

## THE END OF AN ERA— AND THE BEGINNING OF A NEW ONE

MICHAEL GOODCHILD RETIRES

After 43 years of academic excellence and research, and with 6,000,000 miles and 12,000 hours of airline travel, 521 publications, 536 presentations, 57 theses supervised, and \$55,335,816 in research grants behind him, **Michael Goodchild** has retired from the University of California, Santa Barbara. Goodchild, considered the “Father of Geographic Informational Science,” among many other distinctions and achievements, was director of the Center of Spatial Studies ([spatial@ucsb](mailto:spatial@ucsb)) since its inception in 2007. He has moved to a new home in Seattle, WA, but retirement being only relative where he is concerned, he will continue to mentor UCSB graduate students and certainly add to his list of awards, publications, research grants, and miles traveled for the advancement of geographical research.



## NEW DIRECTOR OF SPATIAL@UCSB, MARY HEGARTY

**Mary Hegarty** (Ph.D., Carnegie Mellon University), the newly appointed director of the Center for Spatial Studies, is a professor in the Department of Psychological and Brain Sciences, a fellow of the American Psychological Society, a former Spencer Postdoctoral Fellow, and is the past chair of the Cognitive Science Society. She is Associate Editor of *TopiCS in Cognitive Science* and the *Journal of Experimental Psychology: Applied*. Hegarty is on the editorial boards of *Spatial Cognition and Computation* and *Learning and Individual Differences*. Her current research is funded by the National Science Foundation.

Hegarty researches spatial thinking in complex activities such as comprehension, reasoning and problem solving. In research on mechanical reasoning and interpretation of graphics, she uses eye-fixation data to trace the processes involved in understanding visual-spatial displays (diagrams, graphs, and maps), and making inferences from these displays. A unique characteristic of her research is that she studies spatial thinking from the perspective of individual differences as well as employing more commonly used experimental methods. In her work on individual differences, she studies large-scale spatial abilities involved in navigation and learning the layout of environments, as well as smaller-scale spatial abilities involved in mental rotation and perspective taking. Her current research projects include understanding the roles of internal and external visualizations in reasoning about physical systems including molecules, machines, and meteorological phenomena and the use of visualization versus analytic problem solving strategies in scientific problem solving.



## RECENT EVENTS 2012–2013

- 5/24/12 Colloquium, “Exploring Digital Earth,” Michael Goodchild
- 6/6/12 [spatial@ucsb.local2012](http://spatial@ucsb.local2012)
- 12/2012 Specialist Meeting, “Spatial Thinking Across the College Curriculum,” please see [www.spatial.ucsb.edu/events/STATCC/](http://www.spatial.ucsb.edu/events/STATCC/)
- 2/27/13 Spatial Lightning Talks

## UPCOMING EVENTS 2012–2013

- 6/6/13 [spatial@ucsb.local2013](http://spatial@ucsb.local2013)—“Visualization,” Corwin Pavilion
- 8/2013 International Summer School for Spatial Cognition
- 12/11–12/13 Specialist Meeting, TBD

## A NOTE FROM THE NEW DIRECTOR

The directorship of the Center for Spatial Studies provides exciting research opportunities. As a psychologist and cognitive scientist, I have devoted my career to the study of spatial thinking processes. In my research, I have studied how mechanics, meteorologists, chemists, and surgeons think about space, and how spatial representations—diagrams, maps, and graphs—help us all think spatially. I have also collaborated with researchers in the UCSB Department of Geography to study individual differences in navigation and empirical validation of cartographic design principles.

Another theme in my research is how cognitive science can inform education; I will bring a focus on education to the center this year. Education for spatial thinking was the theme of our [spatial@UCSB.local2012](http://spatial@UCSB.local2012) poster event and plenary session in June and a specialist meeting, “Spatial Thinking Across the College Curriculum” was held in December 2012. In addition, in fall quarter a new educational initiative was held, a Freshman Seminar: “Thinking Spatially in the Arts and Sciences.” I would love to hear from you ([hegarty@spatial.ucsb.edu](mailto:hegarty@spatial.ucsb.edu)) if you have ideas for enhancing the mission of the Center for Spatial Studies.

Mary Hegarty  
Professor,

Psychological and Brain Sciences  
Director, Center for Spatial Studies



## MINOR IN SPATIAL STUDIES



**B**eginning Winter Quarter 2011, students at UCSB have benefited from the unique opportunity to complement their academic majors with a **Minor in Spatial Studies** that features scientific and humanistic perspectives about space, place, spatial reasoning, and spatial analysis, utilizing courses from across 26 departments and programs.

