networking & Community: Gateways Conference

MORE INFORMATION

SGCI Client Chem Compute Meets Goals
https://qrgo.page.link/GGnGK

SGCI Client Update: Chem Compute Usage Doubles
https://qrgo.page.link/aQoLk

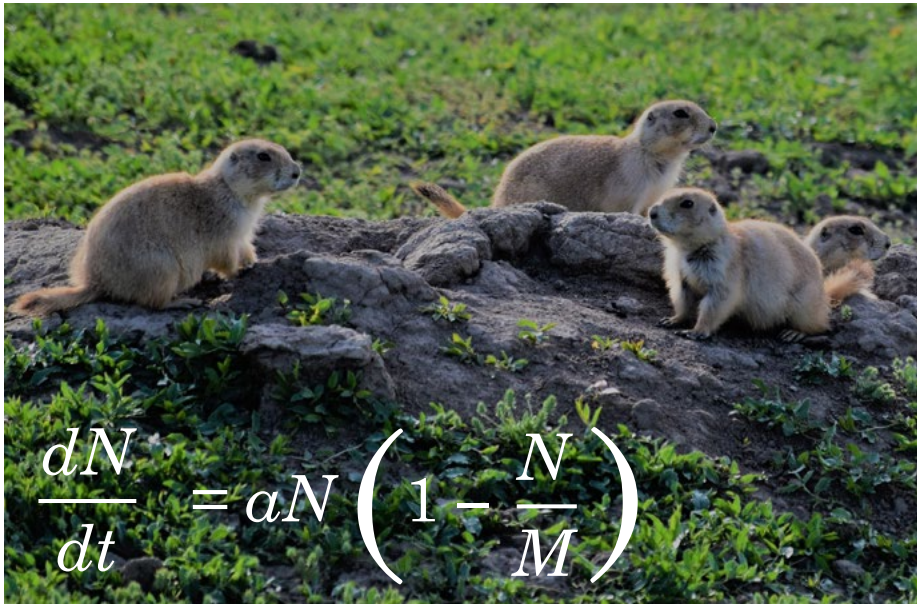


Chem Compute

COMPUTING RESOURCES ARE EXPENSIVE and, with limited budgets, some minority-serving institutions such as Sonoma State University have limited access. Mark Perri wanted to fill this gap by building a gateway that would help undergraduate students solve computational chemistry problems. At first, he provided compute resources by creating a system that worked through a server in his lab. But the system kept crashing, so he knew he'd need something more reliable. He set out to build a new and more sophisticated version of Chem Compute, with an additional goal of enabling faculty to incorporate computational chemistry into their teaching and research curriculum without the hassle of compiling, installing, and maintaining software and hardware.

HOW WE HELPED

With support from SGCI, Perri received guidance and technical help from skilled consultants to build a new Chem Compute that would be both functional and accessible. With additional consultations in usability and cybersecurity, he was also able to modernize and safeguard the gateway.



SIMIODE

IT ISN'T ALWAYS OBVIOUS TO STUDENTS HOW MATHEMATICS CAN BE USED to solve real-world problems. However, working with differential equations, which are used to model and simulate complex systems of change, can help bring mathematics to life. Using differential equations, one can describe how populations change for particular species, how heat moves, how radioactive material decays, how monetary investments change over time, and much more. The **Systemic Initiative for Modeling Investigations and Opportunities with Differential Equations (SIMIODE)** gateway offers students and educators a community of practice around the use of modeling to teach differential equations.

HOW WE HELPED

Participating in Focus Week was hugely impactful for the SIMIODE team, and they credit the experience with opening their eyes to understanding what it will take to make their gateway sustainable. Brian Winkel exclaimed, "Everything that we do now has its roots in what we learned from SGCI. **When we came back from Focus Week, it was a revelation.** We began to realize how exciting these ideas were." From there, they tapped into multiple services for additional support.

