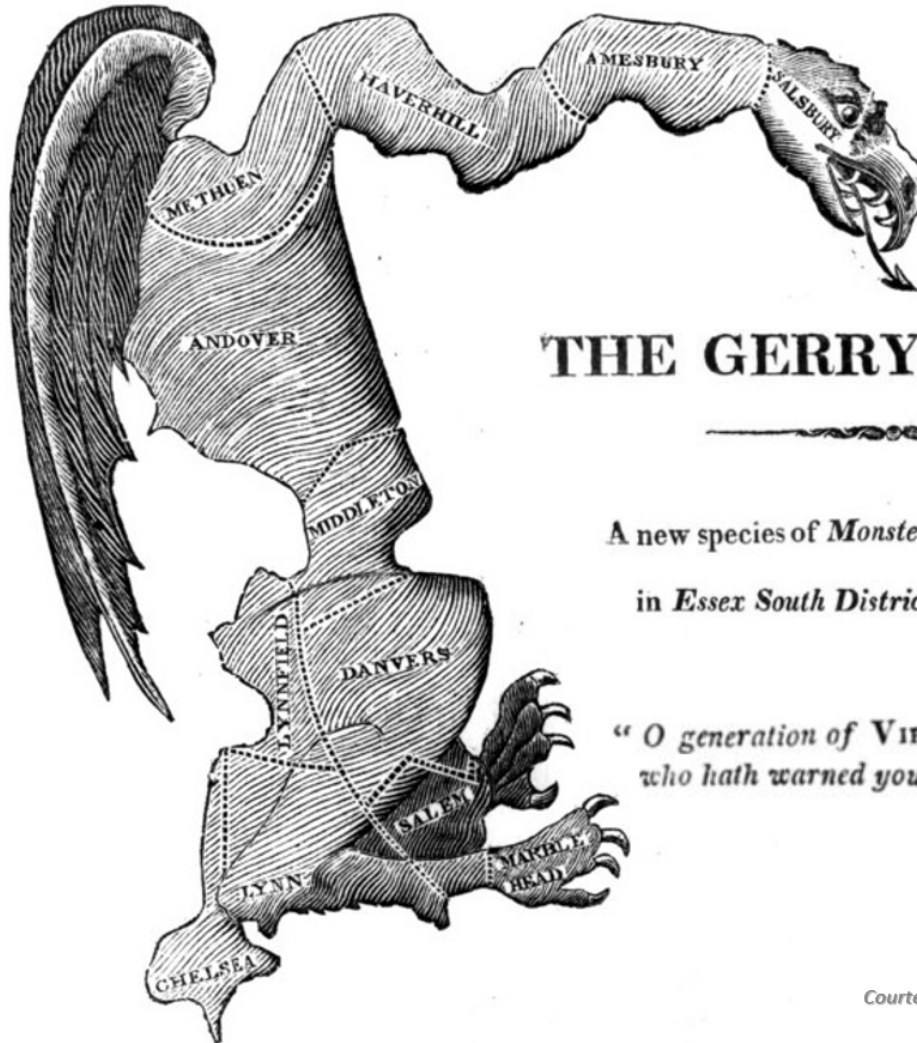# The Geography of Redistricting

May 2-3, 2019

1730 Cambridge St., Cambridge, MA 02138

THE GERRY-MANDER.

A new species of *Monster*, which appeared

in *Essex South District* in Jan. 1812.

" *O generation of* VIPERS !
who hath warned you of the wrath to come ?"

Courtesy American Antiquarian Society

Co-organizers:

Center for Geographic Analysis
Harvard University

IQSS
The Institute for Quantitative Social Science

esri

Co-sponsors:

HARVARD Kennedy School
ASH CENTER
for Democratic Governance
and Innovation

HDSI
Harvard Data Science Initiative

Maptitude
For Redistricting

autoredistrict

Introduction

American partisan politics have reached a fever pitch, amid renewed and urgent questions on the various threats to democracy. Conversations have intensified on the topic of political redistricting, or the process of mapping electoral district boundaries, and the near actuality that this process will be manipulated to favor a single political party. This manipulation has been referred to as gerrymandering, named for the 1812 efforts of Elbridge Gerry, former vice president of the US and governor of Massachusetts (and Harvard graduate in 1762 and 1765).

Gerrymandering is a perennial problem of electoral geography. While redistricting is meant to ensure fairness at the heart of our representational democracy, gerrymandering is a divisive tool used by every party in power. How might geographic information systems (GIS) enable a more transparent and analysis-driven process for political redistricting?

This conference aims at bringing together scholars, technologists and activists in geography, GIScience, political science, government, and mathematics, to review the current practice and implications of redistricting, examine how GIS, geospatial analysis, and big data have played a role in redistricting, explore the proper methods and techniques to ensure legitimacy and protect against gerrymandering, and discuss opportunities for improving transparency and fairness.

The event will start with a half-day workshop on Thursday afternoon, with demos of various redistricting tools and platforms, followed by a full day of plenary sessions on Friday, which will include a keynote address, presentation sessions, panel discussions, and closing remarks. Invited speakers will engage with the audience in discussions on the current status of redistricting, its political implications, tools and technologies for redistricting, and perspectives in how geographic insight and geospatial technology may help prevent gerrymandering in redistricting.

