2022–23 Anthology

InfoGraphics Lab

DATA · DESIGN · DIFFERENCE

AND SO, WE CONCLUDED
THE EARTH IS FLAT

SCIENCE

SCIENCE

Letter from the Director

When I arrived back at the InfoGraphics Lab last Fall after a 15-year detour, I felt a deep sense of being home again, surrounded by like-minded people with common language and values. The familiar map drawers, oak table, and posters on the wall weren't tired with age—rather they reflected the strong and enduring sense of purpose of this place. Forged by Jim Meacham over 35 years at the helm of the Lab, that purpose has changed very little since he described (in 1991) the goals of the Lab to "create high-quality cartographic products, augment GIS instruction, and improve University research." His vision has certainly come to fruition and, while his work is now complete, we continue with this shared purpose.

I am so grateful for being accepted into this community and for the opportunity to help forge a future together. Our team is a dedicated, compassionate, and talented bunch and I'm humbled to witness how many of us have chosen to this place as a home base and believe in its enduring value.

As we reflect upon another year at the InfoGraphics Lab, I am filled with gratitude and pride for the progress we have achieved on so many fronts. This product is one of them—a compendium of Lab identities, features, and perspectives—that reflects the flows of people and ideas that are percolating in the Lab. It also puts student contributions at its center, giving special emphasis to the absolutely central role they play in bringing research, teaching, and practice all together in one place. Through this anthology, we aim to highlight the Lab's collective mission and honor our unique perspectives.

I want to thank our team for their creativity and curiosity across all of our work, and to our partners, collaborators, and supporters for their trust and shared vision. A year from now, projects will have come and gone, but our shared commitments will stay. As we look forward to the coming year, I know we will continue to seek ways to build more connections, reinforce our values, and make meaningful impacts.

Erik Steiner
InfoGraphics Lab Director

InfoGraphics Lab
DATA · DESIGN · DIFFERENCE

The InfoGraphics Lab 2022-23 Anthology would not have been possible without the following:

DIRECTOR
Erik Steiner

PROJECT MANAGER
Lucy Roberts

PRODUCTION MANAGER
Alethea Steingisser

LAYOUT DESIGNERS
Dylan Blisard
Jenna Witzleben

GRAPHIC DESIGNER
Jenna Witzleben

ILLUSTRATOR
Max Johnson

EDITORS
Alethea Steingisser
Erik Steiner
Joanna Merson

CREATORS AND WRITERS
Dylan Blisard
Peyton Carl
McClean Gonzalez
Max Johnson
Eden McCall
Joanna Merson
Gillian Miller
Lucy Roberts
Erik Steiner
Alethea Steingisser
Zhaoxu Sui
Abby Whelan
Jenna Witzleben

OTHER CONTRIBUTORS
Mark Carey
Aniko Drlik-Muehleck
Carolyn Fish
Leigh Johnson
Matthew Kauffman
Erin Moore
Daniel Rosenberg

O
UNIVERSITY OF OREGON

Contents

Mission

Our mission is to generate meaning and impact through data and design. We practice, teach, and study creative data-driven design, fostering collaboration across diverse disciplines to transform research, discover and communicate insights, and engage with pressing societal and environmental challenges.

Beliefs

We believe in the power of data and design to reveal insights, spark curiosity, and inspire change. We are committed to advancing academic research, making substantive impacts on the environment and society, and cultivating a diverse and inclusive community of thinkers, learners and creators.

How we work

We engage in design practices and design thinking across diverse domains. We are particularly interested in cartographic and data visualization and embrace emerging technologies to find meaning and create compelling visual narratives. Our sense of purpose comes from practicing excellence in these pursuits and the desire to discern ways that we can transform research and societal impact through data and design.

We strive to create an environment for creative and intellectual talent to flourish, where interactions between students, staff, and faculty are generative and transformative. We have high standards for excellence in both process and product, but invest most of our energy in people. We believe putting human relationships at the center is the best way to incubate transformative thinking and stimulate collaborative output. We are not experts in your domain, but we will push you. We are curious generalists driven by a desire to discover, understand, and problem-solve. Specialization is essential for maintaining reliable performance, repeatability with little variation – but curiosity breeds breadth across domains, richer mental models, diversity, and originality. We nurture specialists into generalists.

Within our team, we intentionally have overlapping roles. Rather than conceiving of our work as a series of efficient hand-offs and transactions between experts, we envision everyone can bring creative contributions at every step from project conception to analysis to end-product.

Anthology as Practice

by Lucy Roberts

This anthology represents the hard work and creativity of the students and faculty at the InfoGraphics Lab. We started working on this collection in February of 2023, when an independent group of students got together to brainstorm what our anthology could look like, with not just our work, but also the questions and thoughts that our projects have sparked for us personally. Working in the IGL, we have had the opportunity to research and tell many spatial stories. Some of those stories were brought to us by research partners for us to visualize in some meaningful way. More frequently, stories were the natural product of questions and discussions that are raised while researching, compiling, and visualizing data.

Often, we are led to believe that "data visualization" is a noun with a sense of finality, an image or graphic with the purpose of convincing the observer of some truth. However, in the IGL we understand that "data visualization" is a verb; it is an active undertaking that requires collaboration across disciplines and impacts the creators as much as it does the viewers. In this way, the process of designing this anthology has been no different from the other projects we have worked on. The process of building and structuring the anthology has forced us to have challenging and exciting conversations about how we want to build and structure our own community and products as a lab. Together, we have had the opportunity to meet over long nights with cold pizzas and frantic days in the hot Eugene summer. It has allowed us to research and critically reflect on our projects amidst busy school and work schedules. The creative process of assembling this anthology has informed and challenged our own work as much as it has also tried to represent it.

> *"The creative process of assembling this anthology has informed and challenged our own work as much as it also tries to represent it."*

This anthology is broadly divided into the three parts of the lab's identity—**data**, **design**, and **difference**, all linked through this year's theme of movement. At the beginning of each section, we have an overview of how we use each of these principles in our work. Within each section, you will find reflections from lab students on how their work has challenged them to think critically about their work.

Over the coming years, we hope to continue this tradition of working together to compile an anthology of our work, and that these categories of "data, design, and difference" can continue to inform how we approach and solve new problems. Compiling this anthology has given us the opportunity to engage with our research in entirely new ways, and we are excited to share those ideas with you through this inaugural InfoGraphics Lab Anthology.

Lucy Roberts
InfoGraphics Lab Student Manager

On Movement

by Alethea Steingisser

Movement is a fitting theme for this inaugural annual Anthology. Not only did the InfoGraphics Lab experience a literal physical movement this year, the concept is a fundamental area of curiosity and practice in the Lab. At the heart of much of our work is a desire to understand and communicate how phenomena change over space and time.

Stories of change run throughout our work – from animal migrations to landscape changes to historical trends. These are all stories that require spatio-temporal and dynamic forms of analysis and representation. We are constantly grappling with—and redefining—how to uncover patterns in these movements, to communicate the history that led to the current state, or recognize the impact of these changes.
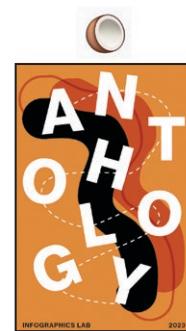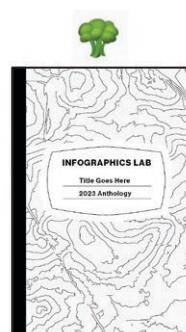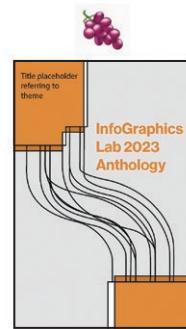
Our goal is often to discern and describe change, and is evident in our three areas of focus:

> We collect and analyze **data** through exploratory means;
>
> we communicate change through dynamic **design**; and
>
> we seek to make a **difference** through positive impacts on our planet and society.

Finally, movement also provides a broader framing for other dynamic aspects of the InfoGraphics Lab. Students move through the Lab during their academic journeys, gaining knowledge, skills, and experiences that direct and inform their paths far beyond their time in our physical space. The Lab leadership moved into a new phase with the retirement of Lab Director and co-founder Jim Meacham in 2022, and Erik Steiner taking the reins as the new Director to lead us into the future. Even our physical space for over 20 years moved to a smaller and more intimate lab environment 182 inches down the hallway.

Movement is constant, expected, and the essence of change and growth. It inspires new pathways, new ways of thinking, new solutions, and keeps us open to different perspectives.

Movement couldn't be a more ideal concept to guide the design of our inaugural Anthology.

Battle for the Best Cover: Each design was assigned an emoji and sent to the Slack channel for everyone to vote for their favorite. Coconut won in this round. Mockup designs by Jenna Witzleben.
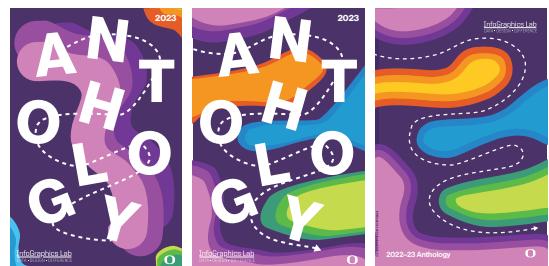
Note From the Designers

by Dylan Blisard and Jenna Witzleben

1. Based on the theme of this year's anthology, we collected visual inspiration relating to the theme of *movement* and mocked up several cover and interior design concepts for feedback (see opposite). The one selected by lab members featured amorphous brushstrokes gesturing towards movement across the page. We continued to iterate on the design to evoke not only to movement generally, but specifically movement influenced by spatial form.

Cover Design Evolution: Further design iterations by Jenna Witzleben and Dylan Blisard.

2. We then utilized colors from our lab logo as an organizing feature of this publication: orange for **data** stories, blue for **design** stories, green for **difference** stories, and purple for **general** content.

3. Finally, we wove brushstrokes across each page with their distinct color. They connect the Anthology from beginning to end, and are the motif that act as a guide to each section, allowing anybody, at a glance, to know what each page's content might hold.

Meet the Team

We are the cartographers, coders, designers, and researchers that call InfoGraphics home.

Dylan Blisard

Dylan is a fourth-year geography student from Ashland, Oregon majoring in Spatial Data Science with a minor in Climate Studies. His interests include cartography, ancient history, web design, and anything related to computers —from programming to building PCs. Dylan has worked in the InfoGraphics Lab since January of 2023. He has contributed to a variety of projects including ungulate migration mapping for the USGS report and the Nevada Department of Wildlife, data wrangling for the *Chronographics* project, and designing layouts for this Anthology.

Peyton Carl

Peyton Carl (she/her) is a recent graduate in Environmental Science with a minor in Geography. She has been with the Lab since January 2022 and has loved being part of such a supportive, educational space. She is passionate about nature and animals and how they overlap with geographic information science and cartography. In her free time, Peyton enjoys collecting and listening to records, reading science fiction, befriending spiders, and camping. She's interested in pursuing a career that integrates her love for ecology with her expertise in cartography and GIS and looks forward to her future as an aspiring environmental scientist.

McClean Gonzalez

McClean is a master's student in Landscape Architecture and Community and Regional Planning. His research focuses on making policy and planning documentation more accessible to ensure that a broad audience can shape decisions made in their communities. McClean's work in the Lab is centered on *Pacific Northwest Atlas of Essential Work*. He collaborates with researchers across campus to develop storylines and graphics, and to integrate the two into the *Atlas* web interface. Outside of the lab, McClean tries to find time to mountain bike and climb between walks with his dog, Penny.

Maxim Johnson

Maxim is a third-year undergraduate majoring in Geography with a minor in Earth Sciences. Maxim's interests include cartography, fantasy world building, and everything geography. He's traveled all over the world which nurtured his passion for geography and motivated continued learning about all aspects of our world. When not in the Lab, Max is usually making fantasy maps and practicing hand-drawn cartography. Maxim has worked on many projects at the InfoGraphics Lab including encoding a timeline of over 2,400 historical figures, helping create a map of historical shipping routes, and working with UO Professor Ben Clark on creating a map of wildfire fuels reduction for Lane County.

Rachael Sol Lee

Rachael Sol Lee is a Ph.D. student in the Environmental Studies and English departments. Her research focuses on the technological interplay that unfolds in contemporary efforts to document traditional ecological knowledge (TEK) in digital humanities and new media projects. At the InfoGraphics Lab, she has contributed to the *Pacific Northwest Atlas of Essential Work* by building interactive maps, supporting site-wide web accessibility efforts, and drawing cartoon bio portraits. Outside of the UO, she is a mixed media artist currently focused on textiles, collage, and creative coding.

Joanna Merson

Teaching and Mentorship, 9–10

Joanna Merson (she/her) is the Cartographic Developer in the InfoGraphics Lab. She can often be found touting the power of mapping by giving workshops, guest lectures, and organizing events like GIS Day. With a B.Sc. in Geomatics (Combined Geography and Computer Science) and an M.A. in Geography, her skills include a foundation in geographic principles, data modeling, and user-driven visualization techniques. Joanna also gained experience with web-app interface design and testing while working within the private sector with GIS industry leaders Esri and its partner Latitude Geographics. Joanna uses this expertise to contribute a balance of user and data-driven visualization techniques to collaborative research projects.

Eden McCall

Rome and Font, 51–52
Visualizing Incarcerated Firefighting, 27–30

Eden is a double major in Journalism and Spatial Data Science, with a minor in Science Communication. She is passionate about using multimedia, data visualizations, mapping, photography, film and writing, to convey cultural and scientific narratives. Eden joined the lab in January 2023 and has focused on designing maps of carceral firefighting for the *Pacific Northwest Atlas of Essential Work*. Eden also works as a video producer for the university's Central Communications team and is a managing editor, cartographer, and web designer for the UO School of Journalism's capstone Science Communication class: Science Story. In her free time, Eden enjoys traveling, scuba diving, rock climbing, and otherwise being outdoors in nature.

Gillian Miller

Assembling the Pieces: Maps and Mosaics, 59–60

Gillian Miller (she/her) is a third-year undergraduate majoring in Environmental Science and Geography. Fueled by a childhood full of summers spent camping, she has long been in love with the natural world. In the summer of 2023, Gillian received the Ice and Environmental Justice Undergraduate Research Award. For this effort, she works with UO Professor Mark Carey to understand the Emmons Glacier and the White River in Washington state as two parts of a whole, and how together they produce labor in the human landscape. Gillian is investigating how cartography can help frame and tell this story through her work in the InfoGraphics Lab.

Lucy Roberts

Lucy is a recent graduate in Spatial Data Science and Technology with a minor in Global Health. She has worked for the InfoGraphics Lab for nearly 3 years and serves as Student Lab Manager. Lucy is passionate about applying GIS skills to solve complex social issues. Over the last year, she worked closely with the Confederated Tribes of the Umatilla Indian Reservation on a project looking for the remains of five of their ancestors. She also reinvests back in her home community in Grants Pass, Oregon, where she worked as a COVID-19 contact tracer for during the height of the pandemic. In her free time, Lucy loves rock climbing and backpacking, and is a leader for the Outdoor Pursuits Program.

Erik Steiner

Erik Steiner is the Director of the InfoGraphics Lab. In past roles he has been an author, artist, cartographer, web developer, and interaction designer on scholarly and other creative works. His interests span a range of academic disciplines in the humanities, social and environmental sciences and sit at the intersection of technology, creative arts, and academic scholarship. Steiner formerly co-founded the Center for Spatial and Textual Analysis at Stanford University and was President of the North American Cartographic Information Society. Outside of work he enjoys running, outdoor adventures, and community-projects. He has three children (Canyon, Jasper, and Sabine) who are his biggest creative muses.

Sierra Rodriguez-Torres

Sierra is a senior studying Planning, Public Policy, and Management. She is currently working at the City of Eugene Public Works Engineering as a Transportation Planning intern and is a student fellow in the InfoGraphics Lab. Working in these two environments has taught her the power of geospatial data and how it can be used as a tool to inform and accelerate policies and optimize development planning. When she isn't a student, intern or a fellow, Sierra enjoys cycling, hiking and playing silly board games with her family.

Alethea Steingisser

Alethea Steingisser (she/her) is the Cartographic Production Manager in the InfoGraphics Lab. She serves as lead designer and project manager on a wide variety of cartographic products, most notably atlas projects including: the *Atlas of Yellowstone* (2012, 2022); *Wild Migrations: Atlas of Wyoming's Ungulates* (2018); *Atlas of Design*, *Volume 4* (2018); and *Archaeology and Landscape in the Mongolian Altai: An Atlas* (2010). Her work consistently garners awards in both cartographic design and subject matter. Alethea was drawn to cartography both because it is perfect blend of art and science, and because of its ability to tell powerful visual stories. Alethea has many, and always growing, interests; some of which include roller derby, making stained glass, knitting, or doing a deep dive into a new topic – as of lately – the life and music of George Michael.

Zhaoxu Sui

Zhaoxu is a first-year Geography graduate student whose research interests include cartography, map-making, and place names. For his thesis, he is investigating the practice of including Japanese place names on maps published in Japan. Zhaoxu is also passionate about designing reference maps. In his free time, he creates self-commissioned world-scale maps and atlases that are a tour-de-force of how to place thousands of labels on compact maps. In the InfoGraphics Lab, Zhaoxu is broadening his programming skills by animating environmental data with ungulate migration route data.

Abby Whelan

Abby graduated from the University of Oregon with a B.S. in Geography and Spatial Data Science in 2022. She worked as a student cartographer in the InfoGraphics Lab for the last two years of her academic program. The experience taught Abby the power of storytelling through maps and graphics in both print and web formats. She is now a cartographer for Moon Travel Guides, where she creates a variety of different maps for travel locations around the world. Abby enjoys being creative while working with large amounts of data. Her love of cartography influences her personal projects too, resulting in a series of disco ball globes. When she's not busy making something in the art studio, you can find her exploring Idaho with her dog, Bogus.

Jenna Witzleben

Jenna Witzleben (she/they) is a queer designer of primarily Euro-American descent. She recently graduated with her master's degree in Landscape Architecture from the University of Oregon. Their studies enabled them to deepen their relationship with biocultural restoration, ethnobiology, Indigenous ways of knowing, land rematriation, environmental justice, and queer and feminist ecologies. Jenna is passionate about exploring these topics through critical cartography projects such as *Monumental Denial,* an atlas exploring the connection between U.S. Historic Landmarks and white supremacy. In their spare time, Jenna works as a volunteer with the Eugene chapter of Herbalists without Borders, the UO Urban Farm, Solidarity Garden, and Huerto de la Familia, supporting the growth of culturally-relevant food and medicine plants in these garden spaces.
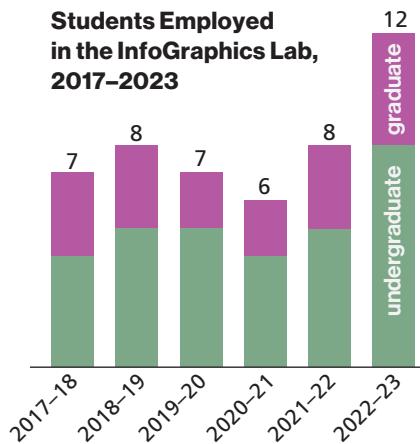
Teaching and Mentorship

by Joanna Merson

Of all the InfoGraphics Lab accomplishments, teaching and mentorship are one of our most sustaining successes. We pride ourselves on being a highly-regarded center of cartography, visualization, and data storytelling training with few comparable programs existing in the US.
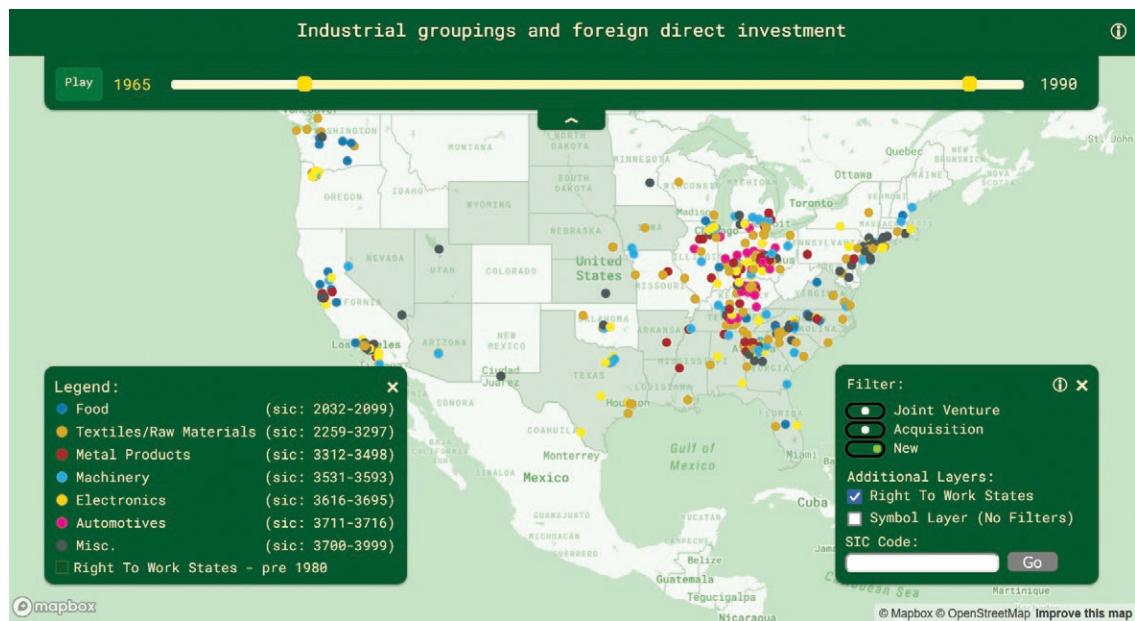
Experiential Learning

Experiential learning and comprehensive 1:1 mentorship are at the core of what we do. As a hybrid research and practice facility, we employ, train, and mentor students through project-based learning in partnership with internal and external affiliates. Students advance their professional, soft, and technical skills through "real world" projects and gain invaluable tools for career readiness. Students work directly with UO faculty and external professionals, participate in mixed teams, and ultimately help manage, lead and co-author academic publications and other products.

