AgroEV: A LANDIS-II Extension to Evaluate the Ecological Viability of Agroecological Landscapes

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Many ways to classify soil microbes into guilds or functional groups (Brussaard, 1998). Simple AgroEV guild classification metrics to allow for MaxEnt network analysis (Bascompte, 2009): 1) principal food, 2)temporal distance from photosynthetic carbon, 3) spatial distance from rhizosphere. Simple taxonomic classification of soil microbe communities using monophyletic, paraphyletic, or polyphyletic designators)?

Guild classification of soil microbes for AgroEV.

Guild Name	Food	Temporal	Spatial
Symbionts	Exudates	$10^1 - 10^3 s$	$10^1 - 10^3 \mu m$
Grazers1	Symbionts		
Grazers2	Detritus		
Predators	Grazers		

Phyletic classification of soil microbes for AgroEV.

Name	Representative Genera
Bacteria	
Fungi	
Protozoa	
Nematodes	

Prob of occurrence of a plant at a given, land-based spatial coordinate is a function of

1. spp dispersal capability
2. bulk, phys/chem props of the soil at the spatial coordinate
3. microbiological props of the soil at the spatial coordinate
4. microcliamte at the spatial coordinate

(after Brussaard (1998))

Rhizospheric interactions/events/processes affect succession: root feeding nematodes alter competitive balance between plant spp (enhancing or retarding one spp thereby altering community structure and landscape succession.

Can cityscapes **influence** weather?

Can cityscapes **generate** weather?

Can cityscapes **influence** weather?

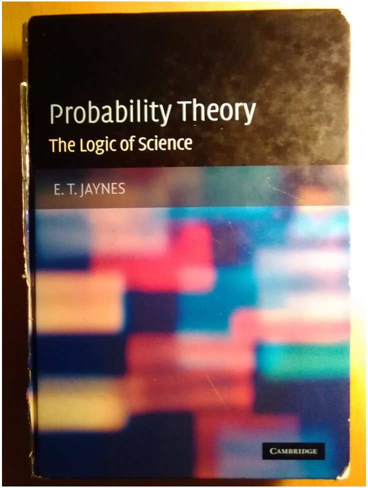
Can cityscapes **generate** weather?

Can cityscapes **cause** thunderstorms?

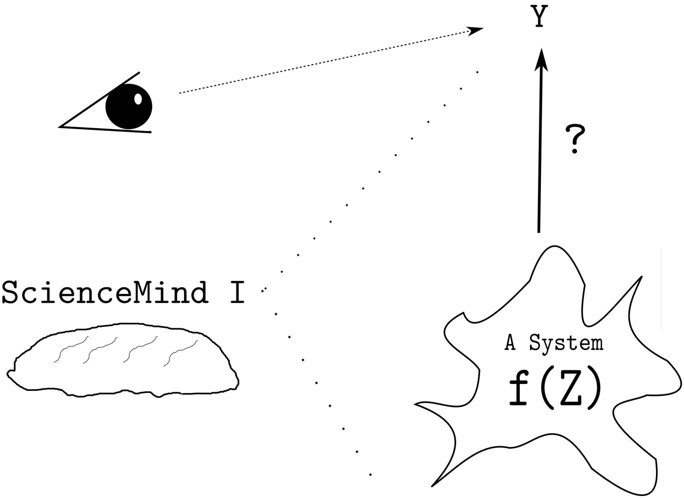
The logic of science:
From Reality to models
and back again

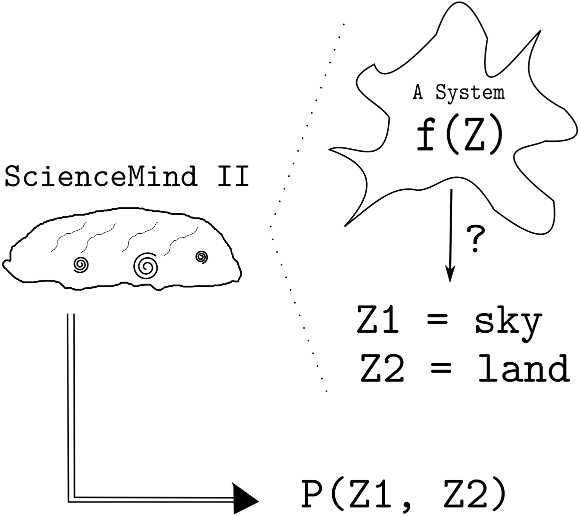
"In virtually all real problems of scientific inference...the problem facing the scientist is of the inverse type: Given the data D, what is the probability that some hypothesis H is true?"

