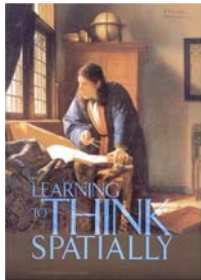



Spatial 2.0:

Spatial literacy, analysis, modeling, & visualization


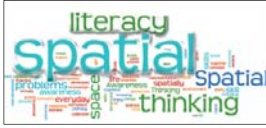



John P. Wilson
School of Architecture
7 September 2012



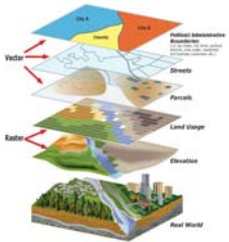
Outline

- Background
 - Pattern & process
 - Location, location, location
 - Flows & cycles
 - Space & time
- Spatial literacy & thinking
 - Geographic information science
 - Geospatial technologies
 - The spatial turn
- A spatially infused university
- Spatial@USC
- Final thoughts






Got GIS? We do, and it *really* works!


Representation



Integration

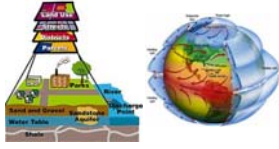
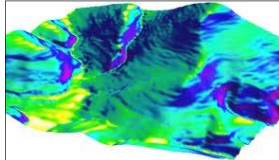



Informed site analysis!

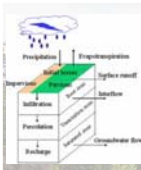


What Does a GIS Look Like?

- Information about what is where (when)
 - The contents of maps and images
- You would know when a computer was being used for GIS because the data stored in it would include maps and images



Building Blocks



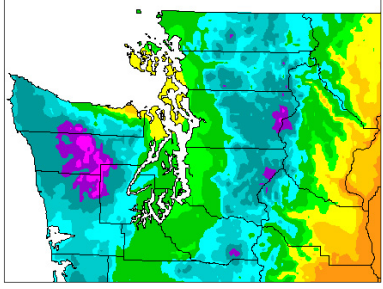

Data

Spatial Sciences Institute

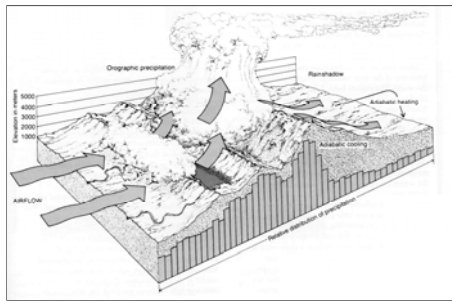
Systems
Models
Assessment
Measurements
Observations

Pattern ... WA precipitation map

Processes ...



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Location, location, location ...



Beverly Hills

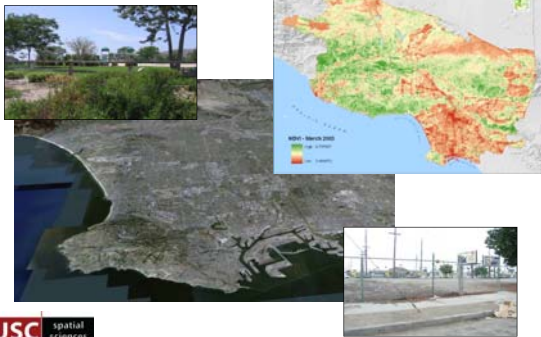


South-Central Los Angeles



8

Land use / land cover



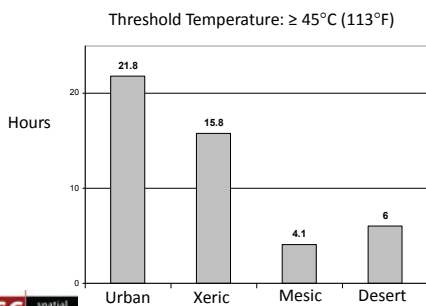
9

Landscapes



10

Average hours of exposure to extreme heat by land cover type



11

Mobility ... Flows



12

Cycles ... Scale, space & time

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Spatial literacy & thinking

- Spatial literacy
 - Ability to use properties of space to communicate, reason, and solve problems
- Spatial thinking ...
 - A cognitive skill that can be used in everyday life, the workplace, and science to structure problems, find answers, and express solutions using the properties of space
 - It can be learned and taught formally to students using appropriately designed tools, technologies, and curricula
 - **A properly positioned GIS (program) could be used to foster spatial thinking across the curriculum**

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Spatial concepts

- Spatial structures
- Spatial properties
- Space-time context
- Positioning
- Spatial dynamics
- Spatial relations
- Spatial interaction
- Spatial transformation
- Representation
- Spatial principles

- position
- distance
- direction
- orientation

- object
- field
- surface
- network
- region, etc.