This singular program draws upon areas of acknowledged research innovations and academic strengths long associated with UCSB—UCSB’s role in the development of geographic information systems (GIS) through the National Center for Geographic Information and Analysis (NCGIA); applications of spatial and spatio-temporal thinking across disciplines, as exemplified by the immersive visualization environment of the AlloSphere; the use of brain imaging in neuroscience; the integrative use of quantitative methods, spatial statistics, and simulations of space-time interactions to understand ecological and behavioral processes across a wide range of disciplines; pioneering developments in the uses of satellite imagery and remote sensing; and innovative applications of spatial principles and practices in the creative arts. Students opting for the minor choose from one of three focus areas: Spatial Thinking, Space and Place, or Spatial Science.

Twenty-four students have already completed the minor and we expect 15 to graduate in summer 2013. Dozens of students have inquired about the program and are seemingly considering it. The minor is open to students from all disciplines, providing an opportunity to build a niche of expertise structured around general concepts for understanding the role of place in society, mastering methodologies for representing information and data in a spatial context (including geographical context), and engaging spatial principles for solving problems and creating new works of art or interpretive insights.

Further information about the Minor in Spatial Studies can be obtained at <http://www.spatial.ucsb.edu/programs/academic-minor.php>.



### FRESHMAN SEMINAR: THINKING SPATIALLY IN THE ARTS AND SCIENCES

**A**s a means of informing students about the Minor in Spatial Studies and attracting promising undergraduates interested in interdisciplinary spatial studies, a freshman seminar in spatial studies, “**Thinking Spatially in the Arts and Sciences**,” was established for Fall Quarter 2012. **Mary Hegarty, Daniel Montello, and Donald Janelle** assembled a stimulating line up of professors from diverse departments to provide students with their unique perspectives and uses of spatial technology in research. This curriculum offers students the opportunity to explore spatial reasoning for problem solving (sciences), creative expression (arts), and interpretation (humanities). They learn how statistics, graphs, maps, and virtual reality aid learning, data visualization, problem solving, and interpretation. Students interact with faculty from the arts, humanities, social and natural sciences, and engineering for understanding how spatial tools may be used to integrate knowledge across disciplines. Enrollment for this class was filled to capacity even before it was advertised. Plans for a 2013 Freshman Seminar are underway.

## THINK SPATIAL BROWN BAG SERIES 2012–2013

12:00–1:00 p.m.

Ellison Hall, Room 5824

- 3/5/13 **Wendy Meiring**, “Nonstationary Spatial Correlation Modeling and Estimation”
- 3/19/13 **Keith Clarke**, “What is the World’s Oldest Map?”
- 4/16/13 **Scott Grafton**, “Spatial Reference Frames for Real and Virtual Movements”
- 4/23/13 **Don Janelle**, “Rivers, Bridges, Stagecoaches, and the Early Nineteenth-Century Space-time Structure of Maine’s Settlement System”

## SPATIAL TECHNOLOGY LUNCH DISCUSSIONS

Originally begun as a graduate forum to share tools and techniques for online mapping, the [spatial@ucsb](mailto:spatial@ucsb.edu) Technology Forum has expanded to include faculty, staff, undergraduates, and technologists from the local community. During 2009–2010 the group held quarterly formal lunch meetings as well as weekly after-hours coding sessions.

The 2009 fires in Santa Barbara and the January 2010 earthquake in Haiti influenced the weekly coding group to emphasize disaster relief infrastructure.

The spatial technology forum continued these coding sessions and quarterly lunches through the 2010–2011 academic year. The weekly coding circle for fall 2010 was organized on the theme Android and geolocation.

The series has recently been revived by Kitty Currier, who, thus far, has organized speakers to share their enthusiasm for grassroots aerial imagery and mapping, as well as mobile mapping technology and its evolution from specialized tool to ubiquitous consumer app. The “Spatial Lightning Talks” Currier organized was particularly fun for the audience and challenging for the 14 speakers, who had all of three minutes to present their topics. Please see <http://www.spatial.ucsb.edu/events/student-forums.php> for presentation details.





# CAVES AND COGNITION:



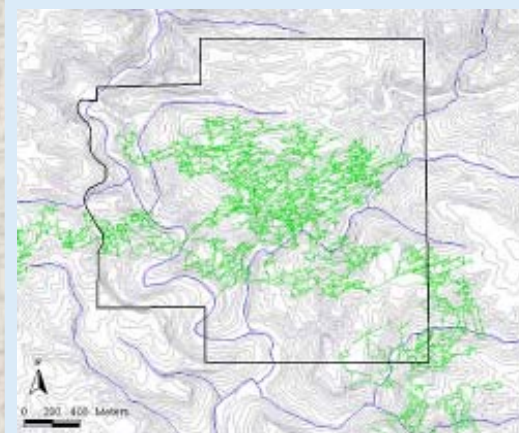
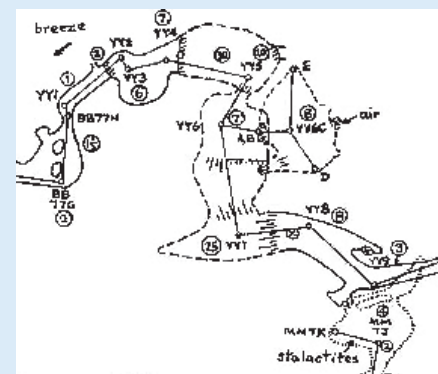
## EXPLORING THE CAVE EXPERIENCE FROM MULTIDISCIPLINARY PERSPECTIVES

