NARSC NEWS

Welcome from the Executive Director

Thank you to everyone who made the 2015 North American Meetings of the Regional Science Association International such a huge success. Approximately 650 regional scientists from across the world gathered in Portland, Oregon to share their latest research findings over three days of presentations. In addition to dozens of breakout sessions we had three interesting and highly informative plenary sessions with the RSAI Fellows Lecture delivered by William Strange of the University of Toronto, the NARSC Presidential address delivered by Rick Church of the University of California, Santa Barbara, and the Isserman Lecture delivered by Edward Feser of the University of Illinois, Urbana-Champaign. Conferences are not just about the exchange of scientific ideas, however, and the meetings provided a number of opportunities for attendees to network, catch-up with old friends, and meet new people. The Thursday evening cruise on the Willamette River aboard the Portland Spirit was one such event that seemed to be enjoyed all who participated. Next year our meetings will be held in Minneapolis, Minnesota. The dates are November 9-12. I hope that you will consider joining us.

Neil Reid, NARSC Executive Director

Words from the Editors

We are delighted to bring you the latest issue of the North American Regional Science Association (NARSC) newsletter. This edition of the newsletter will provide readers with a summary of this year's annual meeting. Featured items of this edition include: the text of the presidential address by Rick Church, a summary of the Boyce, Hewings, and Isard award winners; biographies of new NARSC President Dan Rickman and Councilor Mark Brown; and an update from the member NARSC regional sections.

As editors, our goal is to provide the NARSC memebership with fresh insights and themes in each edition. In this regards, any feedback, comments or suggestions you have about this edition of the newsletter or future editions are greatly appreciated.

Elizabeth Mack and Ran Wei
Newsletter Co-Editors

ISSUE 2, DECEMBER 2015

Featured Content:

Would you like to contribute to the newsletter? Contact editors Elizabeth Mack (emack@msu.edu) or Ran Wei (ran.wei@utah.edu)

Tobler's Law and Spatial Optimization

by Rick Church

In 1970 Waldo Tobler produced a computer movie simulating the population growth of Detroit, Michigan. This work is now considered a classic, especially when considering the computational resources available at that time as well as the limitations of software and capabilities of output displays, like plotters. In describing his approach Tobler stated the following perspective with respect to the problem of estimating the 1940 population of Ann Arbor, MI as follows:

> *More concretely, population growth in Ann Arbor from 1930 to 1940 depends not only on the 1930 population of Ann Arbor, but also on the 1930 population of Vancouver, Singapore, Cape Town, Berlin, and so on. Stated as a giant multiple regression, the 1940 population of Ann Arbor depends on the 1930 population of everywhere else; that is, it is a function of about* 1.6×10^4 *variables, if population data are given by one-degree quadrilaterals……. Instead of using this approach I invoke the first law of geography: everything is related to everything else, but near things are more related than distant things. The specific model used is thus very parochial, and ignores most of the world.*

In being very parochial, Tobler ignored most elements of his problem, by limiting the terms of growth to nearby towns. Some have questioned whether it should be called a law, others have called it crude, and still others have praised it for being pithy and frugal. Many of these viewpoints have been raised in a 2004 issue of the Annals of the Association of American Geographers devoted to the First Law of Geography. In a recent search of the literature, I found work citing Tobler's law in fields such as financial management, cognitive geography, ecology, and social networks, where individuals found elements that are nearby more related than those far away. I might hazard to guess that even newspapers organize the most newsworthy issues close to the first page and the last inside page of each section and that people tend to scan those pages the most because they are the closest at hand and easiest to find. In fact, when one looks closely, our world of computer displays, dashboards of cars, and product layout in stores and warehouses (just to name a few examples) we can see that they involve clustering of related things. Our search for an item can be directed to a neighborhood of related things, like the air conditioning, heater knobs, and fan settings on a dashboard or the retail stores in a land use zone. That is, our actual design often supports the law!

But, what does this have to do with spatial optimization? I believe that the central theme in Tobler's paper is simplicity. He gave an argument for ignoring, or discarding if you will, many small but possible influences in his population growth model. He made his model tractable, especially considering the limited computer and graphical visioning resources of the time. He argued for simplicity, suggesting that simple and frugal (my term) trumps complex and big. So the question is, can we use this concept in spatial optimization and make models smaller and more tractable?

Spatial optimization involves identifying how land use and other activities should be arranged spatially in order to optimize efficiency or some other measure of goodness. Examples include: assignment and transportation problems (resource allocation across space); districting, zonation, and region delineation; facility location (hubs, warehouses, fire stations, etc.); facility layout; network design with or without congestion; and land use protection for species preservation. Pioneering work in Regional Science and Economics by Isard, Stevens, Koopmans, Beckmann, and others used optimization to allocate resources, determine transportation flows, and allocate land, problems that can be classified as spatial optimization problems.

