Agent-based models: what are they good for?
Or: did Schelling really need an ABM?

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An "oblique" introduction to ABMs

Agent-Based Models of Geographical Systems

Springer

ABMs ≠ simple ∀ ABM

- Models are supposed to be simplifications (they're all wrong)
- Are ABMs simple?
- Helen Couclelis (2002) :

"[ABMs add to] the well-known problems of modeling a highly complex, dynamic spatial environment […the additional difficulties of] modeling highly complex, dynamic decision-making units interacting with that environment and among themselves in highly complex, dynamic ways" (pages 4-5)

"The question is whether the benefits of that approach to spatial modeling exceed the considerable costs of the added dimensions of complexity introduced into the modeling effort" (pages 4-5)

"The answer is far from clear and, in my mind, it is in the negative" (page 5).
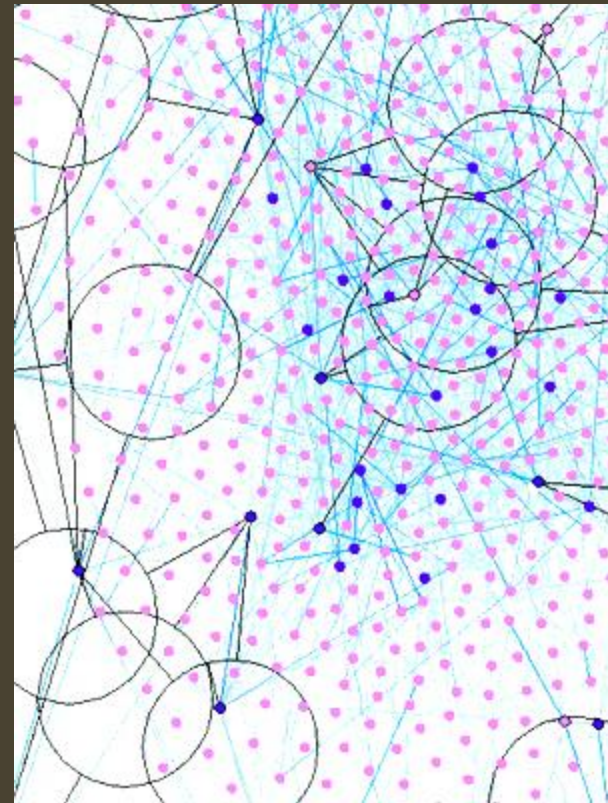
When ABMs *are* worth it (1) Heterogeneity

- Of agents

Source: Wikimedia commons

- Of situations

Source: Wikimedia commons, Katharine Willis

When ABMs *are* worth it (2)
If interactions matter

Source: Wikimedia commons

Association of American Geographers, New York   26 feb 12

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When ABMs *are* worth it (3) Middle sized systems