"SGCI ran a workshop that said, 'You could do all this, and we will help you get started, engage with you, provide a student intern, conduct interviews with your audience, and so on.' ***So our view of SGCI is that it opened our eyes to the possibilities and then they backed it up with the help we needed to pursue those possibilities."***

— Brian Winkel

Website
simiode.org

Funding Sources
NSF

Team Members
Brian Winkel
Leigh Noble
Mark Tourtellott

SGCI SERVICES USED

Gateway Services: Embedded Technical Support, Usability, Sustainability, & Marketing Consulting

Education & Training: Gateway Focus Week, Internship Program

Networking & Community: Gateways Conference

MORE INFORMATION

Science Ambassador Blog: Funding to organize and implement a social media strategy
https://qrgo.page.link/TwJwM

Gateways 2020 - First time attendee's experience
https://qrgo.page.link/rkc8W

Other Programs & Opportunities

7

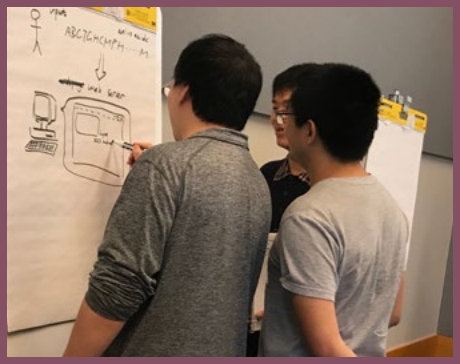
Sustainability Training: Focus Week & Jumpstart Your Sustainability Plan

SCIENCE GATEWAYS USUALLY GROW from the experiences of an individual or group of researchers or educators who see the opportunity to make a process or resource simpler to access, thereby making a larger goal easier to achieve. The people with such insights typically do not have a background in business or even new product development. They come most often from academic settings, which leave them unprepared to tackle the entrepreneurial journey of building and sustaining a science gateway.

Gateway Focus Week was developed to provide such understanding to teams of science gateway builders as they launch a gateway or anticipate taking it to a new stage. They need to anticipate the technical, financial, and community-building challenges ahead of them, particularly those that are unique to gateways as a subspecies of software or websites. Focus Week brings together gateway teams to step through hands-on activities that produce insights to share with others. They leave being better able to articulate the value of their gateway to stakeholders and are equipped with materials and goals that will carry them through the coming years. Rebecca Dikow of the Smithsonian Institution Data Science Lab explained, "We left the week feeling inspired about the potential for our gateway and much more knowledgeable about what is necessary to successfully implement our ideas, engage users, and build a community around the project."

A FLEXIBLE TOOLKIT

Borrowing from the world of startups, participants develop a "napkin drawing" to explain what their gateway does. From there, they identify the value that they offer and define their gateway audiences. They explore budgeting, marketing,



"The SGCI Focus Week was invaluable for discovering approaches to project sustainability. I came away with a newfound understanding of the value of our project that I can clearly communicate to our target community and stakeholders. The Focus Week experts made me think critically about our project and provided excellent insights and advice. With the help of the experts and other attendees, I was able to articulate the importance and uniqueness of our project in a simple, straightforward way. Our project was not as established as the other projects represented at this workshop, but I think ***it has been extremely useful to begin sustainability activities early on in our project so that we can plan what steps to take over the next two to three years."***