For more information about CGA conferences, please visit https://gis.harvard.edu/conferences

Program

DAY 1 - Thursday, May 2, 2019   12:30-5:00PM   Workshops   Room CGIS S020

12:30PM   *Registration*

1:00PM   **Esri Redistricting: Bring clarity to the redistricting process**
Richard Leadbeater (Esri)
Facilitator: Wendy Guan

2:20PM   **Maptitude for Redistricting**
Tracy Horgan (Caliper)
Facilitator: Wendy Guan

3:05PM   *Coffee Break*

3:15PM   **DistrictBuilder**
Robert Cheetham (Azavea) and Michael McDonald (UFL)
Facilitator: Ben Lewis

4:00PM   **Districtr: You Draw the Lines**
Hakeem Angulu (Harvard)
Facilitator: Ben Lewis

4:30PM   **Auto-Redistrict**
Kevin Baas
Facilitator: Ben Lewis

DAY 2 - Friday, May 3, 2019   8:30 – 5:30PM   Plenary Sessions   Room CGIS S010

8:30AM   *Registration*

9: 00AM   **Keynote - Mapping Politics**
Stephen Ansolabehere (Harvard)
Moderator: Jason Ur

9:20AM   **Keynote - Debugging democracy: Using law and data to help bring about fair districting**
Samuel Wang (Princeton)
Moderator: Elizabeth Hess

Program

9:40AM	**Panel 1: Current practices, social and political implications of redistricting** *Stephen Ansolabehere, Clark Bensen, Kim Brace, Brian Olson, Laura Royden, Ryan Weichelt* *Moderator: David DiBiase*
11:00AM	*Coffee Break*
11:10AM	**Panel 2: Geographic and historical perspectives on redistricting** *Iván Espinoza-Madrigal, Benjamin Forest, Diana Lavery, Mark Monmonier, J. Derek Morgan, James Whitehorne* *Moderator: Matthew Wilson*
12:30PM	*Lunch Break, Student Poster Viewing and Fisher Prize Judging*
2:00PM	**Keynote - Geography meets geometry in redistricting** *Moon Duchin (Tufts)* *Moderator: Jason Ur*
2:20PM	**Panel 3: Methods and techniques in redistricting** *Jacob Brown, Ruth Buck, Noah Durst, Blake Esselstyn, Wenwen Li, Michael McDonald, Levi John Wolf* *Moderator: David DiBiase*
3:40PM	*Coffee Break*
3:50PM	**Panel 4: Opportunities for improving transparency and fairness in redistricting** *Micah Altman, Richard Leadbeater, Miles Rapoport, Allison Riggs, Rebecca Theobald* *Moderator: Matthew Wilson*
5:10PM	**Closing Keynote - Mapping the Future of Congress: What's at Stake in 2021** *David Wasserman (The Cook Political Report)* *Moderator: Jason Ur*
5:30PM	**Fisher Prize Poster Awards** *Jason Ur* *Facilitator: Jeffrey Blossom*

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Day 1 ♦ Workshops ♦ May 2, 2019

Esri Redistricting: Bring clarity to the redistricting process
Richard Leadbeater (Esri)

Abstract: In this workshop, we'll discuss several experimental methods to visualize community. You'll also learn about Esri's Redistricting solution, a solution that provides a secure, web-based environment for legislatures, advocates, and citizens to complete and share compliant plans. Plans that bring both clarity and community involvement to the redistricting process. Based on Esri's proven ArcGIS platform, Esri Redistricting provides comprehensive tools for an end-to-end redistricting workflow for plan creation, management, visualization, editing, and collaboration. The session will end with an overview of a free hands-on lesson from the Learn ArcGIS collection, which is sharable to all and distributable to educators.

Richard Leadbeater is Esri's State / Provincial Government Industry Solutions Manager, focusing on developing tools and solutions that address the government administrative functions of policy, elections, redistricting, and business process. He is passionate about helping governments gain the greatest value from the data they generate. Prior to joining Esri in 1997, he worked at the Washington Suburban Sanitary Commission, the seventh largest public water and wastewater utility in the US, where he developed and implemented GIS, computer aided drafting and design, and document imaging technologies.

Maptitude for Redistricting
Tracy Horgan (Caliper)

Abstract: Join us as we discuss how Maptitude for Redistricting's tools help build compact, contiguous districts that balance population while monitoring partisan impact.

Tracy Horgan is the Director of Redistricting Services at Caliper Corporation. She is in charge of Caliper's redistricting and elections software activities. Ms. Horgan has been instrumental in the design of Maptitude for Redistricting, Maptitude for Precinct and Election Management (Maptitude P&E), MAF/TIGER Partnership Software, and Community 2020 and in all aspects of consulting, training, data conversions, and other activities related to these efforts. She provides training, technical support and consulting services for Caliper Corporation. Ms. Horgan is instrumental in the testing and quality assurance for the family of Maptitude products.

DistrictBuilder
Robert Cheetham (Azavea) & Michael McDonald (UFL)

Abstract: This workshop presents an introduction to the Public Mapping Project and the open source DistrictBuilder platform; showcases some current and past uses of the DistrictBuilder technology; and outlines the objectives for a next generation DistrictBuilder.

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Robert Cheetham is the founder and CEO of Azavea, a B Corporation that applies geospatial technology for civic, social, and environmental impact. Azavea's open source software projects include DistrictBuilder, Raster Vision, Raster Foundry, and GeoTrellis. Prior to founding Azavea, he served as a software developer and GIS analyst for the University of Pennsylvania, the City of Philadelphia and the Philadelphia Police Department and as a civil servant in Japan. He has an MLA in Landscape Architecture and Regional Planning from the University of Pennsylvania and a BA in Japanese Studies from the University of Michigan.

Michael P. McDonald is Associate Professor of Political Science at University of Florida. He received his Ph.D. in Political Science from University of California, San Diego and B.S. in Economics from California Institute of Technology. He is co-principal investigator of the Public Mapping Project, whose goal is to enable the public to participate in redistricting by providing via the web the same mapping tools and data available to redistricting consultants. He is author of numerous academic publications on redistricting and has served as an expert witness in redistricting litigation or a consultant to redistricting authorities in fifteen states.