— E.T. Jaynes (2003, p.85)



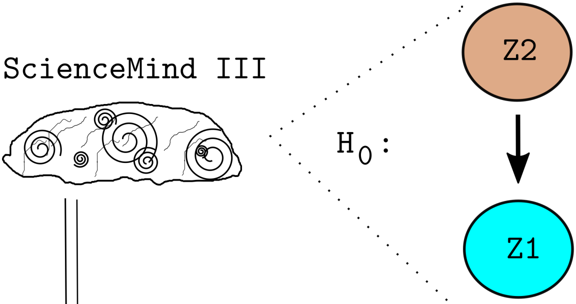
Y={thunderstorm events}




ScienceMind II
A System
f(Z)
?
Z1 = sky
Z2 = land
P(Z1, Z2)

AgroEV for LANDIS-II

Z1={atmospheric conditions}
Z2={land use and land cover}



$$P(Z1,Z2) = P(Z2)P(Z1|Z2)$$

Climatic Change (2012) 113:481–498
DOI 10.1007/s10584-011-0324-1

Urban-induced thunderstorm modification in the Southeast United States

Walker S. Ashley · Mace L. Bentley · J. Anthony Stallins

... "substantive evidence of urban effects on thunderstorm frequency and severity" ...

Geography Compass 2/3 (2008): 620–639, 10.1111/j.1749-8198.2008.00110.x

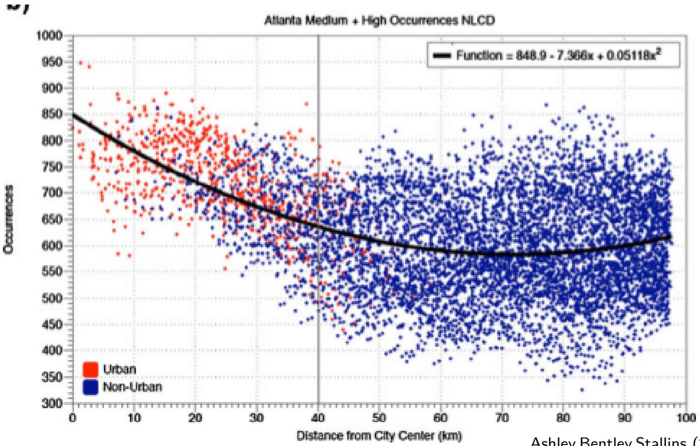
Urban Lightning: Current Research, Methods, and the Geographical Perspective

J. Anthony Stallins* and L. Shea Rose
Department of Geography, Florida State University

"Urban lightning research is still in the descriptive, pattern-identifying stage, with some inroads into mechanism."

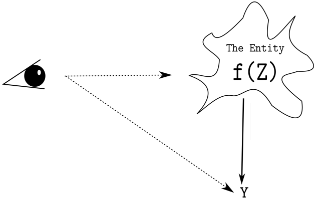
$$P(Z1, Z2) \ = P(Z2)P(Z1|PZ2)$$
$$(dBZ = decibels\ radar\ reflectivity \Rightarrow Z1; NLCD\ code \Rightarrow Z2)$$

Occurrences ≥ 40 dBZ for each 2-km grid cell vs. distance from city center



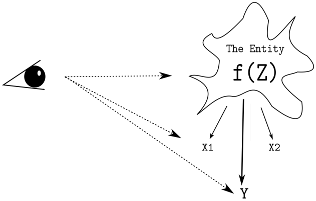
Ashley,Bentley,Stallins (2012)

Scientific Inference: From reality to models and back again



- We observe an entity in Nature that we suspect generates non-random patterns of information
- Our states of knowledge about the causal relationships and processes, $f(\cdot)$, that are operating as well as about the inputs, Z, are limited; often severely
- We assume that some observable outcome, Y, is causally related to the entity as $f(Z) \Longrightarrow \{Y\}$

Scientific inference: From reality to models and back again



- We assume that some observable and measurable attributes (data), $\{X1, X2\}$ are logically related to the entity's internal processes as, $\{X1, X2\}|f(Z)$
- Lacking full knowledge of the entity's processes, we use a probability model and consider $X1, X2, Y$ as random variables with a joint probability distribution function
- Lacking complete datasets, we accept sampled datasets
- We make inductive inferences from the sampled datasets back to $f(Z)$ by assuming sampling distributions, evaluating our prior knowledge, and using the (weaker) syllogisms of plausible reasoning coupled with probability theory

References

Bascompte, J. (2009). Disentangling the web of life. *Science*, *325*(5939), 416–419.

Brussaard, L. (1998). Soil fauna, guilds, functional groups and ecosystem processes. *Applied soil ecology*, *9*(1), 123–135.