Basic Spatial Reasoning

A. Immanuel Kant said it well: *Human brains have "built-in" ways of organizing information: spatially (in space), temporally (in time), causally (by cause-and-effect processes)*

B. Brain-scanning reveals distinct networks that do different kinds of spatial organization:

1. **Comparison** – bigger/smaller, rounder/squarer, darker/lighter, redder/grayer
   Examples: Iowa is smaller than Texas, Poland rounder than Italy,
   China has more dots than Australia on this map,
   Botswana has a darker color than Zimbabwe

2. **Proximity** - next to, near, close to, within its area of influence (its "aura")
   Examples: cabin near a lake, noisy house near an airport,
   gas station near an Interstate highway exit,
   refugee camp near a country with a civil war

3. **Region** - part of a group of places with something in common
   Examples: farms with corn fields in the Corn Belt,
   abandoned factories in the Rust Belt,
   people speaking Spanish in Latin America

4. **Sequence** - in order, along a line, on the way from one place to another
   Examples: third block along a particular street,
   grassland between rainforest and desert,
   middle-age houses between city and suburbs

5. **Hierarchy** - inside something larger
   Examples: counties inside state, states inside country,
   creeks inside watershed of large river,
   rivers or mountain ranges inside continent

6. **Analogy** - in a similar position in a different part of the world
   Examples: ports near mouths of different rivers,
   neighborhoods near downtowns of different cities,
   places in similar positions on different continents

7. **Pattern** - arranged in bunches, lines, arcs, waves, or other non-random ways
   Examples: forts in a line, coral reefs in a ring around an island,
   oil wells in a bunch in one part of a country,
   sand dunes arranged like waves in a desert

8. **Association** - tending to occur together with specific other features
   Examples: stoplights at major intersections,
   people with malaria in places with A. mosquitoes,
   earthquakes at borders between crustal plates

C. There are huge individual differences in how people do different kinds of spatial thinking.

D. Studies show that every student can learn to do every kind of spatial reasoning better.

E. An "expert" map reader is able to use more modes of spatial reasoning, and to use each one better, than a novice. That is why a good map reader can get more information, faster and more accurately, than a novice can.

<u>It's like learning how to learn</u>.

Spatial Thinking in the Human Brain

(a graphic organizer for taking notes)

More than 4000 research studies since 1995 show that the human brain has several "regions" that do specific kinds of spatial thinking, in parallel and often simultaneously.

Spatial Comparison

How are places similar or different?

Spatial Analogies

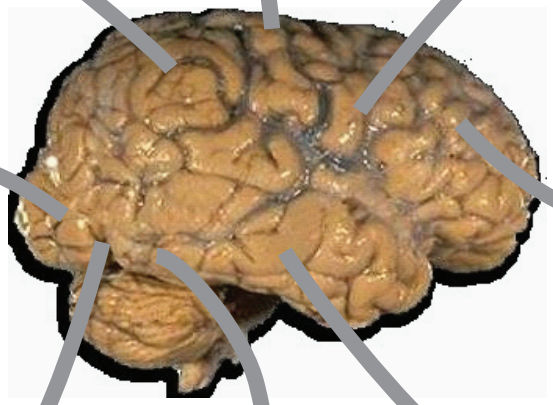
Do places in similar positions in other parts of the world also have similar conditions?

Spatial Auras

How does this place influence other places?

Regions (Spatial Groups)

What groups of nearby places have similar conditions?



Spatial Sequences and Transitions

How do conditions change from one place to another?

Spatial Patterns

Why are features arranged in bunches, lines, rings, waves, or other non-random ways?

Spatial Hierarchies

What smaller entities are inside larger ones?

Spatial Associations

Why do some features occur together in the same places?