Districtr: You Draw the Lines
Hakeem Angulu (Harvard)

Abstract: The goal of Districtr is to make drawing districts and identifying communities easy, fun, and widely accessible. It is a free and open-source web app that uses the Mapbox platform to show the user a locality as a collection of paintable tiles. You can pull up the website on your laptop, tablet, or even phone, and be drawing districts or identifying communities of interest in seconds. We built the tool to meet the needs of civil rights organizations, community groups, and researchers, so we create geographically specific modules on a request basis. For instance, community organizers in Lowell, MA wanted to understand the potential for racial coalition districts, so that module features Census racial data down to the block level. On the other hand, our researchers wanted to understand the distribution of Republicans statewide in Massachusetts, so those modules have election results matched to precincts over a 20-year span. The pace of growth is fast – recently, we've been adding about a module per week.

Hakeem Angulu is a junior at Harvard College getting a joint concentration in Computer Science and Statistics, with a secondary in African American Studies. With a passion for applying computational thinking to projects for social good and justice, he joined the Metric Geometry and Gerrymandering Group under Professor Moon Duchin through the Radcliffe Institute of Advanced Study. In that group, he contributes to the effort to perform computational analysis of gerrymandering and redistricting, in an effort to defend and improve voting rights.

Auto-Redistrict
Kevin Baas

Abstract: The developer of the free and open source software "Auto-Redistrict" will show how the genetic algorithm can be used to meet multiple spatial and statistical criteria simultaneously, and demonstrate proof-of-concept with the software. He will also introduce a way to measure partisan gerrymandering aimed at being more resistant to legal arguments by avoiding counterfactuals, and show how a

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Bayesian probability model can be used to measure the durability of a gerrymander. Finally, he will show how he's applied these tools to measure historical and current gerrymandering, as well as to compare the efficacy of different redistricting algorithms.

Kevin Baas is a self-taught software developer who wrote the automated redistricting software "AutoRedistrict" in his spare time, and released it free to the public. AutoRedistrict uses a Genetic Algorithm to generate districts that satisfy multiple, possibly conflicting, criteria at once. As part of this optimization, it performs spatial and statistical analysis on the districts, which can be exported as maps, charts, and tabular data. Kevin has used AutoRedistrict to do research and analysis on historical gerrymandering and to evaluate potential solutions. Additionally, he's used the software to generate new congressional districts for all 50 states at the request of FairVote.org, and, more recently, The New York Times.

Day 2 ♦ Plenary Sessions ♦ May 3, 2019

Keynote - Mapping Politics
Stephen Ansolabehere (Harvard)

Abstract: Every decade the politics of drawing legislative districts in the United States becomes more intense, and more technical. Technology is often thought to have made gerrymandering easier and more pernicious. My own experience is the opposite. Innovations in GIS software, efforts to make data readily accessible and freely available, and growing analytical expertise have opened and improved the districting process in the United States. The political process of redistricting that followed the 2010 Census saw the introduction of truly independent districting commissions in Arizona and California, the use of public mapping projects in Florida and Virginia, numerous successful cases to improve minority representation, and the first successful federal cases challenging partisan gerrymanders. In all of these instances readily available GIS and data analysis technology was essential. What are the lessons from the 2010 redistricting about the role of technology in the political process, and what can we expect in 2020?

Stephen Ansolabehere is the Frank G. Thompson Professor of Government at Harvard University. He is an expert on U. S. elections, voting behavior, and public opinion. He has researched public attitudes concerning energy and the environment with MIT Energy Studies since 2002, and contributed to the MIT Nuclear Study and the MIT Coal Study. He has published four books and academic research in a wide range of fields, including political science, economics, law, environment, and statistics. He is the Principal Investigator of the Cooperative Congressional Election Study, and a member of the Election Night Decision Desk at CBS News. He is a member of the Advisory Board of the Reuters Institute for the Study of Journalism at Oxford University. In 2007, he was elected to the American Academy of Arts and Sciences.

Keynote – Debugging democracy: Using law and data to help bring about fair districting
Samuel Wang (Princeton)

Abstract: This decade has seen a record number of partisan gerrymanders in the modern era. Technology helped bring this about - can technology also help

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solve the problem? Perhaps the most promising approach is state by state reform, through litigation and redistricting commissions. Legal and mathematical theories can be applied in state courts no matter what the Supreme Court does this year. After the Census, redistricting will be improved immensely by public data and open software to give citizens a greater voice when new lines are drawn across the nation. Together, these strategies can help eradicate gerrymandering, a major bug in American democracy.

Samuel Wang is director of the Princeton Gerrymandering Project (gerrymander.princeton.edu), which combines law and data to assist in redistricting reform. A professor of neuroscience, he holds affiliations with the Center for Information Technology Policy and the Program in Law and Public Affairs. His neuroscience research focuses on data analytics and advanced optical methods to study learning and brain circuit signaling. He has made pioneering contributions to the use of election and polling data to track political races (election.princeton.edu). He is now working on OpenPrecincts, a data project to empower citizen-driven redistricting.

Panel 1: Current practices, social and political implications of redistricting
Stephen Ansolabehere (Harvard), Clark Bensen (POLIDATA), Kim Brace (Election Data Services Inc.), Brian Olson (BDistricting), Laura Royden (Harvard), Ryan Weichelt (UWEC)

Abstract: *Since Baker v Carr in 1962 and the Voting Right Act in 1965, the courts have struggled to define what equal protection in the electoral sphere means. The existing legal frameworks have evolved to define what is meant by equal protection for populations and for racial groups. Based on the experience of those struggles, what have we learned about the value of the vote? What do those lessons imply about the unmet challenge of equal protection based on party and other politically important groups?*

Stephen Ansolabehere see page 7.

