

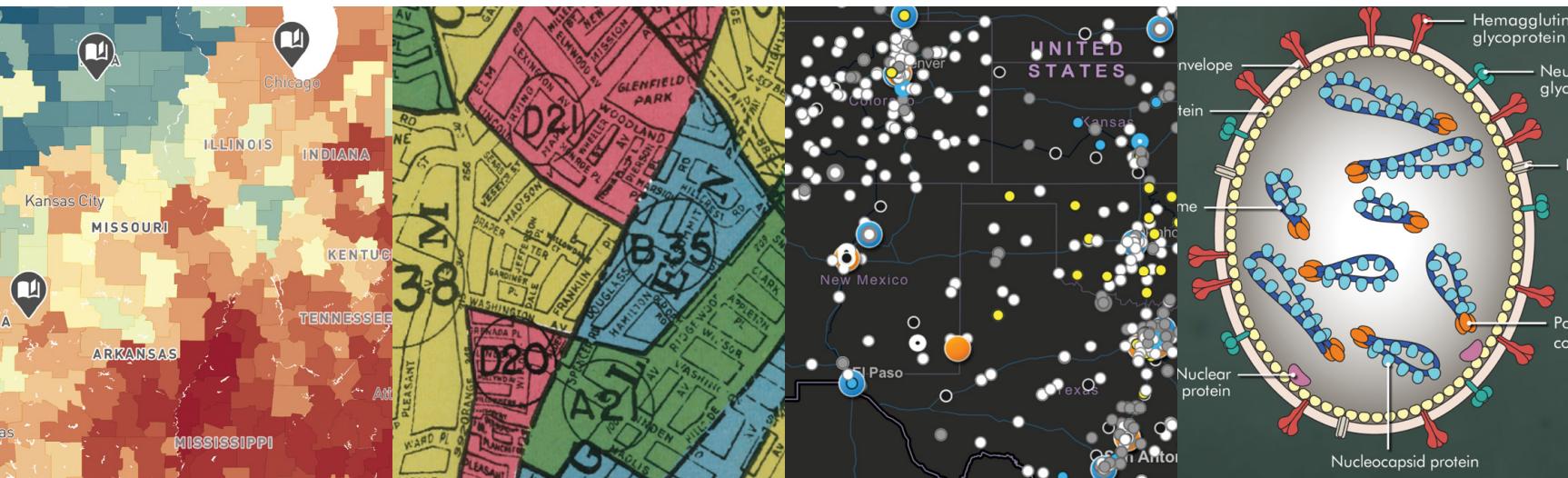


PLACES & SPACES

MAPPING SCIENCE

PLACING DATA IN SPACE

ANNUAL REPORT 2021



Letter from the Curators



Katy Börner bringing maps of science to Morgenstern's Books in Bloomington, IN.

This time last year, we were trying to find the right words to sum up the experience that was the year 2020 and hoping for some return to business as usual in 2021. But while 2021 wasn't exactly a return to normal, it was, in the popular parlance of the day, "normal-adjacent." The year began with many online events and Zoom interactions, but it ended with a definite uptick in face-to-face encounters (although with faces still masked and all of us physically distanced!).

For the *Places & Spaces* exhibit in 2021, the key word was "agility." As curators, this meant being ready to meet audiences at whatever level of engagement they were comfortable with and seize opportunities the moment they were presented. It also meant rethinking the way we presented the exhibit to the public. Maker interviews, curated virtual tours, and the 24-Hour Mapping Event—initiatives you'll read more about in this report—were all the products of such rethinking.

When it came time for the debut of the 17th Iteration in the fall, we were able to work with the University of Notre Dame to construct an event that combined the best of both physical and virtual experiences. Our onsite presence allowed us to feature hands-on learning again (taking appropriate precautions) with our macroscope kiosk, and we were able to celebrate the debut in the presence of friends and colleagues at Notre Dame. At the same time, the online component of the event allowed individuals to attend



Lisel Record introducing Science Fest visitors to the Virus Explorer.

who might normally be unable to do so due to travel considerations or scheduling conflicts. This meant that an international audience could enjoy presentations by exhibit curators in different cities and by microscope makers in different states.

In a year that was often weighed down by ongoing pandemic hardships, events like this helped bolster our faith in and love of scientific discovery and intellectual curiosity. They reminded us that, even in the midst of precarious times, scientists and scholars from



Todd Theriault unveiling the 17th Iteration at the University of Notre Dame.

all over the world are hard at work using data, analytical tools, and visualization techniques to address our most pertinent challenges. And based on the feedback we get as curators, we know there are many people eager to understand how micro- to macro-level phenomena affect their daily lives and how their personal and professional decisions might contribute to a healthy, peaceful, and more equitable existence for all.

2021 Macroscopes



Scott Weingart and Todd Theriault prepare for the 17th Iteration debut at the University of Notre Dame.