Students Employed in the InfoGraphics Lab, 2017–2023

graduate / undergraduate

7 | 8 | 7 | 6 | 8 | 12

2017–18 | 2018–19 | 2019–20 | 2020–21 | 2021–22 | 2022–23

Credit Courses

The Lab also serves students through traditional credit courses in cartography and web mapping offered through the Geography Department. Students learn fundamental software agnostic theory and skills, gain experience designing by putting pen to paper, and then to apply those fundamentals using current technologies to produce meaningful projects of their own interest. In our increasingly web-based and spatially aware world, having the technical skills to create interactive, online maps is a valuable skill, and doing so effectively is imperative. Our regular course on Web Mapping is taught every spring and trains students in foundational programming skills and cartographic and user interface design for interactive maps.

Student Project Spotlight: Map by Timmy Schragel from Web Mapping class.

![GIS Day logo]

Each November worldwide, GIS Day is celebrated during Geography Awareness Week to help others learn about geography and the applications of GIS that make a difference in our society. The InfoGraphics Lab, supported by the Department of Geography, hosts an annual GIS Day Open House in the Knight Library DREAM Lab to showcase the power of GIS on our campus and in our region. The event is attended by UO GIS researchers and instructors, local and regional government agencies, non-profits, and private businesses. It helps foster connections between professionals in the field, across campus, is a great networking opportunity for current students, and attracts new students into Spatial Data Science majors.

GIS Day: Lab alumnus Abby Whelen addressing a crowd of students. A student adjusting the landscape in the "Augmented Reality Sandbox". Photos by Alethea Steingisser and DREAM Lab photographer.

Workshops and Guest Lectures

InfoGraphics faculty are regularly invited to give guest lectures in courses in a range of disciplines. This year, we served Geography, PPPM, ENVS and English. These workshops plant the seeds for critical map reading and critical data thinking skills and build interest in spatial data science and visualization among students from a variety of majors.

SPOTLIGHT:
Supporting Students in Planning, Public Policy and Management
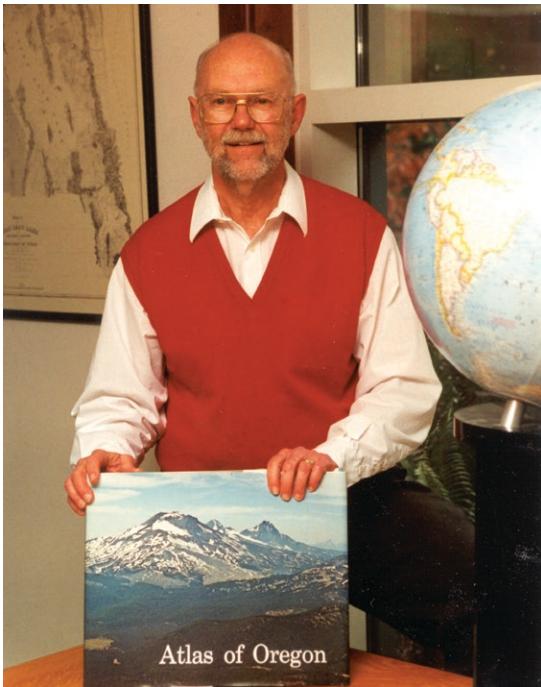
Clear communication is central to the work we do in the public and nonprofit sectors. Increasingly, our audiences have short attention spans and are becoming acclimated to receiving information in short visual bursts. If we really want our audiences to understand, retain, and act upon the work we do, we must find ways to invite their attention and then help them quickly digest information.

 "The InfoGraphics Lab coaches helped my team explore and navigate various ways to present our data analysis in visually appealing and efficient ways. With their guidance, we were able to create a detailed visual representation of our project that our clients absolutely loved and want to continue utilizing in the future. I know I will be using the tools they shared with my team and me in my professional career." – Erika Vasquez Wagner (MPA '23, MNM '23)

Our work means nothing if those affected by it don't understand it. By partnering with the InfoGraphics Lab, we're ensuring that our students enter the professional world with an appreciation for the varied styles of communication they'll need to succeed.

Aniko Drlik-Muehleck
Project Coordinator, Institute for Policy Research and Engagement, PPPM

Teaching Spotlight: Bill Loy's Legacy

by Alethea Steingisser

Bill Loy taught cartography from 1967 to 1997 in the UO Geography Department, sharing his love for and expertise in map design with many students over the course of three decades of classes. He was well-known for his work on the first *Atlas of Oregon* (1970), and in 1988, he and Jim Meacham co-founded the InfoGraphics Lab. Together, they produced the second edition of the *Atlas of Oregon* (2001), which received numerous awards and is still considered a gold-standard in atlas making today. The *Atlas of Oregon* defined the process on how to work with topic experts on dozens if not hundreds of topics, and how to bring those stories and cartographic works together into a beautiful cohesive whole. That foundational work, and the great attention and passion that Bill brought to cartographic design, created the strong foundation of excellence in cartography that the lab is still known for today.

The Bill Loy Award for Excellence in Cartography

Bill established the Loy Award for Excellence in Cartography at the end of his life to continue to recognize and inspire the great cartographic work of UO Geography students. The award is given each year to outstanding cartographic products designed by graduate or undergraduate students majoring in Geography or Spatial Data Science.

The first Loy Awards presented were in 2005, and were given to Alethea Steingisser (who still works in the InfoGraphics Lab today) and Geography graduate student Erik Strandhagen. Since then, 61 students have been recognized for their creativity and execution of cartographic products. Bill continues to inspire excellence, far beyond his time at the University of Oregon.

Bill Loy: Geographer, cartographer, and co-founder of the InfoGraphics Lab.

2023 Loy Award Recipients

Dylan Blisard
Nuclear Testing in the USSR

Lily Kuentz
Tracing the Movement of Abandoned Military Stations Across the Greenland Ice Sheet

Honorable Mentions

Maxim Johnson
Odethia Politica (Found on pages 47-50)

Zhaoxu Sui
Reference Atlas of the World

Left to Right: Alethea Steingisser, Dylan Blisard, Zhaoxu Sui, Maxim Johnson, Lily Kuentz, and Carolyn Fish.

REFERENCE

ATLAS OF THE WORLD

SOUTHWEST CONTIGUOUS USA

Los Angeles (Left) or L.A. as it's commonly known, is the largest city in California and the second-largest city in the United States. It is known for its sunny weather, beautiful beaches, and iconic landmarks such as the Hollywood Sign, Walk of Fame, and Griffith Observatory. It is also home to world-class museums, theaters, and amusement parks like Disneyland.

San Diego (Upper-Right) is known for its beaches, parks, and warm climate. Its attractions include the San Diego Zoo, Balboa Park, and Coronado Island.

Denver (Right), the capital of Colorado, is located at the base of the Rocky Mountains. It is known for its outdoor recreation, craft breweries, and cultural attractions such as the Denver Art Museum and Red Rocks Park and Amphitheatre.

Phoenix (Bottom-Right), the capital of Arizona, is known for its year-round warm weather, golf courses, and desert scenery. Popular attractions include Camelback Mountain, the Desert Botanical Garden, and the Heard Museum.

Las Vegas (Left) is a world-famous destination known for its casinos, entertainment, and nightlife. It is home to iconic landmarks such as the Las Vegas Strip, the Bellagio fountains, and the High Roller observation wheel.

AMERICA **164**

Nuclear Testing In The USSR.

Sources: USGS 2022, Our World In Data 2022
Cartographer: Dylan Blisard 2022

Number of Nuclear Blasts Detected by USGS 1961-1991.

Russia

MOSCOW

Kazakhstan

Earthquake or Bomb?

Nuclear testing is a secretive activity. Fortunately, seismologists can detect blasts through the shocks they send out through the Earth. But can they be mistaken for earthquakes? Both release large amounts of energy very quickly and can be recorded hundreds of kilometers away. However, the forces involved in each are different and create distinct waveforms which are the key to identifying a nuclear blast from an earthquake.

Nuclear Blasts Detected By USGS Per Year 1961-1991.

1961   1966   1971   1976   1981   1986   1991

Tsar Bomba, the largest nuclear bomb ever tested, detected by USGS.

The Soviet Union invades Afghanistan, testing slows.

Chernobyl Disaster halts testing.

InfoGraphics Lab Affiliates

by Erik Steiner

We envision the InfoGraphics Lab as a creative incubator for informal affiliates from across the University of Oregon and beyond to engage on research which contributes to cognate fields of geography, GIScience, cartography, visualization, and communication. This year, the number and disciplinary breadth of affiliates expanded significantly, expressing a growing interest and valuable potential for cross-pollination across research fields.

Who are Lab affiliates?

Affiliates are partners—faculty, graduate students, post-docs and others—who wish to pursue independent and collaborative research work that is informed by spatial data science, design and design thinking, communication theory, and human-computer interaction. These engagements vary in scale from informal exchange to major joint grant proposals.

Through creative collaborations—either explicitly product-driven or broadly intellectually curious—affiliates work in partnership with the Lab team to explore the intersections between fields and methods. In the most applied and practical terms, these collaborations equip researchers with the tools, skills, and students who can collect, organize, and transform data, conduct spatial data analyses, or create beautiful maps, insightful visualizations, and web experiences. Research affiliates are often partners who simply understand and appreciate the value of enhancing the analysis and presentation of their work through visual and spatial methods.

While known for its high-quality atlases and other public-facing cartographic products, the Lab is an equally rich environment for pursuing exploratory research questions using methods from data science, visual analytics, and digital humanities. These generative engagements may or may not involve the creation of map products, but are informed by the fields of design and design-thinking.

Affiliate Spotlight: Carolyn Fish

In my own work, I envision InfoGraphics Lab as a center for engaging with students and IGL faculty to inspire new ways in which to approach our fields of study and provide fodder for future research endeavors. My research on cartography and environmental communication deals specifically with how cartographic practice intersects with climate change science and public understanding—this work is critically informed by my contact with this active community of experienced practitioners who are abreast of the state-of-the-art in print and web map design, current data sources, and geospatial software.

In my view, a growing affiliate program at the InfoGraphics Lab holds potential to create new research infrastructures and social mechanisms in which faculty from disparate disciplines can come in closer contact with one another's work. In the future, I and others hope to draw more on this community of researchers who share interests in the theory and practice of spatial data science.

Carolyn Fish, *Assistant Professor of Geography*

In 2023, we also started an Undergraduate Student Fellows program that pairs undergraduate students with affiliate faculty on seed projects.

Lab Affiliates, 2022–2023

College of Arts and Sciences

Bruce Blonigen, *Economics*
Mark Carey, *Environmental Studies*
Madelon Case, *Biology*
Carolyn Fish, *Geography*
Lauren Hallett, *Biology*
Ocean Howell, *History*
Leigh Johnson, *Geography*
Stephanie LeMenager, *English, Environmental Studies, Just Futures Institute*
Laura Pulido, *Indigenous, Race, and Ethnic Studies*
Daniel Rosenberg, *History*
Johnny Ryan, *Geography*
Woan Foong Wong, *Economics*

College of Design

John Arroyo, *Engaging Diverse Communities and Just Futures Institute*
Aniko Drlik-Muehleck, *Institute for Policy Research and Engagement*
Ben Clark, *Planning, Public Policy and Management*
Erin Moore, *Architecture, Environmental Studies*
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...and You!

Active Projects, 2022–2023

This "map" offers a view into the diverse landscape of projects, subjects, and methods that flowed through the InfoGraphics Lab in 2022 and 2023.

Analytical

Spatial Policies, Place, and the Unhoused

aims to visualize the impact of space-based policy decisions on the unhoused. These mappings fit within a broader goal of understanding importance of place for unhoused individuals .

Chronographics

reimagines, interprets, and reconstructs the pioneering 18th century chronological charts of Joseph Priestley through an interactive digital publication.

Pages 19–22, 23–26

57–58

Internet Infrastructure

is a project that visualizes the global impacts of a 25-year project by the NSRC to train and support indigenous network engineers in developing regional internet infrastructure.

Global Trade Route Modelling

simulates the impact of the transition in shipping technology (from sail to steam) on global martime route paths and speeds. The model will enable economic analyses of differential effects on 19th century trade centers.

Pages 55–56

Spatial Dimensions of Homecare

seeks to reveal the experience of home care workers through a spatial framing. At the scale of the region, city, home, and body, we make visible the patterns of experience that make home care distinctive form of labor.

Mapping Rome

is a long-term project to capture Rome's rich, layered spatial and architectural history through the documentation and digital reconstruction of key historical visual works including maps, photographs, and etchings.

Pages 51–52

Monumental Denial

is a critical atlas project that examines how narratives of colonization and white supremacy are perpetuated through cultural memory, specifically the U.S. National Historic Landmarks program.

Atlas of Essential Work

is a narrative atlas that explores and makes visible the diversity of essential work in the Pacific Northwest. Through a collection of interactive graphical stories, the project iillustrates how labor shapes the region's identity.

Pages 45–46

Carceral Firefighting

investigates the extent and implications of prison firefighting labor in Oregon, highlighting the significance of prison crews in forest fire suppression strategies by the state.

Pages 27–30

Kivalina Resilience

is an exploratory interdisciplinary project to understand how scientific and indigenous knowledge converge to support the resilience of Arctic coastal communities like Kivalina due to climate change

Descriptive

Socially Oriented ←

LandTalk

is a digital platform that archives long-term changes in everyday landscapes through crowdsourced conversations between students and elders.

Sustainability Dashboard

is an interactive front-end to the University of Oregon's Comprehensive Environmental Policy, presenting data visualizations of key sustainability initiatives.

Spatial Ecology of Harvester Ants

is three-decade long study on the spatial composition and collective behavior of more than 1600 colonies of harvester ants at a field site in New Mexico.

Fossil Fuel Resistance

studies the spatial dynamics of fossil fuel protests in the Pacific Northwest, emphasizing the region's strategic role in climate-impacting activities.

Pages 45–46

Cycle Streets Neighborhood Greenways

seeks to promote cycling streets in Eugene by visualizing potential enhancements based on Dutch cycling principles.

Atlas of Global Ungulate Migration

is a global initiative to develop an interactive web platform to catalog and map historic and current ungulate migrations to encourage research and transboundary conservation initiatives.

White River Labor

conceptualizes the White River and its glacier as an essential laborer, emphasizing its combined impact on human labor and physical role within a broader hydrologic system.

Pages 59–60

Wildfire Fuel Reduction Mapping

aims to develop a comprehensive wildfire fuel reduction project map in Lane County. The effort is intended to catalyze cooperation on resilience activities across many agency and public partners.

USGS Ungulate Migration Report

is annual conservation-focused publication commissioned by the USGS to document seasonal migration routes and habitats of mule deer, elk, pronghorn, and other ungulates in the western US.

Pages 31–34

41–42

57–58

Envrionmentally Oriented

CHAPTER TWO

DATA

We recognize the transformative potential of data as a cornerstone of our work. Our appreciation of data encompasses the collection, wrangling, transformation, analysis, and archiving of various forms of evidence. Both quantitative and qualitative forms of data — from drone imagery to GPS-collared deer to textual collections and personal narratives — are foundational to our work, bringing depth, diversity, and nuance to our projects. Whether we're uncovering hidden patterns within complex datasets or translating science stories into impactful narratives, we emphasize the value of evidence to inform, persuade, and build shared commitments. Finally, through responsible stewardship, we seek to ensure the preservation and accessibility of valuable information for future explorations and discoveries.
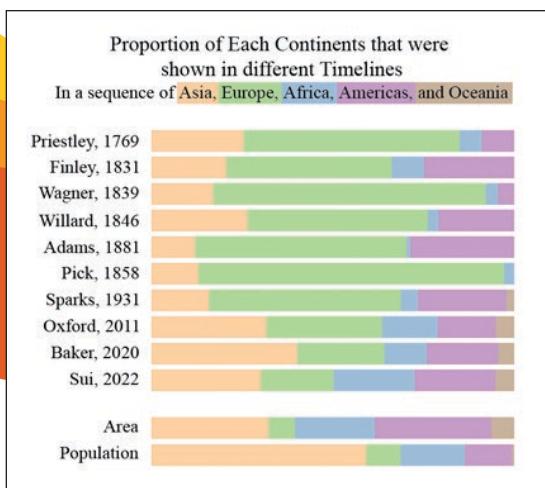
{Data x Movement}

Re-coding for Marginalized Histories

by Zhaoxu Sui • *Peer-reviewed by Peyton Carl and Eden McCall*

Eighteenth century scientist and theologian Joseph Priestley developed some of the first systematic methods to represent historical timelines in visual form. In his 1769 *A New Chart of History*, he uses columns (x-axis) to represent eras and time periods, and rows (y-axis) to show regions to capture the more than 2000 years of world history. It was a groundbreaking project—elegant for its ability to capture an immense amount of information in a single graphical—and it has deeply influenced the design and content of historical timelines for the last two centuries.

Despite the graphical achievements of the *New Chart of History*, questions arise as to the Eurocentric content of the chart and the marginalizing influence it has had. Joseph Priestley was a scientist and educator and most of his lifetime experiences were limited in Europe and the newborn United States, and thus, his world historical timeline was undoubtedly more focused on Europe than any other continents. This focus on Europe can be also explained by the lack of historical research on other continents and skepticisms about the validity of Asian history. The surging Eurocentrism and white supremacy of the 1700s made it difficult for many European and American timeline makers to capture the essential historical figures, events, and stories from Africa, Asia, Oceania, and Americas which could be dated back to thousands of years ago.
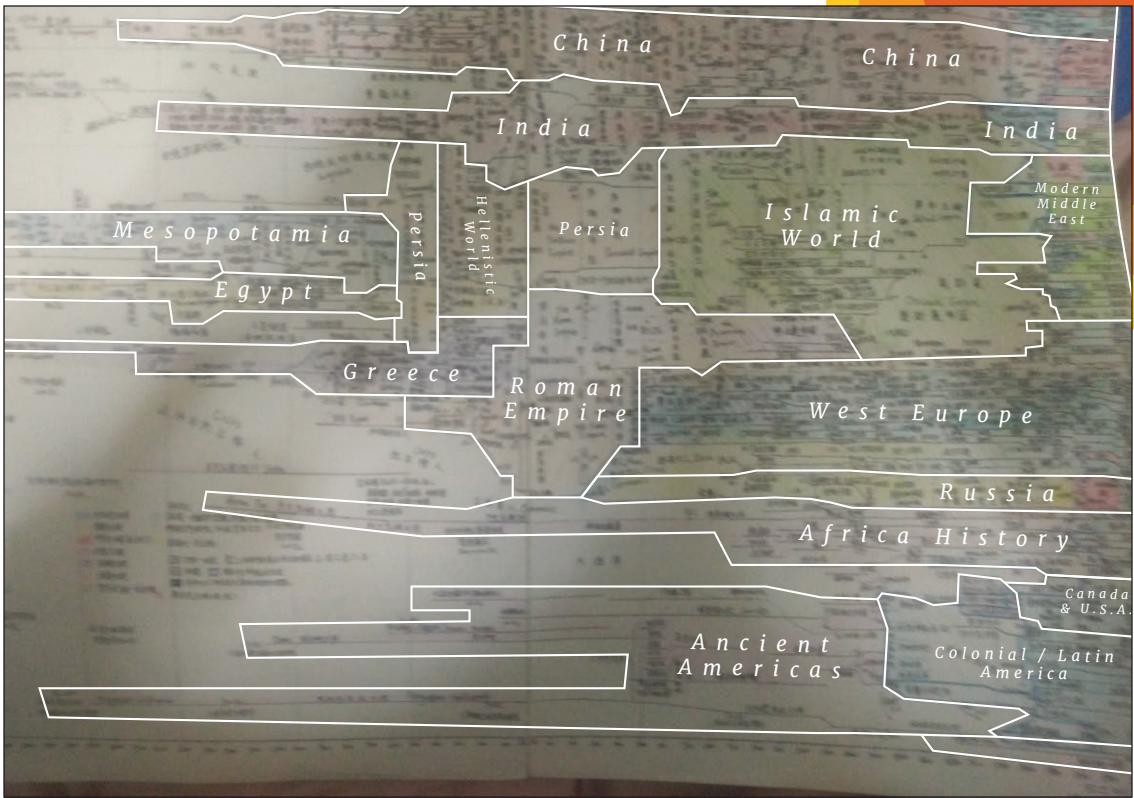
My personal experiences also linked to historical timeline making, which could be traced back to my grandpa's work in dictionary editing. Because of his work in timeline editing in Chinese dictionaries, I started making historical timelines since 2009. My first historical timeline features successions of Chinese emperors, featuring the minority regimes and figures around the China proper. Gradually, my scope extended and began to examine the regimes and people around the World. In 2016, my hand-drawing work, *World History Chart* features hundreds of regimes during human history. However, even though I had not seen Priestley's work during that time, Priestley's basic structure, which influenced the field of timeline creation, impacted my chart indirectly.
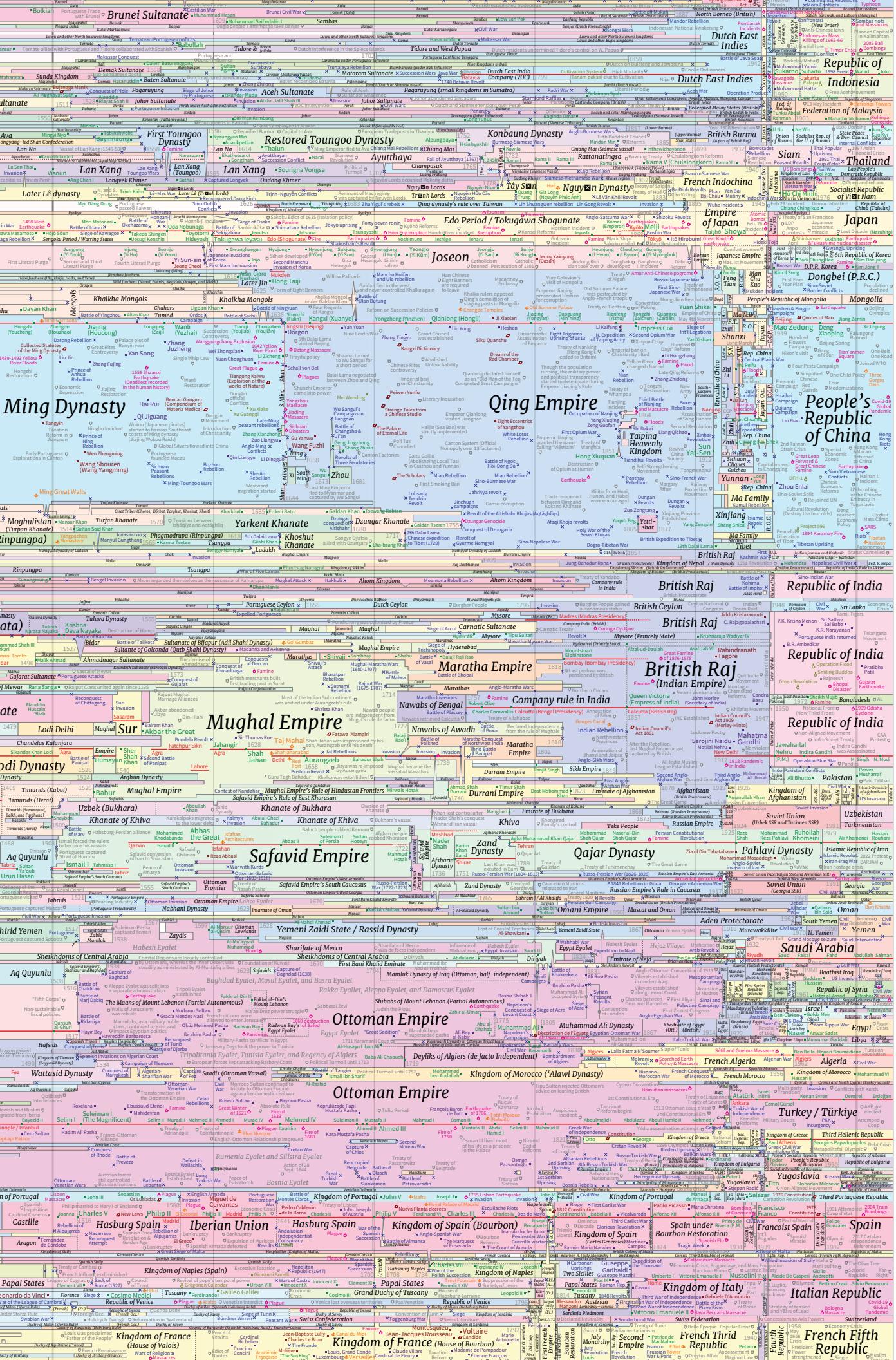
Like many other timelines, Europe composed a large amount of space in my chart. In the following years, with the development of anti-colonial thinking during my undergraduate studies, I am attempting to overcome these biases to create a similar but more balanced representation of the world. I started to digitize the world historical timeline in Spring 2022 by using Adobe Illustrator but struggled with the overwhelming task of graphical editing. However, after I entered the UO, I connected and benefited from the methodologies developed by a collaboration of the InfoGraphics Lab with Daniel Rosenberg's forthcoming project *Chronographics: The Time Charts of Joseph Priestley*. The methodology provided a different but much more concrete framework for me to collect and compile a massive amount of data in a short time.