— Leah Levay, International Ocean Discovery Program

FAST FACTS

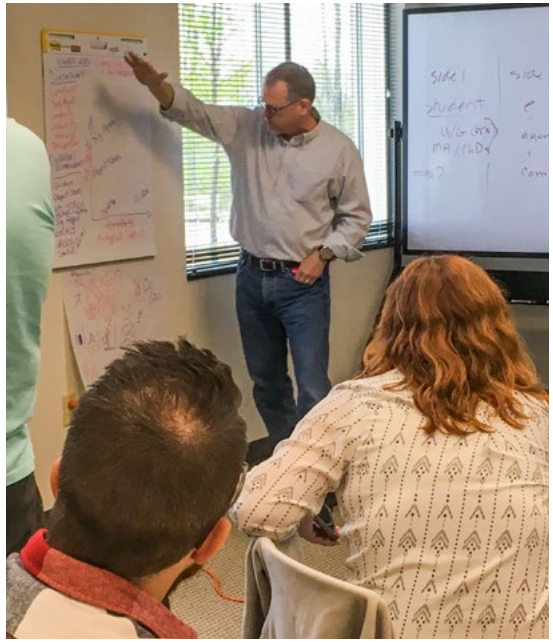
From inception through July 2022

Total number of trainings	21
Total participants	649
Number of projects affected	> 100

and sales, and they even try out usability testing with their workshop colleagues. Along the way, they learn from each other, representing diverse fields and stages of development. To wrap-up their sustainability toolkit, teams leave with a "pitch deck" and the information needed for a strong development, operations, and sustainability plan, for both current and future projects. Twila Moon of the National Snow & Ice Data Center said, "Focus Week covered many important topics that aren't usually covered for researchers, including long-term budgeting, marketing, audience/user research, and diverse and sustainable funding. Also, since these are important ideas regardless of the project, I now have more tools for improvements across multiple projects and even higher levels of my organization."

ONLINE & CUSTOM OPTIONS

Through a transition to virtual delivery, the mini workshop "Jumpstart Your Sustainability Plan" was developed to enable attendees to fit the training in their busy schedules. The short workshop focuses solely on sustainability planning, adapting the same hands-on exercises that have been so well received in Focus Week. Virtual Focus Week also was redesigned for the online format with positive results, even delivered as a specially commissioned engagement with the Australian Research Data Commons. One virtual participant remarked, "What I'm proudest of is iterating on our napkin drawing over two weeks. We went from phoning it in on day one when we used an existing diagram, to nailing it during our pitch on the last day with an analogy that really helped the audience understand what we were doing. Through this exercise, our team really came together and honed the message and purpose that will serve our project far into the future." Moreover, organizations, associations, and event organizers now hire SGCI to deliver a custom Focus Week or Jumpstart program for their own communities. Our expert instructors have presented everything from a single hands-on activity to mini versions of the Week's content, both in person or online, tailored to the needs of their unique audience.



Internships

SGCI'S EDUCATION & TRAINING AREA has offered an internship program providing undergraduate and graduate students with hands-on, science-gateway development experiences. We've provided two main types of internships, with a focus on either software development or usability.

Focusing on software development, students gained experience in coding, wireframes, requirements gathering, and other related skills, plus gained exposure to a gateway's specific discipline. SGCI enhanced the students' experience by offering community support and mentoring to these young professionals. We arranged further professional development through SGCI's Gateways conferences, PEARC conferences, and Hackathons at various conferences.

In the area of usability, teams of two or three students under the supervision of a mentor have applied a variety of usability tools to gateway projects. These shorter-duration engagements have allowed the students to evaluate multiple gateways during the academic year while allowing many gateways to reap the benefits of a high-quality usability consultation. Most of these interns have continued in the field of usability.

FAST FACTS

- **Forty-six students have participated in the program,** with five returning to an additional internship term.
- **More than half of these students are from underrepresented groups.**
- At the end of SGCI's first five years, about 40% of the students were still finishing their undergraduate or graduate programs, but **an additional 35% of participants now work in a related career.**

CLOSE UP: THOMAS JOHNSON III

Johnson completed a bachelor's and master's degree in Mathematics and Computer Science from Elizabeth City State University. SGCI gave him the opportunity to enhance his practical skills with summer internships.