- spatial autocorrelation
- spatial heterogeneity
- spatial association
- distance decay
- access
- availability
- isotropy
- congruence

Source: TeachSpatial (teachspatial.org)

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Geospatial technologies

- Provides tools to solve many of real world problems ...
 - Locating things
 - Routing
 - Location/allocation
 - Locating linear facilities
 - Land use modeling

Constraining Design Approach

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Web / GIScience 2.0

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Multiple Platforms


- Bundle software with data
- Build geoprocessing workflows and services
- Provides multiple entry and exit points for users
- Rapid growth in demand for people with spatial skills

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The spatial turn

- Rapid spread of spatial thinking and GIS throughout the sciences
 - Snow's 19th century work on cholera
 - ACM SIGSPATIAL
- Has swept through social sciences and humanities as well
 - All human action literally *takes place* somewhere
 - Spatial dimension of social interaction key for understanding all of the classic questions about the human condition
- Cf. with statistics as a field of study



Map showing clusters of cholera cases in London epidemic of 1854






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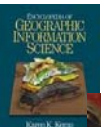

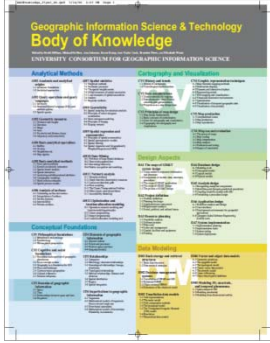
Spatial analysis


Class	Examples
Core concepts	Place, scale, location, distance, centrality, area
Place-based analysis	Distance & directional analysis, geometrical processing, point pattern analysis, map algebra, grid models
Spatial statistics	Exploratory spatial data analysis & spatial statistics, incl. spatial autocorrelation & spatial regression
Surface analysis	Surface form & flow analysis, gridding & interpolation methods, visibility analysis
Network analysis	Shortest path calculation, traveling salesman problems, facility location & routing
Geocomputation	Agent-based modeling, artificial neural networks & evolutionary computing
Geovisualization	Spatial query, representation as process & meaning, map (data) transformation

Various classes of transformations, manipulations & methods that comprise spatial analysis
(Source: Smith et al. 2000, Longley et al. 2010)


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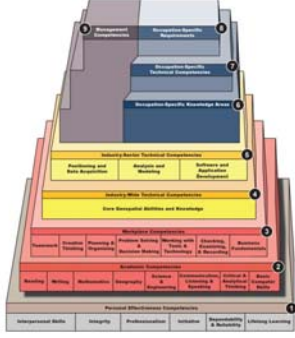
Geographic information science







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Workforce development



- Geospatial Technology Competency Model
 - Positioning and data acquisition
 - Analysis and modeling
 - Software and application development
- UCGIS GIS&T Body of Knowledge
- Los Angeles County





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A spatially infused university

- Teaching spatial literacy** – Promote and facilitate spatial approaches to thinking and reasoning about the Earth
- Teaching spatial science** – Maps & spatial reasoning, principles of geographic information science, etc.
- Teaching spatial applications** – Promote and enable spatial thinking across multiple disciplines
- Managing universities as spatially enabled enterprises** – Facilities management, fund raising, public safety, etc.






Spatial programs at the University of Redlands


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Geographic information infrastructure

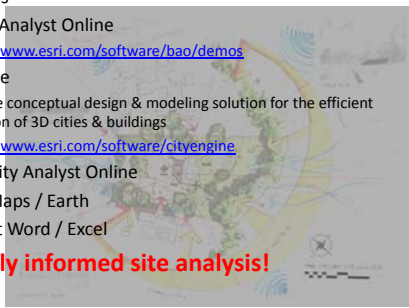
- Contains knowledge describing natural and human environments on Earth
- Includes multiple components
 - Data
 - Data models that provide structure to the data
 - Models and analytic tools that show predictions or suitability
 - Geospatial workflows
 - Metadata, which describes the aforementioned components, and is key to **sharing, discovery and access**
- Relies on web & **mobile** environments to make these ways of thinking about the world more accessible


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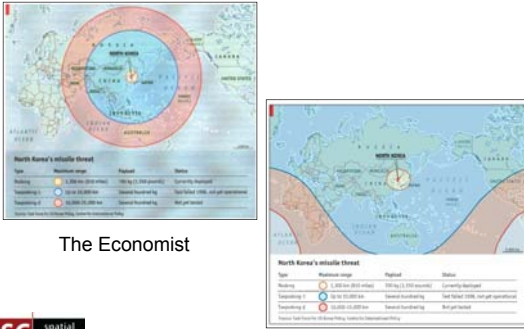
Bundling geospatial data & tools

- Bing Maps
- Business Analyst Online
 - <http://www.esri.com/software/bao/demos>
- CityEngine
 - Unique conceptual design & modeling solution for the efficient creation of 3D cities & buildings
 - <http://www.esri.com/software/cityengine>
- Community Analyst Online
- Google Maps / Earth
- Microsoft Word / Excel
- **Spatially informed site analysis!**



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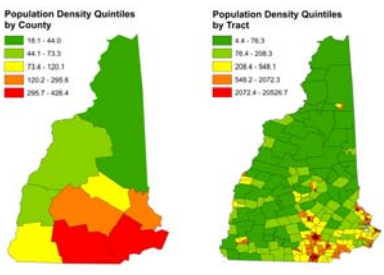
Map projections ...



The Economist

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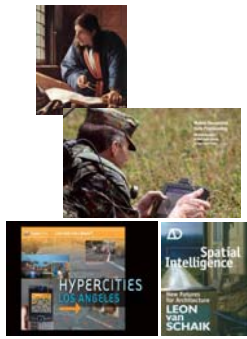
The Modifiable Area Unit Problem



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Spatial @ USC ...

- **GeoPortal**
 - LA County geospatial data assets
- **GIS courses**
 - Maps & Spatial Reasoning
 - Principles of Geographic Information Science
 - Spatial Sciences Practicum
- **GIS/GPS hardware & software**
- **GIS/GPS short courses**
- **GIS help desk**
- **Spatial Studies Minor**
- **B.S. in GeoDesign**




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Questions ...

Project for Public Spaces


Placemaking plans



City-wide strategic plans



Capacity building and cultural change



Placemaking 101

Lighter
Quicker
Cheaper

<http://www.pps.org>

John Wilson
jwilson@usc.edu
<http://spatial.usc.edu>

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