Most spatial optimization problems involve some form of allocation or interaction terms and the classical transportation problem and the capacitated facility location problems are good examples. There is a widely held perspective when structuring a spatial optimization problem using classic Operations Research techniques, like that of linear and integer programming: a model needs to be complete. If, for example, you have a discrete set of potential facility locations of m points (e.g. m=1,000), and a discrete set of customers represented by n points (e.g.

n=1,000), then there can be n times m (or 1,000,000) possible linkages or allocations, even when only a small number of these will be actually used in an optimal solution. Dropping from consideration any possible linkage or flow between any possible pair of facility sites and customers cannot in general be done without compromising the possibility of identifying the optimal solution when using the classic models that have been published in the literature. That is, the domain is usually defined by the complete extent of the problem; it is in a sense immutable. Practitioners in OR and Regional Science fear that dropping terms can prevent optimal solutions from being found, even if they represent far away (high cost) allocations. I agree with this perspective. Simply put, we can't arbitrarily drop terms, just because they represent far away assignments or flows and on the face of it, Tobler's law does not apply.

But, Tobler argued for simplifying and that we can do. For example we can model explicitly each linkage or allocation that is relative low cost (close) with a transport/assignment variable and then represent all higher cost (farther) assignments or allocations with one implicit variable. This implicit assignment or allocation represents service beyond some cut-off with a cost that is equal to the lowest cost link that just exceeds the cost at the cutoff level or amount. Since models like the capacitated warehouse problem usually have a constraint for each linkage variable, modeling many possible high cost explicit assignments with one implicit assignment variable will result in a reduction of variables and constraints, making the problem easier to solve. The solution to this new Tobler inspired model is optimal to the full-fledged problem if all implicit variables are zero in value at optimality! If not, the point of cutoff for assignment/allocation variables needs to be increased for those demands that involve a positive implicit service variable value and the problem resolved. Thus, the model size can be tailored to be frugal and fit the desired problem on the fly until all implicit variables are zero. Using this approach and using a spatially defined data set while solving the capacitated warehouse location problem, I have been able to find that most of the time 70% or more of allocation variables can be dropped while at the same time generating verifiable, optimal solutions to the complete problem. Thus, the first law of geography can be used to guide our approach in defining spatial optimization models, treating near (low cost) differently than far (high cost) without losing the fidelity that we would have if all assignments were modeled explicitly. Further any solution to this new approach provides a valid lower bound on the optimal solution. Further testing may show that solutions within a small percentage of its valid bound can be generated when using only 10 to 20% of the variables that have been traditionally used. This would also perhaps address the underlying idea of Tobler: simple but close.

As for future work, there is a wide range of problems which may be recast in a frugal light, dropping unnecessary terms, especially with respect to handling nearby elements differently than far away elements. For example region delineation problems, like the p-regions problem and the max p-regions problem are so intensive in the use of variables and constraints that only small instances can be solved to optimality. Even stochastic problems are targets for reformulation. We should begin to rethink how these problems and others can be structured to be frugal and optimal. I leave this as a challenge to the Regional Science community to develop and assess newer and frugal forms of other spatial optimization problems.

Rick Church is Professor of Geography at The University of California, Santa Barbara, and currently serves as President of the North American Regional Science Council.

Rachel Franklin wins the 2015 David Boyce Award for Service to Regional Science

The winner of this year's David Boyce Award is Rachel Franklin who is an Associate Professor of Population Studies and Associate Director of Spatial Structures in the Social Sciences (S4) at Brown University. This award is made in recognition of outstanding service contributions members make to Regional Science. Brown's extensive contributions including service as Executive Director of the Western Regional Science Association (WRSA) and book review editor for the Journal of Regional Science (JRS). Dr. Franklin's research endeavors blend topical and methodological topics in both demography and geography. Particular emphases of her research include spatial demography and migration. In these areas she has investigated generational migration patterns as well as population diversity. Rachel has published in a variety of prestigious journals including the *Spatial Economic Analysis*, *Applied Geography*, and the *Journal of Regional Science*.

Alan Murray wins the 2015 Walter Isard Award

This year's winner of the Walter Isard award is Alan T. Murray who is a Professor in the College of Computing & Informatics and the Dornsife School of Public Health at Drexel University. Over the course of his career, Dr. Murray has published over 181 refereed journal articles, books chapters, and conference proceedings in a wide range of journals including *Geographical Analysis, Health & Place, Papers in Regional Science, the Annals of Operations Research,* and the *Journal of the Operational Research Society*. Dr. Murray has also written a book on location analysis and GIS, and edited a volume on critical infrastructure. Aside from his scholarly activity, Alan has also been involved extensively in editorial activities in a wide range of journals, including several regional science. He is the current editor of the *International Regional Science Review* and serves on the editorial boards of the *Annals of the Association of American Geographers* and *Geographical Analysis*.