Proportion of Each Continents that were shown in different Timelines
In a sequence of Asia, Europe, Africa, Americas, and Oceania

Priestley, 1769
Finley, 1831
Wagner, 1839
Willard, 1846
Adams, 1881
Pick, 1858
Sparks, 1931
Oxford, 2011
Baker, 2020
Sui, 2022

Area
Population

Left: Continents shown by graphical area in selected historical timelines since Priestley's in relation to land area and population.

Opposite: Sketches of Zhaoxu Sui's World History timeline production from his 2016 draft (top) to a close-up of his 2017 draft (bottom).

China China

India India

Modern Middle East

Mesopotamia Persia Hellenistic World Persia Islamic World

Egypt

Greece Roman Empire West Europe

Russia

Africa History

Canada & U.S.A.

Ancient Americas Colonial / Latin America

---

ern India Chola Southern India Countries 南门戈 Foundation of NCP

Rajput Era Delhi Sultanate Babur Akbar Aurangzeb East India Company (Brit.) Indian Rebellion of 1857 British Raj
oms) Aybak Taj Mahal

Ghaznavid Dynasty Mughal Empire Maratha Confederacy Sikhs Durrani Empire Afghanistan
Small States Ismail I Safavid Dynasty Afsharids Qajar Dynasty (half colonized)
Seljuks Ilkhanate Timur

Najd / Hejaz / Yemen Najd / Hejaz / Yemen / Oman

Empire Safavids

Crusades Saladin Mamluk Sultanate Ottoman Empire French Invasion (Napoleon) Muhammad Ali Construction of Suez Canal Balfour Declaration
Tulunids Fatimids Ayyubids

N. African Dynasties Morocco Colonizatic

yzantine Empire Byzantines Suleiman I Ottoman Empire Treaty of Lausa
(E. Roman Empire) Fall of Byzantine Kemal Atat
Crusades Mehmed II Greco-Turkish War
Basil I E- W Schism Battle of Navarino Independence
Kingdom Russo-Turkish War Russo-Turkish War Balkan Wars

Magyaroks Hungary Kingdom Battle of Vienna (House of Habsburg) Austrian Empire Austria-Hungary
Great Moravia Rudolf I (House of Habsburg) Franz Joseph I Congress of Vienna
Otto I Kingdom of Bohemia Battle of White Mts. Holy Roman Empire Karl Marx Germany
Frederick I Interregnum Hanseatic League Martin Luther Prussia Bismarck Second Empire
Concordat of Worms Thirty Years War Peace of Westphalia Anglo-Dutch Wars Kingdom of Netherlands
magne Founding of Dutch E. India Company Franco-Dutch War (Austria) Leopold II
om Holy Roman Empire Waterloo
Hohenstaufen Reformation John Calvin French Revolution Battles of Verdun, Marn
Capetian Philip IV Black Death Edict of Nantes Napoleon Bonaparte July Revolution Second Empire Franco-Prussian War Third Repub
Valois House Huguenots Bourbon Louis XIV
Invasion Hundred Years' War Joan of Arc 7 Years War
oms William I Plantagenet Elizabeth I Issac Newton James Watt Industrial Revolution Charles Darwin Queen Victoria British
Alfred Magna Carta England Shakespeare Cromwell House of Hanover Empire
Wales Conquest Henry VIII Scotland Civil War Glorious Revolution South Sea Bubble Reform Act 1832 Chartism
Isabella Ireland Ireland

Ming Dynasty

Qing Empire

People's Republic of China

Mughal Empire

Maratha Empire

British Raj (Indian Empire)

Republic of India

Safavid Empire

Qajar Dynasty

Pahlavi Dynasty

Soviet Union

Ottoman Empire

Turkey / Türkiye

Kingdom of Spain (Bourbon)

Spain

Kingdom of France (House of Bourbon)

French Fifth Republic

Japan

Empire of Japan

Joseon

Siam

Thailand

French Indochina

Socialist Republic of Việt Nam

Dutch East Indies

Republic of Indonesia

Federation of Malaysia

Brunei Sultanate

Saudi Arabia

Yemen

Oman

Egypt

Algeria

Kingdom of Morocco ('Alawi Dynasty)

Italian Republic

Kingdom of Italy

Papal States

Iberian Union

Hasburg Spain

Khalkha Mongols

Mongolia

People's Republic of Mongolia

Dongbei (P.R.C.)

D.P.R. Korea

R.O.C.

Lan Xang

First Toungoo Dynasty

Restored Toungoo Dynasty

Konbaung Dynasty

British Burma

Ayutthaya

Rattanatinga

Durrani Empire

Afghanistan

Kingdom of Afghanistan

Uzbekistan

Turkmenistan

Khanate of Bukhara

Khanate of Khiva

Khiva

Russian Empire

Omani Empire

Muscat and Oman

Yemeni Zaidi State / Rassid Dynasty

Aden Protectorate

Sheikhdoms of Central Arabia

Lodi Delhi

Sur

Mughal Empire

Company rule in India

Pakistan

Bangladesh

Sri Lanka

British Ceylon

Dutch Ceylon

Portuguese Ceylon

Mysore

Carnatic Sultanate

Ahmadnagar Sultanate

Sultanate of Golconda (Qutb Shahi Dynasty)

Sultanate of Bijapur (Adil Shahi Dynasty)

Marathas

Nawabs of Bengal

Nawabs of Awadh

Yarkent Khanate

Dzungar Khanate

Khoshut Khanate

Moghulistan (Turpan Khanate)

Turfan Khanate

Xinjiang

Tibet

British Raj

Kingdom of Nepal

Ahom Kingdom

Zand Dynasty

Afsharid Iran

Aq Quyunlu

Ottoman Empire

Kingdom of Portugal

Kingdom of Naples (Spain)

Two Sicilies

Republic of Venice

Grand Duchy of Tuscany

Tidore and West Papua

Aceh Sultanate

Johor Sultanate

Demak Sultanate

Mataram Sultanate

Mughal Empire

Edo Period / Tokugawa Shogunate

Taiping Heavenly Kingdom

Ma Family

Ma Family

Republic of Syria

Israel

Libya

Tunisia

French Algeria

Kingdom of Greece

Third Hellenic Republic

Yugoslavia

Kingdom of Bulgaria

People's Republic of Bulgaria

Republic of Bulgaria

Switzerland

Third Portuguese Republic

Francoist Spain

French Third Republic

Second Empire

Duchy of Savoy

By gathering information from various online and global resources, I have encoded the marginalized history in countries like Senegal, Tonga, Sri Lanka, and Bolivia. It is impossible to include everything, but these events, people, and stories enrich the historical timeline and create more information density in underrepresented areas. By inserting my data as input into the *Chronographics* methodology, it is easier and convenient to create a more inclusive Priestley-style chart of history. I hope through this effort, I can disseminate marginalized history better than most other historical timeline on the global market.

While the final design of my own chart is incomplete, by analyzing the patterns of information density across several world historical timelines published in Europe and North America, we can reflect on the continental balance in different charts. As the figure shows, Europe is the primary continent emphasized in most timelines that I have researched, a pattern that shows a clear imbalance compared to the land area and population. In the sampled timelines made during the 19th century, Europe comprised nearly 50-90% of the whole chart. This situation has gradually changed since the 20th century, along with the developments in the field of World History and post-colonial thinking.

The quantitative revolution and the development of internet knowledge bases has amplified Western historians' efforts in discovering and recovering the underrepresented history of Asia, Africa, the Americas, and Oceania. These tools make it possible to research and document the lesser-known marginalized history, so children, students, educators, and researchers can more easily gather and publish this information.

Opposite: Current progress on Zhaoxu Sui's Timeline, visualized using the *Chronographics* methodology (2023, forthcoming).

Because I only gathered information on the world historical timelines made by European and North American creators, there might be a sampling bias on either exaggerating or understating the issue of Eurocentrism, and it is also important for us to take a look at the world historical timelines that were published in other regions of the World, so we can utilize the cross-cultural perspective to make a more comprehensive and concrete conclusion.

I hope to complete my chart of world history in the coming year as a large format (59.5 X 121) By using the *Chronographics* methodology developed by the collaboration between the Daniel Rosenberg and the InfoGraphics Lab, I am looking forward to completing the challenge of representing so much information in a single chart and hope to provide a more balanced visualization of human history that draws on modern knowledge bases. ∎

"This piece directs critical attention to the lack of diversity in historical representations. The continental graphic showing the distribution of diversity across various Timelines (including the author's) is easy to follow, relevant to the argument, and displays a strong visualization of how heavy European influence is in retelling history." - PC

Rediscovering History
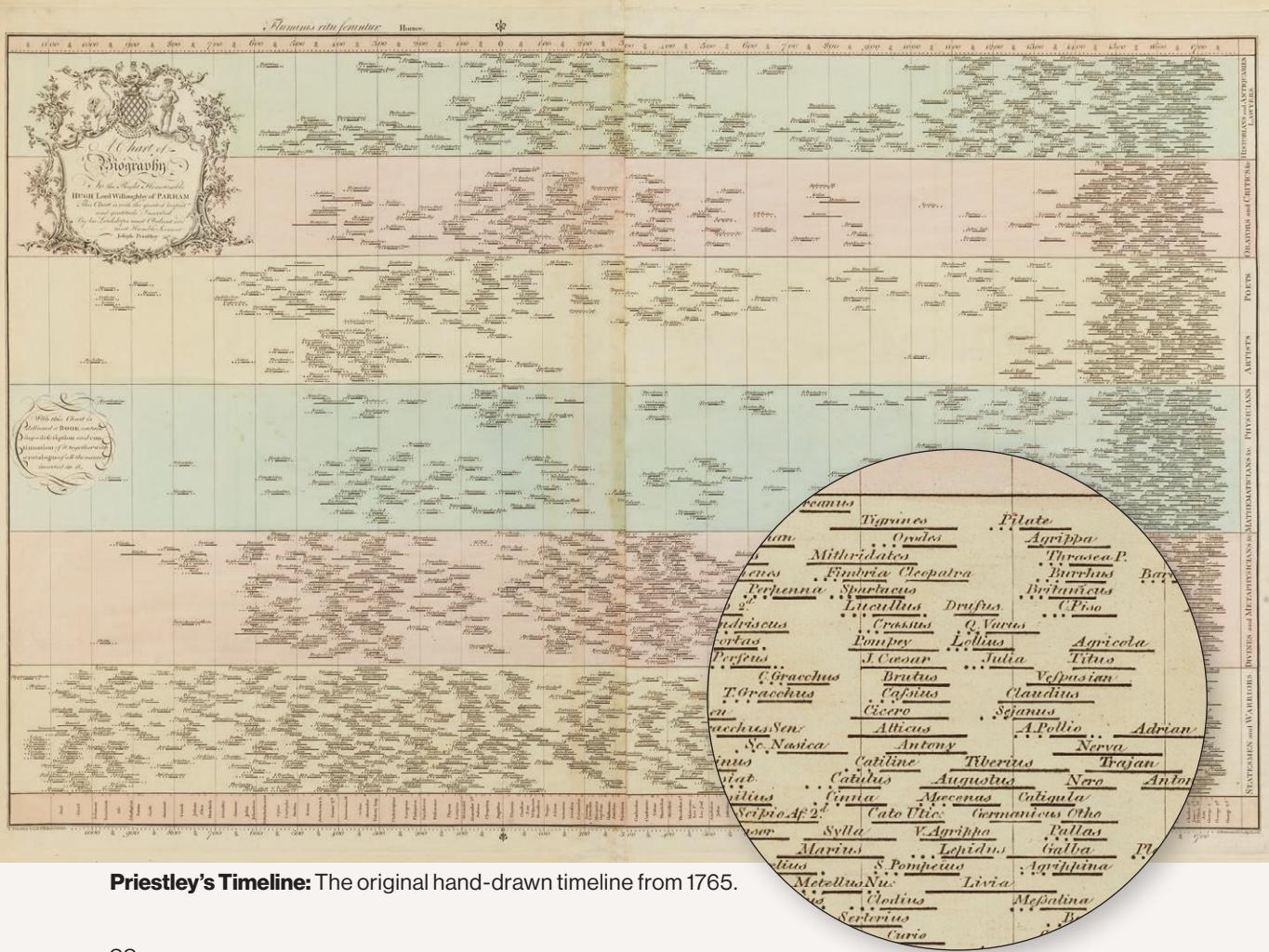
by Maxim Johnson • *Peer-reviewed by Peyton Carl and Eden McCall*

The shifting sands of time have buried many great civilizations, peoples, and more, leaving them to be rediscovered later or forever buried. What remains in written history obscures the civilizations and people who are filtered, lost, or obscured. History has indeed been defined by who writes it—by those in control and those with access to the technology to do so. We must then all feel a sense of duty to bring to bear the technological resources of today to try to recover what has been lost.

Through a collaboration with Daniel Rosenberg (History), we are exploring how early data visualizations influence how we draw timelines today. One such chart—compiled in 1765 by English Renaissance man Joseph Priestley and entitled *A Chart of Biography*—displays nearly

2,500 historical figures. As many of these figures are uncommonly known to modern readers, we research each and identify them in Wikipedia sources and three biographical texts written by John Watkins, John Aikin, and George Crabb.
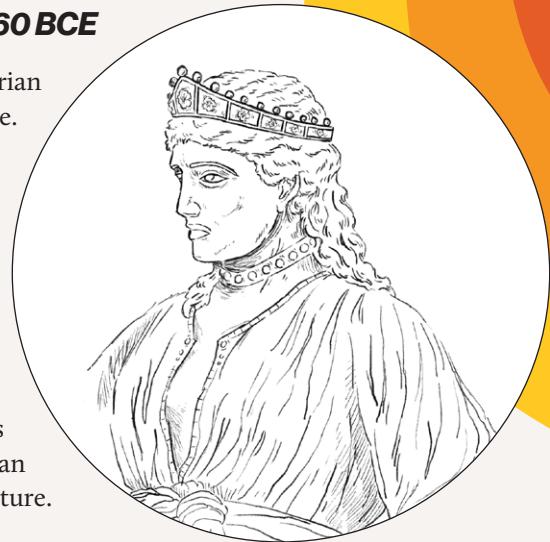
Throughout this process, multiple time periods and figures stood out to me as underrepresented despite being considered significant in their times. Among the 2,500, I chose these figures below as each offers unique facets of history that I feel is lost for the average person. I wrote an excerpt on each figure using our sources, while illustrating how they potentially could have looked in order to allow people to better learn about each individual. Each period and person offers a unique and valuable story which provides context to the world we live in today.


Priestley's Timeline: The original hand-drawn timeline from 1765.

Queen Semiramis, *fl. 760 BCE*

Semiramis was a powerful queen of the Neo-Assyrian empire, one of the most powerful states of its time. There are aspects of her rule which have been mythicized, though she did exist. Semiramis assumed the throne after the death of her husband, Ninus, as her son Ninias was still too young for the throne. It is said she built the famous city of Babylon while also distinguishing herself as a warrior. Semiramis was one of the most powerful figures of her time and has been immortalized in literature for her military prowess and her contributions to the foundations of Assyrian and Babylonian culture.

Zaleucus of Magna Graecia, *fl. 7th Century BCE*

Zaleucus was a legislator for the Locrians, a people of Southern Italy or Magna Graecia. He was known for creating the Locrian code, thought to be Europe's oldest code of law. His laws included rules about undiluted wine, adultery, and expectations of people according to class and occupation. One of his most notable laws stated that every adulterer should lose his eyes. When his own son was convicted of adultery himself, Zaleucus, to justify the law and save his own son, had one eye taken out along with his son.

Aeschylus of Eleusis, c. 525–c. 456 BCE

Aeschylus was known as the father of tragedy. He wrote numerous plays, only seven of which survived to the modern day. Aeschylus is a particularly noteworthy figure due to the nature of his death. It is said that he died of a fracture in his skull, caused by an eagle dropping a tortoise from a great height onto his head. He serves as a reminder to the tragic yet comedic nature of history on certain occasions.

Brennus of the Senones, *fl. 4th Century BCE*

Brennus was the leader of the Senones, a Celtic tribe found in Gaul or modern-day France. He ravaged Lombardy and Tuscany before marching on and pillaging Rome for several months. It would be another 800 years before Rome was sacked again. Brennus was offered a thousand pounds of gold in order to leave the city and the Roman territories, but played a trick on the Romans when he used his heavier sword and helmet as the standard on the scale, causing his demands to be much greater than previously thought. Brennus declared 'Woe to the vanquished!' after their protests which eventually caused Camillus to give battle to the Gallic barbarians.

Irene of Athens, *c. 750–803 CE*

Irene led the Byzantine empire after the death of her husband Leo IV. Her son was too young to run the state at the time of her husband's death, so Irene acted as emperor in conjunction with the young Constantine VI. Irene displayed great talents as a ruler of the empire, despite the insecure position she was in, and ruled until her eventual exile and death in 803 on the island of Lesbos. The reason for this was her aggressive conduct as regent, even going as far as blinding her son to secure the throne.

Hypatia of Alexandria, *c. 350–415 CE*

Hypatia was a Neoplatonist philosopher, astronomer, and mathematician during the 4th and 5th century in Alexandria, the then Roman province of Egypt. She is the only woman who was recognized as the world's leading mathematician and astronomer during her time. She is one of the earliest mathematicians whose life and work exists with detailed knowledge. Considered a genius due to her prowess in multiple subjects, Hypatia would create and edit works such as Ptolemy's *Almagest*, and a commentary on Diophantus' *Arithmetica*.
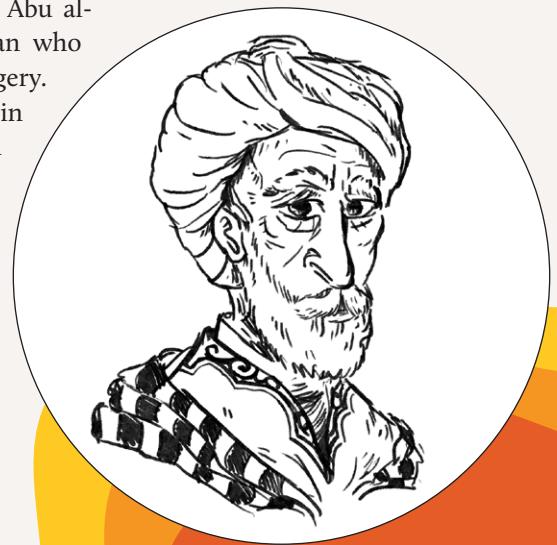
Hipparchia of Maroneia, *c. 350–280 BCE*

Hipparchia was born in Maroneia, Thrace, located in modern-day Greece. She moved to Athens with her family where she met her husband, Crates the Stoic of Thebes. Along with Crates, Hipparchia would practice Cynicism, a school of thought which would reject many norms and conventions of the time, instead valuing gaining happiness through nature. Cynics often denounced conventional desires of wealth, fame, and worldly possessions, choosing to wander the streets begging and preaching. Little survives of her philosophical perspectives, except her rejection of conventional Greek standards and her embracement of cynicism through her husband's poor lifestyle. Hipparchia would choose to live on the streets with Crates, wearing male clothing and living on equal terms with her husband. It is said that when she wrote to Theodorus the Atheist and he questioned why she did not sit behind a loom, that she replied, 'do I appear to you to have come to a wrong decision, if I devote that time to philosophy, which I otherwise should have spent at the loom?'