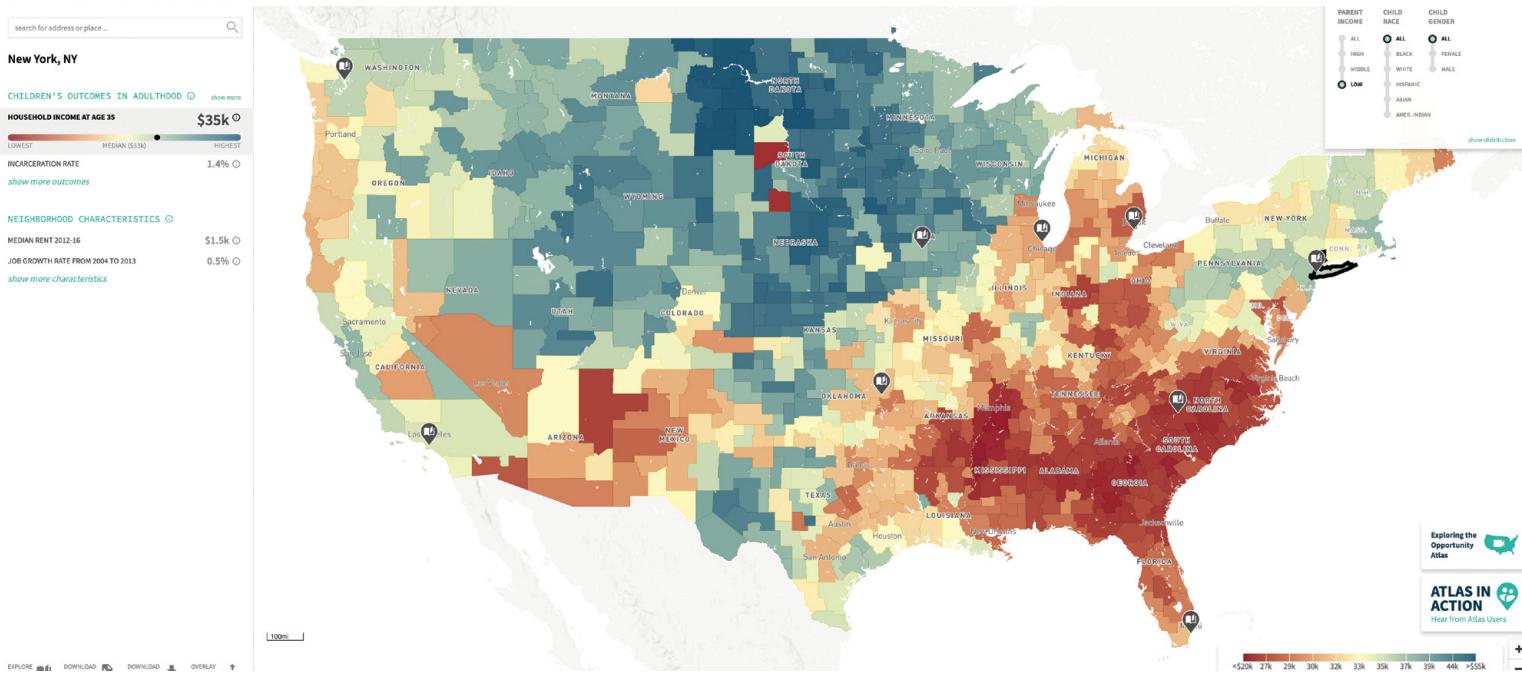
Introduction

The *Places & Spaces: Mapping Science* exhibit, which operates as an outreach activity of the Cyberinfrastructure for Network Science Center, arises from CNS's core belief that the ability to make sense of data is as critical as the ability to read and write or pose and solve math problems. Tools to assist people in visualizing personal or professional data are continually evolving, and this progress is evident in the quality and quantity of interactive data visualizations being developed and used today.

The world is a complex place, and we need effective tools to help us understand and manage that complexity. Macroscopes are software tools that help people focus on trends and patterns in data that are too large or complex to see unaided. Interactive by nature, these powerful lenses can be used to detect actionable information in large volumes of data.

Iteration 17: Macroscopes for Placing Data in Space

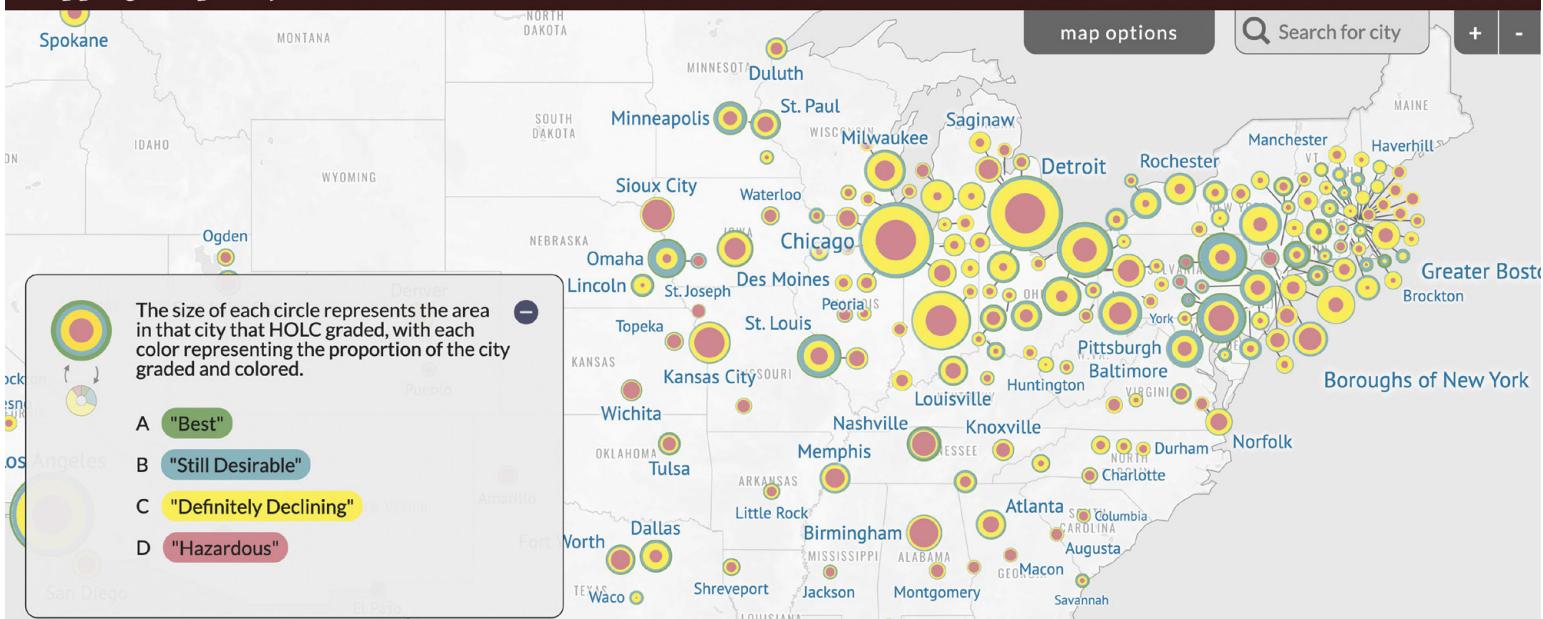
Using maps and 3D models, these macroscopes offer a spatial understanding of some of society's greatest challenges. Placing data in space gives us a sense of the proportion, distribution, and structure of a problem. It can also help us find our own location within the data. Does where you were born affect your income later in life? How different are police methods in your state from others? Did past evaluations of the racial composition of your neighborhood increase or decrease the value of your home? How many copies of the coronavirus could fit across the width of one strand of your hair? By placing complicated problems in a spatial context, these macroscopes help us create, understand, and communicate effective solutions.