Alessandra Faggian wins the 2015 Geoffrey Hewings Award

The winner of this year's award, which honors the achievements of young scholars who have recently completed their doctoral studies, is Alessandra Faggian. Dr. Faggian is a Professor of Economics in the Department of Agricultural, Environmental, and Development Economics (AED) at The Ohio State University. At Ohio State, Dr. Faggian researches a variety of issues in demography, migration, human capital, and labor markets. Alessandra has published over 60 academic papers in several prestigious journals including *Oxford Economics Papers, the Cambridge Journal of Economics, and the Journal of Economic Geography*. Dr. Faggian is the current co-editor of *Papers in Regional Science* and is also actively involved in a variety of regional science organizations. She has served as a councilor-at-large for both the RSA and the NARSC, and is on the Board of Directors of the WRSA.

NARSC Student Paper Competition Results

Thank you to Mark Brown and Bruce Newbold for chairing the student paper competition this year. Mark was the chair of the graduate student-authored paper competition and Bruce chaired the graduate student-led paper competition. We would also like to thank Edward Elgar, Elsevier and the North American Regional Science Association (NARSC) for their contributions of prizes to these award winners; Edward Elgar contributed books, Elsevier provided a 1-year journal subscription, and NARSC provided a cash prize.

Winner Graduate Student-Authored Paper: Heitor S. Pellegrina, Brown University

Heitor is a Ph.D. candidate in the Department of Economics at Brown University where his researches topics are in migration, social networks, intergenerational transmission of poverty, and public policies. His graduate advisor is Jonathan Eaton.

Runner-up Graduate Student-Authored Paper: Yatang Lin, London School of Economics and Political Science

Yatang is a Ph.D. candidate in the Centre for Economic Performance at London School of Economics and Political Science where her researches topics are in development and urban economics. Her graduate advisor is Guy Michaels and Daniel Sturm.

Winner Graduate Student-Led Paper: Joep Steegmansa, Utrecht University

Joep is a Ph.D. candidate in the School of Economics at Utrecht University. His graduate advisor is Wolter Hassink.

Runner-up Graduate Student-Led Paper: Minhong Xu, University of Illinois-Urbana Champaign

Minhong is a Ph.D. candidate in the Department of Agricultural and Consumer Economics at Illinois Urbana-Champaign. Her graduate advisor is Yilan Xu.

Call for Applications: Benjamin H. Stevens Graduate Fellowship

This fellowship was established in 1998 in memory of Dr. Benjamin H. Stevens (1929-1997) in honor of his devotion to teaching, advising, and mentoring graduate students. Students enrolled in Ph.D. programs in North America are eligible to apply for the fellowship to support their thesis research in Regional Science. Faculty at all North American Ph.D. programs are asked to encourage their best students to apply for the Fifteenth Stevens Graduate Fellowship, which will support the winning student's thesis research in the field of Regional Science with a fellowship of $30,000 for the 2016-2017 year. The application deadline is February 15, 2016. Full submission guidelines may be found at http://www.narsc.org/newsite/?page_id=444

The Stevens Graduate Fellowship in Regional Science has also been awarded to the following students:

2000: Michael J. Greenwald (University of California, Irvine; Marlon Boarnet, advisor)

2001: Rachel Franklin (University of Arizona; Brigitte Waldorf, advisor)

2002: Jung Won Son (University of California-Los Angeles; Leobardo Estrada, advisor)

2003: Alison Davis Reum (North Carolina State University; V. Kerry Smith, advisor)

2004: Nicholas Nagle (Univ . of California-Santa Barbara; Stuart H. Sweeney, advisor)

2005: Xiaokun Wang (University of Texas at Austin; Kara Kockelman, advisor)

2006: Joshua Drucker (University of North Carolina at Chapel Hill; Harvey Goldstein/Ed Feser, advisors)

2007: Alvin Murphy (Duke University; Patrick Bayer, advisor)

2008: Paavo Monkkonen (University of California, Berkeley; David E. Dowall, advisor)

2009: Elizabeth Mack (Indiana University; Tony H. Grubesic, advisor)

2010: Adam Storeygard (Brown University; J. Vernon Henderson, advisor)

2011: Peter Richards (Michigan State University; Robert Walker, advisor)

2012: Ran Wei (Arizona State University; Alan Murray, advisor)

2013: Zhenhua Chen (George Mason University; Kingsley Haynes, advisor)

2014: No fellowship awarded

2015: Ahmadreza Faghih Imani (McGill University; Naveen Eluru, advisor)

Meet Your New NARSC President: Dan Rickman

Dr. Rickman is Regents Professor of Economics and Oklahoma Gas and Electric Services Chair in Regional Economic Analysis in the Department of Economics and Legal Studies in Business at Oklahoma State University. Dan's diverse research interests with rural and urban economics include: regional development across the rural-urban hierarchy, poverty, regional business cycles, and migration and immigration. More recently, his research has delved into energy-related topics including energy extraction and the economic impacts of shale oil on regional economies. Dr. Rickman is the current editor of *Growth and Change* and an editorial board member for *Papers in Regional Science*.