Abu al-Qasim al-Zahrawi al-Ansari of Andalusia, *936–1013 CE*

Latinised as Albucasis, and known as Al-Zahrawi, Abu al-Qasim al-Zahrawi al-Ansari was an Arab physician who Priestley described as the father of modern surgery. Al-Zahrawi lived during the Islamic Golden Age in the 11th century. The Islamic Golden Age occurred from the 8th to the 14th centuries, and was a period of time in which great advancements were made in medicine, astronomy, mathematics and more. Al-Zahrawi would contribute greatly to this age, making advancements in surgical tools, techniques, as well as within the fields of medicine, nutrition, dentistry, childbirth, and more. Al-Zahrawi's works, such as the Kitab al-Tasrif had an enormous impact on surgical practices within the classical world, covering many of the topics mentioned before. Al-Zahrawi's medical genius is seenIn one example, where he saved an enslaved girl from a slit throat after she attempted suicide, proving that certain neck surgeries were possible.

# Learning From Data: Visualizing Incarcerated Firefighting
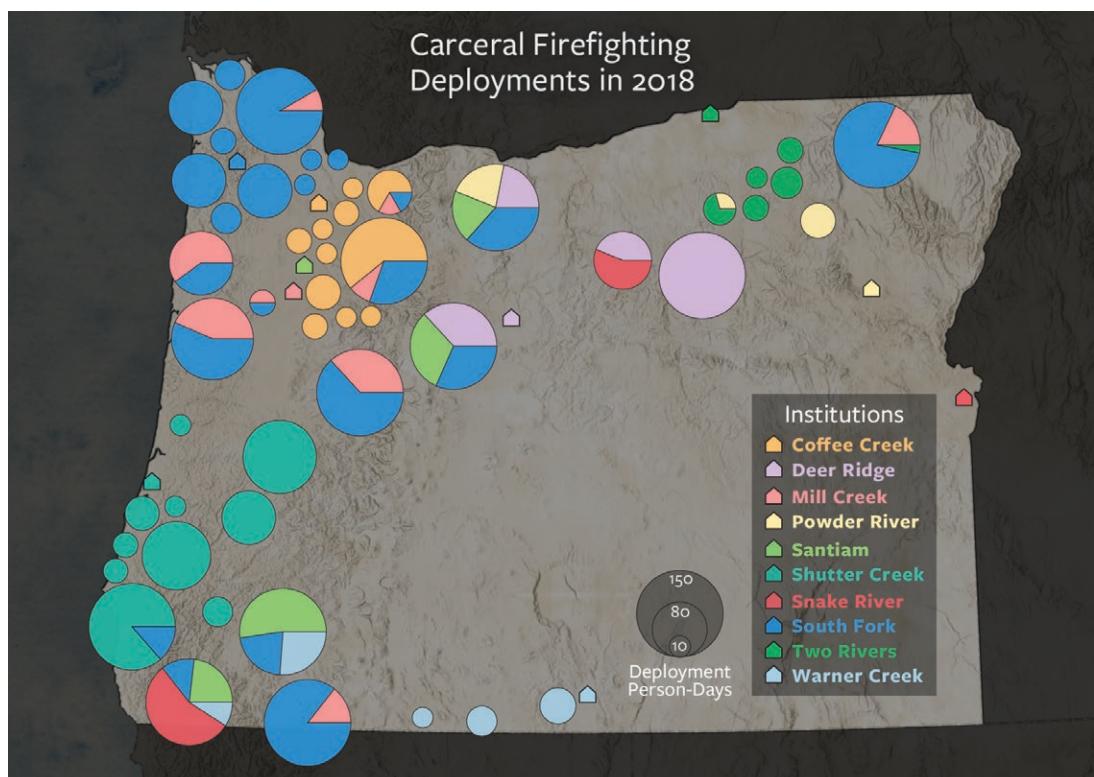
by Eden McCall and McClean Gonzalez • Peer-reviewed by Lucy Roberts and Dylan Blisard

Many Oregonians recognize the smoky skies of fire season signal the seasonal deployment of skilled firefighters, people who work long hours and in extreme conditions to control and extinguish wildfires. Most people will not be aware that among these are hundreds of incarcerated prisoners from across the state who are sent to work directly on the fire lines or in camp support. To make this group of essential workers more visible and stimulate conversations about larger issues of incarceration and labor, UO Geography Professor Leigh Johnson and Geography PhD student Troy Brundidge are collaborating with the InfoGraphics Lab to analyze where, when, and how many incarcerated firefighters work on fires in Oregon. This article describes the data challenges and visualizations produced in that collaboration.

Because there was little prior research on incarcerated firefighting in Oregon, Johnson and

Brundidge first sought to take an exploratory approach. They reached out to the Oregon Department of Corrections (DOC), the agency that manages the state's 10 institutions with firefighting programs, to request information about the 2015–2021 fire seasons. While the ask seemed simple at first (the DOC does report yearly firefighting costs), Johnson and Brundidge quickly learned that there was little structured data on exactly when and where incarcerated fire crews worked.
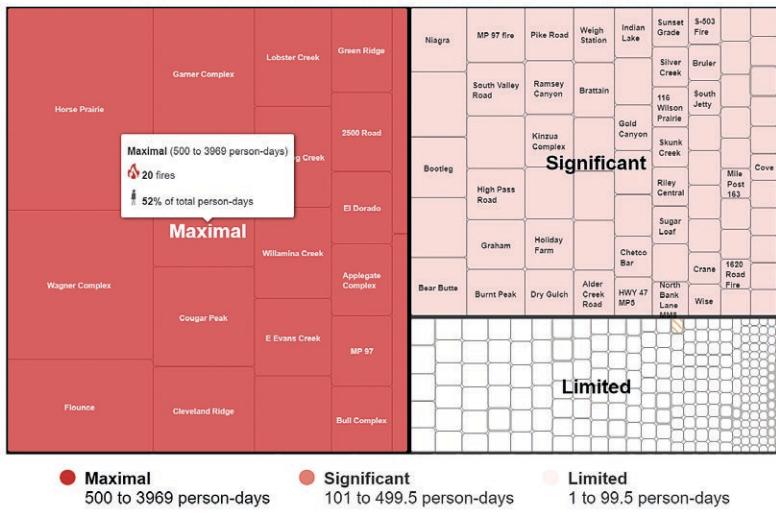
After a public records request process and follow-up exchanges, DOC staff ultimately provided detailed yet informal internal records to our team. Aside from the work to digitize and geolocate this data, these records were not immediately useful for analysis or visualization. Reviewing the records they received, they noticed gaps in the data - end dates for some crew deployments were absent, crew types


Deployment Pie Map: This map shows the number of incarcerated firefighters fighting fires from each correctional facility by 'person-days.'

Person-Days Per Deployment

Each box represents one fire where Carceral Firefighters were deployed. The size of each box represents the number of "person-days" worked by Carceral Firefighters. Each bin, marked by color, further organizes the deployments.

Maximal (500 to 3969 person-days)
🔥 20 fires
🌡 52% of total person-days

Maximal
Gamer Complex, Lobster Creek, Green Ridge, Horse Prairie, 2500 Road, El Dorado, Willamina Creek, Applegate Complex, Wagner Complex, Cougar Peak, E Evans Creek, MP 97, Flounce, Cleveland Ridge, Bull Complex

Significant
Niagra, MP 97 fire, Pike Road, Weigh Station, Indian Lake, Sunset Grade, S-503 Fire, South Valley Road, Ramsey Canyon, Brattain, Silver Creek, Bruler, 116 Wilson Prairie, South Jetty, Kinzua Complex, Gold Canyon, Skunk Creek, Bootleg, High Pass Road, Riley Central, Mile Post 163, Cove, Graham, Holiday Farm, Sugar Loaf, Chetco Bar, Crane, 1620 Road Fire, Bear Butte, Burnt Peak, Dry Gulch, Alder Creek Road, HWY 47 MP5, North Bank Lane MM8, Wise

Limited

Legend
● **Maximal** 500 to 3969 person-days
● **Significant** 101 to 499.5 person-days
○ **Limited** 1 to 99.5 person-days

Interactive Treemap: This visualization shows the variation of person-days worked for each deployment across the five years. It visually contrasts how large a proportion of the total labor was used for a few fires that took a "maximal" amount of labor compared to the large number of deployments that used fewer or "limited" labor per fire. Visible on the *Atlas of Essential Work* website.

weren't specified, and some crew member changes weren't clearly denoted. In addition, the records were inconsistently formatted - institutions, even within years, had fields in different places and with different naming conventions. The same fires were sometimes referenced by different names, which made it hard to identify when multiple institutions deployed to the same fire. Further, fire locations weren't always recorded, as they weren't necessary for the state's bookkeeping. Thus, fire names would have to be matched with their locations from other sources. And, most jarringly, summing "person days" in the annual records frequently totaled fewer than the total the DOC had previously reported, sometimes off by up to 25% - where were these missing days?

This inconsistent formatting, missing information and difficult geolocating shrouded the difficult work of the prisoners in these records. The datasets initially could not be summed, let alone graphed or mapped. To make the data usable, Johnson gathered supporting documentation from the DOC,

including selected data from invoices for complex fires, that could rectify some of the uncertainties. Through dozens of hours spent investigating unclear entries, analyzing records, and correcting data values row-by-row, we developed a comprehensive dataset with information on person--days by fire and by institution. In total, across the six years, incarcerated individuals spent approximately 46,000 person-days working on 324 fires.

To uncover spatial and temporal patterns from these data, we created **three types of visualizations** that reveal details of incarcerated firefighting.
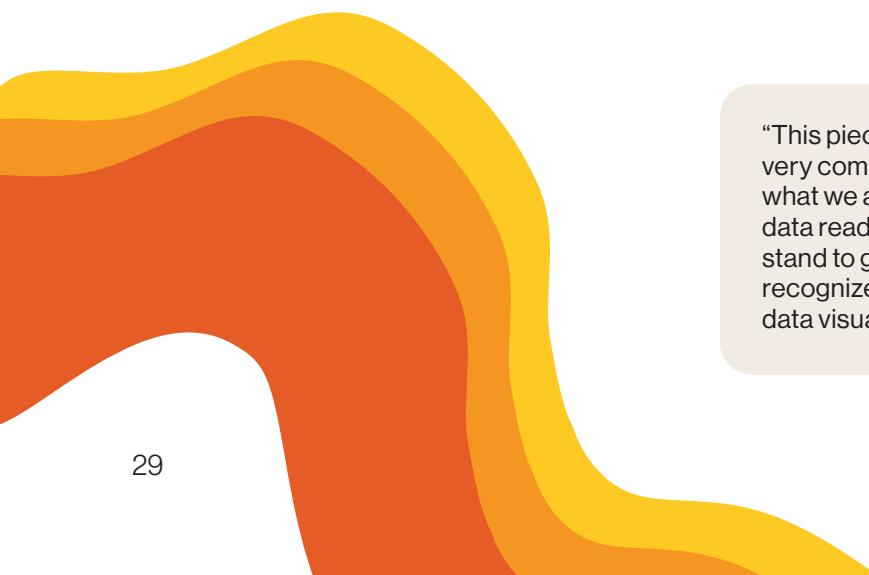
1. The first "pie map" visualization is a series of maps that show where and for how long each institution sent incarcerated people to fight fires across the state for each year from 2015 to 2021. These maps transform coordinates and person-day sums into real places and magnitudes of work to highlight differences across years and institutions in where and how much incarcerated labor is deployed.

2. The interactive treemap includes all years' deployments to fires with scaled boxes showing the number of person-days worked by fire. The majority of deployments add up to fewer than 100 person-days (i.e. one 10-person crew for 10 days), showing that incarcerated fire crews are working on many smaller, lesser-known fires, further decreasing the visibility of their labor.

3. The third visualization is a series of four timelines of significant fires that break down deployments by calendar day. The timelines display how many crews worked, from which institution, and what type of work they performed. These visualizations seek to provide granularity and specificity about what work on actual deployments is like, allowing readers to imagine crews working several days together in fire suppression and camp support.

Through these visualizations, Johnson and Brundidge are now revisiting their initial questions with new data-driven insights into how incarcerated firefighting has differed across years and by institution.

In addition to helping answer preliminary questions and generate new ones, the progression from data to the visual space has prompted us to reflect on what facets of incarcerated firefighting remain less visible. For example, while the visualizations show for the first time where incarcerated firefighters worked, they also privilege a standardized institutional metric of "person-days" that intentionally homogenizes variations in the individual experience. Further research could also provide valuable context comparing how the experience differs compared to non-incarcerated public and private fire crews.

Moving forward, we are excited by the possibility of rethinking the institutional narrative and bringing attention to the lived experience of incarcerated firefighters. Using the reorganized dataset alongside other qualitative sources, we are inspired to pursue questions including: Where and when did an individual work during a fire season? What did their time off look like? What type of work did they do? How were they compensated for their labor? How was their experience different from non-incarcerated crews? How is this work impacting them, and how will it impact their future?

View the interactive visualizations and learn about incarcerated firefighting on the Just Futures Atlas of Essential Work site (essentialwork.uoregon.edu). ∎

"This piece is beautifully written and very compelling. It really highlights what we are missing by not having this data readily available and what we stand to gain by putting in the effort to recognize those contributions through data visualization." - LR
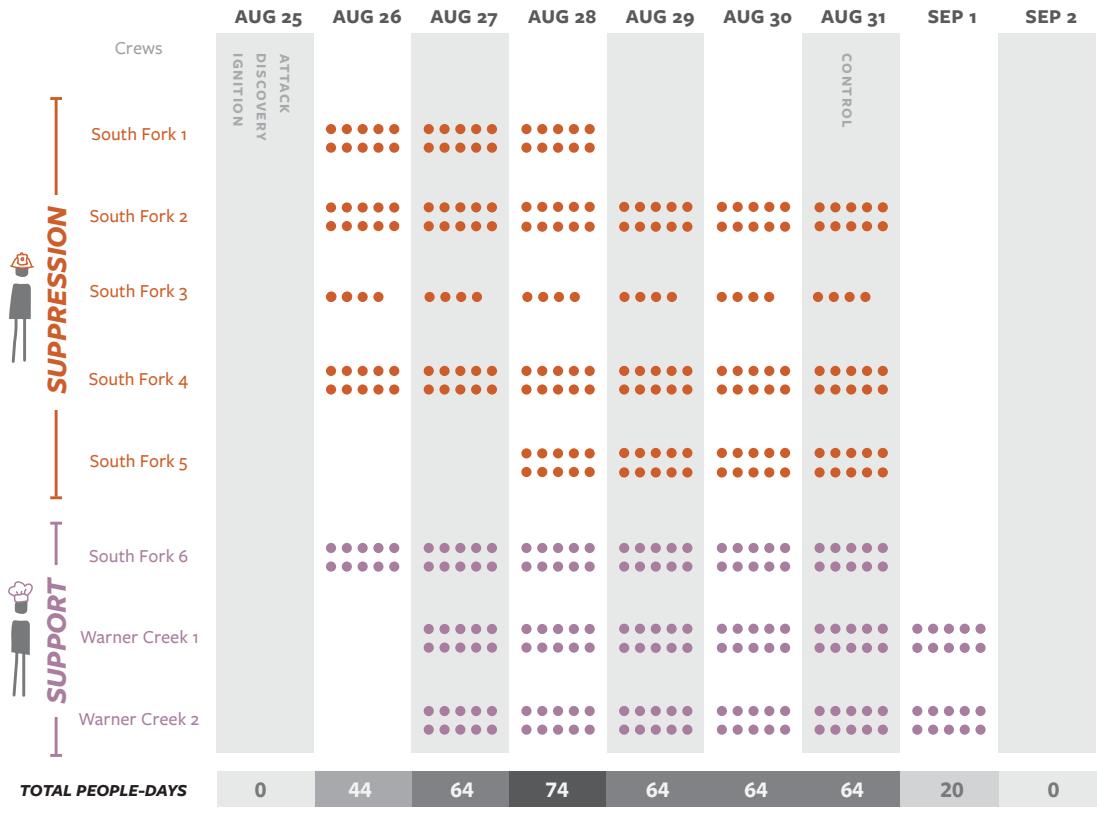
HIGH PASS ROAD FIRE

394 people-days

● 1 circle = 1 person-day

Fire length: **7 days**
People present: **7 days**

SOUTH FORK FOREST CAMP

High Pass Road Fire

WARNER CREEK

Crews	AUG 25	AUG 26	AUG 27	AUG 28	AUG 29	AUG 30	AUG 31	SEP 1	SEP 2
	IGNITION / DISCOVERY / ATTACK						CONTROL		

SUPPRESSION

South Fork 1, South Fork 2, South Fork 3, South Fork 4, South Fork 5

SUPPORT

South Fork 6, Warner Creek 1, Warner Creek 2

| TOTAL PEOPLE-DAYS | 0 | 44 | 64 | 74 | 64 | 64 | 64 | 20 | 0 |

Timeline of the High Pass Fire: This visualization reveals temporal granularity and calls attention to individual crew and different labor roles. Each dot represents a person-day, the accounting unit used instead of hours by the Oregon Department of Corrections. A person-day is one calendar day worked by an AIC. The term AIC or Adult in Custody is used by the Oregon Department of Corrections to describe people who are incarcerated or detained in a correctional facility.

USGS Project Management

by Peyton Carl • Peer-reviewed by McClean Gonzalez and Maxim Johnson
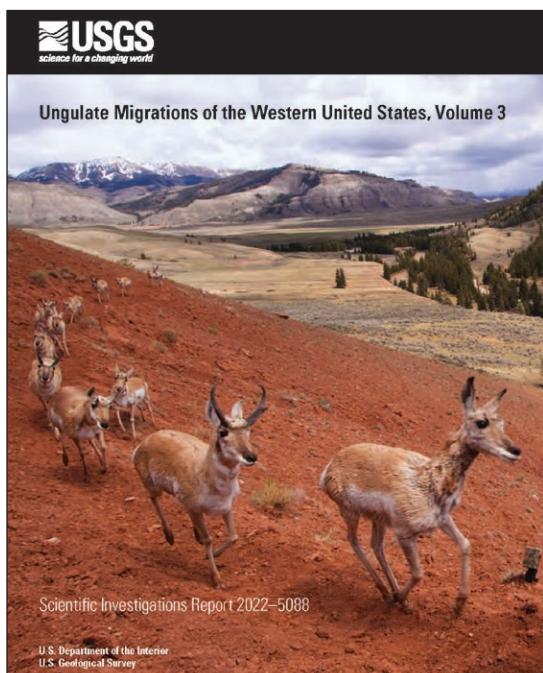
Mapping ungulate migrations for the USGS Report series *Ungulate Migrations of the Western United States* was the first project I contributed to upon joining the InfoGraphics Lab in January of 2022. Through this project, I developed a stronger understanding of cartographic production and project workflow using multiple mapping and design software. Beginning in January 2023, I was provided the opportunity to become the student project manager to oversee our internal product development for the USGS migration maps. Prior to my experience in the Lab, I had never practiced project management, let alone be directly involved with the creation of an important scientific investigations report. Ultimately, this mapping effort has provided me the opportunity to practice and apply skills of professional leadership and communication between peers, faculty, and interagency connections.

The USGS Report is a series (working on volume 4 as of this writing) that focuses on documenting ungulate migration across the

western United States through maps. The maps portray the migratory movements and ranges of ungulate species (mule deer, elk, pronghorn, moose, bighorn sheep, and bison) gained using GPS collars. Because these migrations cover long distances, they are threatened by roads, fences, and other forms of human development. The maps and report provide much-needed information to help land managers, conservationists, planners, and others make decisions using the best available data and science to maintain these big-game migrations.

The USGS Corridor Mapping Team (CMT) coordinates this effort, collaborating with scientists, researchers, wildlife managers and biologists including those from Federal, State, and Tribal agencies across the western United States. The CMT coordinates the data collection and processing from these groups in addition to managing the report text. The InfoGraphics Lab works in partnership with the CMT and is responsible for a good portion of the mapping after the data is processed. This includes creating first drafts for analyst approval, designing the maps first in ArcGIS Pro, then adding advanced symbology and labeling in Adobe Illustrator before the maps are sent off to the USGS cartography team to add their official styles and symbology. The cartographic process requires frequent communication between agencies, intense time management, and detail-oriented thematic map creation using multiple software platforms.

My role as student project manager was to work closely with the Lab's cartographic production manager, Alethea Steingisser, and fellow employees to communicate project status with the CMT as well as train and advise my peers in the Lab on project workflow. I replicated the CMT's production spreadsheet and optimized it for internal use. The production spreadsheet served as a fundamental element of organization and communication within the Lab. To manage communications for this project, I was responsible for providing status
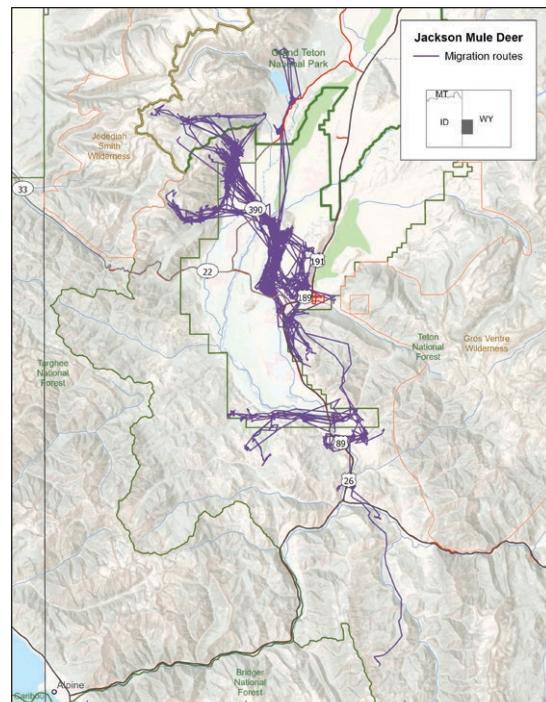

The End Product: *Ungulate Migrations of the Western United States, Volume 3,* published in 2022.