Johnson participated in two successful summer internships through SGCI. His second internship was at the Texas Advanced Computing Center (TACC), working with Dr. Ritu Arora. He shared his positive mentoring experience:

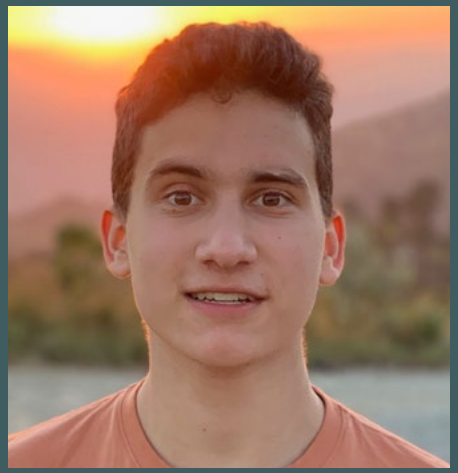
"It was impressive working with her considering that ***she imposed standards for working that both accelerated my growth faster than I had ever previously experienced,*** *and was willing to sit down with me during the internship to see what my goals were."*

***"The most challenging, but also greatest, learning experience** I've gotten out of this internship is working with a large code base and figuring out how to make new features mesh well with existing features."*

— Jacob Harless, undergraduate at the College of William and Mary, interned with QUBES

***"Interning at SGCI was a great opportunity to gain hands-on experience** working with data and analysis tools and understanding how modern science gateways are organized to help scientists in their research."*

— Iakov Vasilyev, undergraduate at the Univ. of California San Diego, interned with Data Discovery Studio



DEEP EXPANSION OF PROFESSIONAL SKILLS

WHEN WORKING ON A GATEWAY, students gain experience integrating their efforts with a substantially larger code base. Beyond learning coding and other skills, these challenging projects build confidence in their capabilities.

Ke'Darius Whitley appreciated his internship at the Texas Advanced Computing Center (TACC) because it was his first opportunity to learn more about Python, a coding language he had been learning on his own. He credits the SGCI internship boosting his overall confidence as a developer.

He said that at Winston Salem State University, "I felt like the outcast because I was new to the coding world." Before working with SGCI he was even contemplating changing his major because "that's how little confidence I felt with myself and with computer science as a whole. Working with SGCI boosted my confidence and made me feel a part of the community."

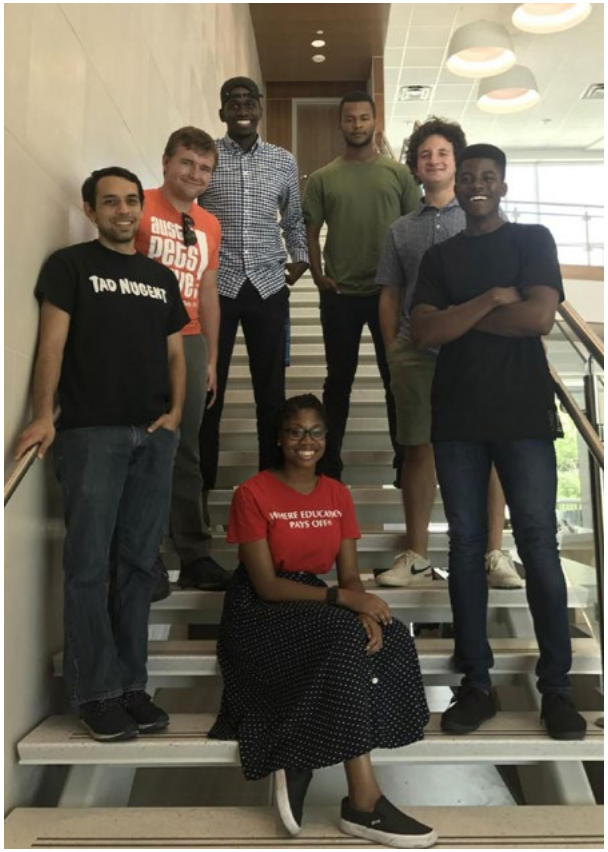
CLOSE UP: YUEXI CHEN

Working with Dr. Emre Brookes, Dr. Alexey Savelyev, and Dr. David Fushman, Yuexi Chen, a doctoral student at the University of Maryland, modified the program ROTDIF by using the GenApp technology for gateways. She successfully developed a science gateway for ROTDIF that provides advanced computational functionalities, streamlines data input, storage, and output, and enables interactive 2D and 3D plotting and visualization. She shared her positive experience:

*"My programming background is in scientific computing, but **I learned new skills to manage large projects.** I also obtained rich experience in web development and user-interface designs, which I had hardly had a chance to be exposed to previously. It was really an exciting internship, and I achieved more than I expected."*

VALUABLE MENTORING RELATIONSHIPS

MENTORS MADE THE LEARNING EXPERIENCES of interns broader than just technical skills. Students reaped the benefit of working in teams and solving problems, thanks to the support of their mentors. Interns who also attended the Gateways conference were also matched up with mentors at the conference, which furthered their connection to the broader gateway community.



Tatyana Matthews (front) with other gateway-development interns at the Texas Advanced Computing Center in 2017.

Joel Gonzalez-Santiago attended the Gateways 2016 conference, where he met Dr. Lynn Zentner of the nanoHUB gateway. The following summer, he interned with the nanoHUB group at Purdue University, researching ways for the gateway to be more self-sustaining.

"I recall several times sitting in my mentor's office drawing up wireframes, connecting dots of concepts, and troubleshooting programming issues. Collaboration with her furthered the perspective that maturation as a professional of any field comes with ***being closely connected with those committed to growth."***

— Tatyana Matthews, undergraduate at Elizabeth City State University, interned at TACC

"... Sometimes when you do not have an answer for a question... it never hurts to ask for help. ***ESIP really helped me hone down on these skills that will ultimately help me for my professional future."***

— Pablo Calix, undergraduate completing an associate's degree at College of Lake County, in Illinois, interned with ESIP

CLOSE UP: GILBERT CURBELLO III

As an undergraduate at California State University, Monterey Bay, Gilbert Curbello III interned with Joe Stubbs as part of the Cloud and Interactive Computing group at the Texas Advanced Computing Center (TACC). Curbello spoke highly of the internship program saying,

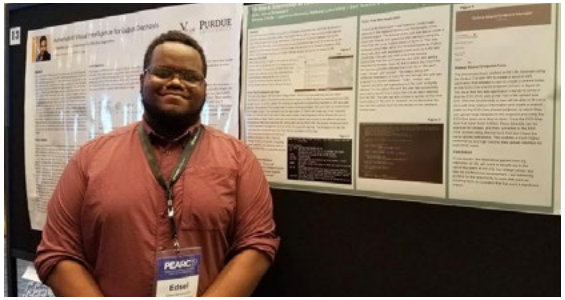
"SGCI offers awesome opportunities for students across the nation... ***If anyone ever gets the opportunity to take part in an SGCI program, they would be mistaken not to take it.*** *There was a lot of support throughout the program, and being able to carry that experience with you is awesome."*

Two years after his internship, Curbello has returned to TACC as a Python developer!

RELEVANCE TO FUTURE WORK

STUDENTS RECOGNIZED THAT THEIR WORK on gateway projects helped them prepare for careers, sometimes in ways they might not have expected. Some students were even offered jobs as permanent team members when hosts saw the students' hard work and capabilities. During her master's program at University of Missouri, Soumya Purohit interned with the Consortium of Universities for the Advancement of Hydrologic Science, Inc. (CUAHSI), enhancing the HydroShare gateway. After graduating, she returned to CUAHSI as a gateway staff member.

Edsel Norwood, a recent graduate of Elizabeth City



State University, participated in two internships with SGCI. About his second internship with the Electronic Transponder Analysis Gateway (ETAG), he said, "It's great being able to take part in such an inspiring project while also gaining valuable skills and experience I can use in the future. Working with the ETAG team exposed me to different language frameworks such as VUE.js while also helping me further my professional development experience."

