

## INTRODUCING **teachspatial.org**

In April 2009 UCSB's Center for Spatial Studies ([spatial@ucsb](mailto:spatial@ucsb)) launched [www.teachspatial.org](http://www.teachspatial.org) as a portal for sharing ideas and resources about spatial thinking. Development of the site resulted from recommendations of a multi-disciplinary Symposium on a Curriculum for Spatial Thinking hosted by the University of Redlands in June 2008. To date, more than 160 people have registered on the site, for the most part K-16 educators and university researchers.

The structure for the site was inspired by a statement in the influential 2006 report for the U.S. National Research Council (NRC) of the National Academies entitled *Learning to Think Spatially*:

... spatial thinking is pervasive: It is vital across a wide range of domains of practical and scientific knowledge; yet it is under-recognized, undervalued, under-appreciated, and therefore under-instructed.

At [teachspatial.org](http://teachspatial.org), we seek to answer some of the questions that arise from that statement in hope of advancing the larger goal it implies: more and better instruction in spatial thinking.

- What are the core concepts of spatial thinking and how do they relate to each other as viewed from multiple disciplinary perspectives?
- Just how pervasive is spatial thinking, and across which domains of knowledge?
- How might spatial thinking be better instructed?

Answers to the first two questions will provide important steps for addressing the third. Although the focus of [teachspatial.org](http://teachspatial.org) is at the undergraduate college level, the challenge certainly spans all grade levels.

To begin answering the first question, we analyzed 20 documents from seven disciplines in which authors particularly identify and/or organize "core" or "fundamental" spatial concepts. This resulted in a list of 186 distinct terms. Many of these are near-synonyms or otherwise closely related, but for the time being we have purposely not merged them in order to maintain all definitional distinctions made by authors. From that list we developed a set of nine broad categories; a more formal classification is planned. These nine bins, offered for discussion, are: 1) general concepts, 2) primitives of identity, 3) spatial relationships, 4) measurement, 5) spatial structures, 6) dynamics, 7) representation, 8) spatial transformations, and 9) spatial inference.

We have also begun to investigate useful organizations of related concepts by integrating two frameworks put forward in the NRC report, "elements of spatial thinking" and "component tasks of spatial thinking," and folding in the distinction between internal (mental) processes and external tools like map-making and computational analysis.

To begin addressing the questions of "how pervasive?" and "across what domains?" [spatial@ucsb](mailto:spatial@ucsb) has undertaken an investigation for *Locating and Measuring Spatial Thinking*. Using methods from computational linguistics, we are

### RECENT EVENTS 2009

- 5/28 10th Annual Dangermond Lecture, **Shashi Shekhar**  
"Evacuation Route Planning: Novel Spatio-temporal Network Models and Algorithms"
- 6/2 CIRGIS Meeting; Geography  
Poster display
- 7/12-17 NIH Advanced Spatial Analysis Workshop: "Spatial Regression Modeling"

### UPCOMING EVENTS 2010

- 2/18-19 "Importance of Spatial Perspectives in Assessing Vulnerability to Disasters," **Susan Cutter** (University of South Carolina); 3:30 p.m., location TBA
- 3/31 Application deadline for NIH Advanced Spatial Analysis Workshop
- TBA CIRGIS Meeting; Geography  
Poster display
- 7/12-16 NIH Workshop, Geographically Weighted Regression
- 7/19-23 NIH Workshop, Spatial Pattern Analysis (*Please see [www.csiss.org/GISPopSci](http://www.csiss.org/GISPopSci)*)

### THINK SPATIAL BROWN BAGS, 2010

12:00-1:00 p.m.  
Ellison Hall, Room 5824

- 1/12 **Michael Goodchild** and **Donald Janelle**, "Preview of the Proposed UCSB Undergraduate Minor in Spatial Studies"
- 2/2 **Keith Clarke**, "The UCSB Virtual Campus"
- 2/17 6824 Ellison, **Marji Puotinen**, "Increased Storminess—Protection for Corals from Thermal Bleaching in a Warming World?"
- 2/23 **Darren Hardy**, "Distance Decay in Anonymous Wikipedia Authorship"
- 3/16 **Raymond Ford**, "Using GIS to Support Trail Planning and Trail Access in Goleta and along the Gaviota Coast"
- 4/6 **Kim Yasuda** and **Seetha Raghupathy**, "Design Initiative for Isla Vista"



## GOODCHILD & RAUBAL AWARDED NGA GRANT

Professors **Mike Goodchild** (PI) and **Martin Raubal** (Co-PI) have been awarded a grant for the project “Geospatial Feature Conflation: Conceptual, Statistical, and Optimization Approaches” from the National Geospatial Intelligence Agency (NGA). Funding is for two years, with the potential of a renewal for another three years after that, resulting in the support of two graduate students, one of whom will be **Linna Li**, whose Ph.D. topic is on conflation.