State	Species	Herd	Update for other reports	Data Status			
				Data analyst name (Analyst)	Analysis Stage (Analyst)	Data Ready for UO? (Analyst)	Map layers Reviewed (CMT)
Arizona	Elk	South of Interstate 40	No	Haley Nelson	Done	Yes	Yes: 13-Feb-2023
California	Mule Deer	Mendocino	No	Evan Greenspan	Done	Yes	Yes: 22-Nov-202
California	Pronghorn	Clear Lake	No	Evan Greenspan	Done	Yes	Yes: 22-Nov-202
California	Pronghorn	Lassen	No	Evan Greenspan	Done	Yes	Yes: 22-Nov-202
California	Pronghorn	Likely Tables	No	Evan Greenspan	Done	Yes	Yes: 22-Nov-202
California	Pronghorn	Mount Dome	No	Evan Greenspan	Done	Yes	Yes: 22-Nov-202
Colorado	Elk	East Gunnison Basin	No	Michelle Flenner	Corridors	Yes	Yes: 9-Feb-2023
Colorado	Mule Deer	Taylor Park	No	Michelle Cowardin	Corridors	Yes	Yes: 9-Feb-2023
Nevada	Mule Deer	Area 17-Toiyabe	No	Jenny McKee	Done	Yes	Yes: 10-Nov-202
Nevada	Mule Deer	Spring Mountains	No	Jenny McKee	Done	Yes	Yes: 10-Nov-202
New Mexico	Elk	Jemez	Yes	Craig Reddell	Done	Yes	Yes: 13-Feb-2023
New Mexico	Elk	Rio Chama	No	Craig Reddell	Done	Yes	Yes: 13-Feb-2023
New Mexico	Mule Deer	San Cristobal	No	Craig Reddell	Done	Yes	Yes: 13-Feb-2023
New Mexico	Mule Deer	Urraca	No	Craig Reddell	Done	Yes	Yes: 13-Feb-2023
New Mexico - Tesuque Pueblo	Elk	Tesuque Pueblo	No	Hall Sawyer	Done	Yes	Yes: 31-Jan-2023
New Mexico - Tesuque Pueblo	Mule Deer	Tesuque Pueblo	No	Hall Sawyer	Done	Yes	Yes: 31-Jan-2023

Tracking Herds: The CMT production status spreadsheet. This Google Sheet is shared between all agencies where progress of text production and map creation is tracked using clearly labeled columns with dates or other specified indicators to maintain timeliness and establish clear communication.

updates to members of CMT during the map production stages. I attended meetings with members of USGS and the CMT to discuss adjustments and improvements, diligently kept track of each step in the InfoGraphics Lab's progress for the mapping efforts, and standardized the workflow within the Lab. For my first assignment as student project manager, I documented the workflow and created a step-by-step tutorial explaining the process of bringing in the processed data, symbolizing it and explaining what to consider when choosing an appropriate map extent. The workflow document explains how to export maps from ArcGIS Pro to AIX (Adobe Illustrator Exchange), which allows us to proceed with our cartographic work in Adobe Illustrator. It continues with direction on how to symbolize and label the map using USGS standardized symbology, and how to export the final product for agency review. Clear documentation of a project of this caliber helps current and future students understand the process of creating maps for this effort and teaches technical skills in ArcGIS Pro and Adobe Illustrator. Through this project, students have the chance to gain familiarity with cartography tools like Esri's ArcGIS Maps for Creative Cloud extension, learn about creating maps for

printed publications, and how to use Adobe Illustrator to learn and practice cartography skills including label placement and applying appearances to thematic map-making.

Jackson Mule Deer: A map of mule deer migration made for Volume 3 of *Ungulate Migrations*.

Adobe Illustrator allows us to quickly apply graphic styles and fonts to maps to visually transform products for readability and aesthetics. Cartographic elements like label placement, alignment, and color are integral in this process. Having a formal guide with detailed instructions of tools and steps required to create these maps establishes a standardized process that anyone can follow.

I am grateful to have been provided with this responsibility; Through this role, I was responsible for establishing a strong personal understanding of the project, transforming the InfoGraphics Labs' internal workflow into a standardized, organized system, and developing professional-level leadership and collaboration skills. I've strengthened my confidence with project management, interagency communication, and cartographic design and honed these skills for my future professional endeavors. ■

(Opposite) USGS Workflow: The workflow for the USGS scientific report on ungulate migration has various steps of production. Establishing a formal workflow for map production allows for organized culmination of professional and aesthetic maps.

(1) Spreadsheet image: The bare bones of good project management is proper organization. This spreadsheet tracks the stages of map production.

(2) Production-stage image (AIX file): For this workflow, the map's vector features are designed in Adobe Illustrator and the raster basemap is added.

(3) Final map: Once the map is complete, the finished file is sent to state analysts and USGS cartographers for approval before it is deemed ready for publication.
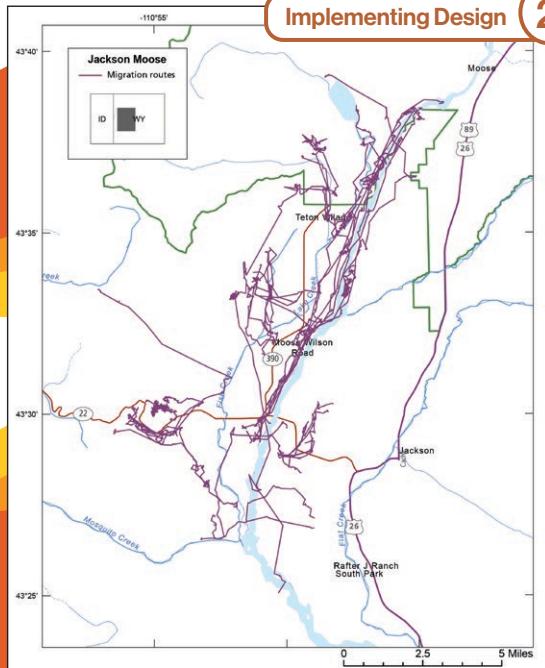
"This piece effectively explains the role of the student project manager position, and the experience of working in the position. It allows for readers to gain a better grasp on the lab as a whole, and how it offers an environment of growth while showcasing the author's extensive knowledge and capabilities." - MG

① **Production Spreadsheet**
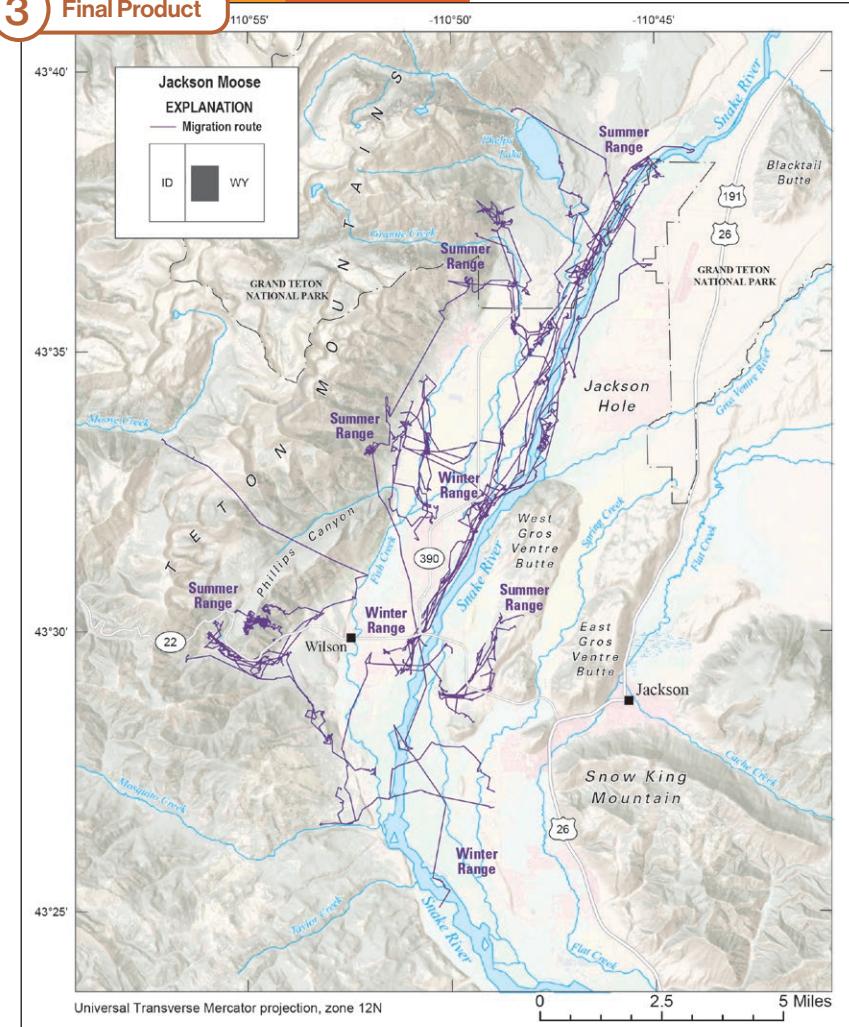
		exported and ...dy for labeling [DATE]	AIX symbo... [NAME]
Elk	South I-40	[DATE]	
Pronghorn	18A	[DATE]	
Mule Deer	Mendocino	12/9/2022	A...
Pronghorn	Likely Tables	1/25/2023	Dylan -
Pronghorn	Lassen	1/10/2023	
Pronghorn	Clear Lake	[DATE]	
Pronghorn	Mount Dome	1/25/2023	Zhaoxu -Re...
Moose	Sand Creek migration	[DATE]	
Mule Deer	Lava Ridge migration	[DATE]	
Mule Deer	Seasonal Ranges (1-12 composite, not lik...	[DATE]	
Pronghorn	Antelope Flats migration	[DATE]	
Mule Deer	Spring Mountain	[DATE]	
Mule Deer	Toiyabe	[DATE]	
Elk	Jemez	[DATE]	
Elk	North San Cristobal	[DATE]	
Elk	Vallecitos	[DATE]	
Mule Deer	Canjilon	[DATE]	
Mule Deer	Jemez Springs	[DATE]	

② **Implementing Design**

③ **Final Product**

DESIGN

We endorse design as an aesthetic and problem-solving pursuit that can be applied in the academic context as part of a process of discovery, exploration and synthesis with potential to substantively impact knowledge construction and science communication. Design, in our view, is a mindset steeped in empathy, focused on usability, and driven by the desire to create meaningful impact. By approaching challenges from a design perspective, we strive to understand and bring new understandings through an iterative, creative process. We believe that design can help discover and communicate insights and that its creative and empathetic orientation fosters cross-disciplinary forms of research and exchange.

{Design x Movement}

HOW TO
AVOID THIS

Designing for Dyslexia: Avoiding Text Disasters

by Dylan Blisard • Peer-reviewed by Peyton Carl and Eden McCall

As visual artists, we aim to share our work with a vast and varied world, but we often see it in different way from our audiences. It can be difficult to create broadly accessible graphics because everyone is unique and interacts with our work differently, sometimes due to biological or neurological differences. People with forms of color blindness may not be able to differentiate between reds and greens or a variety of colors and so we choose colorblind-safe color schemes that allow patterns in data visualizations and the core message of our projects to shine through. A similar but often overlooked form of accessibility is the question of how to design for dyslexic audiences.

Dyslexia, a disability affecting reading, is very common in the United States with rates ranging from between 5 to 15 percent of the population, similar to rates of colorblindness. The idea that dyslexic audiences represent an "edge case" simply doesn't align with reality. Our design choices affect how well that 5 to 15 percent of our audience interprets our message; making meaningful choices about text, spacing, and color distinguishes an average design from one that is accessible to everyone.

Dyslexia is a condition that disrupts the steps required to process written text, including recognizing visual symbols (e.g., letters),

matching them to sounds, and accessing their meaning. Dyslexia also tends to co-occur with attention-deficit and executive function disorders, further complicating the ability to interpret visualizations with high information density. Cartographers can improve the effectiveness of their designs by increasing textual and graphical clarity with an eye toward facilitating legibility and information chunking.

Clarity in a design has both visual and informational qualities. High transparency designs assign a single meaning to every one visual symbol while low transparency designs assign many meanings for every one symbol. An example of low transparency in letter symbols are the English words "thought" and "though"; they change in sound and meaning despite being composed of mostly the same characters.

As any designer knows, it is challenging to maintain clarity while increasing the amount of information displayed. While symbol systems that encode large amounts of data are almost often visually complex, improvements to information chunking can facilitate better interpretation and retention of meaning. An example of this concept and its relation to dyslexia is the syllabic writing of Kana Japanese where each character resembles one sound—as opposed to English in which syllables are often composed of many characters, vary in length, and have inconsistent meanings. Take these examples from Japanese and English:

<div align="center">

けむにまく
Ke·mu·ni·ma·ku
to bewilder

Squirreled
Squir·reled
to move restlessly

</div>

In its native Japanese, the word "kemunimaku" is more easily interpreted by a dyslexic reader: it is clearly divided into

five visual chunks that each carry consistent meanings and form distinctive phonetic syllables; whereas the English word "squirreled" is composed of ten characters and two syllables that elide or run into one another. These examples illustrate how differences in language can affect the overall legibility of a text.

Designing for dyslexia means addressing both reading and attentional challenges for interpreting textual and graphical symbols. Extending already familiar principles, the following guidelines will help improve your designs for dyslexic audiences:

- Left align text, without justification. This improves clarity by making it easier to find the start and end of each line and ensures consistent spacing between words.

- Removing hyphenation (where words are split between lines) can be beneficial for consistency.

- Avoid using all uppercase letters for continuous text as lower case letters have more well-defined silhouettes making them easier to differentiate.

- Using sans serif fonts can make reading easier because serifs often cause letters to run together depending on the length of the serif. Long sentences of continuous italics can also have this effect.

- Text color should provide enough contrast against its backdrop to remain legible.

Compared to the amount of research detailing Dyslexia's effect on reading, little attention has been given to dyslexia's possible effects on mapping endeavors. However, there are a few principles that we can bring over from one to the other. Making cartographic products accessible to a dyslexic audience starts with information density and symbolization.

The most common issue seen on a variety of maps is an overload of information. In an attempt to show everything, cartographers end up obscuring the most pertinent information behind a wall of context. Sometimes splitting information into seperate maps becomes the solution. Other times, it's necessary for designers to weigh the value of each label on their work and remove those that do not enhance the narrative purpose of the map. Following these guidelines will make your map clearer for all audiences:

- Lower information density. Ask whether labels enhance or detract from a map.

- Provide adequate and consistent space between labels, symbols, and boundaries.

- Create contrast between background and foreground elements through color, size, and other visual variables.

Good symbols are often not a problem for people with dyslexia because they are inherently recognizable chunks of visual information. Good symbols should convey their meaning without overloading a person's attention through overcomplicated designs combining three or more elements. As the number of elements increases, a symbol slowly becomes a picture. Cartographers that simplify their symbols will create clearer maps.

As designers, our goal is to reach the broadest audience possible. We should incorporate practices that make our work accessible to all by designing with dyslexia in mind. ∎

"This piece addresses a topic of ability that is less-frequently discussed, and clearly shows how it's important as a designer to consider how the creation of an inclusive and accessible product provides equity in media and sharing information" - EM

Case, Justification, and Italics:

In the example below, text justification creates uneven spacing between words. This eliminates the ragged right edge which aids the eye in moving from line to line. Uppercase letters also have a less defined silhouette than lowercase letters, and italics makes the text appear to run together.

Bad...

IN A HOLE IN THE GROUND THERE LIVED A HOBBIT. NOT A NASTY, DIRTY, WET HOLE, FILLED WITH THE ENDS OF WORMS AND AN OOZY SMELL, NOR YET A DRY, BARE, SANDY HOLE WITH NOTHING IN IT TO SIT DOWN ON OR TO EAT: IT WAS A HOBBIT-HOLE, AND THAT MEANS COMFORT. IT HAD A PERFECTLY ROUND...

Better!

In a hole in the ground there lived a hobbit. Not a nasty, dirty, wet hole, filled with the ends of worms and an oozy smell, nor yet a dry, bare, sandy hole with nothing in it to sit down on or to eat: it was a hobbit-hole, and that means comfort. It had a perfectly round door like a porthole, painted green...

Typeface, Spacing, and Contrast:

In the example below, large serifs cause letters to run together, especially when uppercase. The muted text color should provide enough contrast against its backdrop to remain legible, and letter spacing should be ample but not so much that the space between a letter and the space character begin to get confused.

Bad...

THIS HOBBIT WAS A VERY WELL-TO-DO HOBBIT, AND HIS NAME WAS BAGGINS. THE BAGGINSES HAD LIVED IN THE NEIGHBOURHOOD OF THE HILL FOR TIME OUT OF MIND, AND PEOPLE CONSIDERED THEM VERY RESPECTABLE, NOT ONLY BECAUSE MOST OF THEM WERE RICH, BUT ALSO BECAUSE THEY NEVER HAD ANY ADVENTURES...

Better!

This hobbit was a very well-to-do hobbit, and his name was Baggins. The Bagginses had lived in the neighbourhood of The Hill for time out of mind, and people considered them very respectable, not only because most of them were rich, but also because they never had any adventures or did anything unexpected...

The Art of Labeling USGS Maps

by Dylan Blisard and Zhaoxu Sui • Peer-reviewed by Mclean Gonzalez and Maxim Johnson

Wind River Migrations: A variety of labeling tactics on one map, including topographic, hydrologic, transportation, and populated place features. By Zhaoxu Sui and Dylan Blisard.

Each year as part of the USGS Report *Ungulate Migrations of the Western United States*, the InfoGraphics Lab produces dozens of local and regional maps of mule deer, elk, and pronghorn migrations. These maps capture the local natural and human context through which migrations occur, helping to facilitate targeted conservation planning by local, state and federal stakeholders.

As a federal agency, USGS has strict standards on making maps for formal publication in reports. The selection and styling of labels is a significant part of these standards, including hydrologic features, settlements, national parks, and tribal land. For the purposes of the *Ungulate Migrations* report, topographic labels take on added importance as migration routes and seasonal ranges are closely related to the physical topography.

On modern commercial map products, such as the National Geographic map series or

Benchmark Maps, topographic labels are often visually dominant, emphasizing important mountain ranges or other topographic features with large type spanning wide areas. While this labeling style may be attractive for, say, a recreational audience, this might not be ideal on conservation maps that wish to emphasize migration routes. The concept behind this design practice is called *visual hierarchy*.

Visual hierarchy describes the method of magnifying important features while deemphasizing minor features, aligning with the objectives of the map itself. In our case, the main objective of the report maps is to emphasize the routes and ranges of migrating animals, while still providing adequate reference information. For this auxiliary information, it is preferred to reduce their visual weight to not distract from the attention of the map reader. We applied several labeling techniques to achieve this balance: reducing the font sizes of these features, turning some curved labels into
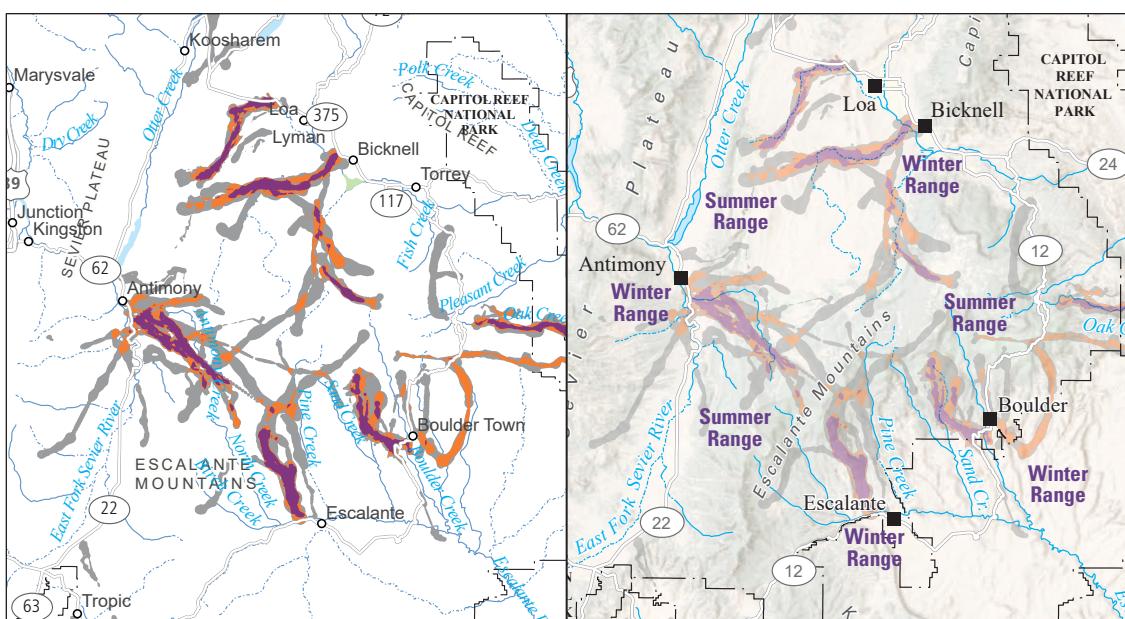
horizontal ones, and removing labels for smaller topographic features.