"While this project was undoubtedly unique compared to traditional internships for a typical electrical engineering student, ***I look forward to fostering these skills in future career paths*** *where designing user-friendly interfaces are key."*

— Nayman Leung, undergraduate at Univ. of Illinois Urbana-Champaign, interned at the National Institute of Standards and Technology (NIST) Center for Neutron Research using GenApp

"[My] internship directly impacted the direction that I took immediately after graduating from the University of Maryland. I studied biochemistry and had not been formally studying any sort of statistics or computation sciences. However, in my current position immediately out of college, … at the National Institutes of Health … I use machine learning models to screen for novel drug compounds. ***I would not be in the position I am in today if I had not done the SGCI internship."***

— Andy Guan, undergraduate at the Univ. of Maryland College Park, developed programs in GenApp

Hackathons

WHAT BETTER WAY to immerse newcomers to real-world programming than an intensive, hands-on dive into a real-world challenge? A hackathon is a collaborative gathering of programmers who form teams to complete projects over a short period of time. Throughout, the participants apply existing expertise and gain new skills.

SGCI brought this experience to the science gateway community by recruiting groups of students and academic or industry project mentors to participate in hackathons associated with conferences such as PEARC, Supercomputing, and ADMI. A primary goal of the hackathons has been to create an opportunity for the community to mentor and interact with promising students. This is new for the science gateway community, and this has helped students move along in their professional development.

MULTIFACETED LEARNING

The nine hackathons organized between 2018 and 2022 were hosted in-person or online. At each event, participants formed small teams—about four students each—dedicated to a single problem, with sometimes as many as nine teams competing to win an award. Some events were focused on HPC or cloud computing challenges, sponsored yearly by our founding collaborator CloudyCluster by Omnibond along with other partners from the HPC and cloud industries. For example, Voltron Data, a minority-owned company offering Apache support, provided a mentor, a judge, and funds. Students went from learning about the projects to delivering an oral presentation and live demonstration in as few as 24 hours, but most events have spanned several days. Students shared how much they benefited from participation, particularly as a way to learn. A 2020 participant said, "I liked being able to learn about HPC technology and connecting with others in the HPC community." Another participant appreciated the challenge: "It pushed me into doing a project that is outside of my comfort zone and pushed me to learn new things. It also got me into working on my teamwork skills and my presentation skills."

AN ITERATIVE PROCESS

With each hackathon, the organizers refined and improved the design of the event. Carnegie Mellon researchers studying hackathons provided support. Over the years, the event has added pre-event orientations and meetings with mentors, designated planning time, defined checkpoints during the night, training for judges, and colocated mentors for on-demand guidance. The mentors and companionship are central to the experience. One 2021 participant recalled, "I like the support in the community and everyone working together. The mix of skills, too, was great. Everyone had something to learn or teach others."

PAYING IT FORWARD

The hackathons not only have contributed to the development of our future gateway workforce

"I really enjoyed watching all of the others, including my own team, solve problems head on, and their outcomes were really impressive to me! Also, I enjoyed the collaboration with the students from different institutions. ***That fosters building real community."***

— HackHPC @ ADMI participant

FAST FACTS

Events from 2018–2022

Student participants	**301**
... at multiple events	66
... from minority-serving institutions	74%
Project mentors	**61**