Opportunity Atlas

As this macroscope demonstrates, the neighborhood in which a child grows up plays a substantial role in his or her future economic mobility. Using research from Raj Chetty, John N. Friedman, and Nathaniel Hendren of Opportunity Insights, and constructed by Joey Cherdarchuk, Eugene Chen, and Daniel Haight of Darkhorse Analytics, the *Opportunity Atlas* measures the average economic outcomes of children from every neighborhood in America, by demographic subgroups like race, gender, and parental income. It uses anonymized United States Census data for

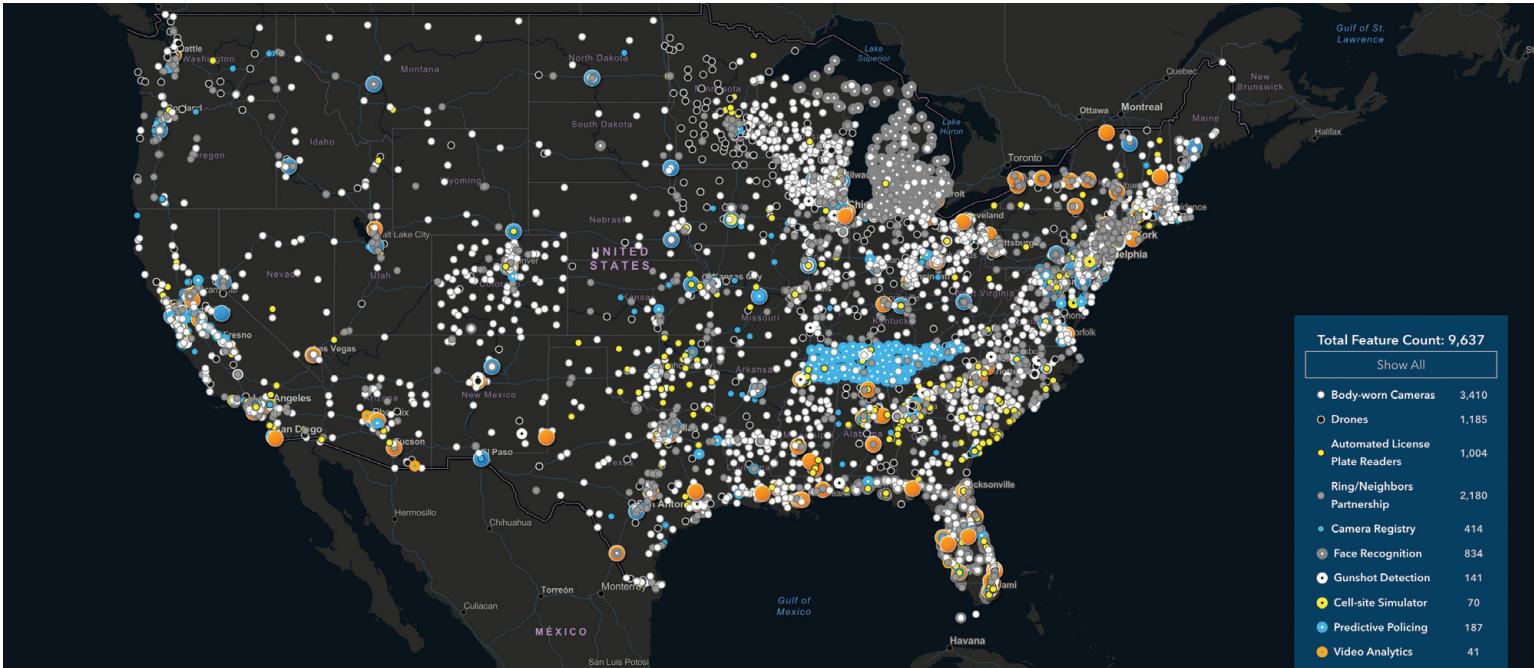
children born between 1978 and 1983. This information is tied to the Census tract where children grew up, no matter where they went on to live as adults. Researchers found that neighborhood characteristics like mean income, number of single-parent households, and the number of employed adults are all strong predictors of economic mobility. Currently used by policymakers, community organizers, and advocacy groups across the U.S., the *Opportunity Atlas* enables targeted, data-driven solutions to address income inequality.



Mapping Inequality: Redlining in America

Created by digital historians Robert K. Nelson and LaDale Winling, *Mapping Inequality* allows users to explore the redlining maps and area descriptions produced by the Home Owners' Loan Corporation (HOLC), a New Deal agency, between 1935 and 1940. Residential neighborhoods were rated as low (green) or high (red) investment risks based on housing quality, rent or sale value, and, most notoriously, the racial, ethnic, and class identity of the residents. Redlining had enormous long-term consequences, helping to

channel private and public capital to white families through homeownership and effectively denying such access to African Americans and other Americans of color. *Mapping Inequality* presents these maps interactively over a digital mapping interface, allowing users to select areas to explore the thousands of area descriptions. Original descriptions of each area, accessible here as transcripts or as scans of the actual HOLC assessments, lay bare the racism inherent in the agency's practices.