Paradoxically, designing and placing labels at lower levels of the visual hierarchy can be time-consuming and require significant attention to detail especially when under strict USGS design standards. A reader's eye's will be instantly drawn to labels that look incorrect or have an unusual placement and will bring down the effectiveness of the work. Two pieces of advice given to us from Alethea, our head cartographer, were to "always create labels that complement the labeled feature," and to "not let labels float away from their features." In practice, on topographic and hydrologic features this means to follow the curves (but not always) and to split the label into multiple parts and give them consistent space. These tips helped us to create labels that felt naturally linked with the features they referenced.

As cartographers, we make every design choice purposefully. Every slight adjustment in font size, line spacing, and placement should positively affect the viewer's experience of our

maps. We tinker with these visual properties so that labels become seamlessly integrated into their surroundings and enhance legibility. Sometimes there are far too many labels; we generalize and subtract until only the most pertinent information is displayed. We ask why certain rivers deserve their place on the map. Do they form a barrier for migrating herds? Or are they a narrow creek whose label takes up more space than the actual feature? Should we label a town with less than 50 people? Does that town play a special role in ungulate conservation? Asking these kinds of questions helps us to narrow down what information is relevant to the narrative and thus leads to a better map.

Labeling and other cartographic practices work together to produce a cohesive whole. Maps that cut corners on one area of design end up lopsided and move the viewer's attention away from the data and towards minor features or flaws. These interrelated concepts form a kind of "art of labeling": the interweaving of context and data into a visual hierarchy that aligns with the scientific purpose of the map. ■

Before and After: After several rounds of research and design, maps from ArcGIS Pro (left) are transformed in Adobe Illustrator (right). Migration routes are de-emphasized to focus on labeling here. By Dylan Blisard.

Animation Through Mapbox

by Zhaoxu Sui • Peer-reviewed by Mclean Gonzalez and Maxim Johnson

For over a decade, the InfoGraphics Lab has collaborated with the Wyoming Migration Initiative to create cartographic products that communicate the complex ecological and conservation issues that migratory ungulates (elk, mule deer, etc.) face during their long-distance movements to and from their seasonal ranges. Our focus is to tell deep visual stories that engage people in understanding migratory science. We do this by creating products that engage a variety of audiences. A few examples include *Wild Migrations: Atlas of Wyoming's Ungulates*, a print atlas highlighting more than 70 stories of ungulate migration; weekly maps used on social media to show the movement of an individual mule deer during her seasonal migration; and maps for government reports, presentations to policy makers and landowners, and the public. - AS

One spatial-temporal story found in *Wild Migrations* explains the relationship between snowpack and migration timing. Wildlife biologists have demonstrated a strong correlation between species size, foraging habits and how much snow each species can tolerate before they migrate between seasonal ranges. The print atlas shows these patterns over time using graphs and side-by-side "small multiples" of maps. Using animation, we can present a visually compelling expression of the timing and scale of the relationship: watching snow accumulate or dissipate as a GPS point, representing a deer, moves across the landscape. In this way, we could visualize a key factor of the impact winter and summer ranges and ask how this behavior might be affected by year-to-year variation in weather or potential longer-term changes in climate.

My task in this project was to help produce a 3D animation "flyover" that automatically follows the path of single mule deer migration changing snowpack during a single migration season.

This extends the work previously published by my colleagues using Esri ArcGIS Pro (available here: https://twitter.com/wyo_migrations/status/1460982078447702019). While that work produced an annotated video for a single season, this work explores using Mapbox GL JS as platform for creating interactive web-based animations of spatio-temporal data.

The animation I created traces the movements of a single mule deer (Deer 255) migrating across Northwest Wyoming from April to July, 2019. The map is created using point data recorded by a GPS collar on the mule deer. Connecting the time-stamped points together to generate a growing migration route, allowing users to see the progression of the mule deer across the landscape. I then synchronized the route animation with time-stamped snowpack raster data from National Operational Hydrologic Remote Sensing center, enabling a direct comparison of the animal migration and weather conditions. In the animated webpage, users may pause, replay, expand the camera to see the whole migration route, or even hide and unhide the snowpack layer.

In pursuing this project, I found that there are multiple advantages to using Mapbox compared with other platforms. Mapbox provides a clean and well-documented JavaScript library to easily handle adjustments to camera positions and angles, modify record settings, and filter single features through several simple lines of code. This differs from ArcGIS Pro, where many of these settings are handled through geoprocessing tools, breaking down to more separate procedures. Also, once an application is built with Mapbox, the code can be reused as a template that could be applied to other datasets. In this case, we chose an implementation that applies our animation settings and design style to different migration corridors or time periods.

There remain still several challenges when coding with Mapbox GL JS to animate animal migrations, most of which are related to adjusting the viewer experience

"This piece provides insights on why you might choose to use Mapbox for a spatial data based animation. Its strengths lie in its review of the applications used, and the process of animation, while providing the author's insight into key parts of the project." - MJ

to accommodate the source data. Ungulate migrations are not uniform, continuous, or smooth in the way one might imagine from the generalized maps we are accustomed to seeing. Any individual mule deer, for example, might have a migratory path that is uneven and variable in both spatial and temporal terms. When animating this path, one needs to consider how to adjust camera angles and movements to convey, say, a week-long stopover after a long-distance movement. Or similarly, how to smooth the camera movement to fluidly follow the GPS collar data which often contains sharp zigzags and other artifacts.

Learning through experiments: Modifying the design of a web application through code alone makes it difficult to visualize. I find that setting up a straightforward workflow to refresh and test the page after changing small pieces of code, allows experimentation with different approaches to evaluate their effectiveness.
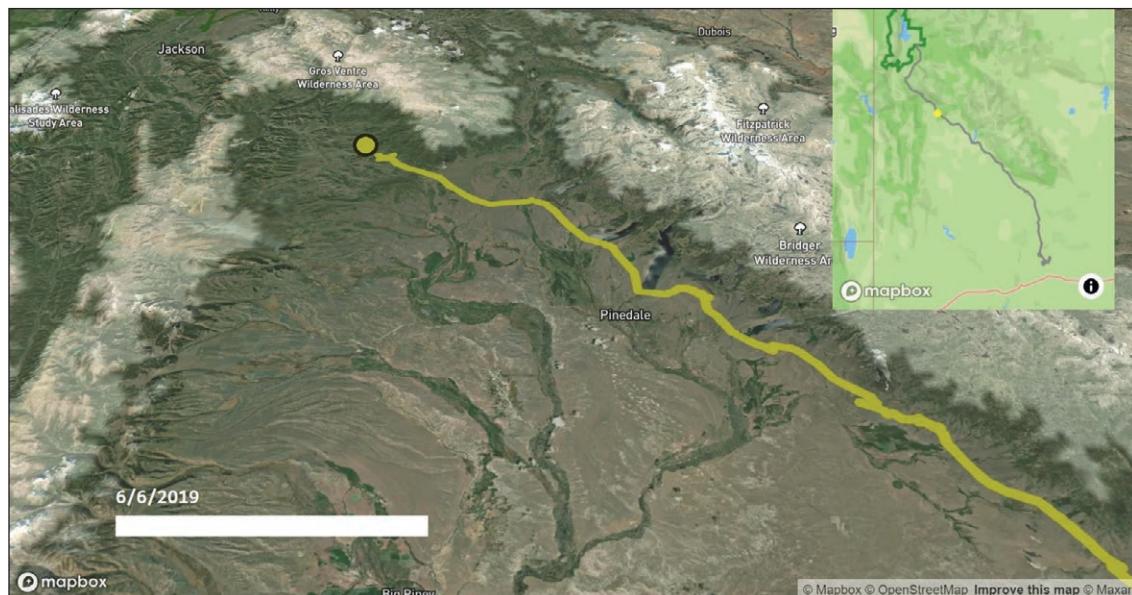
Try different ways to solve problems: By working within common frameworks like JavaScript, it enables developers to draw on a large community of users and variety of powerful libraries. Often, if one method isn't working

you can find another library to achieve a similar result. Identifying when to switch to an alternative approach can be challenging, often requiring you to redo portions of code. Being willing to try multiple approaches (not getting attached to one method) ultimately can solve the problem more quickly and helps you gain more skills along the way .

Always comment sections in the code: Commenting code is essential if you are working in collaborative team, but also to clarify the purpose and structure of your own code.

This project demonstrated that Mapbox GL JS can be an effective method for animating seasonal animal migrations. Synchronizing snowpack and migration movements validated and powerfully illustrated snow cover as a driver of animal behavior and invited new questions that would not have arisen from static maps alone. We envision now re-using this code to examine and present other data layers and additional GPS tracks. In the future, we hope to enrich the user-experience by giving more flexibility for viewers to move the camera, adjust the date and time, and retrieve the specific information of the animal and the events. ∎

Animating Deer 255: A screenshot of the interactive MapBox animation showing the migration route, snow cover, and inset map. Buttons, loading bars, and other features can easily be implemented with JavaScript.

Section Drawings of Protest

*by McClean Gonzalez • Peer-reviewed by Peyton Carl and Eden McCall*

This work is part of the *Pacific Northwest Atlas of Essential Work*, created in collaboration with the Just Futures Institute.
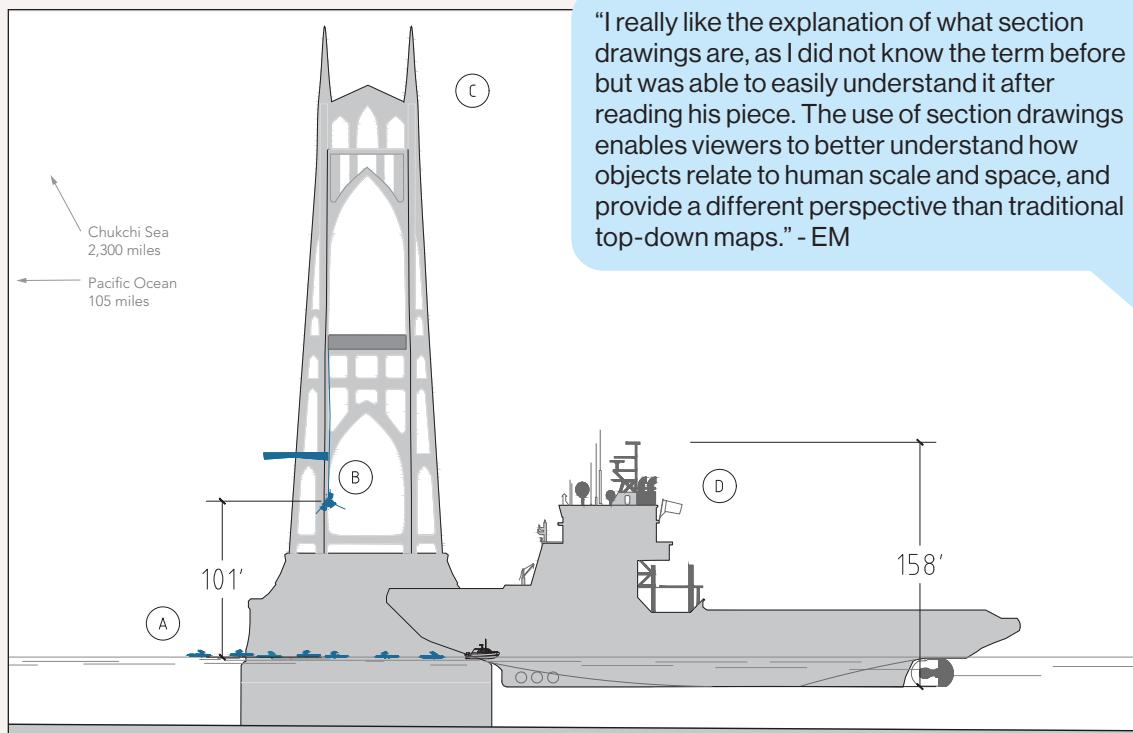
The Pacific Northwest and British Columbia are uniquely positioned as "a thin green line" between fossil fuels extracted from the central United States and export markets in Asia. Activists across this region have seen this as an opportunity to protest the impacts of fossil fuels upon the global climate and in their local communities. They use their bodies as blockades by placing themselves between the infrastructure of rail, pipeline, and water routes and as a visual protest in front of civic and corporate leaders.

The InfoGraphics Lab is collaborating with Erin Moore, UO Professor of Environmental Studies and Architecture, to visualize these acts of protest through maps and architectural section drawings. Such drawings are acts of discovery, recording, and analysis. The dramatic difference in size between human protestors and the fossil fuel infrastructure they are resisting brings into relief the vulnerability of individual humans in the face of global energy forces. It also shows the surprising potency of these acts.

In architecture, section drawings are used to analyze and communicate the size of vertical spaces or objects, such as the space between the floor and the ceiling of a building. They are unique in that they show the vertical dimension without the distortion that occurs in photographs or perspective drawings. In this atlas story, co-authored with Moore and entitled *Lines, Pipelines, and Fossil Fuel Resistance in the Pacific Northwest*, section drawings are used to show the size and spaces created between a person and what they are resisting (e.g., figure below, showing the space between a person rappelling off a bridge and a massive icebreaker on its way to develop Arctic oil fields).

"I really like the explanation of what section drawings are, as I did not know the term before but was able to easily understand it after reading his piece. The use of section drawings enables viewers to better understand how objects relate to human scale and space, and provide a different perspective than traditional top-down maps." - EM

Chukchi Sea
2,300 miles

Pacific Ocean
105 miles

101'

158'
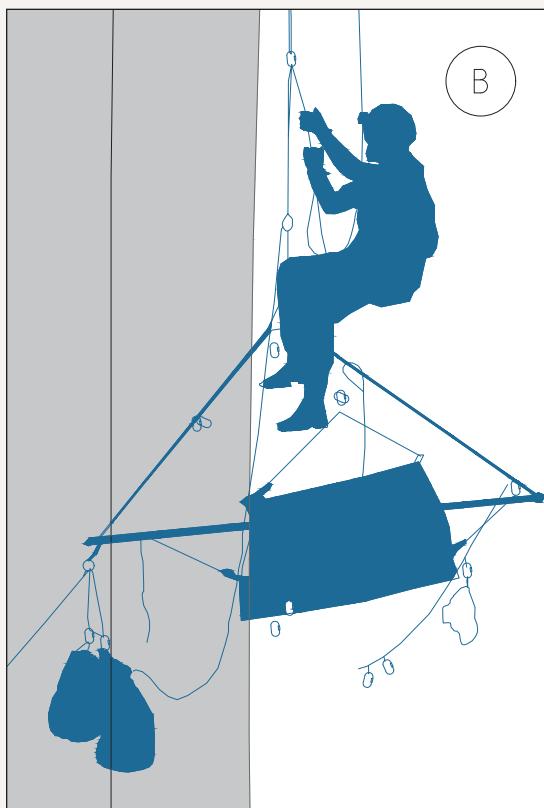
Site Scale: Kayakers and rapeller protest the MVS Fennica, a Shell icebreaker. July 30, 2015 in Portland, Oregon.

To create these drawings, we read news articles and gathered images of selected acts of resistance. Using aerial imagery, we then chose the extent of the space of resistance to draw, and selected a few elements of the landscape to provide context. We then chose which subjects were most important to represent and focused our effort on adding detail to these people or objects. After developing the initial drawings, we identified different scales for each of the final drawings needed to communicate the most important components of each act of resistance. As in the first drawing, the image is at a scale that includes the view of the entire bridge to show how they were physically able to block the channel of the river by dangling within the path of the ice breaker. The second drawing (at right), showing a narrower view, is used to show the details of the equipment needed to live suspended below of the bridge for nearly 40 hours.

Creating section drawings for this project gave me the opportunity to use a technique common and familiar to me in my Landscape Architecture program, and apply it to tell both a visual and spatial story. In my program, I have created section drawings to get a feel for the experience of standing below a proposed wall or large tree. For this project, the section drawings allow the reader to place themselves in the space of the protestors to imagine floating in space below a bridge or in front of an enormous ship. In both cases, section drawings help the reader understand, relate to, and engage with the subject beyond words and common planimetric drawings alone.

By bringing together detailed information from multiple sources and representing them vertically, the section drawings allow for comparisons that are not otherwise possible. Aligning with the broader goal of the *Pacific Northwest Atlas of Essential Work*, this style of vertical representation of space visualizes people from familiar perspectives and scales (as opposed to traditional maps) and ultimately humanizes the data and stories

of activist labor in the Pacific Northwest and British Columbia. In the atlas, these drawings are complemented by regional maps of infrastructure and protest sites. This combination illustrates how the spatial practice of protest operates at multiple scales simultaneously—along critical global energy routes—and within inches of a massive boat. ∎

Human Scale: Activist hanging from St. Johns Bridge in Portland, Oregon using rope and harnesses to suspend supply bags during the 40-hour protest.

On Fantasy Mapping

by Maxim Johnson • Peer-reviewed by Peyton Carl and Eden McCall
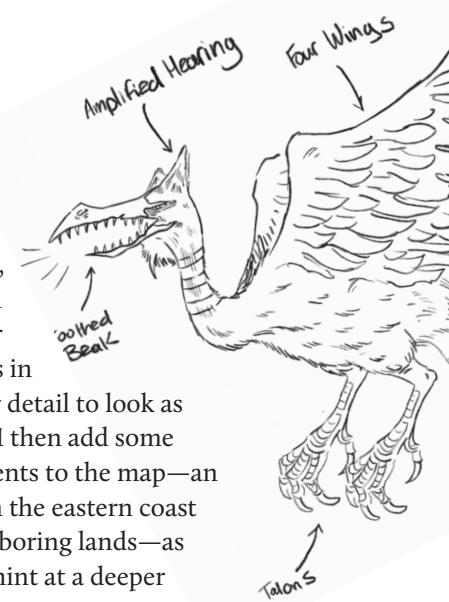
I have always had a passion for geography, and it is often the lens from which I view the world. As a child I traveled frequently with my family, visiting over fifty countries before I was eighteen. For me, geography and how the world works has been at the foundation of my life experiences. At the University of Oregon I decided to pursue a degree in Geography, hoping to understand the many intricate interactions between people, the environment, resources, and more. From physical geography and how landforms are created, to political geography and how people interact, these concepts and many others have been drawing my attention my whole life. My passion for geography and cartography is expressed through my professional work in the InfoGraphics Lab, but also through my own artwork: a fantasy worldbuilding project I have been gradually constructing over the last few years.

My fictional maps display fantasy continents within my world called 'Odethia' and 'Ebion'. These sit on five tectonic plates and stretch from the tropics to the poles. It hosts a great range of fantastical biodiversity (such as dragons and massive insects), as well as unique and interesting people and cultures living in magical places. This realm was initially created using procedural generation in Azgaar's Fantasy Map Generator, where Azgaar's can set earth-like parameters and generate a unique world map with realistic physical characteristics. I then create different layers for topography, bodies of water, labels, and more, editing landforms as I see fit—applying my awareness of realistic geographic processes to a fictional context. Each layer is hand-drawn in the software
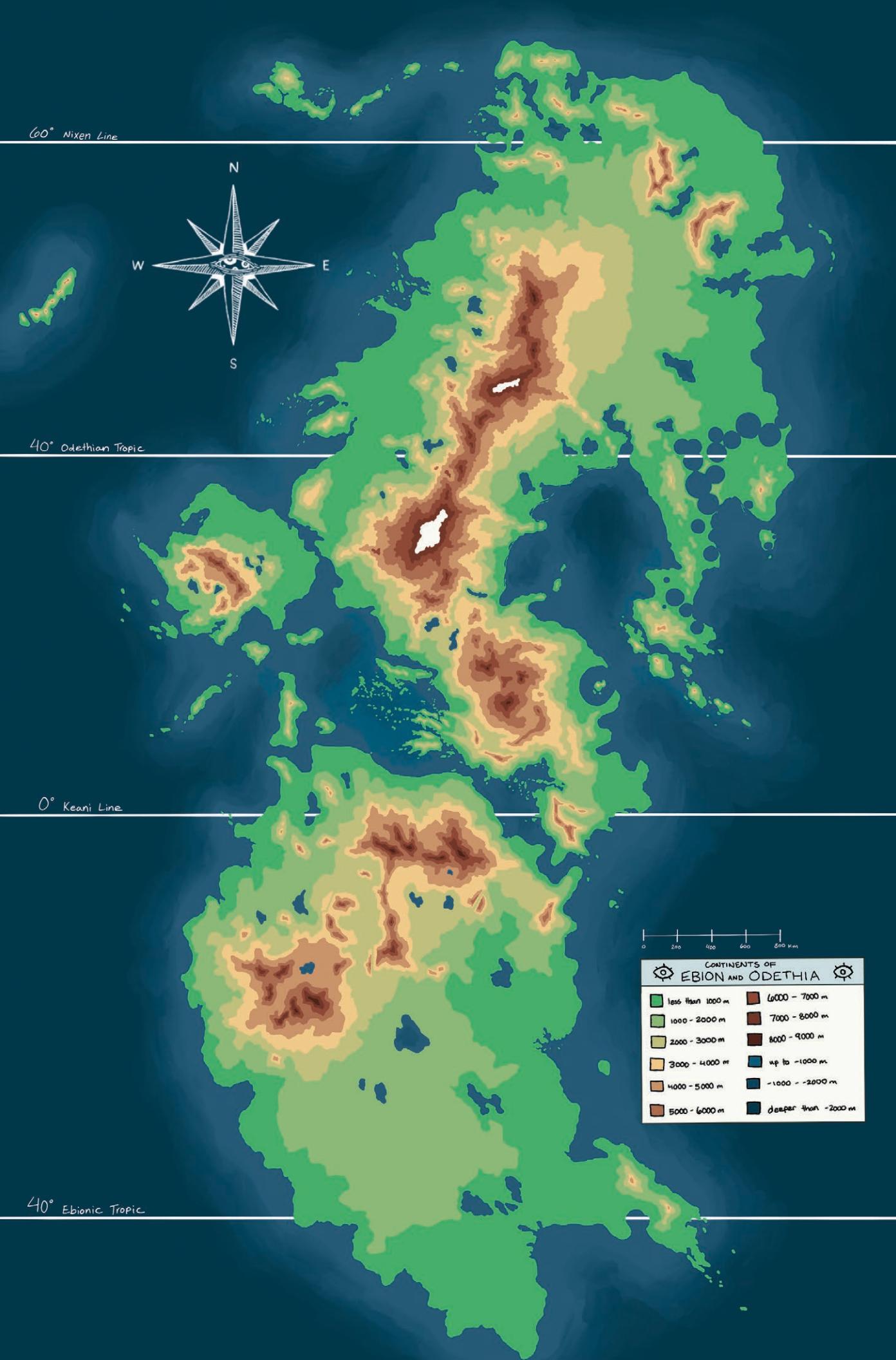
Procreate. As I draw, I edit my layers with geological and other real-world processes in mind, revising every detail to look as it might in real life. I then add some minor fantasy elements to the map—an oddly-shaped sea on the eastern coast or mysterious neighboring lands—as additional features hint at a deeper world history. Besides serving as my own spatial canvas, where I explore old and new concepts of geography and worldbuilding, I hope to pull others into the feelings of curiosity I experience in my favorite fantasy worlds.

