# nacis

**colorado springs**
october 19–22, 2016

## Conference at a Glance

| Tue | Tuesday Night Meet-Up at Phantom Canyon Brewing Co. | meet in lobby at 6 pm |
|-----|-----|-----|

**Wed**
| all day | Geographic Data Collections Day | bus departs lobby at 5 am |
| all day | Practical Cartography Day | in Heritage Ballroom B |
| 7:30 pm | Opening Session in Heritage Ballroom D *followed by* Opening Reception and Map Gallery in Summit Ballroom |

| Thur | Heritage A | Heritage B |
|-----|-----|-----|
| 9:00 am | Design in Web Cartography | Conservation and Sustainability |
| 10:40 am | Smart Mapping | Maps and Learning |
| noon | NACIS Lunch & Business Meeting in Heritage D | |
| 2:00 pm | Mapping Yellowstone | Historical Perspectives |
| 4:00 pm | Mapping Risk and Uncertainty | Finding Our Way |
| 6:30 pm | NACIS Night Out | |

| Fri | Heritage A | Heritage B |
|-----|-----|-----|
| 9:00 am | The Professional Cartographer | Planes, Trains and Automobiles |
| 10:40 am | Storylines in the Map | Mapping in the City |
| noon | NACIS Lunch Bunch | |
| 2:00 pm | Rethinking the Map | Challenges in Spatial Analytics |
| 4:00 pm | Representing Change | Advancing Cartographic Education |
| 6:00 pm | Banquet in Heritage D *followed by* GeoDweeb Geopardy! in Carson Room | |

| Sat | Learning Center | Location TBA |
|-----|-----|-----|
| 9:00 am | Mapping for Change with OSM | Mapping in the Cloud with GeoJSON and TopoJSON |
| all day | Field Trip: Garden of the Gods Hike and Orienteering bus departs lobby at 8:20, 9:00, or 9:30 am | |

| Heritage C | Carson Room |
| --- | --- |
| Drawing the Line | NACIS Commons |
| Let's Talk About Text | NACIS Commons |
| | |
| Elements of Design | NACIS Commons |
| Maps for Social Justice | NACIS Commons |

| Heritage C | Carson Room |
| --- | --- |
| New Terrain | |
| Dynamic Workflows | New Forms of Geospatial Information |
| | |
| Making Maps Useful | Typophiles Retreat, Part 2 |
| Collaborative Cartography | Crafting Campus Maps |

| | Carson Room |
| --- | --- |
| | GIS Basics for Cartographic Design |

# The Antlers

Learning Center

Carson

Fremont

Hayden | Jackson

COLORADO AVE

A

Heritage Ballroom

B | C | D

up to guest rooms

Summit Ballroom

Cameron

Stratton

Antlers Grille

elevators

Judge Baldwin's Brewing Company

front desk

gift shop

MAIN LOBBY

canopy

CASCADE AVE DRIVEWAY

N
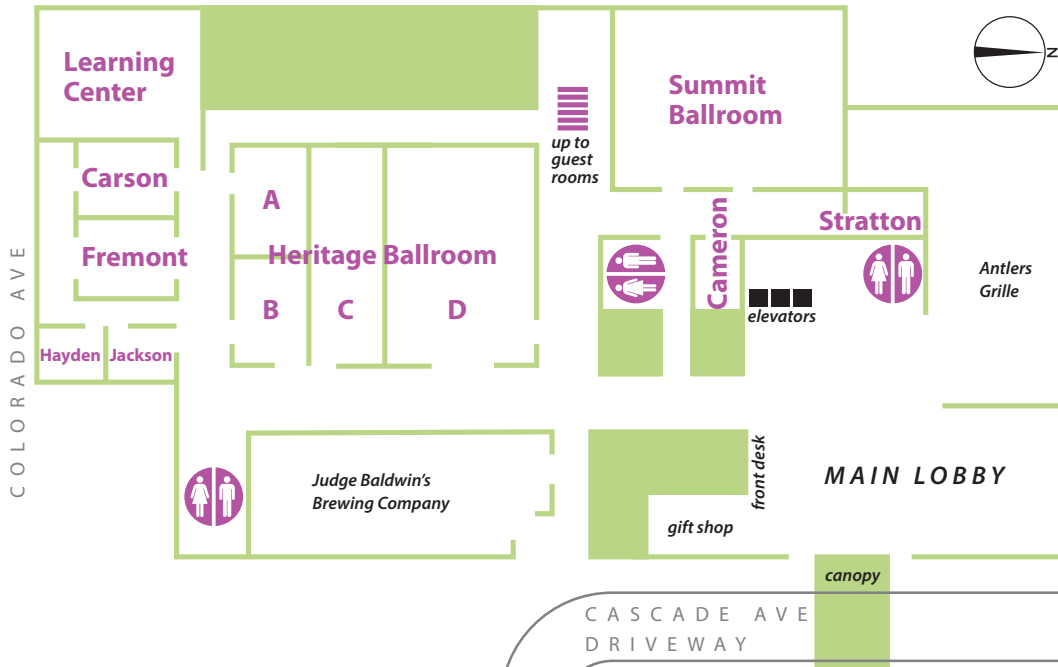
**6:00–8:00 pm**
**Tuesday Night Meet-Up**
*Organizer: Dylan Moriarty*

Just arrived in Colorado Springs? Instead of hanging out by yourself at the hotel, wondering what all the other attendees are doing, connect at our Tuesday Night Meetup! It's a chance to say hello to old friends and make some new ones before the conference begins in earnest.

Join host Dylan Moriarty in the lobby of the Antlers hotel at 6pm, and then head across the street to the Phantom Canyon Brewing Co. (**phantomcanyon.com**) for dinner and conversation to start off your NACIS experience!



**6:00–8:00 pm**
Fremont Room
**NACIS Board Meeting I**

## Wednesday, October 19

### 9:00–10:25 am

**Maki 3.0: Open Sourced Icons for Maps**
*Nathaniel Slaughter, Mapbox*

**Creating, Collaborating on, and Maintaining Maps With Make**
*Seth Fitzsimmons, Stamen*

**Tools for Getting OSM Into Desktop GIS**
*Daniel McGlone, Azavea*

**Breaking up With Raster and Going Steady With Vector Tiles**
*Katie Kowalsky, Mapzen*

**Transportation Flow Mapping: A Practical Productivity Presentation**
*Matthew Hampton, Oregon Metro*

### 10:45 am–12:00 noon

**Branding + Identity With Maps**
*Kate Chanba, Conveyal*

**Pretty Maps Without the Price Tag: Cartography With Just QGIS**
*Emily Eros, Red Cross*

**Re-Thinking Maps for the Web**
*Jon Bowen, National Geographic Maps*

**Data Driven Styling for GL Mapping**
*Molly Lloyd, Mapbox*

**Gunpowder Maps (You Know, for Kids!)**
*Nick Martinelli, Foundry*

### Lunch break

### 1:30–3:10 pm

**The Joy of Hex: Challenges in Creating and Interpreting Spatial Bins**
*Sarah Battersby, Tableau Software*

**Natural Scene Designer Pro 7**
*Tom Patterson, US National Park Service*

**Cartography and the Lost Art of Drawing**
*Ryan Sullivan, Paste in Place*

**The Complete Solution from Data to Mobile Device**
*Nick Burchell, Avenza Systems*

**Hand-Rendered Map Illustration Techniques**
*Molly O'Halloran, Molly O'Halloran, Inc.*

### 3:30–5:00 pm

**All About the Carto
in CARTO Builder**
*Mamata Akella, CARTO*

**InDesign + ArcMap
(Photoshop & Illustrator Too)**
*Brian Greer, Dynamic Planning +
Science*

**Making Map Movies
With ArcGIS Pro**
*Craig Williams, Esri*

**Terrain in Photoshop:
Layer by Layer**
*Daniel P. Huffman,
somethingaboutmaps*

*Practical Cartography Day
Moderators: Carolyn Fish and
Vanessa Knoppke-Wetzel*

### 5:00 am (5 am!)–7:00 pm

**Geographic Data Collections Day: Field trip to USGS and Denver Public Library**

Join us for a field trip tour of the USGS Library and Denver Public Library. USGS Librarian Emily Wild will be giving a tour to show us geospatial collections and provide some insight in how the USGS operates. Librarian Craig Haggit will be providing the tour of the Denver Public Library and map collections which includes Colorado mining claim maps, railroad valuation maps, an Ortellius Atlas, and 10th Mountain Division war maps among others. Individuals will be responsible for public transportation and dining costs. See digital schedule at **nacis2016. sched.org** for full details on how to join.

*Geographic Data Collections Day Organizer:*
*Abraham Parrish, University of Miami*

### 5:15–6:45 pm
### NACIS Fun Run and Walk
*Organizer: Carl Sack*

**Meet in the hotel lobby**

Join us for the Third Annual NACIS Fun Run and Walk! This year rather than tour downtown, we will hit the dirt of the beautiful, wild Rocky Mountain foothills and get a view of our host city from above. We'll shuttle up to Red Rock Canyon Open Space, which features old quarry ponds, impressive vertical fins of sandstone, and views galore. Bring your off-road shoes. Please meet promptly at 5:15pm in the lobby, and plan to be away until at least 6:30 pm. If we have enough vehicles in the group, we will carpool; otherwise we will take a city bus. Runners, walkers, and amblers welcome.

**7:00–8:00pm**
Heritage Ballroom
**Opening Session**

**From Humboldt to Hexbinz**
*Kirk Goldsberry, San Antonio Spurs*

Join us for our opening plenary with Dr. Kirk Goldsberry, a long-time NACIS member and possibly the only cartographer whose work has appeared on ESPN, FiveThirtyEight, and Grantland. Today, Kirk works as an analyst for the San Antonio Spurs, analyzing the spatio-temporal data that basketball players can generate using new systems for tracking player and ball movement around the court.

**8:00–9:30 pm**
Summit Ballroom
**Map Gallery Opening and Welcome Reception**

*Organizer: Martha Bostwick*

The 2016 NACIS Map Gallery features a stunning array of printed maps and posters, tangible pieces, and a very special exhibit on the CIA Cartography Center's 75th Anniversary. Sprinkled throughout the gallery you will find the occasional poster with a QR code on it—this indicates a digital map, and you should scan the code to see these fascinating online contributions to our gallery. Also be sure to keep your eyes open for the bright lettered flags indicating an entry into our annual Student Map and Poster Competition–don't forget to vote!!

## Map Gallery

### Main Gallery

**North Limestone Community Development, Lexington, Ky.**
Sarah Bell, NoLi Community Development Organization, Lexington, Kentucky

**Welcome to Sussex!**
Martha Bostwick, mlbostwick custom map design

**Narrowboat on the Llangollen Canal**
Douglas Cain, City of Fort Collins

**River mile 151: Ohio, Washington County, Leith Run Recreation Area**
Laurel Cornell, Indiana University

**Environs of Franconia College**
Mark Denil

**Franconia College — color**
Mark Denil

**Franconia College — greyscale**
Mark Denil

**Mississippi River**
Matt Dooley, University of Wisconsin–River Falls, David Bergs, Matthew Bergs, Jason Blatz, Cynthia Brewer, Jeff Ferzoco, Donna Genzmer, Kyle Glowa, Sarah Harling, Chris Henrick, Diana Hoover, Brett Kallusky, Alison Link, Nick Martinelli, Ashley Nepp, Chelsea Nestel, Charlie Rader, Tim Stallmann, Diego Valadares, Steve Wolf, and Patrick Wood

**Mapping the National Landscape Conservation System**
Paul Fyfield and Mattye Walsworth, Bureau of Land Management

**Pikes Peak**
David Glassett, Peaceful Valley Maps

**Mt. Shasta Wilderness**
Tom Harrison, Tom Harrison Maps

**The Practice of Generosity, the second principle of 'Right MAP Making'**
Steven R Holloway, toMake™ Press

**The State of Metropotamia**
Daniel P. Huffman, somethingaboutmaps

**Conservation Lands Network**
Maegan Leslie Torres and the Bay Area Open Space Council, Amanda Recinos, GreenInfo Network

**Rutas.MapaNica.Net/ Managua Bus Map**
Michael Luethi, University of Zurich, Switzerland; Felix Delattre, Universidad Nacional de Costa Rica; Jaakko Helleranta, Tekniska högskolan, Finland. We had over 150 students from different Universities in Managua, Nicaragua. Most students were from UCA (**www.uca. edu.ni**) and UNAN (Universidad Nacional Autónoma de Nicaragua).