Atlas of Surveillance

The *Atlas of Surveillance* is a collaborative effort between the Electronic Frontier Foundation and the University of Nevada, Reno Reynolds School of Journalism. Through a combination of crowdsourcing and data journalism, they are creating the largest-ever repository of which surveillance technologies are being used by which law enforcement agencies. The *Atlas* focuses on the most pervasive technologies, including drones, body-worn cameras, face recognition, cell-site simulators, automated license plate readers, predictive policing, camera

registries, and gunshot detection. The use of these technologies is not always hidden; in fact, much information can be found in news articles, government meeting agendas, press releases, and social media posts. The *Atlas of Surveillance* macroscope represents the first effort to locate and aggregate data from a wide variety of sources. The aim of the *Atlas* is to serve as a resource for journalists, academics, and, most importantly, members of the public to check what has been purchased locally and how technologies are spreading across the country.

Envelope

i Host(s)

i Genome Type

i Transmission

i Vaccine

i

Select a category above to classify viruses according to shared characteristics.

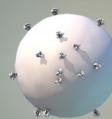
Select any virus below to explore its structure and biology.



+ Rabies



+ Influenza A



+ HIV



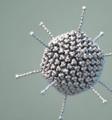
+ Coronavirus



+ Ebola



+ TMV



+ Adenovirus



+ T7



+ Papillomavirus



+ Zika

Virus Explorer

At this point, we are all pretty familiar with Covid-19. And many people know about influenza (aka “the flu”), rabies, HIV, Zika, and Ebola. All of these are viruses: microscopic invaders that hijack the cellular machinery of living organisms. But what do these viruses have in common? And how are they different? Created by members of the Howard Hughes Medical Institute and kapow, inc., the Virus Explorer is a tool for investigating and comparing these fascinating but harmful bugs in the human system. You can

explore the similarities and differences among a variety of viruses by sorting them based on structure, genome type, host type, transmission mechanism, and vaccine availability. Each virus can also be further examined to investigate its size, structure (shown with both interactive 3D models and cross-section diagrams), replication cycle, and more.

New Exhibit Assistant



Exhibit Assistant Ezra Engels

Ezra Engels graduated from Indiana University in 2021 with a BFA in Digital Art and a minor in Art History. He is now at the Luddy School of Informatics, Computing, and Engineering pursuing a Masters of Information Science and a Masters of Library Science, and hopes to specialize in data science. He is passionate about a broad range of information formats and aims to work with information technology in libraries and museums. At CNS, he

can be found communicating with venues and mapmakers, producing digital content, testing macroscope software, and representing the exhibit at events. When he isn't at CNS, Ezra can be found at the Wells Library Makerspace and the Sciences Library. In his personal life, he enjoys painting and visiting parks and nature preserves.

When did you join the Places & Spaces exhibit team?

July 2021.

What are some of your chief responsibilities?

Communicating with mapmakers and exhibit venues, representing the exhibit at events, and managing our yearly release cycle are some of my major duties. I also test macrosopes, keep scimaps.org up

to date, and work with the physical and digital components of the exhibit. I consider familiarity with the contents to be important for planning displays.

What have you enjoyed most about your time with the exhibit?

So far I've had a great experience. I enjoy being a part of an exhibit I'm interested in and the friendly environment at CNS.

Do you have a particular memory involving the exhibit that you'd like to share?

We recently had a birthday celebration for Amatria* in Luddy hall. I really like her, and tell everyone I know about her, so it felt reassuring to see that many others are very passionate about the art installation.

What are you involved with now?

I'm mostly concerned with working on my degrees, specifically learning some math to study data science after being an art student. Besides this, I'm working in media archivism at Memnon in the IU Innovation Center as part of the Media Digitization and Preservation Initiative. I also work at the Wells Library Makerspace, where I like to draw the whiteboard sign and make 3D prints.

*Amatria is the sentient architecture installation hanging near our exhibit offices. Designed and built by Philip Beesley, the Living Architecture Systems (LAS) group, and members of CNS, Amatria is designed to serve as a test bed for understanding how humans co-exist, co-learn, and co-create with artificial intelligences.

New Website Debuts

2021 saw the unveiling of the new and improved scimaps.org, a significant undertaking that involved over a year of planning, design, and testing. From the beginning of the project, we knew we wanted to not only redesign but also rethink the exhibit's online home. Together with a talented team of user experience designers, system architects, and web developers, we set to work on transforming the *Places & Spaces* online experience.

The website had grown enormously over the 17 years since *Places & Spaces* launched, and this refresh provided a perfect opportunity to prune content and improve navigation. Additionally, the exhibit team focused on increasing opportunities for engagement—with the maps and macrosopes, with the exhibit's social media channels, and with a wealth of new content. The exhibit pieces are augmented by



ABOUT EXHIBIT EXPLORE CONTACT US

About the *Places & Spaces* Exhibition

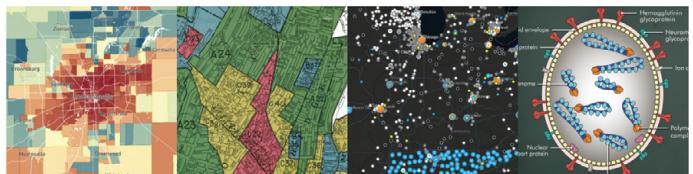


Drawing from across cultures and across scholarly disciplines, *Places & Spaces: Mapping Science* demonstrates the power of maps to address vital questions about the contours and content of knowledge. An interdisciplinary advisory board chose each one of the works in the *Places & Spaces: Mapping Science* exhibit as an outstanding example of how visualization brings patterns in scientific data into focus. The exhibit is curated by the Cyberinfrastructure for Network Science Center at Indiana University. The exhibit has been on display at over 382 venues in 28 countries on 6 continents. It showcases the work of 248 mapmakers that hail from 17 different countries

"This exhibit reveals the power that a good visualization has to convey complex information."