- Warren Weaver distinguished
  - small systems of classical science
  - systems of "disorganized complexity" (e.g. gases)
  - systems exhibiting 'organized complexity' with many elements interacting in non-linear ways
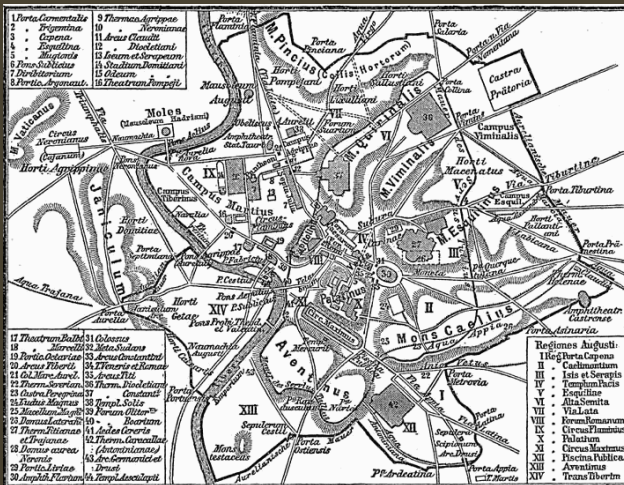
"large compared to two, but small compared to the number of atoms in a pinch of salt" (Weaver 1948, page 539)
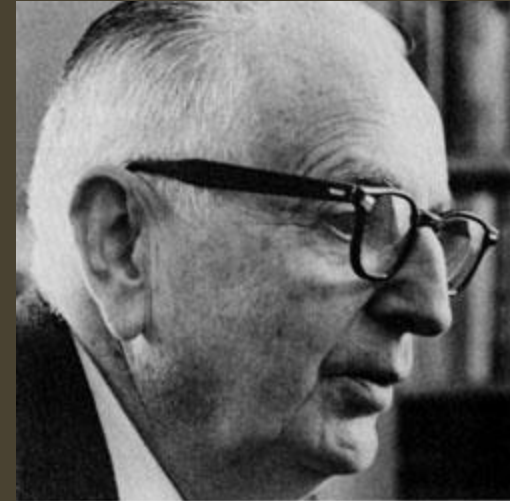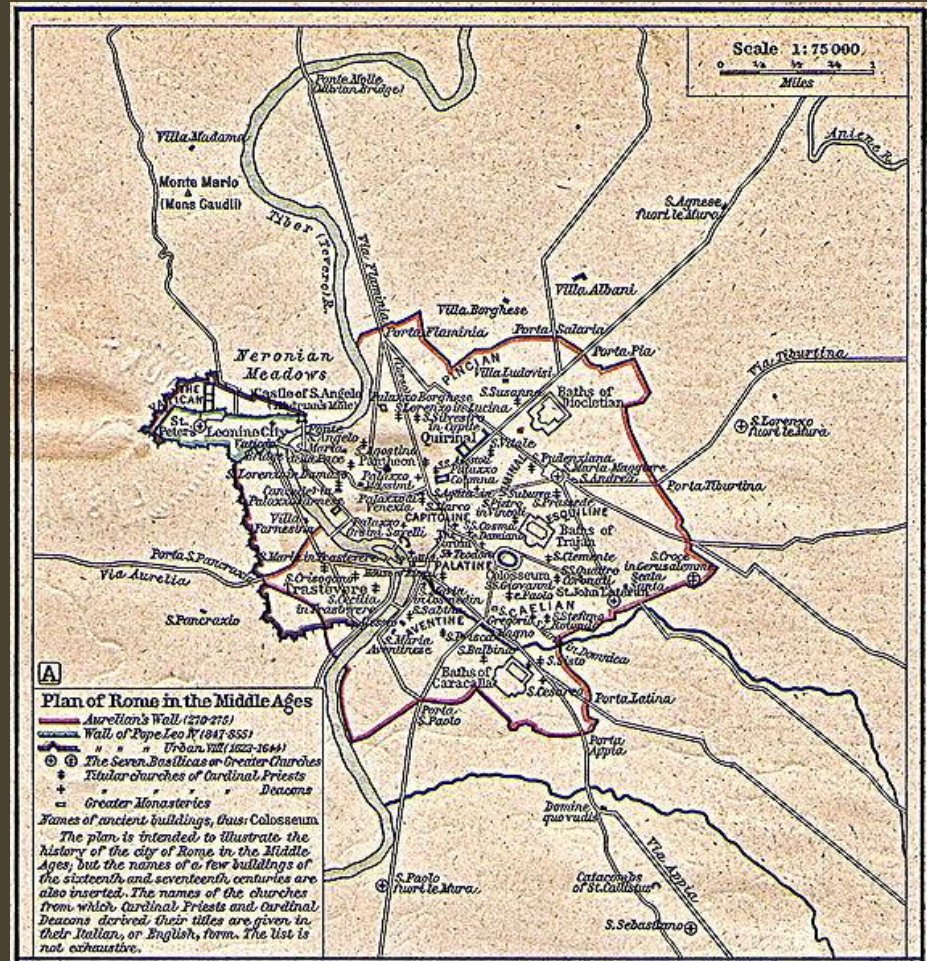

Weaver, W. (1948). Science and Complexity. *American Scientist* 36, 536-44.
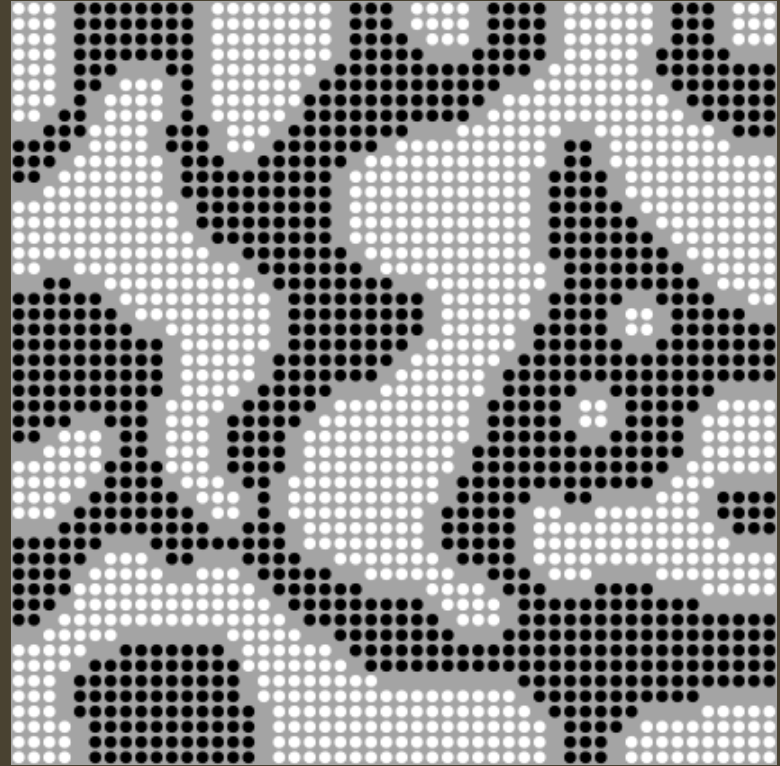
In sum: *contingency*
When *history* matters

