

# Think Spatial

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## The UCSB brownbag forum on spatial thinking

presents

### Diana Stuart Sinton

Director of Spatial Curriculum and Research, University of Redlands

#### ***One Approach to Bringing Spatial Thinking to Higher Education***

**Ellison Hall 3621, 12:00 p.m. Wednesday, 12 December 2007**

**Abstract:** Wide-spread interest in mapping, GIS, and spatial thinking has been growing in educational communities. Capturing and focusing this enthusiasm helps to raise the profile of geography in higher education and allows geographers - and other spatially-minded educators - to share their understanding of how spatial thinking can effectively inform and enhance pedagogy. This talk will focus on how we are developing a campus-wide understanding of spatially-enabled curriculum and a new vision for geography at the University of Redlands.

**Diana Sinton** leads a campus-wide initiative at the University of Redlands to integrate spatial reasoning, mapping, and GIS into numerous academic disciplines. Her focus is the role for spatial literacy in higher education and she recently co-edited *Understanding Place: GIS and Mapping Across the Curriculum* (ESRI Press, 2007). Previously Diana was a Chief Program Officer at NITLE, the National Institute for Technology and Liberal Education. She has taught at Alfred University and the University of Rhode Island, and holds BA, MS, and PhD degrees from Middlebury College and Oregon State University.

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University of California, Santa Barbara

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## The UCSB brownbag forum on spatial thinking

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### William Jacob

Professor, Department of Mathematics, University of California, Santa Barbara

### *Working with the Array, Mathematical Models*

Ellison Hall 6824, 12:00 p.m. Tuesday, 22 January 2008

**Abstract:** In this presentation we will look at video of 4th grades students investigating the different ways to pack 24 candies into rectangular boxes (3-D arrays). Working with this context the students construct important algebraic and spatial ideas, among them: doubling and halving strategies for multiplication, spatial interpretations of commutative and associative properties, and the role of layers in volume. The presentation will be interactive with participants discussing what they see in the clips and student work.

**Bill Jacob** holds a PhD from Princeton University. In addition to his mathematical research in the areas of quadratic forms and division algebra, he is noted for helping undergraduates prepare for teaching careers and has published significant works of importance to teaching and learning mathematics. He has designed and led professional development programs for K-12 teachers and co-/authored *The California Frog-Jumping Contest: Algebra* (Grades 4–6); *The Politics of California School Mathematics: The Anti-Reform of 1997-99*; *Best Buys, Ratios, and Rates: Addition and Subtraction of Fractions* (Grades 4–6), and *The Mystery of the Meters: Decimals* (Grades 4–6).

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## The UCSB brownbag forum on spatial thinking

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**Tobias Höllerer**

Four Eyes Laboratory

Computer Science Department

University of California, Santa Barbara

**When computers get physical — A Path to "Anywhere Augmentation"**

**Ellison Hall 6824, 12:00 p.m. Tuesday, 12 February 2008**

**Abstract:** We use the term "Anywhere Augmentation" to describe a powerful general user interface, making augmented reality (AR) overlays readily and directly available in any situation and location. Graphical annotations can be viewed and placed through optical see-through glasses or by using your phone, PDA, or tablet computer as a video-see-through lens. A key question is how to achieve robust spatial registration between the objects in the physical world and their AR annotations. Promising new approaches make use of computer vision in conjunction with various GIS data sources, which are becoming universally available, allowing mobile users to grow and browse a web of volunteered location-based information around them.

**Tobias Höllerer** is an Assistant Professor of Computer Science at the University of California, Santa Barbara (UCSB), where he co-directs the "Four Eyes Laboratory", conducting research in the four i's of imaging, interaction, and innovative interfaces. He holds Ph.D. and M.S. degrees in computer science from Columbia University and a graduate degree in informatics from the Technical University of Berlin in Germany. His main research interests lie in augmented reality, 3D displays and interaction, visualization, mobile and wearable computing, and adaptive user interfaces.