Kristi Holmes, PhD, director of the Galter Health Sciences Library and associate professor in Preventive Medicine-Health and Biomedical Informatics

Call for Macrosopes



Submissions due: Feb 15, 2022 / [Download Details PDF](#)

[Background and Goals](#) [Submission Details](#) [Review Process](#)

[SUBMIT MACROSCOPE](#)

Important Dates

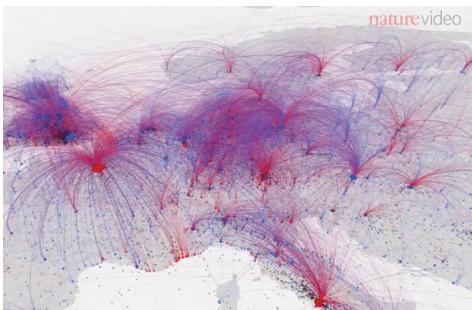
Submissions due (closed)
Feb 15, 2022

Notification to mapmakers (closed)
Apr 01, 2022

Views of the exhibit website.



Nature 150 designer Alice Grishchenko discusses bringing the worlds of art and science together.



Mauro Martino demos the *Charting Culture* macroscope (left) and discusses democracy and data visualization (right).

a learning center which features videos, maker interviews, and blog posts written by exhibit friends and contributors. Visit us today at scimaps.org—and be sure to come back often as new content is being added on a regular basis.

The Learning Center

We are particularly excited about the learning center section of the new website. Here you can find blog posts that will deepen your understanding of macrosopes, provide insight into the lives of map and macroscope makers, and sharpen your data visualization literacy skills. Also, our ever-expanding video collection features map and macroscope makers who will take you behind the scenes of some of your favorite exhibit pieces and discuss the fascinating work they do outside of *Places & Spaces*. Visit today to find out (among other things) which exhibit contributor creates VR experiences to ease the fears of pediatric patients, which artist wants to make international diplomacy more exciting than warfare, and which designer helped create *The Wall Street Journal's* live election maps in 2020.

Venues and Events

Dagstuhl Seminar

After almost a year of remote work, we were ready to take some cautious steps towards in-person meetings. A perfect opportunity to do so came in April with the “Multi-Level Graph Representation for Big Data Arising in Science Mapping” seminar hosted by Schloss Dagstuhl, a historic castle in Germany’s Saarland region that houses the world-renowned computer science research center of the same name. Organized as a hybrid in-person/online event by exhibit

The screenshot shows the official website of Schloss Dagstuhl. At the top, there is a yellow header bar with the Schloss Dagstuhl logo and a message: "Please note our measures concerning Coronavirus / Covid 19". Below the header, the main navigation menu includes "Über Dagstuhl", "Programm", "Publikationen", "Bibliothek", and "dblp". A secondary navigation bar below the main menu lists "Aktuelles", "Konzept", "Organisation", "Gremien", "Förderung", "Projekte", "Presse", "Kunst", "Art Donations", "Ausstellungen", "Geschichte", and "Anreise". The main content area features a large image of an architectural interior, likely the exhibition space. Below the image, the text "Places & Spaces: Mapping Science" is mentioned, along with a detailed description of the exhibit's purpose and features. A sidebar on the left provides additional information about the exhibit, including its international reach and specific tools like macrosopes.

Perla Brown designed a page for the *Places & Spaces* exhibit on the Schloss Dagstuhl website.



Katy Börner, Ingo Günther, Michael Kaufmann, and Alexander Wolff at the Dagstuhl Seminar. This photo had to be taken twice since the first, which also featured Francis Narin, did not have the social distances officially mandated by the German government.

curator Katy Börner and distinguished computer scientist Stephen Kobourov of the University of Arizona, the Dagstuhl Seminar brought together researchers in cartography, information visualization, science of science, and graph drawing to discuss novel graph mining and layout algorithms and their application to the development of science mapping standards and services. Along with presentations by luminaries in the world of science mapping, the Dagstuhl Seminar featured an exhibition of science maps contributed by artists and scientists that served as inspiration and a stimulus for discussion.

Curated Virtual Tours

When quarantine restrictions forced conferences and workshops to go virtual, we looked for a way to keep the exhibit active under these new conditions. Taking advantage of our many recorded and online resources, we developed curated virtual tours. These tours benefited from the ease and adaptability of virtual communication, but still retained the feel of an “event.” They provide an overview of the exhibit’s history and mission, several close-up views of notable maps, and hands-on microscope demonstrations.

Throughout the tour, exhibit contributors take us behind the scenes on their work, offering valuable insights on map and microscope construction designed to inform and inspire audiences to create their own. Afterwards, exhibit curators answer questions and talk with participants.

The first virtual tour took place at the Digital Studies of Digital Science conference during the event’s online “happy hour,” where it was received very positively. We were excited to be part of special programming at the global 25th International Conference on Science, Technology and Innovation Indicators in Aarhus, Denmark, and we enjoyed hanging out locally with high schoolers at the Luddy School Pre-College Program in Bloomington. At the end of the year, we were featured as part of Nesta in London, United Kingdom’s “firebreak session,” a series of events and programming designed to recharge and inspire employees of “the UK’s innovation agency for social good.”



Todd Theriault leads a virtual tour of the exhibit at the 25th International STI conference.

17th Iteration Debut at the University of Notre Dame

When it looked like many college campuses would be going back to in-person learning in the fall of 2021, we immediately contacted exhibit ambassador Scott Weingart and advisory board member Peter Hook. Not only are Scott and Peter fondly remembered former CNS colleagues, they are also recent additions to the University of Notre Dame library system, with Peter serving as the law school's Associate Director for Faculty Services, Instruction, and Outreach and Scott as Program Director for the Navari Family Center for Digital Scholarship. They hosted the debut of the 17th Iteration: "Macroscopes for Placing Data in Space." Notre Dame community members will have ample opportunity to delve into the macroscopes, as the kiosk will reside in the Hesburgh Library until July of 2022.