**Liquefaction Susceptibility for M9.0 Cascadia Earthquake**
Erica McCormick, Cascade GIS & Consulting

## Map Gallery

**Tigers Forever Topographic Map**
Kevin McManigal, University of Montana; Amy Lippus, Garin Wally, Patrick Warner, Bryan Tutt, Aaron Kamoske, Verena Henners, Abby Isaac, Hannah Rosenkrans, Dan Quinn, James Fivecoats, Corbin Brooks, Craig Threlkeld,

**Major Subbasins of the Lake Champlain Basin**
Ryan Mitchell, Lake Champlain Basin Program

**In Catilinam**
Chelsea Nestel, University of Wisconsin–Madison

**What's Being Built in Centennial, Colo.**
Kyoko Oyama, City of Centennial

**Natural Protected Areas of Puerto Rico—an update**
Maya Quinones, US Forest Service Caribbean Landscape Conservation Cooperative, Protected Areas Conservation Action Team

**Uisge Beatha: A Deep Map of Islay Whisky**
Charles Rader, University of Wisconsin–River Falls; Daniel Bochman, University of Edinburgh

**Humboldt Bay**
Amy Rock, Humboldt State University

**Los Angeles Typographic Map**
Josh Ryan, Axis Maps

**Map of China — With Place Names Translated to English**
Beverly Schwab

**Springwater Parks and Community, Greenspaces and Natural Areas of Eastern Multnomah County, Oregon**
Courtney Shannon, Jim Labbe, Springwater Parks & Community

**There Goes The Neighborhood**
Tim Sinnott, Audubon Magazine

**ArcGIS**
Ana Sordomez

**Armenia**
MapsXL Inc.

**World's Best World Map**
MapsXL Inc.

**Hells Canyon National Recreation Area**
Aaron Taveras, Humboldt State University / Map Design Studio

**Parallel Views of EcoRegion Distinction**
Stella Todd, Metropolitan State University of Denver

**Spratly Islands in the South China Sea**
Stephanie Vargas and Leo Dillon, US Department of State

**GeoInquiries**
Maps.com

**Ventura Bikeways Map**
Maps.com

**River Atlas**
Travis White, University of Kansas

## Map Gallery

**Potential Impacts of Stream Rehabilitation on the Lower Long Tom River, Oregon**
Christina Appleby, University of Oregon

**Brazil: Regions and States**
Cristina Bauss, Humboldt State University

**Fences, Trolleys, and Trails: Access to Justice and the Contemporary Community Leadership Role within Local Scale Border Negotiations around Inclusion/Exclusion**
Robin Carter, Alvernia University

**The Crossroads: Ethnic Conflict & Soya Production in Kyrgyzstan**
Chelsea Cervantes De Blois, University of Minnesota TwinCities

**User Based Volcanic Hazard Mapping: Time for Change**
Danielle Charlton, Christopher Kilburn and Steven Edwards, University College London

**Political Vulnerability in California**
Laura Daly, University of California Davis

**Rochester, Minn.**
Tyler Galde, University of Wisconsin–River Falls

**Natural Terrain Map of Denali National Park**
Owen Haugen, University of Wisconsin–River Falls

**Collectively Mapping Syria's Borders**
Meghan Kelly, University of Wisconsin–Madison

**Exploring Terrain: A Hypothetical Bike Tour**
Meghan Kelly, University of Wisconsin–Madison

**Enfolded**
Nick Lally, University of Wisconsin–Madison

**Mt. Kilimanjaro**
Josh Leonard, University of Wisconsin - River Falls

**Chasing Borealis**
Rudy Omri, University of Oregon

**Puget Sound**
Rudy Omri and Dylan Molnar, University of Oregon

**Aldo Leopold Wilderness**
Joben Penuliar, Humboldt State University

**Water Resources of the American Southwest**
Gabriel Rousseau, Portland State University

**Pinpointing Vulnerabilities in the Arctic Ocean**
Gabriel Rousseau and Kyle Lempinen, Portland State University

**Open Skies Outdoor Classroom Site Design**
Tippy Scott, Centre of Geographic Sciences

**Restoring Fish Habitat in the Sandy River Basin**
Christina Shintani, University of Oregon

# Map Gallery

**Jim Thorpe Trail Map**
Patrick Stephens, The Pennsylvania State University

**Tropical Pox**
Soren Walljasper, University of Wisconsin–Madison

**Necropagnosia**
Nate Wessel, University of Toronto

**San Francisco Bay Area**
Aidan Williams, Humboldt State University

**Gold Country, California**
Patrick Wood, Humboldt State University

**Tibet and the Himalaya**
Patrick Wood, Humboldt State University

**Special Exhibit**
**CIA Cartography Center's 75th Anniversary**

CIA's present-day Cartography Center was initially conceived as a unit within the Office of the Coordinator of Information (COI), and would be temporarily housed in four other organizations before settling permanently at the Central Intelligence Agency in 1947. One of those COI recruited was a geographer by the name of Arthur Robinson, who started on October 16th 1941 and shortly thereafter produced COI's first map for President Roosevelt. At that time there were no cartographers as we know them today, so Robinson engaged geographers with interest in mapping and the group developed their techniques on the job. They worked to develop a system of cartography which could operate in the field of intelligence and that was unique to previously utilized systems of map production. Robinson's efforts laid a solid foundation for map production and quality that is still espoused at CIA today and established thematic cartography as a recognized discipline.

Come view samples of our maps from 1941 to present, to gain a better appreciation of their transition in technology, style, and portrayal of intelligence stories.

### Heritage A
**Design in Web Cartography**
*Moderator: Andy Woodruff*

**CartoCSS vs GL: Considering New Technologies for National Park Service Basemaps**
*Taylor Long, NPMap / Colorado State University*

**Ten Commandments of Interactive Web Map Design**
*Robin Tolochko, Uber*

**An Open-Source Approach to Creating a National Critical Habitat Web Map**
*Deanna Sarro, The Pennsylvania State University*

**Maps are Fast and So Can You**
*Sam Matthews, Mapbox*

### Heritage B
**Conservation and Sustainability**
*Moderator: Matt Dooley*

**Mapping the Monolithic Statue Quarries of Easter Island (Rapa Nui)**
*Alice Hom, Jo Anne Van Tilburg, Cristián Arévalo Pakarati, Matthew Bates, Easter Island Statue Project (EISP)*

**Saving Tigers One Map at a Time!**
*Kevin McManigal, University of Montana*

**Maps for Sustainable Tourism for Pennsylvania's Craft Beer and Wine Industries**
*Alison Feeney, Shippensburg University*

**Visualizing Tree Cover Along Linear Parks in San Antonio**
*Sophia Parafina, Docker*

### Heritage C
**Drawing the Line**
*Moderator: Hans van der Maarel*

**Who's on First: Adminstrative Boundaries and Localities**
*Martin Gamache, Art of the Mappable; Nathaniel Vaughn Kelso, Mapzen*

**Developing Mapzen's Neighborhood Database**
*Nat Case, INCase, LLC; Nathaniel Vaughn Kelso, Mapzen*

**Mapping Regions With Partial Boundaries**
*Brandon Plewe, Brigham Young University*

## morning session 1

Summit Ballroom
**NACIS Commons**

*NACIS goes (partially) unconference!*

Something new this year: All day Thursday, we'll have a room set aside for informal sessions. Want to discuss your favorite map obsession with fellow enthusiasts? Or maybe you're looking to network with other cartographers and work through a common problem? Sign up for a slot and add whatever you think our conference is missing!

Visit the registration area to see what's on the Commons schedule, or write your topic in an available time slot (first come, first served)! Chairs, a flipchart, and markers are provided.

10:10 am–10:40 am
**Morning Break**

### Heritage A
**Smart Mapping**
*Moderator: Mary Beth Cunha*

**Enabling Users to Easily Filter TNM Datasets to Smaller Scales**
*Andy Stauffer, Brittany L. Roche, Seth D. Webinger; US Geological Survey*

**Mobile App Cartography for the US National Park Service**
*Jake Coolidge, NPMap / Colorado State University*

**Using Geo-Ontologies to Improve Modeling of Complex Real World Geographies**
*Justin Lewis, Nathan McEachen, TerraFrame*

**Mapping Neighborhood Data from the American Community Survey**
*Richard Lycan, Portland State University*

### Heritage B
**Maps and Learning**
*Moderator: Brooke Harding*

**Reflections on Five Years of Teaching Cartography**
*Robert Roth, University of Wisconsin–Madison*

**Teaching New Cartography**
*Rich Donohue, University of Kentucky; Andy Eschbacher, CARTO*

**From Button Pushing to Problem Solving: Modern Geospatial Technology in the Classroom**
*Lyzi Diamond, Mapbox*

**Cartographic Curiosity: Promoting Interdisciplinary Thinking in General Education Through Maps**
*Joy Santee, McKendree University*

### Heritage C
**Let's Talk About Text**
*Moderator: Amy Griffin*

**From April Fool's to Hollywood: the Making of the LA Typographical Map**
*Josh Ryan, Axis Maps*

**Microaesthetics, Part Deux: Typeface Design and Semantic Effects**
*Elaine Guidero, Cynthia Brewer, The Pennsylvania State University*

**Multivariate Thematic Maps Using Font Attributes**
*Richard Brath, Ebad Banissi, London South Bank University*

**Landscapes of Text: The Art and Science of Geographic Text Visualization**
*Alexander Savelyev, Texas State University*

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12:00 pm–2:00 pm
Heritage D
**NACIS Lunch & Business Meeting**

We invite everyone to participate in our annual NACIS business meeting. *Lunch is on us!*

Heritage A
## Mapping Yellowstone
*Moderator: Pat Kennelly*

**Mapping the
Yellowstone Caldera**
*Charles Preppernau, Manuel
Canales, National Geographic
Partners*

**Designing Wildlife Migration
Maps**
*James E. Meacham, Alethea Y.
Steingisser, University of Oregon;
Hall Sawyer, Western Ecosystems
Technology; Emilene Ostlind,
William Rudd, Matthew J
Kauffman; University of Wyoming*

**100 Years of National Park
Service Tourist Maps
for Yellowstone**
*Scott White, Fort Lewis College*

**National Geographic
Magazine's Yellowstone
Special Issue Cartography**
*Martin Gamache, Art of the
Mappable; Lauren Tierney, Brian T.
Jacobs, National Geographic*

**Interactive Animated
Projected Elk Map
and Terrain Model**
*Alex Tait, International Mapping*

Heritage B
## Historical Perspectives
*Moderator: Martha Bostwick*

**Women Shaping the World:
Women and Globes**
*Judith Tyner, California State
University, Long Beach*

**The First Geologic Maps
of the US**
*John Lindemann, Consulting
Geologist*

**The Coast and Geodetic Survey
in Colorado**
*John Cloud, NOAA Central Library*

**Geohistory-Géohistoire
Canada: Developing a
Partnership for Historical GIS
and Mapping in Canada**
*Byron Moldofsky, Marcel Fortin;
University of Toronto*

**Historical Geocoding & the City**
*Michael Page, Matthew Pierce, Alan
Pike, Jason Yang, Emory University*

## afternoon session 1

Heritage C
**Elements of Design**
*Moderator: Nat Case*

**Amenity Icons From ISOTYPE to OpenStreetMap**
*Will Payne, University of California, Berkeley*

**Implementing Clean, Consistent Cartography at a University-Wide Scale**
*Micaella Penning, Stacey Stark; University of Minnesota Duluth*

**Designing an Atlas with a Minimalist Aesthetic**
*Travis White, University of Kansas*

**Firefly Cartography**
*John Nelson, Esri*

**UConn Women's Basketball: A Sports Cartography Infographic**
*David Glassett, Peaceful Valley Maps*

Summit Ballroom
**NACIS Commons**

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3:30 pm–4:00 pm
**Afternoon Break**

Heritage A
## Mapping Risk and Uncertainty
*Moderator: Kristen Grady*

**Challenges and Opportunities in Mapping the North American Hazardous Waste Trade**
*Eric Nost, Heather Rosenfeld, Kristen Vincent, Sarah Moore, Tanya Buckingham, Robert E. Roth, University of Wisconsin–Madison*

**Effects of Map and Augmented Reality Views of Flood Risk on Concern About Climate Change**
*David Retchless, Texas A&M University at Galveston*

**Towards Cartographic Standards for Web-Based Flood Hazard Maps**
*Eben Dennis, Icon Engineering; Robert Soden, University of Colorado*

**Mapping Uncertain Census Data for Urban Planners**
*Amy Griffin, University of New South Wales Canberra; Jason Jurjevich, Meg Merrick, Portland State University; Seth Spielman, Colorado University Boulder; David Folch, Florida State University; Nicholas Nagle, University of Tennessee, Knoxville*

Heritage B
## Finding Our Way
*Moderator: Hans van der Maarel*

**Indoor Navigation and the Role of Maps**
*Georg Gartner, Technische Universität Wien*

**Deemphasising Dead-Ends: Navigation in Today's Dendritic Cities**
*Nate Wessel, University of Toronto*

**Virtual Reality and Mapping: An Introduction to Matterport**
*Derek Tonn, mapformation*

## afternoon session 2

### Heritage C
**Maps for Social Justice**
*Moderator: Matt Dooley*

**Measuring the Impact of Development on Urban Green Spaces in D.C.**
*Angela Chang, The Pennsylvania State University*

**Mapping Change in North/East Denver**
*Rachel Stevenson, Emily Anderson, Bryan West, Cody Peterson, Isaac Rivera, Jordan Hill, University of Colorado Denver*

**Nonprofit Mapping for Change**
*Tim Sinnott, Maegan Leslie-Torres, GreenInfo Network*

**Poverty Analysis in Sri Lanka Using Commercial Satellite Imagery**
*Nick Hubing, Chris Lowe, LAND INFO Worldwide Mapping*

### Summit Ballroom
**NACIS Commons**

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### 5:30 pm–6:30 pm
**CP Editorial Board Meeting**
Springs Orleans Restaurant

### 6:00 pm–9:00 pm
**NACIS Night Out at Jack Quinn's Irish Pub**

NACIS Night Out is your chance to make new carto-friends and catch up with those you already know.

If it's your first time coming to NACIS and you haven't already signed up for NACIS Night Out - stop by the registration desk to buy a ticket and join in the fun. Dinner and a drink is included in the registration cost, and we'll have a great space all to ourselves at Jack Quinn's Irish Pub just a few blocks from the conference hotel.

### Heritage A
**The Professional Cartographer**
*Moderator: Alex Tait*

**Adventures in Self-Publishing: A Personal, Do-It-Yourself History of Cartography**
*Mark Monmonier, Syracuse University*

**Yet Another Typographic Map**
*Hans van der Maarel, Red Geographics*

**Global Geodata Sources: Topographic Mapping and Satellite Imagery**
*Geoffrey Forbes, Nick Hubing, LAND INFO Worldwide Mapping*

### Heritage B
**Planes, Trains, and Automobiles**
*Moderator: Kristen Grady*

**Using Network Segments in the Spatial Representation of Travel Time Isochrones**
*Jeff Allen, Steven Farber, University of Toronto*

**Husky Lines Mobile App: Adapting Transportation Studies to Our Changing Technologies**
*Elisabeth Leaf, Britta Ricker, Alexa Brockamp, University of Washington*

**Mapping Air Population**
*Michael Peterson, Paul Hunt, University of Nebraska Omaha*

**Mapping Real-Time Flight Data**
*Paul Hunt, Michael Peterson; University of Nebraska Omaha*

### Heritage C
**New Terrain**
*Moderator: Amy Griffin*

**3D Printed Terrain Models and Maps: Current State of Technology and Challenges**
*Michael Higgins, Summit Terragraphics*

**Generalizing Terrain Representations With Vector Sums**
*Patrick Kennelly, Long Island University*

**Practical and Impractical Uses of Terrain Data**
*Chris Henrick, Seth Fitzsimmons, Alan McConchie, Stamen Design*

**Integrating 3D Data Into Cartographic Design**
*David McKittrick, Blue Marble Geographics*

10:10 am–10:40 am
**Morning Break**

### Keep the conversation going online!

Share your thoughts on Twitter with your fellow attendees—and those who couldn't make it—by using the #NACIS2016 hashtag. And make sure to follow @NACIS while you're at it!

Stop by our forums at CartoTalk.com to post longer thoughts, share your slides, and get feedback on your work.

Get your project in front of a wider Internet audience by publishing in *Cartographic Perspectives,* the only free, online, open-access journal in cartography: cartographicperspectives.org.