My first map is called *Topography of Odethia and Ebion* and shows elevation within the continents. This map highlights the natural geomorphic processes I learned studying geography and geology at the University of Oregon. Careful placement and character of mountain ranges, rivers, and lakes expresses this formal knowledge in a visual way. One region where this can be seen is the central mountain range which dominates the continent. To the west individual mountain peaks can be discerned, while to the east, less dramatic topographical features flatten to grasslands. This is because an oceanic plate is subducting underneath the western half of the continent. This mimics the western North America, which hosts a multitude of volcanoes, mountains, and higher elevation environments to the west, but transforms into the Great Plains to the east. The purpose of this map is to inspire curiosity and highlight real-world geomorphic processes through a fictitious yet believable topographical world map.

Topography of Odethia and Ebion: Fantasy map (right) created by Maxim Johnson.

Wings and Hooves: Johnson also created an array of creatures to inhabit his world. Find them hanging around the vast landscapes of *Odethia* and *Ebion*.

N
W E
S

0   200   400   600   800 Km

CONTINENTS OF
EBION AND ODETHIA

	less than 1000 m		6000 - 7000 m
	1000 - 2000 m		7000 - 8000 m
	2000 - 3000 m		8000 - 9000 m
	3000 - 4000 m		up to -1000 m
	4000 - 5000 m		-1000 - -2000 m
	5000 - 6000 m		deeper than -2000 m
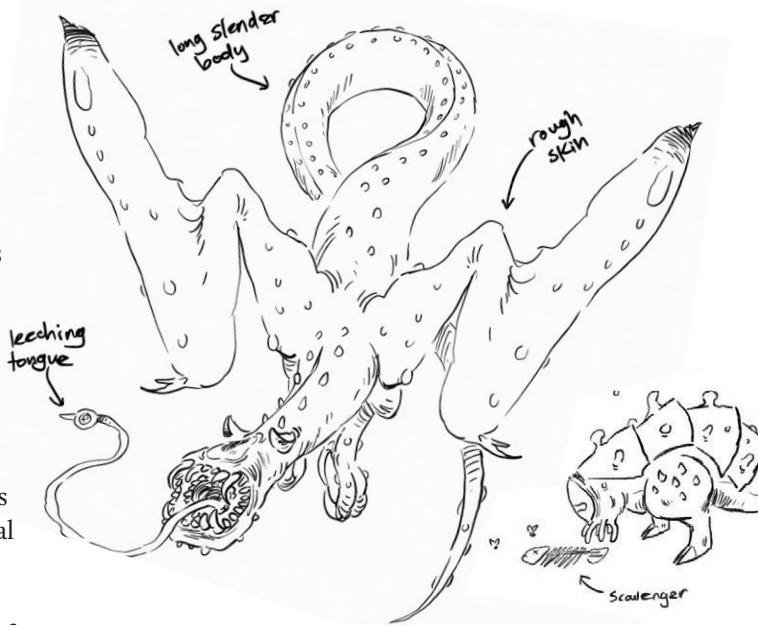
Odethia Politica: Political map of the fantasy continent of Odethia. By Maxim Johnson. *Odethia Politica* received an honorable mention in the 2022–23 Bill Loy Award for Excellence in Cartography competition.

My second map is called *Odethia Politica* and shows routes, countries, cities, and more. Here, I applied concepts of political geography and anthropology, exploring various systems of governance and experimenting with political and historical interactions. One of the biggest challenges in this project was in fact the creation of political entities, traveled routes, and city locations. States are created through years of shared culture and history, and are influenced by a variety of factors such as the environment, movement of people, ideas, and more. The arrangement of political entities includes a plethora of context to consider. How are people distributed in relation to natural resources and the physical environment? What would the weather or disasters look like in the area? These are just a few questions I ask myself when beginning a fictitious landscape. I then move around my map deciding what boundaries exist, where cultural centers exist, and how resources, commerce, and ideas flow throughout this world. While an image is ultimately static, the world depicted is conceived as a dynamic one, with a variety of systems all interacting with one another.
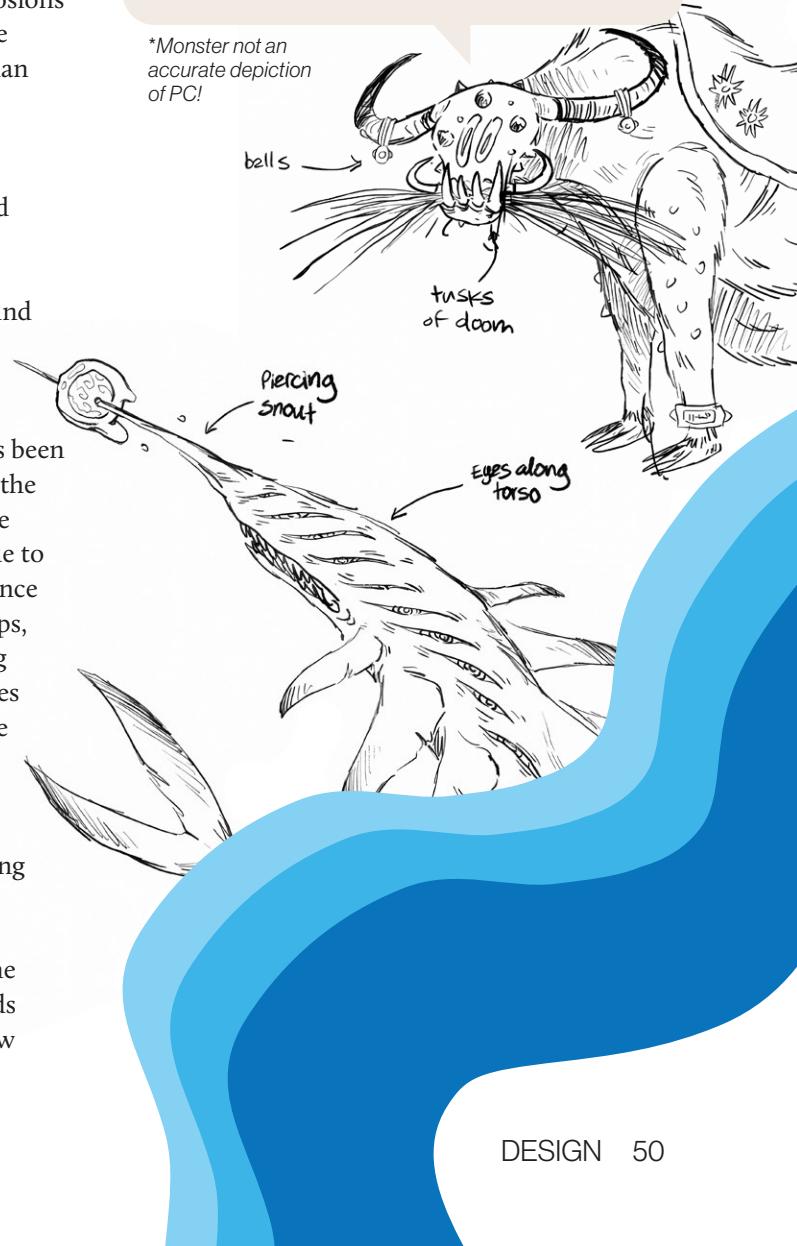
Balancing realistic and fantastical elements is one of the primary issues I came across when creating 'Odethia'. I wanted the continent to be realistic and recognizable but also iconic and novel, so decisions as to what extent landforms were affected by fantasy occurrences were continuous and iterative. I decided that the magic and fantasy elements would not have as large of a geomorphological effect as any great mountain range or valley. The fantasy elements serve as an opening for the curious to further engage with the story of the continent of Odethia, wondering how the landscape was formed and what it is like to live in and experience it. In this vein, the largest fantastical feature is the shattered lakes of Navodevni, created through magical explosions on par with asteroid impacts. Features like these are meant to be more compelling than realistic, but I strive to meet both in the creation of my realms.

There are countless questions I have asked through the creation of my world, and by trying to give context to everything in my world I have had to learn the context behind everything. I have forced myself to ask questions and consider perspectives I never would have before. Due to this constant reiterative process, my world has been continuously changing and evolving over the last five years, being nearly unrecognizable from even just two years ago. As I continue to experience this world, I hope that experience translates into every mountain on my maps, through each and every culture inhabiting its vast lands, and even the tiniest creatures inhabiting every flower and stream. I hope every facet of my world and imagination is as engaging and invigorating as every facet of the real world. This project is the lens from which I look at the world, helping me look closer at every detail as I travel and experience everything. It is my hope to turn this world into one which everyone can experience, just like my favorite worlds and stories, so that people can see just how beautifully complex the world can be. ∎

"The author writes about how his passion for geography and design led him to work on a side project that is worldbuilding. I really like the ending with the example anecdote about the shattered lake." - PC*

*Monster not an accurate depiction of PC!

Mapping Rome: Typeface Matters

by Eden McCall • Peer-reviewed by McClean Gonzalez and Maxim Johnson

Rome wasn't built in a day, and neither were the maps that represent it. Throughout the city's almost 3,000 years of history, architects and historians produced detailed cartographic depictions that document changes in buildings, streets, and important cultural sites. These works cumulatively visualize shifts in Western place and culture, but, in their original disparate paper and tile-plate forms, they remain harder to access and understand.
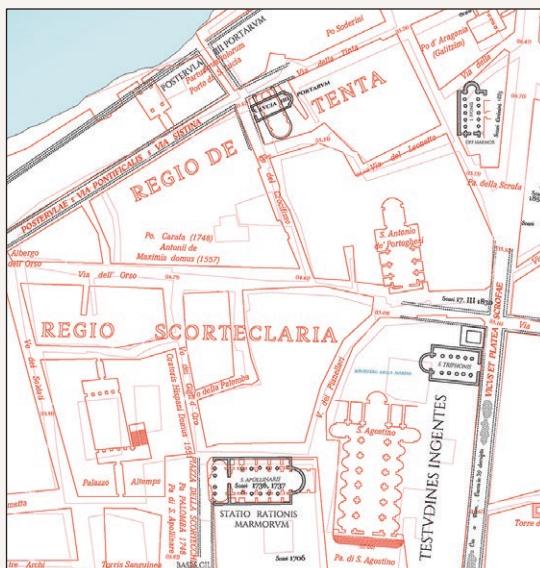
Since 2005, partners at the University of Oregon (James Tice, Giovanni Svevo), Dartmouth (Nicola Camerlenghi), and Stanford (Erik Steiner) have been engaged in a series of projects to digitize depictions of Rome and build interactive tools to explore the city through these lenses (mappingrome.com). The current project investigates the monumental 1901 work of archaeologist Rodolfo Lanciani, the *Forma Urbis Romae* that presents the Eternal City in now-familiar GIS terms, through a time series of overlaid colored layers. In the envisaged interactive version of this map, layers would allow users to overlay ancient and 20th century buildings and streets with current-day structures and satellite imagery to explore how

the city has changed. Additionally, many other layers (e.g. excavations, building plans, etc.) will be annotated and linked to other materials.

The envisaged site enables people to explore the urban morphology of Rome's and to do so in novel and interactive ways. In the same spirit of Lanciani, the team is planning on integrating the wealth of material from their previous projects to create a massive open and spatially-referenced collection. However, as others who have attempted to reproduce Lanciani's work have discovered, the digitization process is laborious and presents conceptual and design challenges. In addition to problems accurately georeferencing archeological features from the hand-drawn map, the question of what degree to maintain verisimilitude to Lanciani's original challenges the very conceptual basis of the project. Should the team correct errors in Lanciani's work? Should it be updated with new archaeological discoveries? Intwined in these questions is the role and value specifically of Lanciani's graphical style, and to what degree it should be preserved in a digital reproduction. While styles like line weight, colors, and pattern fills map seamlessly into modern software, his nuanced combination of engraving techniques within the same building plan disrupt the conventional "point, line, polygon" data model of Geographic Information Systems.

Digitization in Action: Examples of draft fonts applied to the digitized Lanciani map as our closest approximation to the historic fonts.

Lanciani's text presents a unique challenge to replicate. Not only does his handwriting not match any online typeface entirely, but every character has subtle variations, a human touch that digital fonts lack. My role in Mapping Rome was to research and design fonts that match the original text as closely as possible but also are legible on-screen and don't require too much customization.

In practice, my work on this project included researching typeface terminology and scrolling through large catalogs of Google and Adobe Fonts, comparing ascenders, loops, and stroke widths of modern fonts with those hand-drawn over a century ago. After selecting fonts with

Elevations points	Possible fonts	Adobe	Google	In Test Sheet
(14.77) (16.40) (19.79) (15.30) (16.24)	GoodLife (Script)	(14.77) (16.40) (19.79) (15.30) (16.24)		
	Vatican (Medium)			(14.77) (16.40) (19.79) (15.30) (16.24)
Modern structures, roads, etc.	Messiri (Medium)		(14.77) (16.40) (19.79) (15.30) (16.24)	
All caps, regular 3192A6				
DEL PARLA MENTO	IM Fell Roman (Regular)			DEL PARLA MENTO
	Averia Serif Libre (Bold)			DEL PARLA MENTO
All caps, italic	Broadsheet (Regular)	DEL PARLA MENTO		
MINISTERO DI GRAZIA E GIVSTIZIA	IM Fell Roman (Italic)	MINISTERO DI GRAZIA E GIVSTIZIA		
	Averia Serif Libre (Bold Italic)			MINISTERO DI GRAZIA E GIVSTIZIA
All case, italic	Vatican (Regular)	MINISTERO DI GRAZIA E GIVSTIZIA		
Nuova Via del Tritone	IM Fell Roman (Italic)			Nuova Via del Tritone
	Averia Serif Libre (Italic, Regular)			Nuova Via del Tritone
	PT Serif (Italic)	Nuova Via del Tritone		
	Averia Serif Libre (Light, 15° shear)			Nuova Via del Tritone
All case, regular				
Sifone Cloaca	Averia Serif Libre (Regular)			Nuova Via del Tritone

The Style Guide: Example screenshot from a font style guide sheet. All fonts on the Lanciani map are serif, but differ in weight, capitalization, color, and other styling differences depending on the space available and significance of the feature.

potential, I created a font style guide to test point size, color, and oblique versus italicized versions to match the 13 different fonts Lanciani used to label types of roads, buildings, and other geographical features. After these tests, and with feedback from others in the Lab, I added the fonts to drafts of the vectorized maps in Illustrator to see how they integrated with the other layers. While the fonts don't match Lanciani's perfectly, they are approximations that endeavor to capture the stylistic and historical integrity of the originals without requiring too much resource investment or bespoke metadata to control the styling for each individual feature.

Throughout this process, I kept returning to the goal of the Mapping Rome project: preserving historical accuracy while, foremost, increasing these artifacts' cumulative utility and accessibility. Because digitizing and changing mediums inherently reduces pieces' originality,

it begets the foundational design question: how much detail can and should we preserve when digitizing historical works?

Ultimately, for the Mapping Rome project, we have not resolved this fundamental challenge, and determined how closely to match Lanciani's fonts based on time and convenience. We considered custom editing fonts to have different character versions, like a closed loop "g" or a lower ascender height "m," and also to create different variations for each character. For now, however, we were satisfied that the fonts match closely enough to convey the style of Lanciani's writing while being readily deployed in a scalable, dynamic digital format. While digital type cannot match hand-drawn type perfectly in its subtle qualities, a careful font choice can help aid in the reproduction of historical documents for and reinforce the conceptual value of projects like Mapping Rome. ∎

DIFFERENCE

The term difference is meant to evoke our mission to separate signal from noise to discern what is meaningful and make a substantive impact on society and the planet. This framing provides an impetus for creativity and progress and drives a sense of purpose in how we put our skills to work. This value of difference also manifests in our commitment to fostering an inclusive environment that supports our diverse human needs and executing multidisciplinary projects. By embracing these various dimensions of difference, we challenge ourselves to continually deepen our understanding and engage in design practices that drive positive societal and environmental change.

{Difference x Movement}

Communication and Scale

by Lucy Roberts • Peer-reviewed by McClean Gonzalez and Maxim Johnson

I have had the opportunity to explore the concept of "scale" in many ways: scale in terms of project scope and size, scale related to data extent, and scale related to the dimensions of a graphic on a page or screen. Good cartographic design is fundamentally responsive to scale. Project scale determines which graphics are produced and for whom, data scale determines the level of generalization and the labels we place, and graphic scale determines which data we will display within the limits of a figure.

During my time at the InfoGraphics Lab, I have presented my research at local, national, and global conferences which has allowed me to expand my professional network and increased the exposure of our research. The differences in presenting for local, national, and global audiences reflect in a lot of ways the cartographic design decisions we make for different scales, and this conceptual throughline gave me a framework to think about how to communicate to and learn from audiences in these different contexts.

Local Scale

My first-time presenting work for the IGL was at the University of Oregon's Undergraduate Research Symposium (URS) with my colleagues Peyton Carl and Abby Whelan. We discussed our work with the University of Oregon's

Around the Globe: Lucy Roberts presenting at the International Cartographic Conference in Cape Town, South Africa.

Network Startup Resource Center (NSRC), highlighting how cartographers make different design choices for web- and print-based maps. We discussed the design choices we make for different products to a local audience of faculty, staff, and students. Since we were presenting to people who had largely never interacted with the field of cartography before, we largely focused on explaining standard principles in cartographic design through the lens of our work with the NSRC. Rather than explaining the technical nuances of our day-to-day work, this was a venue that allowed us to explain how a cartographic perspective can shape and inform design in many formats. Given this was a University-wide student research event, I was also able to learn from familiar peers in a variety of fields and envision pathways for my own academic trajectory at the UO.

National Scale

Last November, I was invited to present my work at a national level at the North American Cartographic Information Society (NACIS) annual meeting in Minneapolis. There, I presented on the *Global Trade Route Modelling* project, a collaboration with Bruce Blonigen (Economics) and Woan Foong Wong (Economics). In this project, we are adapting a previously published model of historical sailing routes and conditions in the Mediterranean to fit a global scale. As the primary professional and academic cartography conference in North America, NACIS attracts a talented and specialized audience of cartographers and spatial data experts. Because of their deep understanding of the field of GIS, I was able to tailor my presentation to focus on a detailed technical workflow. This allowed me to make

From Left to Right: Peyton Carl, Abby Whelan, and Lucy Roberts present at the Undergraduate Research Symposium at the University of Oregon Price Science Library.

connections with like-minded data analysts and receive valuable feedback on future directions to develop this spatial model.

Global Scale

This summer, I adapted this Trade and Cities presentation for a global audience at the International Cartography Conference (ICC) in Cape Town, South Africa. Like at NACIS, I spoke to an audience of cartographers about a technical workflow. However, since the audience was from an international background, I reframed the presentation to reflect the global nature of our model (e.g., I used Cape Town as an origin/destination example for the global modeling results). One of the goals of adapting our trade model to a global scale is to show how the development of the steam engine has impacted the relative importance of trade cities over time. My hope was to receive feedback from this global audience on the relevance and accuracy of our model in different contexts. It allowed me to question my assumptions and broaden my perspective in ways that are directly relevant to the research itself. The scale of data, a project, or a graphic deeply informs how we approach the design of our projects.

Throughout my time at the IGL, I have learned to consider how the questions of scale extend to the audience for presentations: the data and design choices are dependent on the relevance of that information to audiences in different contexts and geographic scales. As I have been presenting my work to audiences with different backgrounds over the last year, the question of where I am and who I am speaking to has informed what research I present and how I represent it. By explicitly recognizing these distinctions in scale and audience, I engage with new dimensions of my work and open new avenues to learn from others. Speaking at conferences has helped me to grow my confidence as a researcher, my skills as a communicator, and my understanding of how principles of cartography reflect broader ways of interacting with the world around me. ∎

"This piece shows how considering the concept of "scale" in cartographic projects can inform presentations done for local, regional, and global audiences." - PC

Internal Workflows for Long-Term Mapping Projects

by Peyton Carl • *Peer-reviewed by McClean Gonzalez and Maxim Johnson*

The InfoGraphics Lab is a highly collaborative space, with multiple students and faculty working together on tasks for numerous projects. Documenting critical workflows through concise explanations reduces confusion with collaborative work, helping team members understand unfamiliar project tasks or refresh skills. Another method of workflow documentation through the creation of flowcharts (see example below) can visually display a clear project pathway. More broadly, these documents encourage team members to seek answers to questions independently, leading to increased individual confidence with complex projects. The process of articulating and writing out workflows helps students establish strong professional writing skills and allows opportunities for reflection and deeper understanding of a project.