Todd Theriault, Scott Weingart, Peter Hook, and Julie Vecchio introduce Katy Börner's virtual presentation at Notre Dame.

Giving Back to the Community

Each year, we schedule events that are designed to serve Indiana University and the wider Bloomington community. On a beautiful fall day in October, we took part in IU's Science Fest, a fun-filled educational event for parents and kids of all ages. Many visitors stopped by to investigate the exhibit's *Virus Explorer*, a macroscope initially designed to appeal to school-age audiences.

IU's campus was also the site of November's First Thursday Festival, a showcase for the arts and humanities where many come to share and discover new ideas. Participants were able to join us in building both *Fascinators*, formal headpieces designed by architect Philip Beesley, and *Amarias*, the latest in our series of Amatria-related architecture.

In December, Katy Börner delivered a lively introduction to the *Atlas of Forecasts* to an appreciative audience at Morgenstern's Books, a welcome addition to the Bloomington community (see p. 2).



Ezra Engels and Medina Sydykanova greet visitors at IU's First Thursday Festival.



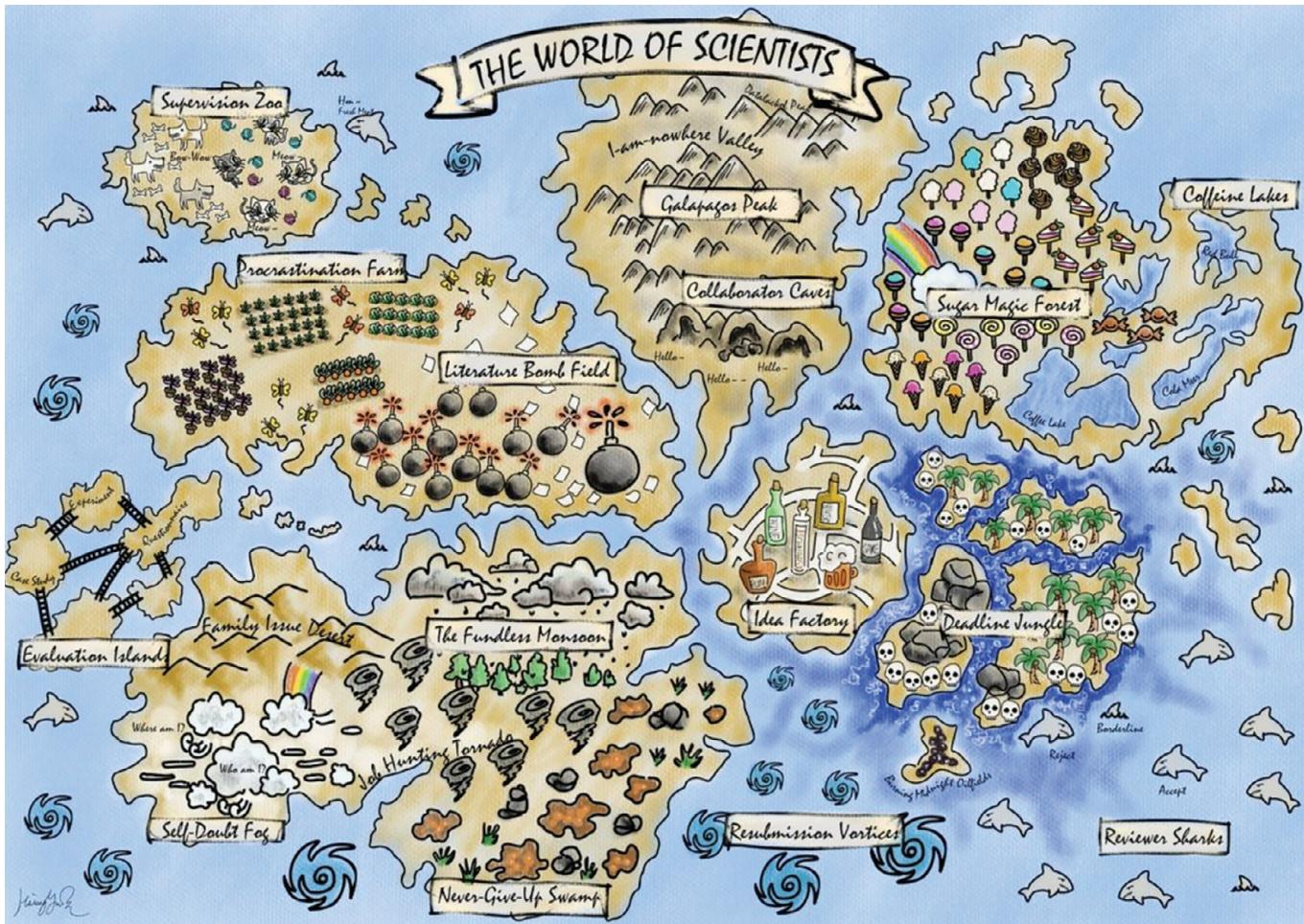
24-Hour Science Map Event

To celebrate the science maps and macroscopes of *Places & Spaces* and the publication of the *Atlas of Forecasts*, we planned a very special event for the end of 2021. We wanted something that would help kick off the holiday season, create ever more excitement for the power and value of science, share the pleasures of scientific discovery, and spread some good energy. And, thus, the 24-Hour Science Map Event was born!

Over the course of a 24-hour stretch, scholars and practitioners from around the globe presented and discussed their work. Since we hosted the event in the U.S. Eastern Standard time zone, our afternoon began with local mapmakers and moved to national presenters in the evening. At midnight, we hopped over to Australia, and then on to experts from Japan and China. In the very early morning, we heard from experts in different locations in Europe. Finally, we ended up back in Bloomington, Indiana, to discuss the latest *Atlas* and announce the winners of the Visualizing Science Contest.



The panel of IU mapmakers (seated, L-R: Bruce W. Herr II, John A. Walsh, Todd Theriault, Michael W. Hamburger, and YY Ahn) receive an early Christmas gift from Katy (standing): The *Atlas* trilogy boxset!