If you've been taking photos during your time in Colorado Springs, share them with the NACIS crowd! Check out our Flickr pool: flickr.com/groups/nacis.

### Heritage A
**Storylines in the Map**
*Moderator: Pat Kennelly*

**James Emery: Cartographer, Artist, Historian**
*Adele Haft, Hunter College, The City University of New York*

**It's a Map Map Map Map World: Cartography, Cinema, and Adventure**
*Victoria Johnson, USAID*

**Uisge Beatha: A Deep Map of Islay**
*Charles Rader, University of Wisconsin–River Falls; Daniel Bochman, University of Edinburgh*

**Map Poetry**
*Lisa Charlotte Rost, NPR Visuals Team*

### Heritage B
**Mapping in the City**
*Moderator: Carolyn Fish*

**Using Historical Maps to Research Pittsburgh's Bridges**
*Todd Wilson, Lauren Winkler, GAI Consultants*

**An Application for Location Selection and People's Preferences for Establishing Schools in Al Ain City, UAE**
*Naeema Al Hosani, United Arab Emirates University*

**Minnesota Smart City/Infrastructure Transparency Stress Tool**
*Katie Stinebaugh, University of Minnesota*

### Heritage C
**Dynamic Workflows**
*Moderator: Andy Woodruff*

**Hashtag to Map: Transforming Zombie Data to Living Maps**
*Rex Cammack, Paul Hunt, University of Nebraska Omaha*

**Data Viz in a Dash: Cartography and Visual Journalism Under Tight Deadlines**
*Joshua Stevens, NASA's Earth Observatory*

**An Approach to Automate Block Cartogram Creation**
*Jeff Blossom, Harvard University; Dynamic Terrain Visualization; Konstantin Käfer, Mapbox*

Carson Room

**New Forms of Geospatial Information**

Panel Session

*Organizers: Jim Thatcher, University of Washington Tacoma, Craig Dalton, Hofstra University Panelists: Susan Schulten, University of Denver, Ladona Knigge, California State University, Chico Jessica Breen, University of Kentucky, Luke Bergmann, University of Washington, Nick Lally, University of Wisconsin–Madison*

Spatial data, of one form or another, inform, shape, and define our everyday lives and choices. Generated through a host of quotidian acts, such as credit card purchases, smartphone application use, and surveillance systems, spatial data is increasingly and continuously fed into massive data systems that collect, aggregate, and analyze it in powerful, new ways. Access to and use of such data demarcates the limits and possibilities of cartographic visualization, shaping world views and popular imaginations. How we see the world through the mediation of cartographic images of spatial data has tremendous impacts on how we perceive ourselves and how we act in the world. Drawing together academics and practitioners, the panel addresses not only what it means to think about new forms of data and their representation, but also what it means to act with said data.

12:00 pm–2:00 pm

**Lunch Bunch**
Meet At Registration Desk

12:00 pm–2:00 pm

**NACIS Board Meeting**
Cameron

Heritage A
### Rethinking the Map
*Moderator: Nat Case*

**Introducing Geographical Imagination Systems**
*Luke Bergmann, University of Washington; Nick Lally, University of Wisconsin–Madison*

**The MAP-Makers Shadow: Transformation, Integrity and Anxiety**
*Steven R. Holloway, toMake Press*

**Fashionable Maps Are Coming to Town. Beep-Beep.**
*Kenneth Field, Esri / International Cartographic Association*

**Argument, Principle, and Value Judgment**
*Mark Denil*

**Maps by Hands: Opportunity, Techniques, & Cherubs**
*Dylan Moriarty, Development Seed*

Heritage B
### Challenges in Spatial Analytics
*Moderator: Fritz Kessler*

**OpenStreetMap Analytics: Rewarding Contributors by Tracking OSM in Real-Time**
*Dylan Moriarty, Marc Farra, Nate Smith, Development Seed*

**Taxis and APIs: Mapping and Analyzing Transportation in New York City**
*Juan Francisco Saldarriaga, Columbia University; David A. King, Arizona State University*

**Taking it Public: Visualizing Geospatial Data on the Web Using Shiny**
*Jerry Shannon, Julia Connell, University of Georgia; Kyle Walker, Texas Christian University*

**Where Do We Put It All? Housing Large Geospatial Data Collections**
*Jo Ashley, Amber Leahey, University of Toronto*

**Mapping Virtual Traffic in Real Space and Time**
*Ryan Mullins, Caroline Ziemkiewicz, Adam Fouse, Aptima*

## afternoon session 1

Heritage C
### Making Maps Useful
*Moderator: Alethea Steingisser*

**Introducing MapStudy**
*Carl Sack, Robert E. Roth, Kristen Vincent; University of Wisconsin–Madison*

**Software Testing: How "Tests" Can Improve Map Design**
*Amy Lee Walton, Mapbox*

**The Making of *Map Use,* the Eighth Edition**

Aileen Buckley Esri; A. Jon Kimerling, Oregon State University

**Mapa: A Mac App for User-Friendly Cartography**
*Quincy Morgan, The Pennsylvania State University*

**Developing a Data Acquisition Policy at the University of Colorado Boulder**
*Philip White, Elise Gowen, University of Colorado Boulder*

Carson
### Typophiles' Retreat, Part 2
Panel Session
*Daniel P. Huffman, somethingaboutmaps;
Elaine Guidero, The Pennsylvania State University*

Without regard for the concept of "popular demand," 2014's Typophiles' Retreat is back! Join your two facilitators, along with a roomful of other typography nerds, for a free-flowing discussion of all things type. This is an audience-driven session, so come prepared to share your knowledge, experience, and enthusiasm with your colleagues.

3:30 pm–4:00 pm
**Afternoon Break**

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## Heritage A
### Representing Change
*Moderator: Fritz Kessler*

**Colors in a Multivariate Attribute Space over Time**
*Luc Guillemot, David O'Sullivan, University of California, Berkeley*

**Mapping Demographic Change with Cartes et Données**
*Kazimierz Zaniewski, University of Wisconsin–Oshkosh*

**How to Build a Space/Time Directory?**
*Bert Spaan, New York Public Library*

**Determining Current Uses of Cartographic Animation**
*Joanna Merson, Arizona State University*

**Beyond Choropleth Animation and Small Multiples: A Cubist Approach to Temporal Data**
*Aaron Dennis*

## Heritage B
### Advancing Cartographic Education
*Moderator: Hans van der Maarel*

**The National Atlas of Korea: Rare Opportunities for Cartographic and Geographic Education**
*Gregory Chu, University of Wisconsin–La Crosse; Chulsue Hwang, Kyung Hee University; Jongnam Choi, Western Illinois University*

**The Lake Champlain Basin Atlas: An Online Portal to Watershed Exploration and Education**
*Ryan Mitchell, Lake Champlain Basin Program*

**Implementing a New Geospatial Data Discovery Interface Across a Multi-Institution Consortium**
*Nathan Piekielek, The Pennsylvania State University; James Whitacre, University of Illinois at Urbana-Champaign*

**GIS-based Discovery Interface to Paper Map Sets**
*Christopher Thiry, Colorado School of Mines*

**iPad Apps for Teaching Geography**
*Abdullah Al-Zubaidi, United Arab Emirates University*

## Heritage C
### Collaborative Cartography
*Moderator: Robin Tolochko*

**Participatory Mapping: Evaluating Practice in Climate Change Projects in Caribbean Small Island Developing States**
*Alison DeGraff, Bheshem Ramlal, Michael Sutherland; University of the West Indies*

**The Gunpowder Mapping Workshop 2015**
*Matt Dooley, University of Wisconsin–River Falls*

**Participatory Mapping with a Homeless Advocacy Group**
*Kate Rigot, University of Colorado Denver*

**Expressions of Place: An Interdisciplinary and Interactive Community Event Series**
*Diana K.B. Hoover, University of Wisconsin–Stevens Point*

## Carson
### Crafting Campus Maps

Panel Session
*Organizer: Nick Martinelli, Foundry Panelists: Erik Steiner, Stanford University; Katie Kowalsky, Mapzen*

Campus maps are an odd business. Who is using them? Who is funding them? Is the goal to help current students find class? Or to engage visitors with the campus in hopes of pulling in those out-of-state tuition dollars? Often the mission and the implementation depend on the funding source and on the department tasked with creating the map. This panel brings together those who have participated in campus mapping on paper or web in a discussion about audience, bureaucracy, mission, and craft that is unique to campus maps, but relevant to many cartographic endeavors.

6:00 pm–9:00 pm
Heritage D/E/F
**NACIS Banquet**

### Mapping the Infinite City

*Joshua Jelly-Schapiro, Writer and Visiting Scholar at the Institute for Public Knowledge, New York University*

In 2010, Rebecca Solnit and a host of collaborators published *Infinite City: A San Francisco Atlas,* launching what has now grown into a trilogy of atlases devoted to America's most iconic cities. In October 2016, the trilogy concludes with the release of Nonstop Metropolis, an atlas of New York City co-directed by the geographer Joshua Jelly-Schapiro, and marking the end of a project that has produced three books and 70 maps making postulates about both the nature of cities and the possibilities of contemporary cartography. This talk will offer a special introduction to *Nonstop Metropolis*, the most ambitious volume yet. It will explore what maps can do, or at least what these particular maps do, by presenting these atlases as counters to the rise of digital navigation and celebrations of what maps did in other eras, and as odes to how cartography lets us grasp or at least gaze at the inexhaustibility of every city, the innumerable ways it can be mapped.

9:00 pm–10:30 pm
**Geodweeb Geopardy!**

Join in on a NACIS tradition, as our own Dennis McClendon channels Art Fleming to host a very mappy version of Jeopardy! Sign up at the registration desk if you'd like to join a team—winners take home great carto-prizes. Otherwise, join the audience to cheer on (and heckle) the players.

Next year in Montréal! October 10–13, 2017

L'an prochain à Montréal! 10 au 13 octobre 2017

Carson Room
## GIS Basics for Cartographic Design and Production
*David McKittrick, Blue Marble Geographics*

Cartography is often cited as the perfect fusion of art and science. The quality of a map is only as good as the data that was used to create it and as understandable as the visual characteristics that are applied to this data. In this workshop we will use Global Mapper to introduce some of the basic principles of GIS data management and processing and follow the workflow from data acquisition or creation to cartographic rendering. Along the way we will demonstrate elements of both vector and raster data processing including data editing and cropping, imagery manipulation, thematic rendering, labeling, and ultimately map layout and publication. We will also explore the integration of readily available 3D data for contour generation as well as topographic or bathymetric visualization. Finally we will incorporate the various elements and datasets into a what-you-see-is-what-you-get layout framework in preparation for web, print, or geospatial PDF publication.

Learning Center
## Mapping for Change with OSM
*Vanessa Knoppke-Wetzel, USAID*

Learn to map data on OpenStreetMap—or help contribute if you already know how! We will teach, provide tracing guides, and talk about how the data created using OSM helps humanitarian organizations and local communities make informed decisions about aid decisions around the globe. Given the former, we are choosing specific places that need data so we can help people out as much as possible. So, whether a newbie or an expert, come have fun with us! Please bring your laptop, and a mouse if you happen to have one (it's okay if you don't).

Location TBA

### Mapping in the Cloud with GeoJSON and TopoJSON

*Rex Cammack, Paul Hunt, Michael P. Peterson, University of Nebraska - Omaha*

GeoJSON and TopoJSON have both emerged as major file formats for JavaScript-based mapping. The popular programming language was introduced in 1995 to make web pages more interactive and did not originally facilitate the reading of files. JavaScript Object Notation (JSON) developed over the past decade as a fast method of data input. GeoJSON is a particular variation of JSON for geographic data. TopoJSON, or Topological JSON, encodes polygons as arcs and significantly reduces file sizes. The workshop examines how these files can be manipulated and displayed using popular Application Programmer Interfaces (APIs). Examples expand upon the existing code for the Mapping in the Cloud book. All participants will create their own webhosting account and upload files from the book's web page. Please bring your laptop with Firefox or Chrome browser to participate in this workshop.

9:00 am–5:00 pm

### Field Trip: Garden of the Gods Hike and Orienteering

What on earth could be better than exploring the Garden of the Gods and learning old fashioned manual navigation using maps? This full-day trip includes transportation to and from Garden of the Gods, a box lunch, permit fees, and a bit of orienteering training before heading out on a mountain hike. You can expect the hike to be approximately 3.5 miles, so please plan and dress accordingly. If you have questions about other details, ask our NACIS volunteer field trip organizer, Jeremy Goldsmith **(jeremywgoldsmith@gmail.com).**

**Adventures in Self-Publishing: A Personal, Do-It-Yourself History of Cartography**    While finishing up Volume Six of the History of Cartography, I wrote and self-published a personal history titled *Adventures in Academic Cartography: A Memoir.* This presentation describes the project with the aim of encouraging others to share their own experiences in book form. Topics covered include organizing the book's content into ten largely thematic chapters; using the family financial diary instead of budgeting; hiring an experienced copy editor to provide the much-needed second set of eyes; adding a picture gallery; coping with Microsoft Word's limitations for page layout; designing and creating my own cover; publishing with Amazon using my own imprint, Bar Scale Press; preparing files for uploading to CreateSpace, Amazon's print-on-demand subsidiary; pricing affordable print and Kindle editions; orchestrating a low-energy promotion that actually got some decent book reviews; and making minor revisions. The Professional Cartographer, Friday 9:00–10:10 am

**All About the Carto in CARTO Builder**    CARTO Builder (formerly known as CartoDB) is a powerful tool for data, analysis, and cartographic design. With an easy-to-use online interface, you can take your thematic web maps to the next level. During this talk, I will highlight how to make a variety of thematic maps from proportional symbols to dot density to the standard choropleth (and more!) all inside of our new and improved online interface. We will touch on important thematic mapping considerations including options for map types based on the characteristics of your data, projections, and enhanced options for color ramps and labeling. We will also explore other data-to-analysis-to-design methods that are now available for your next thematic web map.  PCD 3:30–5:00PM

**Amenity Icons From ISOTYPE to OpenStreetMap**    Episodes of standardization and divergence in the icons used by cartographers and designers over time help illuminate the broader political economy of mapping, tourism, navigation, and the contemporary geoweb. In this talk, I trace the development of the familiar "fork and knife," "cocktail glass," and "coffee cup" symbols to socialist designers in inter-war Vienna who created the ISOTYPE system of pictorial statistics, through the 1960s standardization of pictograms for global travel, sports, and conventions (Buckminster Fuller hailed these symbols as a "worldian language"), up to the present day.  Ironically, a form of visual communication intended to unite a global working class has ended up facilitating economic integration and consumption by global elites.  Elements of Design, Thursday 2:00–3:30 pm