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Abstract: *A brief overview of the current status of redistricting, highlighting the interests of litigants, the outcome compared with these interests, and the interplay with statutes and legal opinions; and observations on technology, from crayons to cathode ray tubes to cell phones, and how it has advanced and how it compares with what is actually used to draw plans. Also look into how we prepare for the upcoming 2021/2022 cycle. To sum it up is to quote Yankee Hall of Famer Yogi Berra: "It's deja vu all over again".*

Clark Bensen is an attorney by training and a data analyst by practice. He has been involved in redistricting and census issues since the 1980 Census and has worked with redistricting stakeholders in over half of the states. As a data analyst familiar with both census and political data, he has developed countless political, demographic, and other datasets for analysis. He was one of the three appointees to the federal 2010 Decennial Census Advisory Committee by the U.S. Secretary of Commerce (2005-2011) with a focus on redistricting issues, joined by Kimball Brace of Election Data Services and Tim Storey of NCSL.

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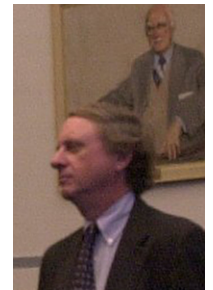
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Abstract: Since the Supreme Court established one-person, one-vote for districts in the 1960s, there have been significant changes in technology, mapping, the Census, and political philosophy that have shaped this country's experiences in redistricting. Mr. Brace will talk about his experiences in the middle of the "political thicket" and what might be expected in the next three years.

Kim Brace is the president of Election Data Services Inc., a political consulting firm located in Manassas, VA, that specializes in redistricting, reapportionment, the Census, and various election administration issues. Since founding Election Data Services in 1977, Mr. Brace has provided redistricting software, geographic and demographic databases, and data analysis and technical support services for redistricting plan development to redistricting commissions and numerous state and local legislatures in more than half the country in the past five decades. As a nationally recognized expert on redistricting and the census, he has delivered speeches, conducted seminars, and testified as an expert witness in over 75 court cases since the 1980s round of redistricting.

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Abstract: Fully automated impartial redistricting is possible and a plausible alternative to biased political maps or human "independent commissions". Or, it could be a starting point for people who want to make fair districts. By focusing on producing good maps, a home computer is enough to make legally viable maps for all the state legislature and congressional districts in the US.

Brian Olson is a software engineer with over 20 years' experience. In his spare time, he created open source software to create impartial non-gerrymandered maps that can be seen at https://bdistricting.com/.

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Abstract: Since the Supreme Court's ruling in Vieth a decade and a half ago, the majority of quantitative research on redistricting has focused on developing methods for measuring partisan gerrymanders. As a result, we now have a solid grasp on the direct effects of gerrymanders on partisan composition in legislatures and some of the factors that seem to be strongly correlated with worse gerrymanders, the key one being when a single party can control the redistricting and map-drawing processes in a battleground state. Courts and independent commissions have been able to rectify some of this gerrymandering, suggesting that geography is not always insurmountable. Likewise, we can see anecdotally the harms that gerrymandering can have on a state or a community, but little empirical work has recently surveyed or measured the expansive downstream impacts of redistricting. Particularly in light of higher polarization, an increase in institutional innovation, a weaker Voting Rights Act, and potential new rulings from the Supreme Court, a natural and needed direction for future political science work in this realm is to examine the effects of redistricting on our democracy and society more broadly beyond a partisan lens.

Laura Royden is a PhD student in the Government Department at Harvard, where she studies elections and judicial politics. She was previously a researcher at the Brennan Center for Justice, focusing on quantitative

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approaches to studying, measuring, and analyzing redistricting. Laura graduated from MIT in 2014 with an S.B. in urban studies & planning and a minor in political science.

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Abstract: *As Republicans swept control across many state houses after the 2010 Midterms, resulting redistricting models saw an unprecedented number of potential examples of Partisan Gerrymandering. Perhaps the most obvious examples of this could be found in Wisconsin, Pennsylvania, and North Carolina. For Wisconsin, the impact of Act 43 in redrawing state assembly and state senate districts resulted in a fundamental social (Act 10), political (electoral realignments), and economic (Foxconn) reorganization not seen before in the Badger state. Therefore, Wisconsin provides an excellent example on what impact partisan gerrymandering can have on a variety of levels and institutions.*

<u>Ryan Weichelt</u> is Associate Professor of Geography and Director of First Year Experiences at the University of Wisconsin – Eau Claire. His current research has been focused on electoral geography of Wisconsin and redistricting and gerrymandering studies. Highlighting these issues are recent publications of the Atlas of the 2016 Elections (contributor and co-editor) and a chapter in the Handbook of the Changing World Language Map, titled "The Language of Reorganizing Electoral Space" with co-author Gerald Webster.

Panel 2: Geographic and historical perspectives on redistricting
Iván Espinoza-Madrigal (LCR), Benjamin Forest (McGill), Diana Lavery (Esri), Mark Monmonier (Syracuse), J. Derek Morgan (UWF), James Whitehorne (Census Bureau)

Abstract: *I will focus on the Voting Rights Acts and the legal and policy needs of people of color in redistricting, including the creation of minority opportunity districts.*

<u>Iván Espinoza-Madrigal</u> is the Executive Director of Lawyers for Civil Rights (LCR). Iván has filed and won dozens of life-changing and law-changing cases on a wide range of civil rights issues, including voting rights, racial justice, immigrants' rights, and LGBT/HIV equality. Under his leadership, LCR has become a hub for litigation, advocacy, and resistance in response to the current climate. Previously, he worked at Lambda Legal, MALDEF, and Fried Frank LLP. Iván clerked in the U.S. Court of Appeals for the Sixth Circuit, and the U.S. District Court, SDNY. The National LGBT Bar Association has recognized him as one of the Best LGBT Lawyers Under 40, and the Boston Business Journal included Iván in its "Top 40 Under 40" list in 2018. A summa cum laude and Phi Beta Kappa graduate of the University of Pennsylvania, he received a Juris Doctor from NYU School of Law, where he was a Root-Tilden-Kern Scholar. Iván recently received the Boston Bar Association's Beacon Award, and the University of Pennsylvania's Martin Luther King Award in Social Justice.