First prize went to
@wuhsiangyun for
this entry in the
Visualizing Science
Contest.

Exhibit Advisors

The Indiana University exhibit team benefits greatly from the expert input it receives from this international advisory board. Advisory board members review exhibition submissions and provide their expertise and guidance to the exhibit on many levels.



Gary Berg-Cross is a cognitive psychologist (PhD, SUNY-Stony Brook) who has taught at a number of institutions over his career (SUNY, Widener, University of Delaware, George Washington, George Mason University, and others). For eight years, he served as the Spatial Ontology Community of Practice (SOCOP) Executive Secretariat helping to run workshops and vocabulary development efforts to advance the field. Currently, Berg-Cross serves as a consulting knowledge engineer on earth science projects and is co-organizer of the annual Ontology Summit hosted at NSF and NIST. [Potomac, MD, USA]



Donna J. Cox is the first Michael Aiken Chair, director of the Advanced Visualization Laboratory (AVL) at the National Center for Supercomputing Applications, and director of the Illinois eDream Institute, all at the University of Illinois at Urbana-Champaign. She is a recognized pioneer in Renaissance Teams and supercomputer visualizations for public outreach, and in 2006 she was selected by the Chicago Museum of Science as one of 40 modern-day Leonardo da Vincis. [Urbana-Champaign, IL, USA]



Bonnie DeVarco writes and lectures on design science, virtual worlds, next-generation geographic information systems, information visualization, and the culture of cyberspace. Previously, DeVarco was a Distinguished Visiting Scholar with the Media X Research Network at Stanford University (2009-2012) and served as chief archivist for the Buckminster Fuller Archives. Currently, DeVarco is completing a book on Buckminster Fuller and is coauthor with Eileen Clegg of *Shape of Thought*, on the history and evolution of visual language. [Palo Alto, CA, USA]



Ingo Günther has tried to cross-infuse journalism and art even before he founded the first independent TV station in Eastern Europe (Leipzig's Channel X) in 1989. That same year he began the Worldprocessor project, which has resulted in well over 1,000 modified thematic globes that not only reside in museum collections but have also graced the covers and pages of political magazines (Foresight, Harper's). His works have appeared in museums all over the world, including the Nationalgalerie Berlin, the Guggenheim Museum, Kunsthalle Düsseldorf, Espacio Buenos Aires, Iwaki City Art Museum, Somerset House in London, Hood Museum at Dartmouth, and the MIT Museum. [Karlsruhe, Germany]



Francis Harvey is head of the Department of Cartography and Visual Communication at the Leibniz Institute for Regional Geography and professor of Visual Communication in Geography at the University of Leipzig, Germany. His research and teaching activities center around geographic information systems (GIS), particularly their technologies, applications, ethical dimensions, and societal implications. Harvey's *Primer of GIS: Fundamental Geographic and Cartographic Concepts* (Guilford, 2015) is now in its second edition. [Leipzig, Germany]



Peter A. Hook is an associate law librarian at the University of Notre Dame Law School. He received his doctorate from the Luddy School of Informatics, Computing, and Engineering at Indiana University where his primary research focus was information visualization, particularly the visualization of knowledge organization systems, concept mapping, and the spatial navigation of bibliographic data in which the underlying structural organization of the domain is conveyed to the user. [South Bend, IN, USA]



Lev Manovich is professor at the City University of New York (CUNY) Graduate Center and author of several books on digital culture, including *Software Takes Command* (Bloomsbury Academic, 2013). In 2007, Manovich founded the Software Studies Initiative in order to develop a new paradigm of Cultural Analytics through data analysis and interactive visualization of patterns and trends in media and visual cultures. [New York, NY, USA]



Elijah Meeks is the executive director of the Data Visualization Society and a data visualization engineer at Apple. His prior experience includes working in the digital humanities at Stanford and developing data visualization applications at Netflix. He is the author of D3.js in Action, the data visualization library Semiotic, and various essays on the subject of modern professional data visualization. His work includes the development of data visualization libraries, tools and exploratory applications. [Los Gatos, CA, USA]



André Skupin, professor of geography at San Diego State University, is interested in the application of geographic metaphors, cartographic principles, and computational methods to the visualization of non-geographic information. His research is interdisciplinary, aimed at increased cross-fertilization between geography, information science, and computer science. Recent work includes novel methods for visualizing human movement and demographic change as trajectories in n-dimensional attribute space. [San Diego, CA, USA]



Olga Subirós is an architect, exhibition designer, and founder of Olga Subirós Studios. Recently, she co-curated (with José Luis de Vicente) Big Bang Data, a major exhibition of data-driven artworks and objects that provide crucial insight into the world of big data. Since 2014, the exhibit has toured worldwide, appearing at the Centre de Cultura Contemporánea de Barcelona (CCCB), Fundación Telefónica in Madrid, Somerset House London, ArtScience Museum Singapore, Centro de Cultura Digital in Mexico, and the DOX Centre for Contemporary Art in Prague. [Barcelona, Spain]



Stephen Uzzo is vice president of science and technology for the New York Hall of Science where he works on exhibit and program development projects related to STEM learning, scientific visualization, sustainability, and network science. Uzzo also serves on the faculty of the New York Institute of Technology Graduate School of Education, where he teaches STEM teaching and learning. [Queens, NY, USA]



Benjamin Wiederkehr is founding partner and managing director of the Zürich-based design and data visualization studio, Interactive Things. He is also part of the Open Government Data task force in Switzerland and helps to facilitate open access to government data for everyone. On [Datavisualization.ch](#), Wiederkehr provides insight into his research and working process and documents topical use cases in the field of data visualization. [Zürich, Switzerland]

Atlas of Forecasts Completes the Trilogy

In December, The MIT Press published the final installment of Katy Börner's Atlas Trilogy—*Atlas of Forecasts: Creating Desirable Futures*. The publication of this book completes a journey that began in 2010 with the *Atlas of Science* and continued through 2015 with the *Atlas of Knowledge*. The *Atlas of Forecasts* highlights the utility and power of models combined with data visualizations to describe complex social and technological systems. It provides an accessible entry to model design and usage, addressing key methodological questions and introducing different model types and their usefulness in forecasting the future. It also demonstrates how visualizations of model results can help communicate the likely consequences of today's decisions on tomorrow's world.