**An Application for Location Selection and People's Preferences for Establishing Schools in Al Ain City, UAE**    GIS-constructed thematic maps can describe a variety of information relating to development activities. This study aimed to locate the best sites for establishing schools in the city of Al Ain, through researching the potential of suitable locations as well as examining peoples' preferences. Al Ain has seen unprecedented population growth and rapid development; therefore, this study aimed to establish suitable models for the distribution of schools. It was concluded that schools were not evenly

distributed, and cooperation should be established with the relevant authorities and the ministries that are concerned with the development of education services. Mapping in the City, Friday 10:40 am–12:00 noon

### An Approach to Automate Block Cartogram Creation

Cartograms that show a statistic in the form of equal sized blocks allow the map reader to quickly compare quantities across an area. However, at the time of this project, there existed no tool or algorithm that automatically converts a GIS shapefile into a block cartogram. This talk will detail an approach that produced a block cartogram for a Texas county shapefile using data manipulation in Excel and the Cartography Toolbox in ArcMap. Dynamic Workflows, Friday 10:40 am–12:00 noon

### Argument, Principle, and Value Judgment

Most discourse on cartography draws or assumes a clear distinction between "legitimate" and "propaganda" maps. The former is by definition a conscientious attempt to map things fairly while the latter is characterized as a scurrilous attempt

to deceive and hoodwink. However, because all maps make at least implicit claims to truth, and thus to a positive ethical stance, it is unclear how one is to judge a map's, or mapmaker's, ethics. What, then, constitutes cartographic ethics? To wit: in what vile part of this propaganda map doth the evil lodge? Tell me, that I may sack the hateful mansion. This talk will briefly examine the issue of cartographic ethics, ethical legitimacy, and ethical practice. Re-thinking the Map, Friday 2:00–3:30 pm

### Beyond Choropleth Animation and Small Multiples: A Cubist Approach to Temporal Data

Common approaches to cartographically presenting geographic time series include small multiples and animation. However, it is uncertain whether map-readers can effectively derive accurate and comprehensive understanding of a time series dataset from these methods. This talk focuses on ideas like using principle component and cluster analysis to derive significant trends from time series datasets and displaying these patterns cartographically. We can apply the thinking of 20th century cubist

artists, who analyzed and reassembled objects from more than one viewpoint for greater context, to how we present geographic time series. Instead of dynamic animations of choropleth maps, we might use dynamic processing techniques to create more abstract and insightful maps. Representing Change, Friday 4:00–5:20 pm

### Branding + Identity With Maps

Maps are integral to an organization's branding mix, but often stand alone, both visually and conceptually. GIS and marketing departments often function separately, and seldom bring in a carto-graphic designer to bridge the gap. To demonstrate how useful it is to include them in the design process, I will use the recently developed Arlington County Commuter Services Bicycle Comfort Level Maps as an example. I will also use these maps to discuss strategies that optimize maps for branding and help organizations unify their internal messaging-such as creating descriptive icons and symbology, storytelling, user testing, and using maps for promotion and tourism. PCD 10:45 am–12:00 noon

**Breaking up With Raster and Going Steady With Vector Tiles**   Cartographer meets map tiles. That infamous meet-cute has caused scores of love, commitment, and eventual heartbreak for all of us in web mapping. The technology behind tiles is constantly changing, growing, and expanding-but where does that leave a cartographer? Are the limits of raster tiles worth abandoning for the mysterious, bad boy vector tiles? This talk will impart the wisdom of how a cartographer's quest for true love in her tiling scheme and possible workflows can adapt smoothly to a new relationship with vector tiles.  PCD 9:00–10:25 am

**CartoCSS vs GL: Considering New Technologies for National Park Service Basemaps**   NPMap builds tools for the National Park Service that empower park staff to create functional, well-branded digital maps. One of our primary products is Park Tiles, a suite of online basemaps designed for NPS using the CartoCSS approach. New developments in WebGL are expanding the possibilities of map design, display, and interaction. This talk will highlight NPMap's exploration into the new word of GL basemaps, focusing on our team's considerations for if, when, and how the National Park Service will adopt this new cartographic technology.  Design in Web Cartography, Thursday, 9:00–10:10 am

**Cartographic Curiosity: Promoting Interdisciplinary Thinking in General Education Through Maps**   This presentation reports how introduction of cartography in general education courses can help university students combat limits of subject-specific thinking and embrace complex interdisciplinary critical thought. In an age where students often resist complex thinking in favor of finding answers through a quick search on their phones, introducing them to maps and cartographic practices can prompt social awareness, problem-solving skills, and citizen-engagement.  Maps and Learning, Thursday 10:40 am–12:00 noon

**Cartography and the Lost Art of Drawing**   This talk will illustrate the benefits of integrating hand sketching into the map design process. As cartography and related disciplines come to rely on the computer and digital technologies as their primary design and production tool, the unique benefits of hand sketching and its relationship to visual thinking and design development have been overlooked. The presentation will share specific examples and methods from the author's work and offer suggestions for how others can incorporate hand sketching into their work flow. Additionally, examples from other cartographers and designers will be included.  PCD 1:30–3:10pm

**Challenges and Opportunities in Mapping the North American Hazardous Waste Trade**   HazMatMapper is an interactive map designed to facilitate exploration of transnational flows of hazardous waste in North America (**geography.wisc.edu/hazardouswaste/map**). Conventional narratives emphasize that wealthier countries export waste to poorer ones, overlooking how marginalized communities within wealthier countries may be exposed to hazards. To move beyond this limitation, we assembled a novel geographic dataset from documents held by the US EPA describing over 18,000 shipments of waste made be-

tween 2007 and 2012 to US processing facilities.  *Mapping Risk and Uncertainty, Thursday 4:00–5:20 pm*

### The Coast and Geodetic Survey in Colorado
The Coast Survey, now NOAA, has devoted far more time and energy to the high ranges and basins of the interior west than one might expect from an outfit with Coast in its name. The undulating high geography and dry crystalline air are conducive to the long observations necessary to efficiently tie the coastlines geodetically across the continent. This presentation will showcase the historic progression of the cartography of geodesy, with a twist on the notion of mapping for change. Aberrations and errors discovered in precise observations in and around the Rocky Mountains, once realized and pursued, led to discoveries about the structure of the atmosphere, and also Carl Aslakson's major correction in the speed of light. The mapping caused the change.  *Historical Perspectives, Thursday 2:00–3:30 pm*

### Colors in a Multivariate Attribute Space over Time
How can colors be used to unravel spatiotemporal patterns in a multivariate geographical space? Perceptually consistent color spaces such as L*a*b* or L*c*h* are well defined, but their use in qualitative cartography is still relatively rare. Furthermore, qualitative color palettes are often randomly selected and do not relate the distance between colors to degrees of difference between categories depicted on the map. This study presents a tool allowing to select colors and automatically connect them to a multivariate space. This study shows that careful consideration of a color palette and its relation to the mapped data space can assist in the visualization of complex spatiotemporal patterns.  *Representing Change, Friday 4:00–5:20 pm*

### Complete Solution From Data to Mobile Device, The
This presentation will use Avenza products to demonstrate how cartographers can bring raw geospatial data into graphic design applications to create high-quality maps, and then show how they can be distributed to smartphones and tablets for public consumption. You will see how to easily and quickly distribute maps to readers globally for use in their work and for their leisure activities.  *PCD 1:30–3:10pm*

### Creating, Collaborating on, and Maintaining Maps With Make
Reproducible, automated workflows are fundamental to the creative process. They provide a safety net for experimentation and document complicated step-by-step actions. Makefiles have been used to compile source code for decades, so we'll start there. Data preparation (format conversion, re-projection, filtering, project initialization) and post-processing steps (PDF generation, compression, publishing to the web) can be viewed as a series of transformations. This prevents us from needing to remember error-prone, rote steps and allows us to focus more on creativity and collaboration.  *PCD 9:00–10:25 am*

### Data Driven Styling for GL Mapping
In May of this year, Mapbox introduced Data Driven Styling for the open source Mapbox GL JavaScript library. This release opens up new possibilities for map styling at runtime and the ability to build dynamic thematic maps and data visualizations on the fly. This talk will discuss how data-driven styling can be used for both dynamic

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data visualizations and base map design and why data-driven styling coupled with other Mapbox GL JS features like efficient vector tiles, symbol clustering, and runtime styling is a milestone for web and mobile mapping technology. I will provide live examples and resources to allow participants to take advantage of these new features in their work. PCD 10:45 am–12:00 noon

**Data Viz in a Dash: Cartography and Visual Journalism Under Tight Deadlines**　NASA's Earth Observatory publishes maps, satellite imagery, and data visualizations daily. Increasingly our publications feature multiple images, driving the need to produce figures with great speed. Creating maps and data visualizations swiftly while maintaining high standards for quality poses a challenge for teams both large and small. The first goal of this talk is to discuss the Earth Observatory's approach to design guidelines and standardized workflows that enable us to meet tight deadlines with high expectations. The second goal is to share open tools and resources from NASA and others that are useful for fast-paced visual journalism in earth science. Dynamic Workflows, Friday 10:40 am–12:00 noon

**De-emphasising Dead-Ends: Navigation in Today's Dendritic Cities**　Algorithmic detection of dead-ends and highly indirect streets could help cartographers reduce visual noise in transport maps, without resort to generalization techniques that simplify data or remove it entirely. In this presentation, I'll discuss algorithms for detecting dead-ends and apply them to a sample of regions, using OpenStreetMap data. I'll attempt to show how the resulting classification can be used to reduce visual noise and make maps easier for the eye to navigate. Preliminary results show that dead-ends make up between 12 and 45 percent of all streets and/or paths in my broad sample of regions, and can depend in varying degrees on the chosen transport mode for which the network is constructed. The proposed technique then has special relevance for mode-specific transport maps or maps for users with unique access constraints. Finding Our Way, Thursday 4:00–5:20 pm

**Designing an Atlas with a Minimalist Aesthetic**　This project was born of a conversation about how stripped down a map design can become before the mapped features are unrecognizable and the design no longer retains any aesthetic or functional elegance. Heady stuff, but relevant to a series of river maps I wanted to design. I started with two beautiful works of inspiration (Darton and Gardner's 1823 Comparative Heights of the Principal *Mountains and Lengths of the Principal Rivers* and Joost Grooten's 2005 *Metropolitan World Atlas*) and the minimalist design aesthetic found in the De Stijl movement, the Bauhaus school, and the International Style (simply put, less is more and form follows function). This presentation shares my process of conceiving and developing this river atlas, the final design solutions I arrived at, and early attempts at both print and digital production. Elements of Design, Thursday 2:00–3:30 pm

**Designing Wildlife Migration Maps**　This presentation focuses on the role of cartography in wildlife migration study in Wyoming and the Greater Yellowstone Area. Representing complex scientific data in clear and

meaningful ways presents major design challenges. Specifically, working with the visual interrelationship of GPS-derived migration data and the landscape setting is covered. The same points, lines, and polygons derived from the GPS data can tell different ecological stories such as migration timing, seasonality, speed, or fidelity to a particular route. This cartographic challenge is compounded by the multitude of interrelationships between the ecological behavior and the landscape. Elevation, land cover, land ownership, and special management areas can all be equally important contributors to the migration story and therefore a necessary component of the map. Maps and graphics from the in-production *Atlas of Wildlife Migration: Wyoming's Ungulates* will be used to illustrate these cartographic challenges and solutions. Mapping Yellowstone, Thursday 2:00–3:30 pm

### Determining Current Uses of Cartographic Animation in Geography Through a Journal Content Analysis
Animation offers a captivating and informative avenue for representing dynamic data in cartography. Likewise, leading cartographic research aims to improve animation use through data and user evaluation to establish best-practice guidelines. But how many of these guidelines actually reach the research community? This question is investigated using a content analysis determine how cartographic animation is used in major geography journals in the past 5 years. I specifically examine what types of animation are used, the purpose behind their use, and the congruence between the animations and the data represented. This analysis is used to examine both how cartographic animation is used outside of the cartographic research community, and if, in the era of digital maps, there is a need for better facilitating methods for including animations in academic publications. Representing Change, Friday 4:00–5:20 pm

### Developing a Data Acquisition Policy at the University of Colorado Boulder
Acquisition of data from external sources is often overlooked in academic libraries' collection development policies. Library policies' inclusion of data acquisition guidelines range from well-defined to nonexistent. Recognizing a need for a coordinated approach, librarians at the University of Colorado Boulder sought to formalize data acquisition guidelines to avoid acquiring data of limited usefulness and to improve cohesion of interdepartmental data policies. We systematically reviewed literature and collection policy documents from more than 20 peer institutions to identify common approaches and explore data collection assessment strategies. We will discuss best practices for implementing a data acquisition process. Due to the dynamic nature of GIS data, we will also examine the unique policy needs of geospatial data users. This presentation discusses our findings and explores broader applications for library-wide collection development. Making Maps Useful, Friday 2:00–3:30 pm

### Dynamic Terrain Visualization
Visualizing terrain in maps is vital in the outdoors, and also helps in understanding the greater context of the location. Rendering it dynamically in the web browser, or on the mobile device allows for great design flexibility

to create a stunning looking map. In this talk, we're looking at the whole chain of DEM data sourcing, processing and distribution, as well as creating a terrain visualization with Mapbox GL that goes beyond classical hillshading by incorporating terrain openness for showing macroscopic terrain. Dynamic Workflows, Friday 10:40 am–12:00 noon

### Effects of Map and Augmented Reality Views of Flood Risk on Concern About Climate Change

Research has shown that people with direct experience of flooding also tend to express more concern about climate change. One explanation for this increase in concern is that such direct experience decreases the psychological distance of climate change, making it more tangible and concrete by relating it to one's immediate physical environment. However, research in this area has not considered whether mediated experience delivered through geospatial visualizations of local flooding can similarly affect concern about climate change, or how these effects may vary with the scale or distance of the geovisualization. Accordingly, I consider how varying scale and distance

in map and augmented reality views of flood risk data affects both perceptions of this flood risk and associated concern about climate change. Mapping Risk and Uncertainty, Thursday 4:00–5:20 pm