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Canadian Boundary Commissions as a Model for U.S. Redistricting?
Abstract: *Canada has used non-partisan, arms-length boundary commissions for Federal redistricting since the late 1960s while their use in U.S. is more limited and more recent. I will briefly review the workings of these commissions and their impact on redistricting before identifying some lessons for*

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the U.S. The contrast between the Canadian and U.S. experience helps illustrate the advantage of structural solutions to gerrymandering compared to regulatory approaches.

Benjamin Forest is an Associate Professor of Geography, an Associate Member of the Department of Political Science, and a member of the Centre for the Study of Democratic Citizenship at McGill University. His current research examines the political representation of ethnic minority groups and women, the use of monuments and memorials for (re)constructing post-Soviet national identities, and various issues of electoral geography, political parties, and governance.

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Abstract: *How much are current congressional boundaries defined by physical features (e.g. mountains), infrastructure (e.g. highways, railroads), or other existing boundaries (e.g. county lines)? Communities form next to rivers, highways, and see themselves as belonging to a particular county and state. I calculate a "natural communities" score for each district using administrative boundaries, infrastructure, and physical geographic features that adds information beyond geographical compactness.*

Diana Lavery is a product engineer on Esri's Living Atlas and Policy Maps teams. She has over a decade of experience as a practitioner of demography, sociology, economics, policy analysis, and GIS. Prior to joining Esri, she held research positions at the RAND Corporation and at the Population Reference Bureau. She has co-authored articles in Journal of Urban Health and Transportation Research Record. Lavery earned a B.A. in quantitative economics and an M.A. in applied demography, both from the University of California, Irvine.

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Abstract: *Ranked-choice voting in multi-member districts can resolve inequalities resulting from partisan gerrymandering by letting the voters create their own clusters, without artificial cartographic interference. Cambridge, Massachusetts has used ranked-choice balloting since the 1940s, and Maine recently demonstrated that the process is computationally feasible for larger constituencies. Moreover, multi-member districts based on established, stable regional identity need not have their boundaries redrawn every ten years insofar as Census results could accord each district's representatives a proportional vote similar to the shares voted by corporate stockholders. Resulting differences in voting clout would be no less fair than the current privileging of seniority and party affiliation.*

Mark Monmonier is Distinguished Professor of Geography in the Maxwell School of Citizenship and Public Affairs at Syracuse University, where he teaches classes on map design and environmental cartography. He has authored 20 books, including *How to Lie with Maps*; *Bushmanders and Bullwinkles: How Politicians Manipulate Electronic Maps and Census Data to Win Elections*; and *Connections and Content: Reflections on Networks and the History of Cartography*, to be released by Esri Press in August 2019. He was editor of *Cartography in the Twentieth Century*, published in April 2015 by the University of Chicago Press. In November 2016 he was inducted into the URISA (Urban and Regional Information Systems) GIS Hall of Fame.

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Abstract and Biography

Mapping town hall meetings to explore constituency-representative pairing

Abstract: *A fair redistricting process should improve the chances of achieving the ideal of proper matching of the constituency to district geography. But, how can we tell when we fall short of that ideal? The occurrence of town hall meetings within a district indicates an opportunity for dialog between constituency and representation. We have developed a spatial model and analysis of town hall meetings across the 114th United States Congress. This talk will describe this model, the findings, and some of the potential implications of the results.*

J. Derek Morgan is an Assistant Professor of GIS at the University of West Florida. While completing his doctoral degree in geography at Florida State University, Morgan worked on a team building one of the first web-based participatory redistricting applications (MyDistrictBuilder for the Florida House of Representatives). This experience was informative to the inner workings of legislative redistricting and high-lighted many of the challenges of public engagement with this vital process that only occurs once a decade.

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Abstract: *The current Census role in redistricting geography is based on Public Law 94-171 passed in 1975. This law requires the Census Bureau to allow the states, in a non-partisan manner, to identify the small area tabulations they need for legislative redistricting. These small areas have been traditionally defined as tabulation blocks and voting districts (i.e. precincts, wards, etc.). The Census Redistricting Data Program provides the states an opportunity for input to these geographies.*

James Whitehorne is the Chief of the Census Redistricting & Voting Rights Data Office. He began his career at the US Census Bureau as a geographer in the Geography Division working and eventually leading the effort on the geographic support to the redistricting data program as well as the statistical areas program, which includes census tracts and block groups. Before joining the Bureau in 2006, James worked on contract for 5 years at the Civil Rights Division of the U.S. Department of Justice, as a Geographic Information System specialist. James holds both a B.S. and a B.A. in Geography from Pennsylvania State University.

Keynote – Geography meets geometry in redistricting
Moon Duchin (Tufts)

Abstract: *The study of redistricting stands to benefit from stronger interconnections between the domain knowledge in geography and mathematics. I'll focus on the examples of segregation indices and compactness scores to consider successes and failures at the interface across those two disciplines.*

Moon Duchin is associate professor of mathematics at Tufts University. She has been active in educating others about how to overcome gerrymandering — the drawing of legislative districts that favor one party, class, or race. She helped create a program to train mathematicians to be expert witnesses in court cases over redrawn electoral districts.