As with past volumes, the *Atlas of Knowledge* features an abundance of illustrations, including maps from iterations 7–10 of the *Places & Spaces* exhibit. The *Atlas of Forecasts* won the 2022 PROSE Award for Excellence in Physical Sciences and Mathematics. It received many positive reviews, including one in *Foresight*, which hailed it as “a sumptuous work that will give modelers and forecasters the perspectives and intellectual power to deal with the challenges of uncertain futures.”



Katy Börner and book designer Tracey Theriault with the *Atlas of Forecasts*.

Host the Exhibit

Put your institution on the map by hosting *Places & Spaces*. The exhibit consists of 100 framed, high-resolution maps, and 28 interactive macroscopes that travel on a touchscreen kiosk. Ingo Günther's *WorldProcessor Globes*, hands-on science maps for kids, the *Illuminated Diagram*, and the award-winning film *Humanexus* are also included. Give your audience the chance to play with data and make sense of science and technology developments.

The *Places & Spaces* exhibit travels in a variety of formats to fit every space and budget. Explore our all-digital options, purchase individual maps, or purchase a poster version of the exhibit. Our digital display is a high-resolution slideshow of 100 exhibit maps, optimized for showing the full breadth of the exhibit on one screen. The majority of our exhibit maps are also available for individual purchase or as an archival set. All maps are 24" x 30" (61 x 76 cm) and can be ordered as inkjet prints, high-quality archival prints, and framed prints. Visit our website to explore the many ways you can bring the exhibit to your space (scimaps.org).



Ingo Günther's *WorldProcessor Globes*.



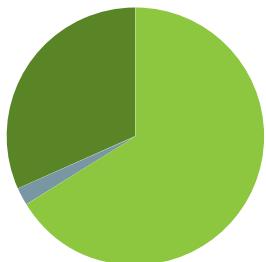
The high-definition touchscreen microscope kiosks.

Exhibit in Numbers

Finances

Exhibit finances are managed by the Cyberinfrastructure for Network Science Center at the Luddy School of Informatics, Computing, and Engineering at Indiana University. Shown below are exhibit expenditures for January 1–December 31, 2021.

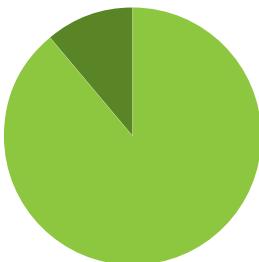
2021 EXPENSES



Total: \$9,110

| | |
|-----------------------|---------|
| Compensation | \$6,043 |
| Travel | \$207 |
| Supplies and Expenses | \$2,860 |

2021 REVENUE



Total: \$9,110

| | |
|--------------------|---------|
| CNS Support | \$8,110 |
| Sales and Services | \$1,000 |

100

MAPS

in large format, full color, and high resolution.

215

MAPMAKERS

from fields as disparate as art, urban planning, engineering, and the history of science.



77



MACROSCOPE MAKERS

including one whose job title is "Truth and Beauty Operator."

28

MACROSCOPES

for touching all kinds of data.

447

DISPLAY VENUES

from the Cannes Film Festival to the World Economic Forum.

227



PRESS ITEMS

including articles in *Nature*, *Science*, *USA Today*, and *Wired*.

38



WORKSHOPS ORGANIZED

6,626,774

WEBSITE VISITS

Resources

Books and Essays

Börner, Katy. 2010. *Atlas of Science: Visualizing What We Know*. Cambridge, MA: The MIT Press. (mitpress.mit.edu/books/atlas-science)

Börner, Katy. 2015. *Atlas of Knowledge: Anyone Can Map*. Cambridge, MA: The MIT Press. (mitpress.mit.edu/books/atlas-knowledge)

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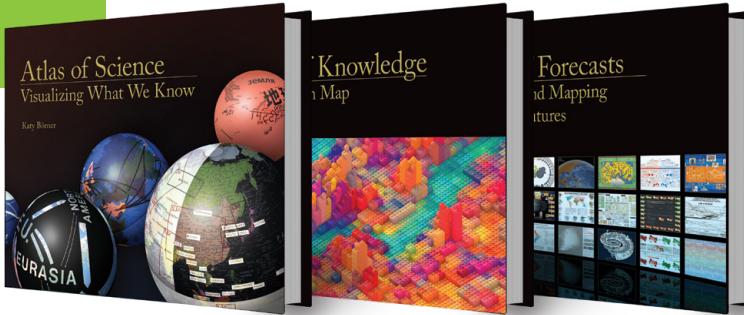
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Websites and Videos

Places & Spaces: Mapping Science: scimaps.org

YouTube. CNS Channel. (www.youtube.com/user/CNSCenter)

YouTube. HuBMAP Consortium Channel. (tinyurl.com/y95t8ux9)

Tools

Science of Science (Sci2) Tool (sci2.cns.iu.edu) is a desktop application that was specifically designed for the study of science. It supports the temporal, geospatial, topical, and network analysis and visualization of data sets at the micro (individual), meso (local), and macro (global) levels.

Courses

The Visual Analytics Certificate (VAC) (visanalytics.cns.iu.edu) course provides an overview about the state of the art in information visualization. It teaches the process of producing effective visualizations that take the needs of users into account.

The Visible Human Massive Open Online Course (VHMOOC) (tinyurl.com/y5dzrkr4) presents an overview of tissue data acquisition and analysis, demonstrates single-cell analysis and CCF mapping techniques, and introduces major features of the Human BioMolecular Atlas Project (HuBMAP) portal.



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