### Enabling Users to Easily Filter TNM Datasets to Smaller Scales

The US Geological Survey's National Geospatial Technical Operations Center (NGTOC) currently hosts vector data themes (including elevation, hydrography, transportation, boundaries, structures, geographic names, and woodland tint) appropriate for cartographic display at approximately a 1:24,000 scale. NGTOC is evaluating methods to enable users to automatically filter the 1:24,000-scale data so that it may be appropriately used at smaller scales through database enrichment. A new attribute, named VisibilityFilter, is currently being evaluated which will tag each feature with an appropriate (smallest) scale-of-use. While the VisibilityFilter attribute will enable users to define the content appropriate at a target scale, the resulting content may still require geometric simplification for specific user needs. This presentation will describe the VisibilityFilter attribute and demonstrate

how it can be used. Smart Mapping, Thursday 10:40 am–12:00 noon

### Expressions of Place: An Interdisciplinary and Interactive Community Event Series

In the heart of Wisconsin, where the Menomonie people have lived for many thousands of years, in a small city that houses a medium-sized liberal arts university, some generous and visionary individuals, organizations, and corporations join forces to celebrate culture and reinvigorate community. One of these undertakings is the upcoming event series, Expressions of Place sponsored by the University of Wisconsin–Stevens Point. During this talk I will present the genesis for this project, the variety of arts and geography mash-ups in the program, some obstacles encountered as well as discoveries made while organizing this compendium on mapping, sensing, living and expressing Place. Collaborative Cartography, Friday 4:00–5:20 pm

### Fashionable Maps Are Coming to Town. Beep-Beep.

Cartographic style used to be that which defined a particular look and feel, perhaps that of a National Mapping Agency or news

agency. Perhaps now it has more to do with individuality and the search for expression. Here, I explore cartographic style, how fashions are established and how they change. What is the equivalent of the pair of flares? What's safe? What's edgy? What should we be looking forward to for next "season"? I introduce work the ICA Map Design Commission has begun to develop a series of style guides. These are intended to provide a modern cartographic wardrobe for the style-conscious mapmaker. Rethinking the Map, Friday 2:00–3:30 pm

**The First Geologic Maps of the US**    In 1809 William Maclure—one of the first American geologists—published what is arguably the first geologic map of the United States. Over the next three decades this map, little changed with the exception of its topographic base, was republished in four iterations. To the modern earth science community these maps are largely unknown. What caused these seemingly pioneer maps to slip into near obscurity? Historical Perspectives, Thursday 2:00–3:30 pm

**Firefly Cartography**    We cartographers swim in points, lines, and polygons. But their absolute and abrupt geometry seldom matches the uncertainty of our data, and the dissipating nature of the phenomenon it represents. What's more, our basemaps often compete for visual prominence with that thematic data, and we might miss out on a great opportunity to inject a sense of scale and urgency. This is why I love firefly cartography! Join me as I attempt to rationalize this aesthetic style, provide a step-by-step demonstration of the creative process, and link to resources for map makers to geek out on it themselves. Elements of Design, Thursday 2:00–3:30 pm

**From April Fool's to Hollywood: The Making of the LA Typographical Map**    I knew Axis Maps originally for their typographical maps of various cities. So as the most recent member of Axis Maps, I knew I just had to create the worst possible version as an April Fool's joke. After the presentation, the decision was made to transform the map into an actual product. This talk will detail the process of making a proper typographic map: from getting and processing the data from OSM to producing the map in Illustrator. Due to being made completely out of type, typographic hierarchies, color, and style are extremely important and will be highlighted, using the original April Fool's version for contrast. Let's Talk About Text, Thursday 10:40 am–12:00 noon

**From Button Pushing to Problem Solving: Modern Geospatial Technology in the Classroom**    The world of mapping technology moves fast. Even cartographers in industry have trouble keeping up with the newest trends in geospatial software, libraries, and programming languages. This presents a nontrivial problem for instructors in higher education: students want to be prepared for jobs after college, which means they want to learn the latest and greatest tools. How are teachers supposed to keep up? In this talk, I will present some ideas on how instructors can help students stay on the bleeding edge of geospatial technology without putting in hundreds of extra hours. The talk will factor in perspectives from industry while focus- **41**

ing on the real challenges of working in an academic environment, using real world examples from a university that is overhauling its geospatial technology program this year. Maps and Learning, Thursday 10:40 am–12:00 noon

### Generalizing Terrain Representations With Vector Sums

Generalizing terrain representations using shaded relief are challenging, with previous efforts focusing on two methods. The first approach involves filtering or modifying the original terrain data to make a more generalized elevation model. The second approach involves filtering or generalizing the values of gray on the shaded relief map itself. An alternative approach presented here is to use surface normal vectors that are first resolved into x, y, and z components and then summed within the kernel of a low-pass filter. In this manner, the orientations of these vectors used in relief shading and associated surfaces are adjusted independently of the elevation value. Results appear sharper than generalized terrain models that are shaded or generalized shaded relief maps when a kernel of the same dimension is. New Terrain, Friday 9:00–10:10 am

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### Geohistory-Géohistoire Canada: Developing a Partnership for Historical GIS and Mapping in Canada

The Canadian Historical Geographic Information Systems (HGIS) Partnership Development Project is a diverse group of geographers, historians, librarians, research NGOs, GIS companies, and members of the public. We are working to improve our collective ability to research historical subjects using GIS, and map them, primarily on the web. We are reaching out to the larger HGIS community to consolidate knowledge about what kinds of resources are currently available, and what will be needed in the future—not only to build historical GIS data and tools, but also to facilitate collaboration and data-sharing. This presentation will present preliminary results from a user needs study, and will discuss plans for pilot projects in the coming year. Historical Perspectives, Thursday 2:00–3:30 pm

### GIS Basics for Cartographic Design and Production

Cartography is often cited as the perfect fusion of art and science. The quality of a map is only as good as the data that was used to create it and as understandable as the visual characteristics that are applied to this data. In this workshop we will use Global Mapper to introduce some of the basic principles of GIS data management and processing and follow the workflow from data acquisition or creation to cartographic rendering. Along the way we will demonstrate elements of both vector and raster data processing including data editing and cropping, imagery manipulation, thematic rendering, labeling, and ultimately map layout and publication. We will also explore the integration of readily available 3D data for contour generation as well as topographic or bathymetric visualization. Finally we will incorporate the various elements and datasets into a what-you-see-is-what-you-get layout framework for web, print, or geospatial PDF publication. Saturday morning workshop

### GIS-based Discovery Interface to Paper Map Sets

The GIS-based Discovery Interface Project has created a visual, interactive, searchable, web-based portal that provides patrons with an easy way to understand what maps are owned by the library, and how to

access them. Embedded within the interface are links to records in the library's catalog, and, when available, links to scanned copies of the maps. These interfaces have allowed patrons, from afar, to easily search our map holdings, and quickly understand what is available. The processes developed by the map collection's staff are the start of a crowd-sharing effort that will allow other libraries to easily create their own discovery portal and thus provide access to their map collection. Usually, patrons know exactly what part of the globe they are searching for; these portals take the user right to their area of interest and shows what paper maps are available. Advancing Cartographic Education, Friday 4:00–5:20 pm

### Global Geodata Sources: Topographic Mapping and Satellite Imagery
Geoff Forbes will provide an update on recent changes in availability of large-scale mapping of countries around the world, including newly available datasets and recently updated coverages. Changes in methods of circulation and data format, such as digital-only and print-on-demand, born-digital and vector-only will be discussed. How these issues affect pricing and licensing will also be covered, as will the exploitation of commercial value-added services of data sourcing and GIS processing by map collections. Nick Hubing will provide a historical overview of satellite imagery and review new developments including launches, decommissioned satellites, SmallSats, sensors based on the International Space Station, off-the-shelf image datasets and cloud-access to imagery. Extraction of map data layers from imagery will also be addressed. The Professional Cartographer, Friday 9:00–10:10 am

### The Gunpowder Mapping Workshop 2015
In October 2015, twelve NACIS members participated in the Gunpowder Mapping Workshop in River Falls, Wisconsin. This presentation highlights our adventures and showcases the artwork that resulted. Collaborative Cartography, Friday 4:00–5:20 pm

### Gunpowder Maps (You Know, for Kids!)
Alternate titles include, "How we got a university to let us ignite gunpowder on campus, with kids, unsupervised, to make maps." Or, "How we convinced a city to buy a one-day $2.5 million insurance policy so we could ignite gunpowder at the local library with kids and make maps." Spoiler Alert: I have no idea really, we just did it, people were engaged, and we got to talk about maps with a bunch of kids and their parents, which was super. We reflect in this talk on how to engage the larger community in discussions about maps and mapping. PCD 10:45 am–12:00 noon

### Hand-Rendered Map Illustration Techniques
Simple, practical design, drafting, and painting tips I've picked up from architecture school, art classes, and years of trial, error, and experimentation in the making of hand-rendered maps. We'll walk through the mapmaking process, starting with finding good, copyright-free base maps and designing the page/area layout. We'll look at papers and transferring techniques; pen nibs for line work and lettering; inks for fountain and dip pens; watercolor techniques for shorelines and mountains. I'll also touch on Photoshop cleanup and file assembly, and will be eager to hear tips and techniques that work best for you. PCD 1:30–3:10pm

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### Hashtag to Map: Transforming Zombie Data to Living Maps

In this research we are investigating how to turn data flowing through social media hoses into live maps. The first aspect of this project is gathering and storing this zombie data. We'll look at issues such as endless versus revolving data storage, spatial or non-spatial data storage, distributive versus aggregated data, raw versus contextual data, and server versus client processing. The results of these infrastructure decisions coupled with map and interactive design choices provide map users with the ability to work with data that is more lifelike than raw zombie data. The underlying data flow and processing research will be demonstrated through a case study that looks at temporal and cumulative patterns of tweets about NCAA College football teams. Dynamic Workflows, Friday 10:40 am–12:00 noon

### Historical Geocoding and the City

The Digital Lab at Emory's Center for Digital Scholarship has produced a 3D geodatabase and geocoder of 1930s Atlanta as part of its Atlanta Explorer Project, which seeks to transform city directories and historical spatial data into geospatial tools and immersive visualizations for exploring the history of the city. This presentation discusses the methods used and lessons learned from the first phase of the project and how it has informed our strategy to produce geocoders for the years 1867–1930. Historical Perspectives, Thursday 2:00–3:30 pm

### How to Build a Space/Time Directory?

The NYC Space/Time Directory will make urban history accessible through the kinds of interactive, location-aware tools used to navigate modern cityscapes. It will provide a way for scholars, students, and enthusiasts to explore New York City across time periods, and to add their own knowledge and expertise. Over the past five years, NYPL Labs—the R&D and digitization lab of the New York Public Library—has worked on many digitization, crowdsourcing, and digital cartography projects, all aiming to make the collection of the New York Public Library more accessible. The NYC Space/Time Directory will build on top of those efforts, and it will create new connections between previously unconnected library collections and data sources, allowing people to tell new stories about the history of New York City. Representing Change, Friday 4:00–5:20 pm

### Husky Lines Mobile App: Adapting Transportation Studies to Our Changing Technologies

The Husky Lines research project takes a mixed-methods approach to identifying barriers to public transit usage for the student population of the Tacoma campus of the University of Washington. The first step was to illuminate existing public transit deserts and simultaneously implement a student survey to measure student perceptions of transit use. Based on these findings, the team is recommending new bus stops and bus lines to better serve the student population. A mobile application, tapping into built-in sensors, measures actual commute patterns and is augmented with a traditional travel diary to measure perception of commutes. Finally, this study provides an example of how mobile technology can be used to support transportation surveys. Planes, Trains, and Automobiles, Friday 9:00–10:10 am

**Implementing a New Geospatial Data Discovery Interface Across a Multi-Institution Consortium** In recent years, the availability of geospatial data has increased dramatically. so that the focus has shifted away from the data production efforts of individuals and towards large-scale multi-institution data documentation and discovery projects. In 2015, nine university members of the Committee on Institutional Cooperation began a collaborative effort to build and populate a geospatial data portal. The portal leverages the newest data documentation and discovery tools including GeoNetwork to create ISO metadata records and GeoBlacklight as the platform for a web-based discovery interface. Advancing Cartographic Education, Friday 4:00–5:20 pm

**Implementing Clean, Consistent Cartography at a University-Wide Scale** The Geospatial Analysis Center has recently taken over from Facilities Management the task of designing and managing campus maps at the University of Minnesota Duluth. The new wall maps are a long-overdue update to the previous black & white CAD drawings, and through their new design seek to ease navigation for students and increase the sense of campus incorporation into the surrounding community. Challenges have included creating new workflows for units who have previously managed their data outside of a GIS to using integrated data in a central GIS repository. It has become our mission to be the central core for spatial data, mapping, and cartography at UMD, with the goal of clean, consistent output that will create greater cartographic congruency across campus. Elements of Design, Thursday 2:00–3:30 pm

**InDesign + ArcMap (Photoshop & Illustrator Too)** Using ArcMap, InDesign, Photoshop, and Illustrator in tandem has allowed high-volume, high-quality production in our 2-person shop. We will present a whirlwind dive into our workflow for a 50-map series of flood depth and inundation maps. This workflow includes data driven pages map production in ArcMap, batch raster processing in Photoshop, graphic legend production in Illustrator, and composition in InDesign. PCD 3:30–5:00PM

**Indoor Navigation and the Role of Maps** Over the past several decades, navigation applications have increasingly conquered the world with online mapping services, car navigation systems and ubiquitous smartphone distribution. Currently, outdoor navigation implementations are quite well-advanced and mature, but indoor navigation applications have proven more challenging, even with improved indoor localization techniques, standardization of indoor models and public indoor data gathering efforts. In this contribution several concepts for indoor navigation services are discussed and some developments towards deriving indoor landmarks and appropriate cartographic models highlighted. Finding Our Way, Thursday 4:00–5:20 pm

**Integrating 3D Data Into Cartographic Design** With the increased availability of 3D data, our traditional two-dimensional, top-down view of the world is becoming somewhat obsolete. We now have access to data that provides an immersive perspective of the natural or man-made

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environment and inexpensive tools to use this data. We will explore the procedure for transforming a simple XYZ file or a dense lidar point cloud into an accurate representation of the terrain. This gridded raster surface model is the basis for the creation of contour lines or a hillside pattern, both of which add an element of texture to any cartographic rendering. We will also demonstrate the process for creating a cutaway or cross-sectional view of the terrain as well as draping imagery or other map layers over the terrain model to create a uniquely realistic topographic perspective. New Terrain, Friday 9:00–10:10 am