MORE INFORMATION

Hackathon Planning Kit
https://bit.ly/3recXJK

How to Support Newcomers in Scientific Hackathons
https://bit.ly/3RiaoRo

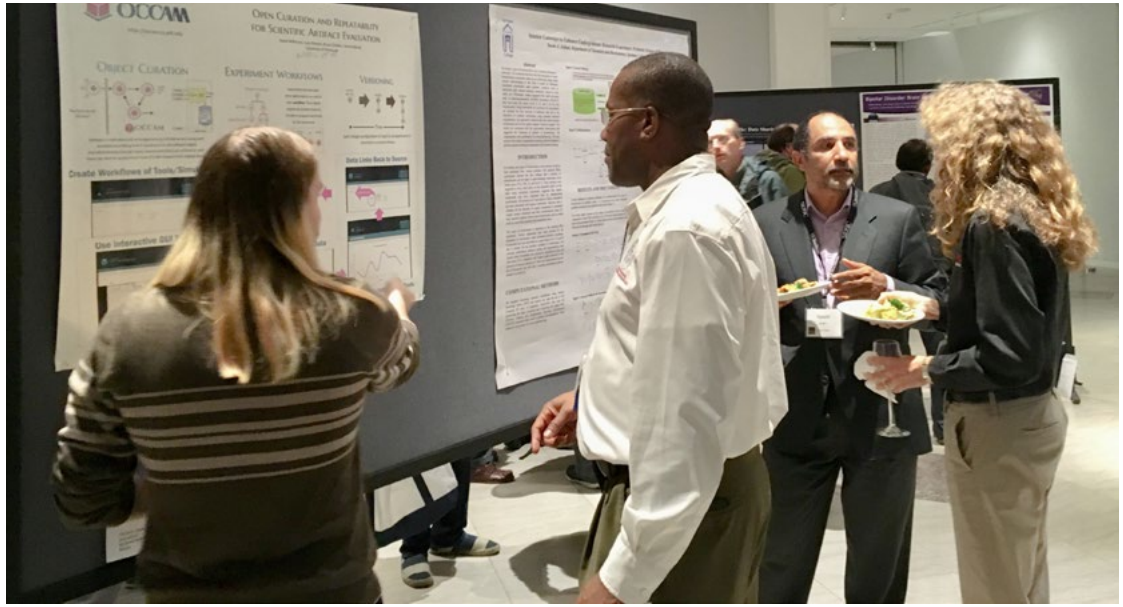
Organizing online hackathons for newcomers to a scientific...
https://bit.ly/3xXsyRr

but also have been a part of making hackathons easier for other groups and science projects to organize. The observing researchers at these events collaborated on peer-reviewed papers about organizing hackathons and mentoring newcomers, and they directed lessons learned into a free, online kit for planning hackathons. SGCI's latest pursuit is organizing faculty-only hackathons, with the same goal of inspiring learning, collaboration, and community!

YOUNG PROFESSIONALS NETWORK

SGCI's Workforce Development team organizes the Young Professionals (or YP) Network, a community for those just starting out as well as for experienced researchers and educators who are using science gateways. Associate Director Linda Bailey Hayden describes the YP Network as a social network that allows newcomers and gateway veterans to support one another. They spread the word about gateway-related opportunities at SGCI and beyond.

Each year, the YP Network awards outstanding individuals with the **Young Professional of the Year Award.** Recipients are announced at the Gateways annual conference. This is a chance to shine a light on the up-and-coming talent within the gateway community, especially entry-level and mid-level talent who may not yet be recognized for their contributions and abilities. After receiving the award, the winners are notified about opportunities to engage with students, help with Hackathons, or serve as trainers in SGCI's summer Coding Institute—all ways to give back to students who might follow in their footsteps. As Hayden explains, the YP of the Year awardees "give back to the community. They serve as trainers, mentors, and educators through the Hackathon. ***They are superstars who develop the next generation."***



Annual Conference

Creating spaces for members of the community to connect with each other was central to the formation of SGCI. Gateway creators are often isolated from other gateway-building peers because they come from diverse domains and may be the only person in their field working on such a project. In fact, one persistent challenge for gateway developers has been to identify existing tools that accomplish what they need for a specific gateway.

The annual Gateways Conference series began in 2016 as an expansion of the ten Gateway Computing Environments (GCE) workshops that had been hosted at larger conferences. It brings together people across domains to share their discoveries, tools, best practices, and wisdom, leading to new collaborations and friendships.