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Panel 3: Methods and techniques in redistricting

Jacob Brown (Harvard), Ruth Buck (UVA), Noah Durst (MSU), Blake Esselstyn (EQV Maps), Wenwen Li (ASU), Michael P. McDonald (UFL), Levi John Wolf (ASU)

Partisan Segregation

Abstract: *Using new techniques in spatial data processing, we measure the local partisan isolation of every registered voter in the United States, creating a spatially-weighted measure for over 180 million individuals. For each registered voter in the country, we identify their 1,000 nearest neighbors who are also registered voters, and measure the distance they live from each neighbor. With this information, we measure how exposed each voter is to different partisans among their neighbors. A large portion of partisans, especially Democrats, live with virtually no exposure to the other party. For most Democrats, partisan segregation exceeds racial segregation, with voters more likely to encounter a member of another racial group in their daily lives than an out-partisan. This level of segregation is found across the country, even in low-density areas, and it is not attributable only to racial segregation.*

Jacob Brown is a Ph.D. student at Harvard's Government Department. His research interests include political behavior in American politics, political geography, experimental design for social policy analysis, and the development of methodological tools for measuring political data. Current work includes projects on the long-term determinants of political behavior, the development of new measures of partisan segregation, and the application of multiple over-imputation methods to handle measurement error.

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Abstract: *Redistricting is a set of trade-offs among priorities such as population balance, respect for existing political boundaries, contiguity, compactness, and minority representation. Computers are not equipped to make these trade-offs, but methods in computing can help us to evaluate whether or not plans behave as though drawn to fulfill just the stated rules and objectives — and not some hidden agenda. This presentation will explore how the Metric Geometry and Gerrymandering Group approaches applications of computing and geometry to redistricting.*

Ruth Buck is a member of the Metric Geometry and Gerrymandering Group at Tufts University directed by Moon Duchin. Ruth's work for MGGG focuses on GIS, cartography, and political and demographic data. She has led precinct data collection efforts across multiple states, including Ohio and Massachusetts, and is currently working on a project analyzing the impact of potential structural changes to Chicago's City Council. Ruth is a graduate of Macalester College, where she studied geography and data science.

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Abstract: *Municipal annexation is the most common means by which local governments in the United States redraw their jurisdictional borders, with cities conducting more than 100,000 annexations totaling more than 5,000 square miles of territory since 2000. Prior quantitative research suggests that as municipalities annex territory along their jurisdictional fringe they often sidestep African Amer-*

ican neighborhoods, a practice that appears to be exacerbated by state annexation laws and the recent invalidation of Section 4 of the Voting Rights Act by the Supreme Court. This process of racially selective annexation constitutes a form of local government gerrymandering with important implications for local democracy, voting rights, and access to local government services. Future research on the topic should take advantage of advances in GIScience to explicitly incorporate space as a means of both measuring and explaining patterns of selective annexation.

Noah J. Durst is an Assistant Professor of Urban and Regional Planning in the School of Planning, Design and Construction at Michigan State University. His research interests include the politics of municipal annexation and, in particular, the role that race and economics play in the redrawing of city borders; the impact of land use regulation and housing policy on the accessibility, affordability and quality of housing for lower-income households; and urban informality (non-compliance) in housing markets in the United States. Noah has a Ph.D. in Public Policy from the LBJ School of Public Affairs at the University of Texas at Austin.

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Abstract: While full-featured redistricting software programs serve a vital function, other streamlined tools, often produced by individual volunteers or very small organizations, can suffice to fill specific niches. These utilities—free-standing applications, web services, and GIS plugins—address methods and processes integral to both the exercise of plan creation and evaluation of existing plans. Teams of academics, advocates, and journalists have leveraged such tools to well-publicized effect in North Carolina and on the national level.

Blake Esselstyn, a geographic information systems (GIS) expert, is the founder of EQV Maps, a North Carolina-based consultancy dedicated to principled redistricting. He has provided mapping services to plaintiffs in multiple gerrymandering cases, served as an expert witness, taught undergraduate and graduate students about redistricting and GIS, co-led a redistricting-related hackathon, and converted jurists' instructions into maps in the Duke/Common Cause NC independent redistricting commission simulation. Blake holds degrees from Yale and Penn as well as professional certifications as a geographic information systems professional (GISP) and a member of the American Institute of Certified Planners (AICP). When time allows, he blogs at www.districks.com.

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Redistricting in the Era of Big Data

Abstract: Redistricting or regionalization has found significant real-world applications in (re)drawing electoral districts, supporting environmental or urban economic modeling. Redistricting problem is often defined as a spatial optimization problem where linear integer programming is often used for approaching the optimal solution. However, these exact solution methods are often found challenging in the presence of big data and non-linear objectives or constraints. This talk will briefly introduce the use of a heuristic approach for solving redistricting problems involving big data. Specifically, solutions to a unique set of redistricting problems, where compact regions are main objectives to achieve, will be discussed.

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Wenwen Li is associate professor of computational spatial science at Arizona State University. Her expertise is cyberinfrastructure, big data and geospatial artificial intelligence (GeoAI). She has led a number of NSF, USGS funded projects to apply these cutting-edge techniques in studying environmental and urban changes (i.e. polar climate, natural feature detection, urban economic modeling, and urban health studies). She was 2015 NSF CAREER award winner and has published nearly 100 papers in peer-reviewed journals, conference proceedings and books.

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The Predominance Test: A Judicially Manageable Compactness Standard for Redistricting
Abstract: *I propose a "predominance test" to identify when a district becomes so contorted in shape that a bright line is crossed such that the district is legally suspect. The test works by comparing the compactness of districts in a near-maximally compact redistricting plan to those in a target plan under analysis. The test has three virtues: it provides a judicially manageable standard to identify when a compactness violation occurs in a legal framework familiar to courts; it is flexible to states' compactness standards; and compactness is evaluated with respect to what is possible in the geographic region that a district is located. I describe an application of the predominance test in a challenge to Virginia's state legislative districts, where a judge accepted the predominance test and found the evidence it produced compelling. While the predominance test is not a gerrymandering cure, it provides reasonable constraints to prevent the most egregious gerrymanders in states with a heretofore unenforced compactness criterion.*

Michael P. McDonald - see page 6.