**Interactive Animated Projected Elk Map and Terrain Model**   This presentation will look at the design and production process for creating an interactive map exhibit showing the elk migration in the Greater Yellowstone ecosystem. The center of the exhibit is a solid terrain model. A high-lumen projector casts an interactive animated map image onto the model from an iPad controller mounted to the reader rail. The primary design challenge was to show a complex geographical story in

a manner that would be easy to understand and manipulate for a general user. An additional challenge was to create an effective animation of the annual elk migration and the seasonal changes in the environment. Mapping Yellowstone, Thursday 2:00–3:30 pm

**Introducing Geographical Imagination Systems**   Spatial theory in human geography often describes space as situated, dynamic, processual, relational, and contingent, suggesting non-Euclidean topological theories for grappling with the complexities of space. How, then, can cartography contribute to bringing these spatial imaginaries to fruition without reinscribing an understanding of space as a static, empty container waiting to be filled with points that precisely locate discrete objects within it? In this talk, we present a prototype of a Geographical Imagination System—a web-based interface that encourages the interpretative construction, collision, and collaging of relational and absolute spaces. Rethinking the Map, Friday 2:00–3:30 pm

**Introducing MapStudy**   What is MapStudy? Simply put, it's a platform that aims to empower the next generation of scientific cartography experiments. Have you ever wanted to test whether a certain type of map, certain visual variables, certain interactions, or certain data are better for particular purposes? MapStudy makes it easy! This talk will cover what MapStudy can do for you, how to set it up, and what lies ahead for the project. You don't have to wait to use it though—go fork MapStudy on GitHub at github.com/uwcart/mapstudy now! Making Maps Useful, Friday 2:00–3:30 pm

**It's a Map Map Map Map World: Cartography, Cinema, and Adventure**   From the dotted line journeys of Indiana Jones and the traveling by map shortcut of *The Muppet Movie* to Lex Luthor's model of New California in *Superman* and the treasure map at the heart of *Romancing the Stone,* on-screen cartography has played a memorable role in many classic adventure movies. This talk will examine the way maps are represented in these films, both as plot drivers and as

decorative elements, as well as the car-to-centric tropes, in-jokes, and mistakes contained therein. Additional attention will be paid to the construction and design of movie maps. Storylines in the Map, Friday 10:40 am–12:00 noon

**iPad Apps for Teaching Geography** With the information technology revolution, geography teachers are looking for innovative ways to teach geography and keep students involved. We investigated various iPad apps that can be used as engaging online tools for teaching geography to students of all ages. Results indicated that these apps provide a number of stimulating games, quizzes, and some other materials that can possibly bring life to geography learning. We have concluded that using apps in teaching geography provides interactive content to engage students and keep them motivated, and they perform better. Advancing Cartographic Education, Friday 4:00–5:20 pm

**James Emery: Cartographer, Artist, Historian** In the early 1930s, James Emery created two maps to illustrate Kenneth Slessor's poetry collections:

*Trio* (1931) and *Cuckooz Contrey* (1932). During WWII, he made maps of the new military railways in Lebanon, where he was stationed as a draftsman; produced the relief map of Tobruk to accompany Chester Wilmot's 1944 book on the siege of that desert port; and created watercolors of the Middle East. Back in Sydney, he drew maps celebrating European "discoveries" of Australia. Yet almost nothing is known him today. My talk will tell the story of James Emery through his art and maps, and through the words of others. Storylines in the Map, Friday 10:40 am–12:00 noon

**The Joy of Hex: Challenges in Creating and Interpreting Spatial Bins** Complex, large point datasets present challenges for visualization and synthesis of spatial patterns due to the density of marks and resulting clutter from overlapping mark symbols. One suggested method for dealing with complex point datasets is to partition the space into polygonal bins, and symbolize each bin based on point count inside the bin. Because regular polygonal (e.g., square or hexagonal) bins appear as same size and shape,

they are suggested as a method for improving ability to analyze smooth, continuous change in point distributions, while avoiding artifacts from irregular political bin geometry. However, there is a fallacy if regular geographic bins are really considered to represent "same size and shape." In this presentation, we discuss challenges and tradeoffs the cartographer must consider in creating spatial bins. PCD 1:30–3:10pm

**The Lake Champlain Basin Atlas: An Online Portal to Watershed Exploration and Education** Originally developed in 2002 using static PDF maps, the online Lake Champlain Basin Atlas is one of the Lake Champlain Basin Program's (LCBP) most effective education and outreach tools. The atlas includes standard themes as well as content focused on management issues specific to the Lake Champlain watershed. It is used extensively by students and educators as a source for research and for mapping exercises. The LCBP is redeveloping the atlas using contemporary web mapping tools, both open source and proprietary. With links to the source data and to ArcGIS Online feature layers, the new

atlas will be a portal to exploration of the watershed and a point of departure for mapping activities that use modern tools and techniques. I will discuss the redevelopment of the atlas and its use in LCBP E&O efforts, and explore additional educational applications and the role of atlases in education in the digital age. Advancing Cartographic Education, Friday 4:00–5:20 pm

**Landscapes of Text: the Art and Science of Geographic Text Visualization** Geographic textual information is abundant—for example, data such as place mentions can be extracted from news articles and books, and social media data are frequently associated with explicit geographic coordinates. Such data have been demonstrated to contribute to our understanding of a particular place from perspectives such as those of health, crime and political sciences. A promising approach to analysis of these data is geovisual text analytics: the science of analytical reasoning about large collections of geo-textual information facilitated by interactive visual interfaces. This talk will present a comprehensive overview of existing text visualization techniques

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and discuss the theoretical and practical challenges of geographic visualization of textual information—that is, making maps of text. Let's Talk About Text, Thursday 10:40 am–12:00 noon

**The Making of *Map Use,* the Eighth Edition** The eighth edition of *Map Use: Reading, Analysis, Interpretation* is being released this month. For decades, *Map Use* has served as a comprehensive, foundational companion for college-level students and instructors, for professionals in a variety of fields where maps are important, and also for casual map users. This new edition fully integrates advancements in GIS, GPS, remote sensing, and web mapping into the text throughout all the chapters. It includes a new chapter highlighting map design. New to this edition, too, are almost 50 new figures, as well as an expanded glossary that defines key terms and topics. It is also available in e-book format allowing us to also include links to online maps, animations, and web sites, thus expanding the examples and resources the book offers. Making Maps Useful, Friday 2:00–3:30 pm

**Maki 3.0: Open Sourced Icons for Maps** It can be a challenge to design a consistent and readable set of symbols for any map, but the limited resolution and variability of digital screens provide additional hurdles. The Maki project has been an attempt to work within these constraints and provide an open-source set of vector symbols for common map points of interest. The vector icon set embraces the pixel grid and is easily customized with different colors and backgrounds to fit a wide variety of maps styles. Earlier this year, Maki 3.0 was released with a focus on improving three core aspects of the project: the overall design of the icon set, tools to create customized versions, and clear style guidelines to help anyone design new symbols for the project. This talk will focus on the processes and design considerations for each of these aspects, and how they are already helping people use Maki and contribute to its evolution. PCD 9:00–10:25 am

**Making Map Movies With ArcGIS Pro** Video has become a common and compelling way to share cartographic content in today's age. Standard

video formats work well across web, mobile, and desktop environments, allowing you to author once and share widely. This makes video an enticing format for cartographic communication, allowing the author to guide the viewer through space, time, and theme. Animations open up a rich, flexible way to make maps which extends the cartographer's toolkit. We'll show how to use animations in ArcGIS Pro to create map movies of thematic data and simulated environments in 2D and 3D. We'll also show videos created in ArcGIS Pro to demonstrate additional possibilities.  PCD 3:30–5:00PM

**The MAP-Makers Shadow: Transformation, Integrity and Anxiety**   Map-makers are hiding behind the rule-books, and the cartographic-GPS-GIS-image machine cranks on. To step aside/outside and practice the fourth precept of "Right MAP Making,": "deep listening through direct-contact" takes not only time & effort, but is central to the integrity of the map-maker and map-making. Integrity and transformation come through listening to our anxiety and awakening to confront

the long shadow that casts itself over today's maps; "Keep the Earth Round."  Rethinking the Map, Friday 2:00–3:30 pm

**Map Poetry**    Maps. When I talk about maps at my job as a data journalist, I talk about visual elements representing the physical world. When I talk about maps with my philosophy friends, we talk about mental models that help us navigate the word of ideas. I love maps in both forms. Let's bring them together! Which beliefs, thoughts, and narratives can we map with visual elements? And how can we tweak geographical maps to give the audience new mental models about the world?  Storylines in the Map, Friday 10:40 am–12:00 noon

**Mapa: A Mac App for User-Friendly Cartography**    Mapa is a new cartography application for MacOS developed with usability at its core. While existing mapmaking packages provide powerful functionality for GIS professionals, their complexities often discourage untrained users. Mapa infuses the familiar interface conventions of a modern Mac productivity app with a

geospatial engine, resulting in a robust yet user-friendly tool for designing common types of thematic maps. By taking a fresh, focused approach to what a cartography app can be, Mapa aims to render mapmaking a more regular and accessible practice.  Making Maps Useful, Friday 2:00–3:30 pm

**Mapping Air Population**    Air population refers to the total number of people flying above the earth at any point in time. These people form a distinct and separate population from those still physically connected to earth. Real-time air population can be estimated by using an extensive network of ground aircraft sensors based on ADS-B (Automated Dependent Surveillance-Broadcast). An aircraft determines its position via GPS and broadcasts its position along with its identification, aircraft type, altitude and speed. Most commercial passenger aircraft are equipped with ADS-B transponders. The total number of passengers is calculated by multiplying the number of seats for each aircraft by the current seat occupancy rate. In the interactive, real-time mapping system, maps are provided to show total state

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air population and the density of air population. Planes, Trains, and Automobiles, Friday 9:00–10:10 am

**Mapping Change in North/East Denver**    In the spring of 2016, various students from multiple disciplines at the University of Colorado Denver, came together to research and map the current and future redevelopment happening in North/East Denver, projects presenting serious questions regarding social and environmental justice for adjacent communities. These students have developed an informational resource aimed at shedding light on the adverse impacts these projects have on primarily Hispanic and low-income populations. A website showcased a series of maps visualizing development project areas and the demographics of the local population and various impacts of those development projects. Maps for Social Justice, Thursday 4:00–5:20 pm

**Mapping Demographic Change with Cartes et Données**    Demographic change over time can be shown on several types of quantitative thematic maps. Some types (e.g.,

choropleth and bar graph maps) have been frequently used to portray spatial and temporal trends in population change and its two components, natural increase and migration. Other less popular types (e.g., nightingale and polar graph maps) can also be used for displaying demographic trends from a more complex (i.e., multidimensional) perspective. This paper discusses several cartographic techniques, available in the latest version of the French software package Cartes et Données, for mapping population change at the state and county level. Representing Change, Friday 4:00–5:20 pm

**Mapping for Change with OSM**    Learn to map data on OpenStreetMap—or help contribute if you already know how! We will teach, provide tracing guides, and talk about how the data created using OSM helps humanitarian organizations and local communities make informed decisions about aid decisions around the globe. Given the former, we are choosing specific places that need data so we can help people out as much as possible. So, whether a newbie or an expert, come have fun with us! Please bring

your laptop, and a mouse if you happen to have one (it's okay if you don't). Saturday morning workshop

**Mapping in the Cloud with GeoJSON and TopoJSON**    JavaScript was introduced in 1995 to make web pages more interactive and did not originally facilitate the reading of files. JavaScript Object Notation (JSON) developed over the past decade as a fast method of data input. GeoJSON is a particular variation of JSON for geographic data. TopoJSON, or Topological JSON, encodes polygons as arcs and significantly reduces file sizes. The workshop examines how these files can be manipulated and displayed using popular Application Programmer Interfaces. Examples expand upon the existing code for the *Mapping in the Cloud* book. All participants will create their own webhosting account and upload files from the book's web page. Please bring your laptop with Firefox or Chrome browser to participate in this workshop. Saturday morning workshop

**Mapping Neighborhood Data from the American Community Survey**    In Portland, Oregon,

neighborhoods are an important part of the language of place and there is considerable interest in neighborhood-level mapping of the socioeconomic data from the American Community Survey. It is feasible to build neighborhood level aggregations from Census block group data, with some allocation around the borders, however when aggregated to the neighborhood level, standard errors are large and map viewers are confused by the uncertainties of the mapping. This paper proposes a workaround, a cure with some serious side effects: to include "some surrounding area" around each neighborhood in the allocation process through the use of an adaptive bandwidth grid. The resulting map is generalized but has less sampling error. The cure is a reduction in uncertainty and the side effect is geographical ambiguity. Smart Mapping, Thursday 10:40 am–12:00 noon

### Mapping Real-Time Flight Data

The Federal Aviation Administration (FAA) tracks flights through a combination of flight plans and radar. This data is publicly available; live flight data can be acquired by requesting access to the FAA System Wide Information Management (SWIM). This daunting process requires security and hardware infrastructure and heavy coordination with FAA liaisons. Alternatively, many private companies, such as FlightAware, are already connected to SWIM and augment this information with a network of ground stations that acquire ADS-B signals from airplanes. A cloud-based system is demonstrated for mapping this data in real-time using a series of JavaScript AJAX requests. The requests return data that are mapped on-the-fly using web-based mapping APIs. The data are further analyzed to determine the number and type of planes flying above each US state. Planes, Trains, and Automobiles, Friday 9:00–10:10 am

### Mapping Regions With Partial Boundaries

Many regions, even official jurisdictions such as governments, have incomplete boundaries. That is, their boundary definitions reference features that do not close. While today such partial boundaries are usually limited to informal regions, prior to the era of scientific mapping and GIS they were the norm. Arbitrarily connecting them in a GIS polygon destroys the integrity of the original definition. When the boundaries are changing over time, the problem becomes even more complex. I will present possible solutions for representing changing partial boundaries honestly in GIS using an assertion-based data model, reasoning about them, and visualizing incomplete regions on maps. Drawing the Line, Thursday, 9:00–10:10 am

### Mapping the Monolithic Statue Quarries of Easter Island (Rapa Nui)

Eastern Polynesian figurative carving traditions developed on Rapa Nui into a distinctive body of monolithic stone sculpture (moai). About half of all moai remain embedded in the bedrock of a centralized quarry established within a unique volcanic feature named Rano Raraku. This presentation describes the production of an illustrated archaeological atlas of Rano Raraku moai based upon extensive archaeological field survey, statue excavation, photogrammetry, illustrative cartography, and cross-references to archival documentation. Relationships between the quarry and ceremonial sites across the island are visually presented through spatial analysis. We examine

the challenges of organizing data for reinterpreting the past while planning for the future of moai conservation and further research. Conservation and Sustainability Thursday, 9:00–10:10 am