My expertise as a Lab employee focuses heavily on cartographic design, with my primary project being the USGS ungulate migration mapping. This project, among many others in the Lab, has a meticulous process that takes time to learn and acclimate to. To increase the accessibility of this project, I developed an internal workflow document that includes step-by-step instructions for each element of the project with the goal of establishing a standardized process that can be utilized and adapted to future use. In addition to the USGS ungulate migration maps, my efforts on the *Chronographics* project include the creation of a workflow documenting the details of digitizing Joseph Priestley's *Chart of Biography*. My role in creating internal

workflow documentation for the Lab has served as an iterative learning process for long-term projects and has provided me with professional project organization and management skills

USGS Migration Mapping Workflows

Data acquisition and communication: Beyond the technical and cartographic efforts, it is essential that we maintain strong communication with the state and tribal wildlife agencies who coordinate ungulate (mule deer, elk, pronghorn, among other species) migration data across the Western US throughout the process to ensure that each map goes through each stage of the workflow.

Basemap development: Our workflow begins in ArcGIS Pro, where we place and symbolize this spatial data. We curate a basemap with the goal of selecting relevant service and feature layers. We determine an appropriate map extent using the provided spatial data for regional context before sending a draft map for approval by state and tribal agencies.

Migration visualization: Following approval of the map extent, we export the ArcGIS maps to be stylized in Illustrator. Creating these maps is more than placing relevant data, it requires thorough cross-referencing using resources like USGS's The National Map and the Geographical Names Information System (GNIS) database. We ensure that any prominent features referenced in the publication text or requested by the respective state or tribal analyst are included

with geographic nomenclature that corresponds with the Federal and National standard.

Cartographic styling: The cartographic design workflow for this project requires intense attention to detail. Having workflow documentation of the specific fonts, colors, and styles that must be applied by following standardized design methods used by the USGS minimizes inconsistency between maps.
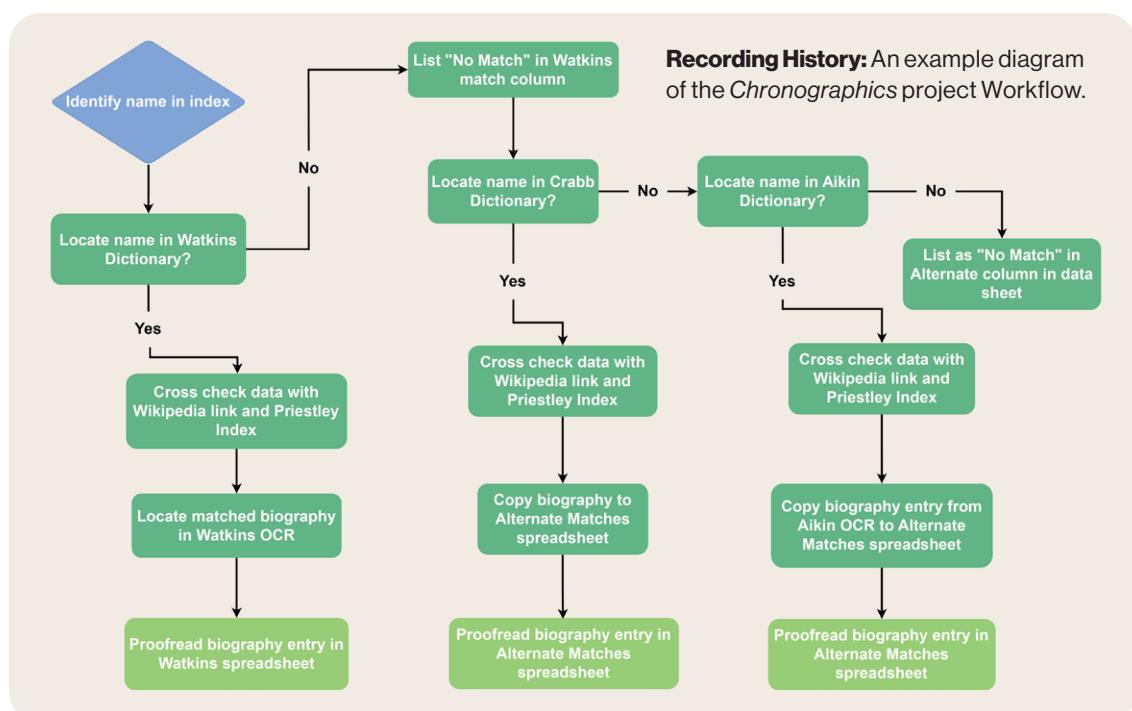
Final Revisions: Beyond the initial set-up phase, there are multiple design, labeling, and review that require file transfers and approvals between us, the state and tribal analysts, and the USGS.
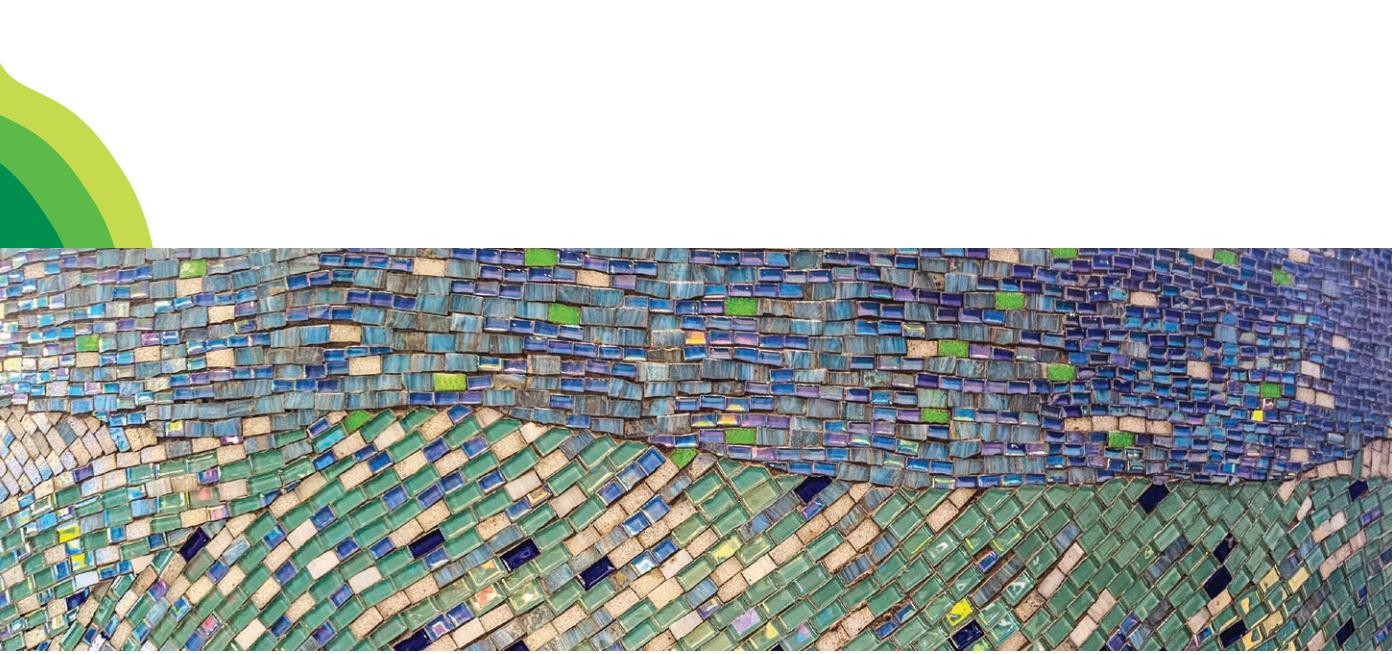
Chronographics Workflows

A collaboration between the Lab and Daniel Rosenberg (History), *Chronographics* is a digital interactive reconstruction of two 18th century timeline graphics by polymath Joseph Priestley. One of many documented workflows on this project includes digitization guidelines to develop biographical narratives, identify informational discrepancies, and fill in data gaps within Priestley's *Chart of Biography*. Expansive biography texts by John Watkins, George Crabb, and John Aikin are used to match historical figures to names listed in the *Chart of Biography*. The workflow document explains the columns of interest in the dataset and provides directions for effectively matching from a biographical text to Priestley's chart and index of names. Vigilant attention to detail is essential to match historical figures as accurately as possible and minimize error. Having a clear understanding of the project workflow helps to not only manage time, but to facilitate accuracy and diligence with large datasets and with reading historical texts.

The process of developing workflows helped me see how effective systems can lead to both individual and team satisfaction and success. Gaining professional writing and teaching skills was a valuable benefit of working at InfoGraphics Lab as a student. Developing a stronger understanding of the InfoGraphics Lab's projects also encourages me to learn more about each team member's contributions and dive deeper into the magic of creating awesome workflows. ∎

Recording History: An example diagram of the *Chronographics* project Workflow.

The Mosiac: Cartography, the InfoGraphics Lab, and now Gillian's research all work to assemble individual fragments into a larger picture that conveys meaning far beyond what each piece could achieve. Photo by Magda Ehlers.

Assembling the Pieces: Maps and Mosaics

by Gillian Miller • Peer-reviewed by Erik Steiner

Through my work with the InfoGraphics Lab this summer and my further exposure to data and design, I find myself returning frequently to the image of a mosaic. This image serves as a metaphor for both the practice of mapmaking and understanding the world around us, but also the collection of interpersonal relationships and talents in the Lab. Like tiles in a mosaic these two entities piece various data and perspectives into a cohesive whole that conveys more meaning than the sum of its parts. This brought me to consider my project, examining Emmons Glacier and the White River in Washington State, from a different perspective.

In my understanding, one of the many purposes of cartography is making sense of and piecing together the world around us. A cartographer's job is, in part, to assemble facets of our different realities into a map that conveys a collective meaning. When I came to the InfoGraphics Lab, I wanted to tap into this process of construction and visual communication with my research on the White River. Rivers, especially glacial-fed rivers, are impressively multi-faceted beings: depending on where and how we observe them, a river can be a recreational playmate, a reason

for families and communities to gather, a common enemy, a barrier, a habitat, or a resource for drinking water. For every turn in the river, there is a new function, a new way it interacts with the people and the land surrounding it. For much of the summer, I juggled several of these functions as possible research topics, trying to determine which one was the most strong or interesting.

Simultaneously, though without realizing it, I was learning how the InfoGraphics Lab functioned as a unit. The Lab pieces together diverse talents and perspectives into a kind of map. Everyone in this Lab brings a different skill set and perspective to the team. For every gap in knowledge, there is someone with a complementary strength, and together the team manages to navigate a multitude of projects, problems, and challenges. It is undoubtedly a privilege to work with a group of people such as this, and I am conscious of how my evolving piece in this mosaic is expressed through my project.

Data and design is the art and science of bringing together various perspectives,

stories, and data and joining them into a unified representation that conveys something meaningful about the land, human experience, the world, and reality. In parallel, this Lab serves as the mortar that binds our individual ideas, faults, and strengths. Similarly, the ever-evolving mosaic of the InfoGraphics Lab grows stronger from each member's abilities and experiences. It constructs and supports an intricate tessellation capable of things more extraordinary and thoughtful than anything we could accomplish on our own.

This exposure helped me think about my research through a new lens. Instead of trying to pick one aspect to focus on, I started considering the various sections of the White River and the glacier as part of a map, as part of the same journey and force. I came to conceive of the glacier-river body as a laborer and its "uses" or actions as a kind of work. Further, I noticed that when conceived as a whole, we are able to understand how the glacier-river system has shaped, and interacted with, human labor. I found myself at what, in hindsight, seems like the inevitable conclusion of my research that the glacier and river must also be viewed together to truly understand their value, their impact, much like a mosaic, or a map This means reassembling

segments of the river and glacier that have been perceptually separated based on how the body is used or interacted with differently in those areas. I am ultimately mapping the river and glacier back into the broader hydrologic system, starting with Emmons Glacier on Mount Rainier all the way down to where the White River meets the Puyallup near the Puget Sound. I too am building a mosaic.

Cartography and the InfoGraphics Lab take divergent fragments and bring them together into a composition much more powerful than each of the contributing factors individually. This approach is a source of immense creativity, and I am inspired by this method of seeing the world and hope to continue learning how to apply it in my own work, one tile at a time. ∎

"This article uses a creative metaphor to explain the author's evolving imagination around mapping and their participation in a collective lab environment. The concept is then connected to their own research that considers a river system through a multifaceted but holistic process." - ES

Swimming Along: Gillian at a glacial lake below the terminus of Emmons Glacier on Mount Rainier.

Alumni Spotlights

Abby Whelan
BS Geography and Spatial Data Science and Technology (2022)

In 2022, Abby graduated from the University of Oregon with a Bachelors of Science in geography and in spatial data science. Her first job post-graduation was with the Idaho State Tax Commission, as detailed in the article below. Today she is working with Moon Travel Guides where she creates a variety of maps for locations around the world!

After graduating from the University of Oregon in 2022 with a BS in Geography and Spatial Data Science, and leaving my student position in the InfoGraphics Lab, I started working as a GIS analyst with the Idaho State Tax Commission. I was initially concerned about my experience moving into this position. It didn't explicitly have a visualization emphasis, something I focused on and enjoyed as a student in the InfoGraphics Lab. However, I was able to reflect upon how my experience at the IGL helped prepare me for a broad array of cartographic tasks that were directly relatable to my new career.

As a student cartographer in the InfoGraphics Lab, I contributed to the University of Oregon Sustainability Dashboard project. In this role, I was responsible for digitizing stormwater drainage basins from engineering drawings across the University of Oregon campus. This included creating spatial data geometry, as well as entering and editing the attribute information including surface type, area, treatment type, and engineering drawing date.

This experience proved to be immediately relatable to working with property tax data. One of the key responsibilities of the GIS department at the Idaho State Tax Commission is to digitize the annexation of land to tax code areas. Property owners pay taxes to districts created to fund services such as hospitals, schools, and pest control. The geometry of these districts frequently change via state legislation to meet the needs of communities. This means that parcels of land are frequently added to tax code areas. To make these legal changes for the following fiscal year, the GIS department

receives an extensive amount of documentation, which becomes digitized. This includes maps which can be georeferenced, as well as property legal descriptions which utilize the Public Land Survey System to delineate the new tax code area boundary.

The Idaho State Tax Commission uses the same software (ArcGIS Pro) and geoprocessing tools that I used to edit stormwater basins in the InfoGraphics Lab. The 'Create Features' and 'Modify Features' data editing tools have once again become my friends! I didn't fully realize how useful the GIS skills that I learned while working at InfoGraphics would be in my first career job.

However, after a little over a month in this position, I found another opportunity as a cartographer with Avalon Publishing where I now create maps for travel books. Not only is this role more aligned with my passion for sharing maps with a broader audience, but I get to utilize a wider range of skills, such as cartographic principles and knowledge about how to efficiently and effectively use Adobe Creative Cloud, that originated during my time producing maps and graphics at the InfoGraphics Lab. In the months since I left the Lab, I have employed a wide range of GIS, cartographic, and design skills in a range of professional positions. I know that the broad suite of professional tools, knowledge, and experiences I gained with the InfoGraphics Lab will continue to serve me into the future.

-Abby Whelan

Bill Limpisathian
PhD Geography (2022)

Bill Limpisathian is now an assistant professor of cartography at the University of Wisconsin-Madison and a faculty affiliate of the UW Cartography Lab. He credits the hands-on experiences and mentorship received while a member of the InfoGraphics Lab as being instrumental to his professional development.

Riley D. Champine
BS Geography, minor in Planning, Public Policy and Management (2015)

Riley is currently the Associate Director of the University of Richmond's Digital Scholarship Lab. Previously, he was a cartographer at National Geographic. His undergraduate work at the InfoGraphics Lab laid a strong foundation for both these roles—teaching him not only the skills to make maps and tell stories with data, but also by providing invaluable opportunities to collaborate with a team of professionals tackling complex projects.

Kati Perry
MA Geography (2019)
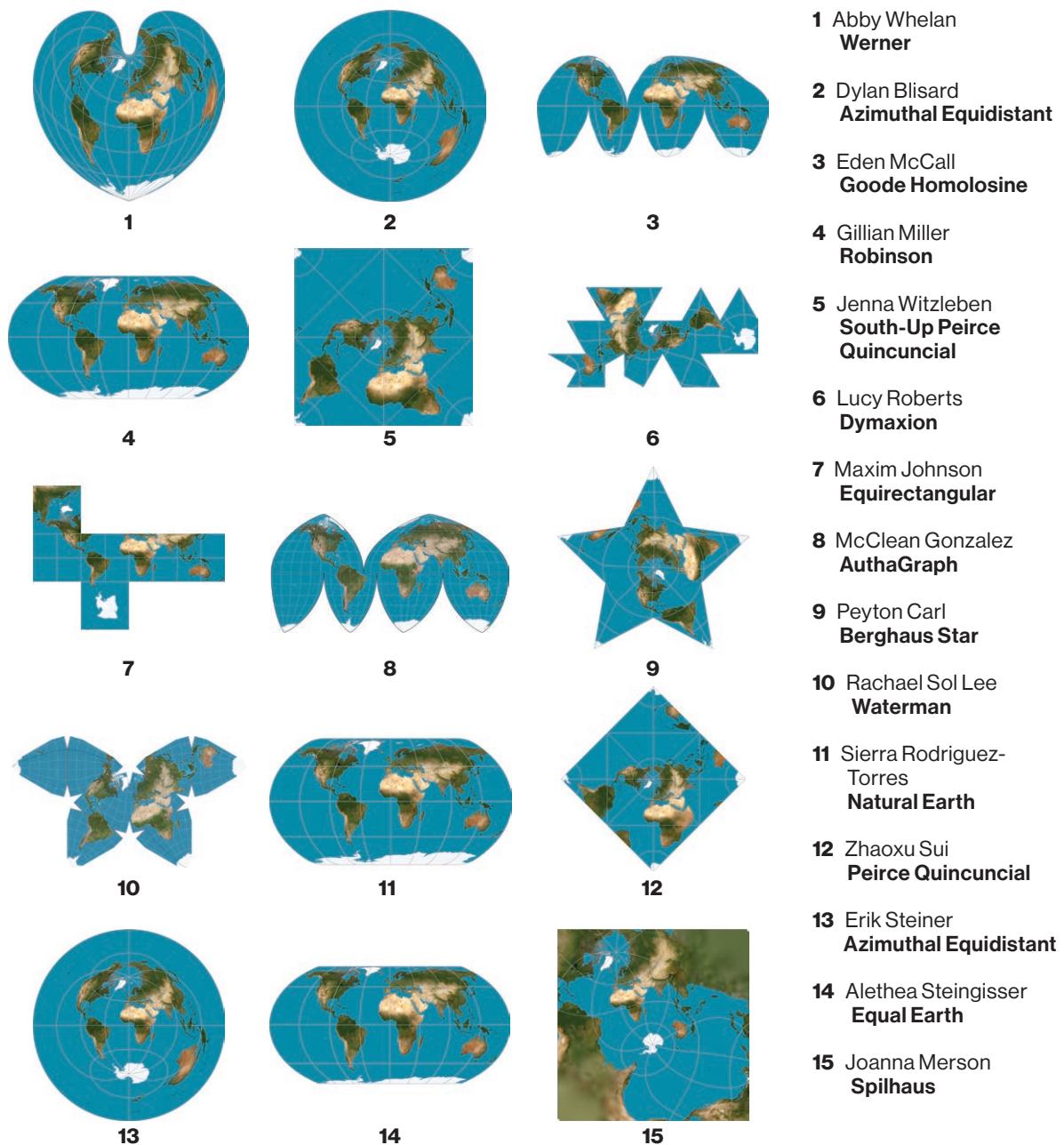
Kati Perry is now a graphics reporter at the Washington Post. As a Master's student at UO, she worked in the InfoGraphics Lab, an experience that sharpened her interest in visuals and web development. It also helped her build a community of peers with similar interests and goals.

Our Favorites

OUR FAVORITE COLORS

1	(color swatches)
2	(color swatches)
3	(color swatches)
4	(color swatches)
5	(color swatches)
6	(color swatches)
7	(color swatches)
8	(color swatches)
9	(color swatches)
10	(color swatches)
11	(color swatches)
12	(color swatches)
13	(color swatches)
14	(color swatches)
15	(color swatches)

OUR FAVORITE PROJECTIONS

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14

15

1 Abby Whelan
   Werner

2 Dylan Blisard
   Azimuthal Equidistant

3 Eden McCall
   Goode Homolosine

4 Gillian Miller
   Robinson

5 Jenna Witzleben
   South-Up Peirce Quincuncial

6 Lucy Roberts
   Dymaxion

7 Maxim Johnson
   Equirectangular

8 McClean Gonzalez
   AuthaGraph

9 Peyton Carl
   Berghaus Star

10 Rachael Sol Lee
   Waterman

11 Sierra Rodriguez-Torres
   Natural Earth

12 Zhaoxu Sui
   Peirce Quincuncial

13 Erik Steiner
   Azimuthal Equidistant

14 Alethea Steingisser
   Equal Earth

15 Joanna Merson
   Spilhaus

EAST 11TH AVE

ALDER ST

Bushnell
University

McKenzie

MILLER
THEATRE
COMPLEX

Villard

Lawrence

University

Pacific

UO
Annex

Computing

Allen

L O

LILLIS BUSINESS COMPLEX

UOPD West
University
Station

Duck
Store

Fenton

Friendly

Columb

EAST 13TH AVE

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KINCAID

We've Moved!

The InfoGraphics Lab
has moved across the
hall to Condon 167.

Condon

Chapman

Tykeson

Johnson

Collier
House

Prince
Lucien
Campbell
(PLC)

Schnitzer
Museum
of Art

Susan
Campbell

Hendricks

ALDER ST

Alder

Knight
Library

Gerlinger
Annex

Gerlinger

UNIVERSITY ST

Ess

Lokey
Education

Arth
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Who Makes the Campus Map?

From 1988 to 2016, the InfoGraphics Lab produced the
UO Campus Map. The "map" grew over the years from
a printed sheet into a modern robust app and software
infrastructure. In 2016, Ken Kato (former Associate
Director of InfoGraphics) founded the Location
Innovation Lab to manage the map full time. His team
has built out the system to serve a huge number of
functions on campus including operations, safety,
planning, business continuity, and sustainability.

Campus Map Link

utd
rogr
Bar

EAST 18TH AVE

InfoGraphics Lab
DATA · DESIGN · DIFFERENCE

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