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Abstract: *Construct validity is undervalued in political science and geography about gerrymandering. From Kousser (1996) to Tam Cho (2017), post-Bandemer concerns about standards, concepts, and measures of partisan bias abound. Scientists and scholars should do better qualitative work to design better measures of partisan fairness based on perceptions and beliefs on what fairness means from practitioners and participants in redistricting processes. This can generate some interesting insights, as I will show through the qualitative results from my dissertation on methods & measurements of partisan bias.*

Levi John Wolf, PhD is a Fellow at the Center for Spatial Data Science and a Lecturer in Quantitative Human Geography at the University of Bristol. He is a quantitative social scientist, using spatial statistics and computation to make sense of US politics, economics, and social dynamics. In particular, he is interested in how the boundaries we draw, such as neighborhoods, congressional districts, or policy administrative zones, both create and reflect socio-spatial processes. In addition, he has consulted on spatial analysis and geocomputation for companies doing terabyte-scale spatial data science, such as NextDoor and CardoDB, and is a leading contributor to the Python Spatial Analysis Library and the JuliaGeo ecosystem.

Panel 4: Opportunities for improving transparency and fairness in redistricting
Micah Altman (MIT), Richard Leadbeater (Esri), Miles Rapoport (Harvard), Allison Riggs (SCSJ), Rebecca Theobald (UCCS)

Participative Open Redistricting

Abstract and Biography

Abstract: *The Public Mapping Project enabled greater participation in the redistricting process by developing DistrictBuilder, an open-source software redistricting application designed to give the public transparent, accessible, and easy-to-use online mapping tools. We supported organizations and governments across the nation and in Mexico with their public mapping efforts. We discuss how individuals and communities, when they have access to the same tools and data as politicians, can create legal maps that express their representational needs that are both more compact and fair.*

Micah Altman is Director of Research and Head/Scientist, Program on Information Science for the MIT Libraries, at the Massachusetts Institute of Technology. Previously Dr. Altman served as a Non-Resident Senior Fellow at The Brookings Institution, and at Harvard University as the Associate Director of the Harvard-MIT Data Center, Archival Director of the Henry A. Murray Archive, and Senior Research Scientist in the Institute for Quantitative Social Sciences. Dr Altman conducts work primarily in the fields of social science, information privacy, information science and research methods, and statistical computation -- focusing on the intersections of information, technology, privacy, and politics; and on the dissemination, preservation, reliability and governance of scientific knowledge.

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Sanitizing with Sunlight: The Best Disinfectant Known

Abstract: *Redistricting is suffering from an identity crisis; it wants privacy and security while one calculates and figures, but this only brings suspicion, doubt, and speculation. Arguably one of the more data-centric, complex, and highly defined applications a state performs, the process is fraught with experts with different viewpoints and wants. Inherently a human process, can math solve our wants for community? Can you take politics out of politics? Borrowing from the Sunlight Foundation, the only true way to kill a gerrymander is by opening up the Redistricting process to sunlight.*

Richard Leadbeater

* * *

Abstract: *The redistricting that took place after the 2010 elections produced a number of states with partisan gerrymanders, in some cases seriously extreme. There have been numerous court cases and decisions, but the overarching judicial status of partisan gerrymandering is highly uncertain. However, citizens in a number of states have taken matters into their own hands, working on legislative efforts and ballot initiatives which have drawn widespread public support. These efforts will lead into the 2020 elections and beyond, and I will present an overview of the current state of play and places to watch.*

Miles Rapoport has been the Senior Practice Fellow in American Democracy at the Ash Center for Democratic Governance and Innovation of the Harvard Kennedy School since January of 2017. His work at the Ash Center focuses on bringing together practitioners of election policy and reform together with scholars working in these fields. On behalf of the Ash Center, he has organized conferences on "Getting to 80% Voting Participation", "Governing and Legislating in Divided Times" (with the National Conference of State Legislatures); "Democracy, Inequality, and America's Future" (with the Class and Inequality section of the

Abstract and Biography

American Political Science Association) and organized a conference in November of 2017 on "Gerrymandering, Redistricting, and the Fight for American Democracy". Rapoport served for 14 years in Connecticut State Government. From 1985-1884, he was a state representative representing West Hartford, serving as a member and Chair of the Government Administration and Elections Committee. From 1995-1998, he was Secretary of the State of Connecticut. After his government service, he served as President of Demos from 2001-2013, and President of Common Cause from 2014-2016.

<center>* * *</center>

Abstract: Redistricting, in part because of historical technological limitations, has often been a process completed behind closed doors and with little to no public involvement, monitoring, or the accompanying accountability that would follow a transparent and participatory process. But access to the technology and data needed to meaningfully participate in the redistricting process has changed – now the key for improving transparency and fairness is linked to the ability to educate the public about the process, make it truly accessible to the public, and equip the advocates with the tools they need to advocate for their communities. The Southern Coalition for Social Justice has a history of working with community-based organizations and advocates in the South to do just that, and will expand that program in the upcoming redistricting cycle.

Allison Riggs leads the voting rights program at the Southern Coalition for Social Justice, an organization she joined in 2009. Her voting rights work has been focused on fighting for fair redistricting plans, fighting against voter suppression, and advocating for electoral reforms that would expand access to

voting. She has litigated voting rights and redistricting cases on behalf of grassroots groups like NAACP Conferences, the A. Philip Randolph Institute, and the League of Women Voters in states such as Texas, Florida, Virginia and North Carolina. In 2018, she argued the Texas redistricting case in the United States Supreme Court, and in 2019, she argued the North Carolina congressional partisan gerrymandering case in the United States Supreme Court. Allison works closely with grassroots organizations and communities of color as they seek to advance their political and civil rights. She received her undergraduate, Master's Degree and J.D. from the University of Florida.