**Mapping the Yellowstone Caldera** The print and web products for Yellowstone Volcano required integration of GIS data and 2D illustrations into a 3D scene in Cinema 4D, while preserving correct spatial relationships and staying within the limits of the hardware and software. We present our process for displaying high-resolution, spatially-accurate terrains and cross sections in this talk. While we used Cinema 4D as our 3D modeling and rendering software, these methods can also be used in Blender. Mapping Yellowstone, Thursday 2:00–3:30 pm

**Mapping Uncertain Census Data for Urban Planners** The introduction of the American Community Survey has led to more timely but less certain demographic estimates in the United States, particularly for small areas like census tracts or block groups or for population subgroups. This makes it more important than ever for

the end users of the data to understand and account for uncertainty when using the data to make decisions. Here, we report the results of a user experiment with urban planners that compared two different designs for communicating uncertainty in maps of demographic estimates. Mapping Risk and Uncertainty, Thursday 4:00–5:20 pm

**Mapping Virtual Traffic in Real Space and Time** Understanding the logical and spatiotemporal connections of computer networks is an essential requirement for those ensuring information availability, integrity, and confidentiality. Past network visualizations have, generally, focused on representing either their logical structure or physical location. Approaches to the former typically involve node-link diagrams, which offer utility for small networks but fail when scaled to the complexities of large modern networks. Approaches to the latter effectively communicate where networked assets are, but place significant cognitive load on the human to figure out how and how quickly information will get there. In this presentation, we present a novel network visualization concept which combines

approaches from traffic mapping and node-link diagrams to show the minimum time to communicate between network nodes. Challenges in Spatial Analytics, Friday 2:00–3:30 pm

**Maps are Fast and So Can You** Maps on the Web are in constant flux; technologies change, renderers improve, and data storage formats become more standardized. In order for a full mapping infrastructure to perform at its best, a huge number of updates are required at all depths of the stack, not just on the browser. Tools such as Mapbox GL JS are getting faster and faster, but that doesn't come without major changes to the underlying technologies at Mapbox. This talk will outline the major core improvements around GL-based maps at Mapbox, including work around the Vector Tile Specification, vector tile encoding performance, and the latest decoding & rendering improvements in Mapbox GL JS. Design in Web Cartography, Thursday, 9:00–10:10 am

**Maps by Hands: Opportunity, Techniques, & Cherubs** Our workflows are, with few exceptions, entirely

digital. This is fantastic for productivity, accuracy, and a million other reasons—but by building in the same tools we risk uniformity in output. There are endless ways to make something look custom, but one of the best is to simply incorporate illustrative elements—whether they be a hand drawn pattern, icon marker, or classic marginalia. While those elements will inevitably bring to mind maps of the past, I'll argue there are plenty of map makers today utilizing these techniques to great, albeit more subtle, effect. I'll go over when these sorts of embellishments are appropriate, and some techniques I've found useful for bringing handiwork to the digital world. Rethinking the Map, Friday 2:00–3:30 pm

### Maps for Sustainable Tourism for Pennsylvania's Craft Beer and Wine Industries

Maps can greatly influence a person's perception of an area and they should be a logical tool for planning a trip. While tourism maps can be a blatant form of advertising, they assist in generating knowledge and an impression of the destination. Sustainable tourism is experiencing remarkable growth, particularly with the movement of the local traveler, triggered by people's desires to eat and drink. We'll examine maps generated for Pennsylvania's craft beer and wine tourism industries in both paper and digital form. The goal is to identify common themes and marketing techniques that can be applied to generate a sustainable map for the Colchagua wine region of Chile. Conservation and Sustainability Thursday, 9:00–10:10 am

### Measuring the Impact of Development on Urban Green Spaces in D.C.

Washington has experienced a steady surge of growth over the past 10 years, with increases in jobs, development and a changing demographic leading the way. The loss of public green space often accompanies urban growth and development, and most often disproportionately affects the poor and disenfranchised. Using Census, National Land Cover, and other open source data, this project will identify if and where public green spaces in D.C. have been impacted by demographic change and development. The analysis will be viewed through a social justice lens and demonstrate how GIS can be used to measure equality of access to public goods and resources, particularly in a rapidly changing city landscape. Maps for Social Justice, Thursday 4:00–5:20 pm

### Microaesthetics, Part Deux: Typeface Design and Semantic Effects

Maps are a multilayered semiotic system, and map text comprises an important part of this system. Among its many utilitarian functions, such as labeling places and features, type contributes to the semiotic code of a map through its aesthetic appearance, often conceived as personality, or semantic effect. Effective typographic design for maps requires careful attention to the personality-linked characteristics of type, called microaesthetics, which influence reader perception. We propose a redefined subset of cartographic visual variables that involve type, and demonstrate how we derived a list of microaesthetics and linked them to semantic effects using ecological statistics. These lines form the basis of a framework that could be used by cartographers and other designers to determine an appropriate typeface for their map. Let's Talk About Text, Thursday 10:40 am–12:00 noon

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### Minnesota Smart City/Infrastructure Transparency Stress Tool

Conversations about infrastructure are easy to avoid when we bury public information in long reports across multiple agencies. As cartographers and GIS professionals, we are often called to bring together disparate data sources, break them out of their tabular cells, and create simple, attractive tools for communication. The Minnesota Smart City/Infrastructure Transparency Stress Tool is a collection of web maps and associated visualizations of infrastructure quantity, age, need, and spending for Minnesota's cities. These maps provide an approachable tool for the public, legislators, city officials, and other stakeholders to change conversations about Minnesota's present and future infrastructure. Mapping in the City, Friday 10:40 am–12:00 noon

### Mobile App Cartography for the US National Park Service

The number of mobile apps available to guide visitors through America's special places has exploded in recent years. NPMap aims to provide National Park Service-produced alternative apps that put a ranger's expertise and up-to-date information directly on your device. Not surprisingly, maps are a key component to these mobile experiences. We'll start with a look at our app framework and project workflow, and how the cartographic design process fits within this broader framework. Design decisions are driven by accessibility and usability concerns, and by the desire to speak to the narratives and intangible qualities that make these places unique. Smart Mapping, Thursday 10:40 am–12:00 noon

### Multivariate Thematic Maps Using Font Attributes

We introduce label-based cartograms as a form of thematic map that overcomes some limitations of choropleth maps and area-based cartograms. Labels explicitly encode geographic entities facilitating identification for a less geographically literate audience. Labels can encode multivariate data using a variety of visual attributes, including typographic attributes, not otherwise used in other types of encoding such as the area encoding used in choropleth maps. It is feasible to encode ten variables within labels including quantitative attributes. Labels can be equally sized, so that larger items are not more salient than other entities. The approach can be extended to more abstract maps such as knowledge maps. Let's Talk About Text, Thursday 10:40 am–12:00 noon

### The National Atlas of Korea: Rare Opportunities for Cartographic and Geographic Education

The 2014 National Atlas of Korea innovates in multiple aspects: data selection and portrayal, integration of media and maps, providing pedagogy, and unrestricted online access. The Atlas integrates aspects of socioeconomic, political, educational, demographic, and environmental data that harmonized with national development. It also integrates rare but accurate data about demographic, economic, urban, and migration attributes of North Korea. Several freely downloadable lesson plans were developed for use by American secondary school teachers. Advancing Cartographic Education, Friday 4:00–5:20 pm

***National Geographic* Magazine's Yellowstone Special Issue Cartography**   We will discuss the cartographic work that illustrated the May 2016 *National Geographic* Greater Yellowstone special issue. We will specifically discuss the elk migration supplement as well as the land ownership and reference maps found throughout the issue. Specific topics will include GIS analysis of elk GPS collar migration data, base map data compilation, relief, property ownership and finally the interactive edition of the supplement. Mapping Yellowstone, Thursday 2:00–3:30 pm

**Natural Scene Designer Pro 7**   Natural Scene Designer Pro 7 has a slew of new features, and I will demonstrate my favorites. SVG Export to Adobe Illustrator: combining vector shapefiles and raster 3D terrain is now easy with NSD 7. The exported vectors in SVG format include a bounding box matching the size of the rendered 3D terrain. Multiple Lights: northwest light is not always the best solution for depicting all features on a shaded relief. To improve the appearance of tricky terrain features,

NSD Pro 7 now gives you the option to add multiple lights on a relief. You can adjust the azimuth and elevation angle of each light. Is that ski area you are mapping not high enough? You can use the improved terrain editing tools to brush in more elevation. Texture Shading also allows you to enhance shaded relief with a now built-in rendering option. PCD 1:30–3:10pm

**Nonprofit Mapping for Change**   For 20 years, GreenInfo Network has helped organizations transform geographic data into clear, compelling messages. We'll discuss how a well-designed map can boost the effectiveness of an organization's mission, message, or campaign. We'll share how we work in partnership with our clients to develop cartographic communication tools that deliver the right message to the right audience at the right time with efficiency and elegance, and we'll give you a behind-the-scenes tour of our mapping/development process. We'll also talk about some of our most successful client partnerships and discuss the positive changes our work has helped bring about. Maps for Social Justice, Thursday 4:00–5:20 pm

**100 Years of National Park Service Tourist Maps for Yellowstone**   For 100 years, the National Park Service (NPS) has been a major publisher of tourist maps for Yellowstone National Park. These maps illustrate a wide range of cartographic styles that have resulted from technological changes, agency management and budgetary decisions, and tourist perceptions and needs. Early NPS tourist maps for Yellowstone focused on train and stagecoach travel. By the 1920s, the emphasis had changed to park exploration on roads by private automobile. These early maps employed very simple cartographic techniques and printing methods. Since the 1990s, computer mapping software, digital elevation data, and interactive maps have provided more detailed information, along with better cartography, for Yellowstone's visitors and map users. Mapping Yellowstone, Thursday 2:00–3:30 pm

**An Open-Source Approach to Creating a National Critical Habitat Web Map**   U.S. federal agencies are required to consult with the Fish & Wildlife Service to ensure that their

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actions will not put at risk the survival of endangered and threatened species. Understanding the geographic locations of critical habitats provides these federal agencies with knowledge to make informed decisions as to whether and to what extent actions may impact these listed species. This presentation showcases a Web application intended to aid federal agencies in this regard by providing a map showing the critical habitat spatial data, a listing of all endangered and threatened species attributes, and additional information about each species. Development of the map required consideration of different options for data format, application program interface, and plug-in libraries using open-source data standards and software. Design in Web Cartography, Thursday, 9:00–10:10 am

**OpenStreetMap Analytics: Rewarding Contributors by Tracking OSM in Real-Time** Mapathons are an increasingly effective way to get data into OpenStreetMap. The Missing Maps project hosts mapathons to increase the amount of data in areas that don't have large local OSM communities. Using

the OSM tasking manager and data from Missing Maps, the American Red Cross built an analytics platform that tracks user trends in real-time and rewards contributors for their efforts. This talk will explore the design challenges inherit in the scale of an OSM project, and how we handled developing an architecture that needs to reliably handle bursts of data during high periods of activity, yet reducing costs by auto scaling to input as required. Challenges in Spatial Analytics, Friday 2:00–3:30 pm

**Participatory Mapping with a Homeless Advocacy Group** This presentation will cover participatory mapping and other supportive work done with and for members of activist group Denver Homeless Out Loud. So far, collaborative research has involved mapping the locations of publicly available restrooms in central Denver, and using various visualization strategies to easily depict how accessible they are to a homeless population. Upcoming work may involve the identification of potential sites for tiny home villages using GIS analysis. Collaborative Cartography, Friday 4:00–5:20 pm

**Participatory Mapping: Evaluating Practice in Climate Change Projects in Caribbean Small Island Developing States** Participatory mapping is a form of intimate cartographic collaboration with communities that utilizes unique local/traditional knowledge and is currently being recognized as a valuable tool to approach the impacts of climate change. This research gathered information on participatory mapping in Caribbean small island developing states (SIDS) and compiled a database of projects supplemented by the creation of an adaptable best practice methodology. The significance of these results is their value to connect and educate practitioners, encourage best practice in Caribbean SIDS, and embolden the use of local/traditional knowledge in the face of climate change impacts. Collaborative Cartography, Friday 4:00–5:20 pm

**Poverty Analysis in Sri Lanka Using Commercial Satellite Imagery** This session will use an extensive Sri Lanka poverty mapping project recently completed for the World Bank to demonstrate how to successfully perform feature extraction and

classification of high-resolution optical satellite imagery. This was the first such use of remote sensing for the World Bank. The presentation will explore manual feature extraction methods vs. automated Object Based Image Analysis. Output of custom mapping (including statistics) will be compared to open-source mapping, and applications of map data layers extracted from imagery will be discussed.  Maps for Social Justice, Thursday 4:00–5:20 pm

### Practical and Impractical Uses of Terrain Data
Stamen has been collecting, processing, and experimenting with worldwide digital elevation models (DEMs) for the past year. The primary output of this is the Open Terrain project, which aims to collect resources on how to process and work with DEMs and their derivatives using open source tools, and cloud-based and scale data pipelines. In this talk we'll demonstrate how we're using the Open Terrain data to add hillshades to HOT's humanitarian map style and to reboot our OSM-based classic Stamen Terrain style and deploy it worldwide. We'll also explore some impractical uses of DEMs that we've experimented with purely

for their aesthetic value.  New Terrain, Friday 9:00–10:10 am

### Pretty Maps Without the Price Tag: Cartography With Just QGIS
To produce quality maps for disaster situations, the American Red Cross constantly struggles to balance rapid deadlines with good cartographic design. We also believe in using free and open software whenever possible. Historically, we struggled to make print-ready maps using just QGIS; its print composer isn't intuitive and certain functionalities just aren't there. We'll show how to do some of our favorite styling effects without needing Adobe tools, we'll demonstrate how to make the print composer work, and we'll share some of the limitations we're still experiencing.  PCD 10:45 am–12:00 noon

### Re-Thinking Maps for the Web
Creating maps for the Web has become unavoidable in modern cartography, as the use of mobile devices has risen exponentially. Not only has the size of the canvas changed to that of a playing card, but users expect the map you create to work

equally as well on a phone or tablet and everything in-between while on a fast turnaround. The challenge now is how to take everything, scale it down or modify it to what the audience expects, and still get the point across. Although interactive maps are flashy, they're not always the best solution. So let's rethink optimization and design what we can in a realistic timeframe. I will demonstrate examples where National Geographic has woven together toolsets to intuitively and quickly serve our audience.  PCD 10:45 am–12:00 noon