SOMETHING FOR EVERYONE

The Gateways conferences include hands-on tutorials, paper presentations, demonstrations, and of course, keynote speakers. Interactive events have included poster sessions; sponsored exhibits; a variety of participant-led, spontaneous discussion groups; and networking opportunities. Attendee Enis Afgan remarked, "Attending Gateways 2017 was on the top of my list for this year and the event was even better than I envisioned. It was great to see a welcoming community of like-minded people to learn about interesting projects, share thoughts, and make plans for the future. The organization of the event was one of the best I've ever attended; every aspect of the program was planned in a thoughtful way."

"The time spent there listening to presentations and talking to people was so valuable for me (and also so much fun!). ***I returned with lots of connections and possible interactions—nothing could be more vital for our work…The whole atmosphere was one of finding out what others are doing and telling them what we are doing****—I'm not sure what it was about your conference, but it was very magical in that way!"*

— Ann Christine Catlin, 2018 participant

Learn more about the Gateways Conference and Proceedings
https://bit.ly/3xW1ORo

> *"Although I had heard about the Gateways conference for a few years, this was the first one I attended... After I attended,* ***I wondered why I waited so long to decide to attend."***
>
> *— Leigh Noble, 2020 participant*

BROAD PARTICIPATION

SGCI also supports students who attend the conference, pairing them with a mentor in the field. Jared McLean, a student participant at several conferences, shared, "Speaking with professionals in the gateways community was very useful for learning about potentially useful technologies. Being an interdisciplinary conference, hearing about perspectives on development patterns and design principles from professionals in a variety of fields provided good insight into techniques which could be applied to my work for improving user experience." More than 450 people (including 54 students) attended the first four years of the conference in person from 2016 to 2019. The conference has stayed at a comfortable size to make connections easy. Yubo Qin, a student participant at Gateways 2019, exclaimed, "When I met a person who had read my paper, I felt very excited because I realized that my research could have a real impact on this community. As a Ph.D. student, working days and nights at the lab, this motivates me a lot!"

Even when COVID-19 disrupted face-to-face meetings, the conference went online in 2020 and continued to allow connections at a distance, with participants from the US, Canada, Mexico, Europe, South Africa, and Australia. Many newcomers with limited time or funding for travel were now able to join, with the annual number of attendees doubling. Leigh Noble, a newcomer in 2020, wrote, "Participating in the conference was valuable to me in ways I had not anticipated. I was able to learn rapidly about many different aspects of science gateways. The conference was friendly and encouraged networking among participants." In October 2021, the online conference was free, and 40% of the audience was developers, a group that typically might not have travel funds available. A free, online mini-conference in April 2022 also promoted access with a continued conversation of short talks and tutorials. In October 2022, the conference returned to a face-to-face format.

CONTINUING IMPACT

The conference also helps presenters share more broadly. Keynotes and many sessions have been recorded and posted on YouTube, while all papers and posters are archived in online proceedings. Each year, authors of papers, alongside presenters at the European International Workshop on Science Gateways (IWSG), are invited to submit an extended version of their papers to a special journal issue on science gateways. These special issues have been in *Future Generation Computer Systems* and *Currency and Computation: Practice and Experience.*

Looking ahead, the conference now has an advisory board to make the event community-driven in 2023 and beyond. The board analyzes a variety of events and brainstorms how to keep the conference successful and attractive to an even broader community. While creators and providers of science gateways are well represented at Gateways, the goal is to attract more domain researchers and educators using science gateways.

CONNECTING WITH THE WIDER COMMUNITY

Sponsors have supported the program, too, with returning sponsors representing software (CloudyCluster by Omnibond, Hubzero®), service providers (XSEDE/ACCESS, Internet2), and academic centers (TACC, IUPTI Science Gateway Research Center, SDSC, Trusted CI), to name a few. Sponsors host information tables at a poster session and during breaks. Lee Liming of Globus, a sponsor at Gateways 2019, said, "The conference was a great experience as a sponsor. I met with representatives of research labs I have ongoing business with, and the conference staff went out of their way to provide opportunities for interactions with conference attendees. This was a great way to make connections and have face-to-face interactions with an energetic community of cutting-edge research computing professionals."

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