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**Paul Van Zuyle**  
Westlake GIS

## ***Building Regional GIS Data Infrastructure***

**Friday, 22 February, 2008**

**12:00 – 1:00 p.m.**

**6824 Ellison Hall (ICESS Conference Room)**

Paul's talk will include a broad discussion of GIS data infrastructure and data sharing activities, including:

- A brief history of data sharing among local government agencies in LA, Ventura and Santa Barbara counties for the past ten years.
- The Channel Islands Regional GIS collaborative and its activities. (<http://www.cirgis.org>)
- The Open Data Consortium and its activities. (<http://www.opendataconsortium.org/>)
- The 2006 California Attorney General's opinion on GIS parcel records and the California Public Records Act.
- The role of state and federal agencies in promoting data sharing.
- A view of the role of libraries, colleges and universities in facilitating the exchange of GIS data.

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## The UCSB brownbag forum on spatial thinking

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**Kun Lee**

Professor of Urban Sociology at the University of Seoul, Seoul, Korea

Visiting Scholar, Department of Geography, University of California, Santa Barbara

### **Moving Towards Register-based Censuses in Korea: A Long Way to Go**

**Phelps Hall 3512, 12:00 p.m. Monday, 3 March 2008**

**Abstract:** The traditional way of census taking in Korea has been challenged by government officials, congressmen, and academics. They argue that the Korean censuses can be replaced by a register based on the use of administrative records. While this argument is true in conception, it is hard to achieve in reality. There are difficulties in linking administrative records owing to political issues over confidentiality and “big brother”. Nonetheless, because the register-based-census may be the only choice in the near future, it is necessary to develop methodologies for their potential use in census taking. As a first step towards a register-based-census, I have compared the population census of 2005 with the population register. Data are aggregated at the level of the smallest administrative region, called Eup, Myon, Dong in Korea.

**Kun Lee** holds a Ph.D. degree in sociology from Harvard University, an M.S. degree in mathematics from Rutgers University, and a B.S. degree in mathematics from Seoul National University in Korea. His research interests focus on labor markets, information society, and national statistics. He is currently exploring the usefulness of GIS in sociology and statistical analysis.

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### Daniel R. Montello

Professor, Department of Geography / Affiliated Professor, Department of Psychology

University of California, Santa Barbara

### Spatial Thinking with Different Media

Ellison Hall 6824, 12:00 p.m. Tuesday, 11 March 2008

**Abstract:** We derive spatial knowledge from our direct experience in the world—looking, touching, grasping, walking, and so on. But we also derive it from indirect, or symbolic, sources. These sources include maps and pictures, words that are spoken or written, and now virtual reality systems. In my talk, I discuss ways that spatial knowledge derived from direct and indirect sources is similar, and ways it may be different. This has implications for best practices when communicating spatial information in education and other contexts.

**Dan Montello** completed his MA and PhD in Psychology from Arizona State University, and has a BA in Psychology from The Johns Hopkins University. His research interests include spatial perception, cognition, and behavior; cognitive issues in cartography and GIS; spatial aspects of social behavior; environmental psychology and behavioral geography. Dan was appointed recently as Co-editor of *Spatial Cognition and Computation*, and has published a book with Paul Sutton (2006) *An introduction to scientific research methods in geography*.

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## The UCSB brownbag forum on spatial thinking

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### Jack Loomis

Professor of Psychology, UCSB

### *Twenty years of research on the Personal Guidance System: What did we learn?*

**Ellison Hall 6824, 12:00 p.m. Tuesday, 1 April 2008**

**Abstract:** Since 1987, Reginald Golledge (Geography, UCSB), Roberta Klatzky (Psychology, Carnegie-Mellon) and I have been doing research and development of a GPS-based navigation system for blind people. We had the world's first system up and running in 1992. I will go over a little of the history behind our project (how it came to be and what was involved in getting the first system working). Since those early days, many similar projects have sprung up around the world and there are now several successful commercial products, but the unique feature of our design has been the use of a virtual acoustic display as part of the user interface. Such a display allows the traveler to hear buildings and other points of interests speaking their names, as if coming from loudspeakers at these locations. Most of my talk will focus on user studies evaluating this and other "spatial" displays in comparison with conventional synthetic speech displays, studies which reveal the superiority of virtual sound.