### Reflections on Five Years of Teaching Cartography
Cartography has changed, is changing, and always will be changing. Arguably, cartography's innate state of flux is what makes our profession both unique and valuable: as we engage in the design process, we tinker, adlib, and innovate across a wide array of tools and techniques. Yet, this creative and rapid adaptation does not always translate well to instruction. In this presentation, I discuss my anecdotal experiences over the past five years to restructure the cartography curriculum at the University of Wisconsin–Madison in order to adapt

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to sweeping shifts in conceptual framings, web mapping technologies, and professional expectations. Maps and Learning, Thursday 10:40 am–12:00 noon

### Saving Tigers One Map at a Time!

A unique partnership between the University of Montana Department of Geography and the Panthera large cat conservation organization has been producing high-resolution topographic maps of the Parsa Wildlife Reserve in Nepal and the Manas National Park in India. Twelve student cartographers have worked for the last two years to create over 24 topographic maps that cover both parks. These maps are being utilized in the field by anti-poaching patrols as part of the Tigers Forever program. We'll conclude with a discussion of the challenges and successes while mentoring aspiring cartography students through a project of this scope and size. Conservation and Sustainability Thursday, 9:00–10:10 am

### Software Testing: How "Tests" Can Improve Map Design

Human fallibility can emerge in even the most impeccable of design projects. Testing is a standard in software development but visual design typically requires the human eye. However, in the world of code-driven web maps, tests can help you and your team quickly identify and resolve even visual discrepancies. Over the past year, our cartographic team has been developing our own design testing suite. The initial goal was to automate style checks before releases and it has grown into a tool that ensures design consistency across our core map styles. This talk will outline our results (both pass and fail), discuss the iteration and evolution of our tests, and share open-source tools we used. Making Maps Useful, Friday 2:00–3:30 pm

### Taking it Public: Visualizing Geospatial Data on the Web Using Shiny

Governmental and nonprofit institutions have increasingly created data dashboards based on open datasets to increase transparency and encourage citizen participation. Two limitations have hampered these efforts. First, raw datasets are often complex and difficult to decipher for non-specialists. Second, software to visualize trends within the data is expensive. Shiny, a data visualization system developed by RStudio, provides solutions to both issues. Shiny harnesses a variety of existing tools such as Leaflet, Plotly, and Highcharts, and encourages users to interact and explore datasets. Challenges in Spatial Analytics, Friday 2:00–3:30 pm

### Taxis and APIs: Mapping and Analyzing Transportation in New York City

Taxicabs are a critical aspect of the public transit system in New York City. We'll present two projects that map and analyze taxi data. The first one looks at cash versus credit card payments and analyzes their spatial distribution in relation to the unbanked population of the city. The second project attempts to quantify how far cabs have to travel empty before they can pick up another passenger, and maps their travels using multiple routing APIs. This project analyzes transportation policies while also reflecting upon the tools we use to perform our analysis; it is as much about the tools as about the content. Challenges in Spatial Analytics, Friday 2:00–3:30 pm

### Teaching New Cartography

New mapping tools and needs continue to converge, producing stunning ways of

visualizing data and gaining insights. Both industry and the academy are eager to embrace these emerging trends. This talk explores mapping education from two complementary perspectives. CARTO stands at the forefront of integrating frontend tools like D3 and Leaflet with backend services supported by PostGIS, enabling a web-based solution to traditional desktop GIS processes. New Maps Plus at the University of Kentucky blends the skills required to harness the web platform with traditional cartographic education. Maps and Learning, Thursday 10:40 am–12:00 noon

**Ten Commandments of Interactive Web Map Design**  What are the do's and don'ts of making an interactive map? What are different things to consider for different mapping scenarios? What do you need to think about when designing mobile maps? I talked with a bunch of professional mapmakers about how they make interactive maps and, from those interviews, created a comprehensive list of best practices and conventions for designing maps for the Web. Design in Web Cartography, Thursday, 9:00–10:10 am

**Terrain in Photoshop: Layer by Layer**  Inspired by the many things I've learned through attending NACIS, I set out a couple of years ago to map the landforms of Michigan. The end result was a 4 GB Photoshop file, which I will deconstruct before your very eyes. I'll use it explain some helpful techniques for working with bathymetry, land cover, relief, and more, interwoven with tales of how the connections I've made through this remarkable organization and conference made it all possible. PCD 3:30–5:00PM

**3D Printed Terrain Models and Maps: Current State of Technology and Challenges**  3D printing technology offers exciting possibilities for cartographers to create accurate full-color terrain models of their work. For areas with mountainous or complicated terrain features, producing a physical map with the precise 3D terrain shape makes for a valuable interpretation tool.  3D printing allows a quick and accurate process for creating these terrain/map models, but it also has challenges and limitations. Since 2008, Summit Terragraphics has been

using 3D printed terrain models as molds for the thermoformed raised-relief map production process. This presentation will look closely at the design, data requirements, data processing, and construction of a 3D-printed terrain model of the island of Kauai. New Terrain, Friday 9:00–10:10 am

**Tools for Getting OSM Into Desktop GIS**  Since its inception, OpenStreetMap has crowdsourced the addition of millions of features of spatial data across the world. It's become a fantastic resource for geographic reference data and it's constantly being improved and updated. While it's open source and the data is free, getting it into a usable format for analysis in desktop GIS, for example, can take a bit of effort. This talk will provide an overview of a handful of tools and apps for getting data from OSM and into desktop GIS software such as ArcGIS and QGIS. PCD 9:00–10:25 am

**Towards Cartographic Standards for Web-Based Flood Hazard Maps**  Online, interactive web-maps are rapidly becoming important tools in the communication of flood hazards. **59**

Although there is a wealth of study and information available guiding the design of traditional cartographic products, there is comparatively little research available that is solely focused on web mapping formats. This presentation will discuss initial findings of ongoing research being conducted in partnership between Icon Engineering and the University of Colorado Boulder. Outcomes of the work will lead towards the development of design heuristics and best practices for visualizing flood data through interactive web-mapping products. Mapping Risk and Uncertainty, Thursday 4:00–5:20 pm

### Transportation Flow Mapping: A Practical Productivity Presentation
Learn how to quickly and efficiently make transportation flow maps using easily gathered data. PCD 9:00–10:25 am

### UConn Women's Basketball: A Sports Cartography Infographic
As the UConn women's basketball team cruised to their fourth consecutive national championship, I embarked on a personal quest to map their recent dominance. In the last four years and a 151–5 record, they defeated 64 teams from 27 states and the District of Columbia. But how should I map that? Follow my journey of sports mapping with its ups and downs of data collection, projection selection, data display, and infographic design. See the final map at goo.gl/zAHC5E. Elements of Design, Thursday 2:00–3:30 pm

### Uisge Beatha: A Deep Map of Islay
Uisge beatha: water of life. Deep maps draw on a long tradition of chorology in geography in order to understand place. The development of a deep map focused on the island of Islay, Scotland reinserts cartography as a central part of multilayered topographical writing and multiple-media through the creation of a deep map that explores the whisky industry of Islay. We document the process by which the map was developed and includes a discussion of archival research, field work, interviews, sketches, photographs, and mapping used in its creation. The compilation of multiple layers of geo-spatial data included base map, hydrography, geomorphology, land cover, social space, and distillery locations. Storylines in the Map, Friday 10:40 am–12:00 noon

### Using Geo-Ontologies to Improve Modeling of Complex Real World Geographies
The GIS industry has a long history of developing geographic boundary data from a geometric perspective (points and polygons) with supporting attribution that is often little help to better understand how geographies relate to each other. Algorithms using traditional techniques implementing geometric and/or attribution analysis can provide greater geographic context. However, using these methods it is often very difficult to achieve high accuracy across geographic hierarchies and large areas. Modeling locations as Geo-Ontologies with the open source RunwaySDK platform allows for defining relationships between features in ways that are much more flexible to maintain regardless of where in a layered hierarchy those features may traditionally exist. Smart Mapping, Thursday 10:40 am–12:00 noon

### Using Historical Maps to Research Pittsburgh's Bridges
Pittsburgh, the City of Bridges, is also known for its convoluted roads. The development of the city's roads is linked to the develop-

ment of the city's bridges. For the 2015 book *Pittsburgh's Bridges,* the study of historical maps became a key research tool. Maps revealed bridges that were eliminated when valleys were filled in and streets that were rearranged when new bridges were built. This research showed that by going back far enough in time, there was an explanation for each irregularity. This presentation will show these findings through maps and images past and present, explaining the city's inconsistencies and abnormalities that make it unique. Mapping in the City, Friday 10:40 am–12:00 noon

### Using Network Segments in the Spatial Representation of Travel Time Isochrones

Isochrones are often used for visual analysis of mobility and accessibility in urban areas. We will discuss an alternative method to conventional isochrones; using computed travel times to classify network segments rather than generating isolines or polygons. We will outline the data, tools, and geoprocessing steps required to make these kind of maps as well as discuss visualization considerations for different scales, subject matter, and for static and interactive maps. Further

discussion will include their advantages and disadvantages when compared to conventional isochrones, particularly in terms of classification options and mapping in conjunction with other data. Planes, Trains, and Automobiles, Friday 9:00–10:10 am

### Virtual Reality and Mapping: An Introduction to Matterport

The long-rumored arrival of virtual reality, in a commercially-viable sense, seems to finally be here. And its impacts upon map creation and wayfinding could be profound. No longer forcing end users of the wayfinding resources we develop (of which map illustration is but one) to understand the world in the one way we've visually presented it to them, virtual reality solutions are marrying planimetric and oblique/pictorial illustration with panoramic photography and the ability to freely move within a place. This session will introduce attendees to one VR-compatible solution I've become intimately familiar with over the past eighteen months: Matterport (**matterport. com/try/**). Finding Our Way, Thursday 4:00–5:20 pm

### Visualizing Tree Cover Along Linear Parks in San Antonio

One measure of success for green space is canopy cover because it provides corridors for movement of plant life, animals and people. San Antonio established the River Walk as part of a flood control program in the 1940s. Since then, the city has been expanding the system of linear parks by adding segments and connecting feeder rivers into the Greenways Trails system. This talk presents tools and methodology to automate measurement of canopy cover along these linear parks over time using satellite imagery. It will also discuss techniques for visualizing canopy cover for the purposes of urban planning and supporting land use studies. Conservation and Sustainability Thursday, 9:00–10:10 am

### Where Do We Put It All? Housing Large Geospatial Data Collections

The Ontario Council of University Libraries (OCUL) is a consortium of 21 university libraries that collaborates through collective purchasing and shared digital library infrastructure. OCUL's Scholars Geo-

Portal service (**geo.scholarsportal. info**) uses Esri software to provide a set of online tools for identifying, exploring, and downloading licensed geospatial datasets for academic research in Ontario. This session will introduce the GeoPortal's interface and discuss various data related issues and demands facing the current version of the geoportal. Challenges in Spatial Analytics, Friday 2:00–3:30 pm

### Who ARE the People in Your Neighborhood? Developing Mapzen's Neighborhood Database
Mapzen's free and open Who's on First is, like most gazetteers, a big list of places with stable identifiers in a place hierarchy, but we're modeling a new way to think about gazetteers: a space where debate about a place is managed but not decided. In compiling data for the neighborhood layer, we have encountered challenges in the range of city political structures, the relationship of city to sub-city entities, and in the lack of documentation and data for neighborhoods in many places. Our starting point was shapes derived from Flickr's neighborhood tags, but we discovered additional serious issues with the original compilation of those tags. We'll look at these questions in a tour through cities big and small. Drawing the Line, Thursday, 9:00–10:10 am

### Who's on First: Adminstrative Boundaries and Localities
Who's on First is an open source gazetteer. Administrative level 2 and localities boundaries for countries outside North America and Europe were largely missing from this gazetteer. We have been collaborating on a project to populate or create these from open sources when available or secondary sources when necessary for most of the world. We have built polygons from point sources, scoured the internet for national mapping agency data, and compiled boundaries for dozens of countries around the world, helping create a true open source dataset that can be used for any purpose. Drawing the Line, Thursday, 9:00–10:10 am

### Women Shaping the World: Women and Globes
Globes today are looked at as toys or teaching aids for the elementary schools or as decorative objects for the home. But in the 18th and 19th centuries, globes were scientific instruments, and while they were used in schools they were used to teach mathematical or astronomical geography; they were not mere toys. While the history of women in cartography has only recently begun to be studied, women's contributions to the creation of globes have been almost totally ignored. Yet women have been involved in globe making since at least the 18th century, there have been at least nine US patents for globes and tellurians granted to women and globes were edited and sold by women. Historical Perspectives, Thursday 2:00–3:30 pm

### Yet Another Typographic Map
Inspired by the amazing work produced by other NACIS members I decided to produce, self-publish, and market a typographic map. This was a big step away from my comfort zone and a great learning experience, this talks highlights that process. Starting off with selecting the area of interest, deciding on the typefaces to use and producing the map to the process of selecting a printer, determining pricing and setting up a website with webshop. The Professional Cartographer, Friday 9:00–10:10 am

Weber Ave

Boulder St

Platte Ave

Bijou St

Kiowa St

Pikes Peak Ave

Colorado Ave

Nevada Ave

Vermijo Ave

Tejon St

Kiowa St

Cascade Ave

Colorado Ave

Pikes Peak Ave

Antlers Pl

Sierra Madre St

Bould Crescent

N

2

1

0

Minutes Walking

**Acadia Park**

**Pioneers Museum Square**

**Monument Park**

**Antlers Park**

Monument Creek

to I-25

to I-25

**Antlers Hotel**

Coquette's Bistro & Bakery

Odyssey Gastropub

Jerusalem Cafe

Paris Crepe

Azada Mexican Grill

Pita Pit

Rico's Cafe & Wine Bar

Rendezvous Cafe

Bingo Burger

Everest Nepal

Kings Chef Diner

Brewers Republic

Rabbit Hole

Mediterranean Cafe

Ola Juice Bar

Phantom Canyon Brewing

Caribou Coffee

The Melting Pot

Il Vicino Wood Oven Pizza

La Baguette Cafe

Springs Orleans

Seeds Community Cafe

Chipotle

Red Gravy

*Jack Quinn's Irish Pub (NACIS Night Out)*

Nosh

East Coast Deli

The Perk

Over Easy

Saigon Cafe

Thirsty Parrot

Sonterra Grill

Corner Cafe

*These are suggested places to eat around downtown Colorado Springs. To find out more about these restaurants and others, visit www.yelp.com or your favorite restaurant finding app.*

Map by Mamata Akella