The research will provide a theoretical foundation to the integration of incompatible geospatial data. The increasing and rapid development of remote sensing and other technologies, as well as the growth of the Internet, provide abundant opportunities to collect and access vast volumes of geospatial data. In addition to well-known datasets provided by the government, such as US Census TIGER/Line files, and free data services, like Google Earth, large amounts of geospatial information are being generated by individuals all over the world every day, which creates an increasingly extensive net of volunteered geographic information. Large volumes of geospatial data have the potential to benefit scientific research, decision making, and everyday life. However, it is not always easy to take advantage of this abundance, due to inconsistency, incompatibility, and heterogeneity among various datasets.

Conflation of heterogeneous datasets opens possibilities for updating, averaging to obtain better estimates, and analysis and modeling. In this project, we propose to design a relational-algebra framework for conflating geospatial data from diverse sources; to develop statistical and optimization approaches for multi-source data integration; and to develop new methods of spatiotemporal reasoning. The research will extend across different time instants and different data standards. The findings of this project will not only meet the requirement of creating higher-accuracy data from multiple sources, but also will offer a new direction for utilizing rich yet incompatible geospatial data in order to facilitate spatial reasoning.

*Thanks to Prof. Martin Raubal for providing the information for this article*

examining several large text corpora to measure the degree to which analytical spatial reasoning is in evidence across disciplines. The first measure is a fairly simple “spatial term density,” using for the most part concepts from the list of 186 mentioned earlier. It has so far been applied to a corpus of 200,000 NSF abstracts over a 20-year period and to the course descriptions for all departments from the 2008 UCSB catalog. Preliminary results do indicate great disciplinary breadth. A related study in progress compares those measurements with human assessments of spatiality in scientific text, to inform design of more cognitively sound linguistic metrics.

What motivates these efforts is the notion that the enumeration of learning objectives for the explicit instruction of spatial thinking will require a thorough understanding of its nature and its breadth of application, in virtually all knowledge domains. You will find further explanation of the work mentioned here at [www.teachspatial.org](http://www.teachspatial.org). This collective undertaking by the emerging “teachspatial community” is just under way, so stay tuned for further developments as it evolves.

*Karl Grossner*

## WHERE IN THE WORLD IS MIKE GOODCHILD?

### AN ACADEMIC LIFE IN THE EARLY 21<sup>ST</sup> CENTURY

**W**hen I was first appointed assistant professor more than 40 years ago life was very much as it has been portrayed in books and movies that feature professors—C. P. Snow’s novels about Cambridge, Albee’s *Who’s Afraid of Virginia Woolf*, *Educating Rita*, or Roth’s *The Human Stain*. I wore tweed jackets and ties, lectured, met with departmental colleagues and students, and even shared the occasional glass of sherry—I thought of summers as time to relax. Today my professional life couldn’t be more different. I spend most of my time glued to my laptop, writing papers, developing presentations, and exchanging emails with students and colleagues. With high-speed Internet connections available almost everywhere, my physical location has become almost irrelevant. Only the timestamp on outgoing emails hints at where I am physically located; an email sent at 3 a.m. California time is more likely to have come from somewhere in Asia than from California. I sometimes wonder why I still have a UCSB office, since apart from using it to store my books and hard-copy journals, what I do there is little different from what I do in airports, hotels, while working at home, and in spare moments on the other side of the world.

I recently went through my records to analyze my patterns of travel over the past 10 years. I found 1,331 separate flights to a total of 127 different airports, and 256 (successful) landings at Santa Barbara Airport. The total time spent in the air was more than 4,000 hours (two full working years), giving an average elevation over 10 years of more than 5,000 ft although I live at sea level. I racked up this record by giving keynote addresses



at conferences, attending meetings of national and international committees, participating in workshops, giving guest lectures on other campuses, preparing evaluations of other programs, examining doctoral candidates, meeting with collaborators—and taking the occasional personal time out to vacation and visit family, although often this was combined with some professional activity.