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Abstract: Knowledge about the process of apportionment and confidence in data used for redistricting are the best preparation to ensure that all parties involved are engaged and validated. How can we encourage people to have this conversation? By understanding the guidelines for how district lines are drawn, by whom, and under what circumstances, community members will be able to gain a sense of how and why constituencies are formed. Using an accessible online mapping tool for collecting information, analyzing data, and visualizing results will help empower community members and students to be part of the conversation so they are prepared to ask questions of cartographers and of those who will select the final maps.

Rebecca Theobald is assistant research professor in the Department of Geography and Environmental Studies at the University of Colorado Colorado Springs. For ten years, she coordinated the Colorado Geographic Alliance, part of a network founded in 1986 by the National Geographic Society. While

exploring geography skills and content with elementary and secondary students, she identified opportunities to leverage giant floor maps and geospatial technology tools as entry points for discussing geographic questions to address political issues in classrooms and with community organizations. She earned doctoral and masters' degrees in geography from the University of Colorado at Boulder and a bachelor's degree in political science from Middlebury College (VT). Since 2015, she has served as editor of the National Council for Geographic Education's journal, *The Geography Teacher*.

Closing Keynote - Mapping the Future of Congress: What's at Stake in 2021
David Wasserman (The Cook Political Report)

Abstract: *From new independent commissions to heightened public scrutiny and court intervention, the next round of congressional redistricting will look a lot different from the last one. This keynote will take a political forecaster's approach to 2021, assessing the upsides and risks for each party in the states poised for the most upheaval. Republicans' dominance in the 2011 process couldn't withstand a Democratic wave seven years later, and profound demographic shifts and changing voter allegiances could force both parties to rethink their game plans.*

David Wasserman is House Editor for The Cook Political Report, where he is responsible for analyzing U.S. House Races. In 2018, his interactive collaboration with FiveThirtyEight, the "Atlas of Redistricting," took top prize for News Data App of the Year at the Data Journalism Awards. David is a contributor to NBC News and has served as a contributing writer to the Almanac of American Politics. A graduate of the University of Virginia, David is a Spring 2019 Pritzker Fellow at the University of Chicago's Institute of Politics, where he is teaching a seminar on congressional redistricting.

## Fisher Prize Poster Awards
Jason Ur (Harvard)

Jason Ur is Professor of Anthropology in the Department of Anthropology at Harvard University, and director of its Center for Geographic Analysis. He specializes in early urbanism, landscape archaeology, and remote sensing, particularly the use of declassified US intelligence imagery. He has directed field surveys in Syria, Iraq, Turkey, and Iran. He is the author of Urbanism and Cultural Landscapes in Northeastern Syria: The Tell Hamoukar Survey, 1999-2001 (2010). Since 2012, he has directed the Erbil Plain Archaeological Survey, an archaeological survey in the Kurdistan Region of northern Iraq. He is also preparing a history of Mesopotamian cities.

Panel Moderators & Session Facilitators
Jeff Blossom, David DiBiase, Wendy Guan, Elizabeth Hess, Ben Lewis, Matt Wilson

Jeff Blossom is the GIS Service Manager of the CGA. He has experience working in the GIS industry as a technician, analyst, developer, manager, and educator. Prior to joining the CGA, Jeff was the GIS Photogrammetry Administrator for the City and County of Denver. He has a M.A. in Geography, and teaches GIS at the Harvard Extension School and Salem State University.
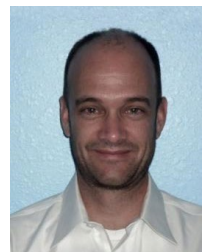
Abstract and Biography

David DiBiase leads the Education Team within Esri's Industry Solutions group. The Team promotes GIS use and spatial thinking in higher education, schools, and youth groups worldwide. Before joining Esri, David founded and led the Penn State Online GIS Certificate and Masters degree programs. He served as lead editor of the U.S. Department of Labor's Geospatial Technology Competency Model and the GIS&T Body of Knowledge published by Association of American Geographers. He also led the National Science Foundation-funded "GIS Professional Ethics" project from 2008-2010, and continues to lead professional ethics workshops for Penn State Online.

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Elizabeth Hess is the Executive Director of the Institute for Quantitative Social Science. In partnership with the IQSS Faculty Director, Gary King, she is responsible for overall strategic, programmatic, and financial management of IQSS, working across the organization to ensure delivery of first-class research and administrative infrastructure to support its constituents. Liz also oversees programmatic activities including software development projects, cloud computing resources, internal and external collaborations, and new program development.

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Wendy Guan is the Executive Director who manages daily operations of the CGA. She came to Harvard in 2006 as the Director of GIS Research Services for the newly established Center. Prior to that, she managed professional services at a GIS consulting firm; headed a geospatial technology department for a forestry corporation; and supervised GIS teams in a government agency. Wendy has a Ph.D. in ecology; a M.A. and M.S. in geography, and a B.S. in biology. She taught GIS in various universities, including the Harvard Extension School.

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Ben Lewis is the Geospatial Technology Manager of the CGA. He is the system architect and project manager for WorldMap, an open source infrastructure that supports collaborative research centered around geospatial information. Before joining Harvard, Ben was a project manager with Advanced Technology Solutions of Pennsylvania, where he led the company in adopting platform independent approaches to GIS system development. Ben studied Chinese at the University of Wisconsin and has a Masters in Planning from the University of Pennsylvania.

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Matthew W. Wilson, PhD, is Associate Professor of Geography at the University of Kentucky and Visiting Scholar at the Center for Geographic Analysis at Harvard University. He co-founded and co-directs the New Mappings Collaboratory, which studies and facilitates new engagements with geographic representation. He has previously taught at the Harvard Graduate School of Design, and his current research examines mid-20th century, digital mapping practices. He earned his PhD and MA from the University of Washington and his BS from Northwest Missouri State University.

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