**Jack Loomis** has been a Professor of Psychology at UCSB since 1974, where he has conducted basic research on a broad range of topics including tactual perception, visual space perception, auditory space perception, visual control of locomotion, spatial cognition, and social interaction. In the 1980s, he came up with the idea of a navigation system for blind people, designed a virtual acoustic display as part of its user interface, and has been director of the R&D project ever since. In the 1990s, he and Andrew Beall developed technology for creating visual virtual reality and introduced virtual reality as a basic research tool at UCSB, where it has been widely used. He also has been an instrument rated private pilot with an interest in improving flight safety.

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### Mary Hegarty

Professor of Psychology, UCSB

#### The Role of Spatial Ability in Medicine: Applications in Selection and Training

Ellison Hall 5824, 12:00 p.m., Tuesday, 22 April 2008

**Abstract:** The study of anatomy, one of the fundamental components of medical training, includes many spatial concepts, such as the shape of anatomical structures, their relative locations, and how they are connected. When carrying out medical procedures the internal structures of the body are not directly visible, so that medical professionals have to rely on mental models of these structures. Spatial cognition is also central to understanding medical images, including those produced by CT, MRI, X-Ray, and ultrasound. In this talk I will report on a project in which we examined the role of spatial visualization abilities (internal visualizations) and interactive 3-d computer visualizations (external visualizations) in enhancing spatial thinking in the context of medicine. The research conducted during the 4 years of the project included (1) basic research on the role of spatial abilities in the medical professions of surgery and dentistry, (2) development of psychometric tests to measure spatial skills in these professions, (3) studies of how people use external visualizations while making inferences from 3-D spatial representations and (4) studies of the development of surgical skills and anatomy learning using 3-D virtual models.

**Mary Hegarty** is Professor and Vice Chair of the Psychology Department at UCSB. She received her BA and MA from University College Dublin, Ireland and Ph.D. from Carnegie Mellon University. The main goal of her research is to study the nature of spatial thinking in complex activities such as comprehension, reasoning, and problem solving. Specific topics of current interest include comprehension of complex visual displays, e.g., weather maps and animations, understanding individual differences in spatial cognition at both behavioral and neural levels, and training of spatial thinking in the context of science and medical education. She is a fellow of the American Psychological Society, a former Spencer Postdoctoral Fellow is on the editorial board of *Journal of Experimental Psychology: Learning, Memory and Cognition* and *Spatial Cognition and Computation* and is a member of the governing board of the Cognitive Science Society. Her current research is funded by the Office of Naval Research and the National Science Foundation.



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### Reginald G. Golledge

Professor, Department of Geography, University of California, Santa Barbara

### The Nature of Geospatial Knowledge (and when to teach it)

Ellison Hall 5824, 12:00 p.m. Wednesday, 21 May 2008

**Abstract:** Knowledge of spatial concepts is the key to enriched Spatial Thinking. I distinguish between the unconscious awareness of space and spatial relations that permeate our everyday behavior, and the level of spatial awareness that is achieved by developing a spatial concept vocabulary along with a (learned) comprehension of what the concepts and relations embedded in that vocabulary imply. To elaborate this idea, I build on the basic work of Mark and Egenhofer's "Naïve Geography" paper. The result is a compendium of language and behaviors in space that support the idea that we all have different mixes of incidental and intentional spatial knowledge.

**Reginald Golledge** obtained his PhD in Geography from the University of Iowa, and holds BA and MA degrees in Geography from the University of New England, Australia. His research interests focus on cognitive behavioral geography, including spatial decision making and behavior and environmental perception; transportation modeling; and geography and disability. Golledge is the recipient of numerous awards, including the Lifetime Achievement Honors of the Association of American Geographers, Fellow of the American Academy of Arts and Sciences, the Grosvenor Medal for Geographic Education, and the Institute of Australian Geographers International Geographers Gold Medal. He also holds honorary degrees from Göteborg University and Simon Fraser University, Canada, and served as a Past President of the Association of American Geographers.

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