Source: Wikimedia commons
Meyer's *Konversationslexikon* (1885–90)

Source: Wikimedia commons
Historical Atlas by William R. Shepherd, 1923

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The Schelling model

Forsé and Parodi, 2010 (but really much earlier…)

- A re-interpretation of the Schelling model
- Discretised tolerance levels < 0.333 are effectively > 0.5
- Resulting levels of segregation are not surprising
- A linear relationship between tolerance and segregation levels that result
- Schelling's model is not complex, or even very interesting
- Most interesting: they use Monte Carlo randomisation to show these findings

- Not everyone is convinced…

Saving Schelling

- Does it really matter?
  - YES, if you're really invested in the 'headline' from the Schelling model…
  - …but NOT really if you think about why Schelling's style of model is appropriate
- Forsé and Parodi's critique revolves around only seeing the model in terms of aggregate outcomes – which (maybe) aren't that interesting, *really*
- Seeing the value in Schelling's model comes down to *contingency*:
  - the *choices* that agents face, and *the particular moves they make* should be more closely examined

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Paying attention to contingency
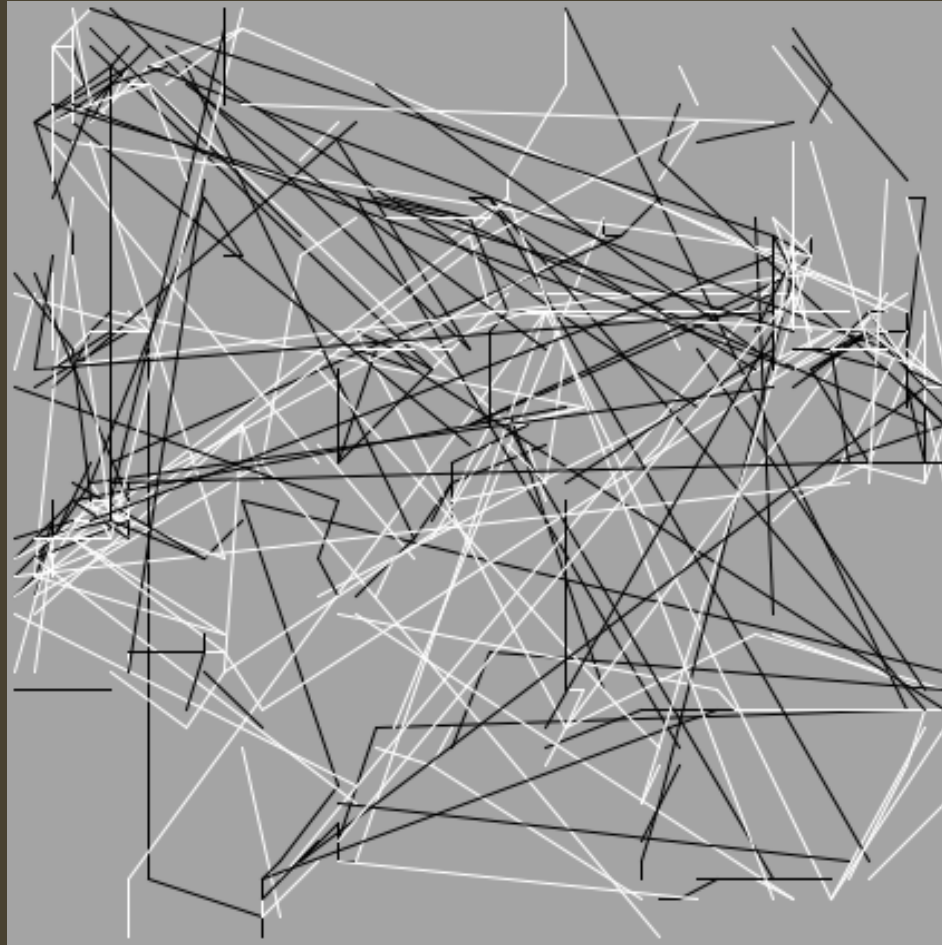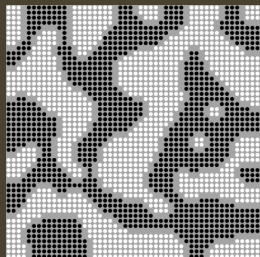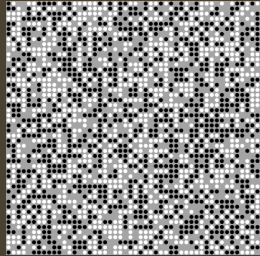
"There are eight million stories in the [...] city; this has been one of them"

Conclusions (sort of)

- I'm not the first person to say these things, and I won't be the last
- Analysis that pays more attention to the *events* in our models is needed
- These are dynamic, disaggregated models, so we should explore them in ways that respect those properties

References

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