Building a Vibrant and Enduring Spatial Science

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Outline

- Spatial roots
  - Geography
  - Landscape architecture
  - Computer science
- The (current) opportunity
- Guiding principles
  - Spatial as an enabling discipline
  - Core concepts & distractions
  - Role of collaboration
  - Changing character of spatial data
  - Role of geodesign | actionable science
- Final Thoughts

The opportunity

- Spatial turn
  - Rapid spread of spatial thinking & GIS throughout sciences
    - Snow’s 19th century work on cholera
    - Scholten’s new book
    - ACM GIS Conference series
  - 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
- New academic units
- New academic programs

Five guiding principles

- Spatial as an enabling discipline
- Core concepts | distractions
- Role of Collaboration
- Changing character of spatial data
- Role of Geodesign | actionable science

Spatial as an enabling discipline

- Cf. with statistics
- Need small number of fundamental spatial scientists, larger numbers of translational scientists?
- Know ourselves, our role in the knowledge discovery process
  - GIS&T Body of Knowledge projects
  - Learn how to connect & collaborate with others

Core concepts | Duckham 2014

Spatial structure
Dynamism Uncertainty Cognition Design Scale
**Dynamism**

- Catalina Island Fox, Photo: Courtesy of Tim Coonan
- Mission Blue Butterfly, Photo: Courtesy of Travis Longcore

**Uncertainty**


**Cognition**

**Design**

- Maps Technology

**Scale | complexity**

- **Global**: Cloud cover and CO2 levels control primary energy inputs to climate and weather patterns
- **Meso**: Prevailing weather systems control long-term mean conditions; elevation-driven lapse rates control monthly climate and geological substrate events control on soil chemistry
- **Topo**: Surface morphology controls catchment hydrology; slope, aspect, horizon, and topographic shading control surface insulation
- **Micro**: Vegetation canopy controls light, heat, and water for understory plants; vegetation structure and plant physiognomy controls nutrient use
- **Nano**: Soil microorganisms control nutrient recycling

**Distractions**

- GeoComputation 2007
Role of Collaboration

- Work with scientists in other domains
- Tackle "big" questions in new and important ways
  - Use of taxi, cell phone & social media data to explore form and function of metropolitan regions, cities, etc.
- Key criteria for success ...
  - Collaboration needs to involve more than spatial scientists
  - Sum of the parts must be greater than the parts themselves

Urban form | function

Placemaking, neighborhoods, active living

Economic organization

Industry in Motion: Using Smart Phones to Explore the Spatial Network of the Garment Industry in New York City
Sarah Williams
Elizabeth Currid-Halkett
2014

Role of the Web

Changing character of spatial data

- Finer granularity in terms of both space and time ...
  - Exposure modeling
  - Digital terrain modeling
  - Other examples?
- 3D
- Crowdsourcing | Volunteered Geographic Information
- Social media
- Sensing systems
- Changing role of government

Exposome
3D | LiDAR surface models

Crowdsourcing | VGI

Crowdsourcing | social media

GeoSensor networks

Changing role of government

Geodesign | placemaking

American Community Survey

Poverty in Rural America, 2008

Spatial thinking
Geospatial technologies
Focus on the future
Design as a force for good
Collaboration

Capacity building
Human well-being
Sustainable development
Spatial leadership
Professional ethics
Final thoughts

- Spatial as an enabling discipline
- Core concepts | distractions
- Role of collaboration
- Changing character of spatial data
- Role of geodesign | “actionable” science

Our past work ...

- Focused on terrestrial environments
- Focused on space (less about time)
- Focused on what is or what has been
- Ignored most of the world ...
  - Oceans – cover 70% of Earth’s surface
  - Buildings – people spend 85% of their lives indoors & dense urban areas have far more interior space than land area
- Not well aligned with everyday places & non-expert users
- Not connected to sketch & recording needs of design disciplines

Close | 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/

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