Archaeological research demonstrates that across cultures and time periods, both ancient and modern people have used the dark zones of caves as ritual spaces but rarely for habitation. The dark zone in a large cave is the part with constant temperatures that sunlight does not reach. Apparently, dark zones have physical properties experienced by humans that lead to the assignment of similar meanings to these spaces for different societies across time and place, affording their use as sacred or ritual spaces and venues for intentional semiotic communications. Anthropologists have long studied ritual and religion, and have contemplated the universality of religious beliefs. Recent research trajectories focus on the structure of the mind as the fundamental causality of the occurrence of religious or spiritual beliefs. What has not been considered in any of these research programs is the role of human environmental perception and cognition that is crucial in establishing cosmologies and other foundational beliefs. The role of caves in human experience and thought is of particular interest, as well as understanding the qualities of specialized cave environments that lead to their common emotional and intellectual responses, and establishes their meaning as powerful spiritual venues.

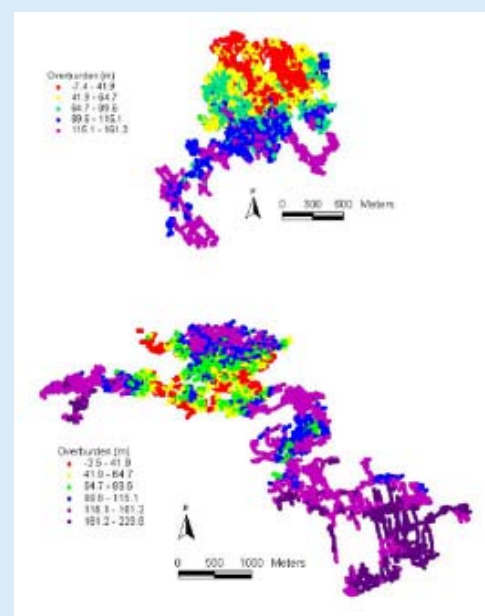
On October 18–20, 2012, a small multidisciplinary symposium on this topic was held at the University of California, Merced, organized by Professors **Holley Moyes** (archeology, UC Merced), **Teenie Matlock** (cognitive science, UC Merced), **Michael Spivey** (cognitive science, UC Merced), and **Daniel Montello** (geography, psychology, UC Santa Barbara). Fifteen other scholars from around the world participated, from anthropology and archeology, psychology, linguistics, literature, history, geography and geographic information science, geology, and architecture. Participants discussed how humans think about, talk about, and represent caves. The symposium seeks to establish a multidisciplinary scholarly community to examine human perceptions and experience of caves and explore the role of cave space in human cognition and behavior in order to better understand how cave space acquires meaning. The meeting was structured to create synergies between disciplines, and stimulate new research and partnerships between the humanities, social sciences, cognitive sciences, and geosciences. More specifically, the symposium's goals were to: (1) focus on and establish research questions; (2) explore the contributions of different disciplines and learn from multidisciplinary perspectives; (3) share the work of different research groups; (4) stimulate new research and partnerships by creating synergies; and (5) publish the proceedings to explore the topic and establish lines of inquiry.

Presentations by participants and group discussions addressed various relevant topics, including: Cave in Myth and Cosmology; Caves as Ritual Venues; Cave Representations in Fiction (literature, art, film, television, video games, virtual reality); Role of Caves in Social Memory; Landscape Approaches; Caves as Architectural Spaces; Caves and Language; Perception Studies; Spatial Research/Cave Mapping; Navigation in Caves; and Cave Geosciences.

*Daniel Montello  
Professor, University of California, Santa Barbara*



*A portion of the Jewel Cave line plot, overlain on Digital Line Graphs representing the Monument boundary, surface elevation contours, and surface drainages.*



*Wind and Jewel Caves, shaded by ranges of overburden. Wind Cave is shallower than Jewel.*

*GIS maps from Rene Ohms and Matthew Reece, "Using GIS to Manage Two Large Cave Systems, Wind and Jewel Caves, South Dakota." Journal of Cave and Karst Studies, April 2002.*