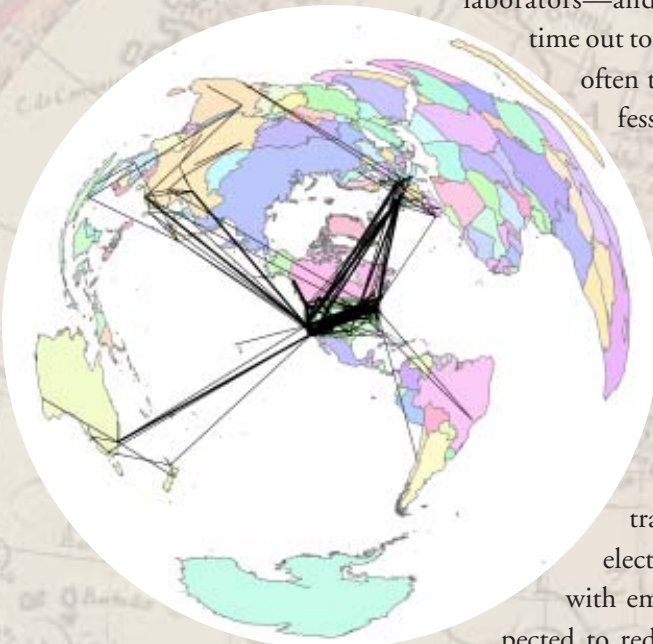
In retrospect it is hard to see exactly when this transition began. It must have begun well before 2000, because my travel records show virtually no change over the decade in the rate of travel, though oddly 2001 was the heaviest year, despite the effects of 9/11 on air travel worldwide. Paradoxically the electronic communication that began with email in the late 1980s and was expected to reduce the need for academic travel

has actually *increased* it. And it is abundantly clear that the best of current virtual-meeting software cannot compete with the effectiveness and productivity of face-to-face meetings.

The peripatetic professor has long been the subject of satire, by such authors as David Lodge and Malcolm Bradbury. Bradbury's *Doctor Criminale* is a post-modernist who appears at international conferences, gives his stimulating keynote, and then disappears—only to surface at the next international conference. His academic appointment is believed to be at a university somewhere in Eastern Europe; ironically, he is killed after delivering a guest lecture at UC Santa Barbara when attempting to cross a bike path.

I would argue strongly that this new academic lifestyle is successful—in enhancing research productivity, the sharing and dissemination of ideas, the building of collegial networks, and many other metrics. Today I am as likely to collaborate with someone on the other side of the world as with someone down the hall from my office, with abundant benefits to research and education. But it is not sustainable—150,000 miles of airline travel per year has a carbon footprint roughly equal to that of a commuter who daily drives a 400-mile round trip. It is hard to escape the irony of flying people half way around the world to discuss global climate change or sustainability. Face-to-face meetings may have greater value, but is that value worth the environmental cost? As a geographer I love to travel, and I have been able to do so to a degree that most people can only dream of. I need to argue forcefully for virtual meetings whenever possible, but what can I say to the young academic geographer who is as attracted to travel as I?

*Michael Goodchild*



## SUMMER WORKSHOPS PAST AND FUTURE

[spatial@ucsb](mailto:spatial@ucsb) and the **Center for Spatially Integrated Social Science (CSISS)** hosted a week-long workshop on **Regression Modeling** in July 2009. The workshop was funded by a National Institute of Health (NIH) grant to support training for population and health researchers to enhance their research applications of advanced spatial analytical methods.



CSISS is the UCSB partner on a five-year

NIH award to the Population Research Institute at The Pennsylvania State University (PSU). Drs. Stephen Matthews (PSU), Mike Goodchild, and Don Janelle (UCSB) are co-Principal Investigators.

In 2010 UCSB will host two workshops: **Geographically Weighted Regression**, instructed by Chris Brunsdon, Martin Charlton, and Stewart Fotheringham, will be held 7/12–16; **Spatial Pattern Analysis**, will be held right afterward, 7/19–23, instructed by Jared Aldstadt, Arthur Getis, and John Weeks.

All applications are to be submitted online at [www.csiss.org/GISPopSci](http://www.csiss.org/GISPopSci), beginning in mid-January, with an application deadline of March 31, 2010. Please browse the website for further workshop details.

## STUDENT FORUMS:

At least once per quarter, [spatial@ucsb](mailto:spatial@ucsb) hosts lunch discussions on spatial technology at 3512 Phelps Hall. The goals of the discussion group are to: facilitate graduate discussion and interdisciplinary collaboration on spatial topics; inform attendees about the goals and work of the Center for Spatial Studies; and foster a center-associated graduate student cohort. Please see [www.spatial.ucsb.edu/events/student-forums.php](http://www.spatial.ucsb.edu/events/student-forums.php) for upcoming lunches.



Please browse our newly revised website at

<http://www.spatial.ucsb.edu/>