Meet Your New NARSC Councilor: Mark Brown

Mark Brown is your new NARSC councilor for 2016-2018. Dr. Brown is in the Economic Analysis Division, Statistics Canada. Mark received his Ph.D. from the School of Geography and Geology at McMaster University. His previous employment includes an assistant professor in the Department of Geography at McGill University. His research program encompasses two related themes: the causes and effects of international trade, and the dynamics of industrial change in rural and urban places. He has received multiple academic awards, including the Statistics Canada Research Fellowship, Fullbright Scholarship, and CRSA Student Paper Award.

Regional Section Updates

Mid-Continent Regional Science Association (MCRSA)

Next year, the MCRSA will host the next meeting of the North American Regional Science Association (NARSC) in Charlotte, NC June 9-11. Kate Nesse and John Leatherman to serve as Local Arrangements Co-chairs. Haifeng Qian will serve as Program Chair.

Earlier this year, the MCRSA hosted its 46th annual conference in St. Louis, MO. At this conference, the MCRSA partnered with the USDA North Central Regional Center for Rural Development (NCRCRD) to sponsor graduate student travel grants up to $450/student.
Five travel grants awarded totaling $2,250.

MCRSA 2014-15 Executive Committee: Past President: Richard Cebula; President: Rebekka Dudensing; President Elect: Biswa Das; Vice President: G. Jason Jolley; Representative to NARSC: Kate Nesse. John Leatherman to continue as Executive Director.

Southern Regional Science Association (SRSA)

The 54th annual meetings were held in Mobile, AL, and had about 100 participants, and 26 sessions.

The 2015 Barry M. Moriarty Graduate Student Award went to George Mawuli Akpandjar at the University of Mississippi for the paper entitled: "The Effect of Homeownership on Unemployment: Outcomes and Implications"

At the annual meeting, Brian Cushing was elected as SRSA 2015–2016 Program Chair; Don Lacombe and John Winters were elected to the Council; and Tom Knapp was named NARSC representative. One new SRSA Fellow was named: Rose Olfert.

For its 55th annual meetings, SRSA will return to Washington, DC, March 31–April 2, 2016.

Western Regional Science Association (WRSA)

WRSA's 54th annual meeting was held in Tucson, Arizona, and had about 180 participants. At the annual meeting, Alan Murray was selected as WRSA 2015–2016 Vice President; Mark Brown and Michel Dimou were appointed to the Board. One new WRSA Fellow was named: Richard Morrill.

WRSA will hold its 55th annual meeting on the Big Island of Hawaii, February 14–17, 2016. As of thetraditional October 15th deadline, paper submissions had more than met expectations. The deadline has been extended to November 16, partly to accommodate those who attend the NARSC meeting and don't have time to submit a full paper to WRSA by October 15.

Art Getis has endowed an annual lecture in spatial analysis at the WRSA meeting. The inaugural speaker in Santa Barbara was Keith Ord; the 2014 speaker was Luc Anselin; the 2015 speaker was Harry Kelejian. Our speaker in Hawaii will be Ed Glaeser.

WRSA's 2017 meeting will be held in Santa Fe, NM, at the La Fonda Hotel February 15–18.

Call for Donations: Benjamin H. Stevens Graduate Fellowship

In order to continue to offer The Benjamin H. Stevens Graduate Fellowship in Regional Science, the Stevens Fellowship committee seeks donations in ongoing support of this award. The Fellowship is awarded in memory of Dr. Benjamin H. Stevens, an intellectual leader whose selfless devotion to graduate students as teacher, advisor, mentor, and friend continues to have a profound impact on the field of regional science. Fundraising efforts to increase the Fellowship's endowment are ongoing. Donations should be sent to: The Stevens Fellowship Fund, First Financial Bank, 1205 S. Neil Street, Champaign, IL 61820 USA. Checks should be drawn to The Stevens Fellowship Fund. Donations may also be made by credit card through the NARSC website at www.narsc.org/newsite/donations2.php.

Upcoming Regional Science Meetings

WRSA will hold its 55th annual meeting on the Big Island of Hawaii, February 14–17, 2016.

SRSA will hold its 55th annual meeting in Washington, DC, March 31-April 2, 2016.

MCRSA will host its 47th annual meeting in Charlotte, NC, June 9-11, 2016.

WRSA will hold its 56th annual meeting in Santa Fe, NM, February 15–18, 2017.