Why is there social diversity? A puzzle?

Two powerful and general mechanisms in interpersonal interaction

- **Homophily** $\Rightarrow$ the more similar people are, the more they influence each other.
- **Influence** $\Rightarrow$ the more people influence each other, the more similar they become.

How can there be stable diversity in opinions (e.g. on cultural issues) in a world where nobody is entirely disconnected from influence?
Tendencies towards polarization in political opinions

- Increasing variance of opinion distribution in some issues in some historical periods (e.g. Sexual morality; attitudes towards poor people; lifestyles; consumption tastes)
- Research on small groups: groups often fail to decrease opinion differences (van Knippenberg et al. 2007, Early et al. 2000, Feldman 1969)

Political polarization in the internet (Lazer ea 2009)
How is diversity possible in connected networks?

Social influence is a powerful and general mechanism in interpersonal interaction

- *Influence* ⇒ tendency to become more similar to influential (attractive) others
- *Connected network*: everybody is at least indirectly influenced by every other actor in the network.

Early generation of formal social influence models (French, Abelson, Harary...):

In connected network all agents gradually move towards emergent consensus

⇒ monoculture.

⇒ Why is there normative, political and cultural diversity?
Emergent consensus in connected networks

Classical formal models of continuous social-influence dynamics:

- Incremental updating of continuous bounded opinion
- Actors opinion moves towards weighted average of neighbors’ opinion

(Abelson 1964; Berger 1981; DeGroot 1974; French 1956; Harary 1959; Lehrer 1975)

In connected networks, opinions will always converge to perfect uniformity.
Diversity in connected networks: homophily+influence

Models of Carley, Axelrod, Mark, Nowak & Latané...add homophily
- the higher the similarity, the more influence

Axelrod 1997: Stable diversity can be an equilibrium
- Influence stops when individuals are too different
  - i.e.: zero overlap.
- Preservation of diverse, isolated “subcultures”
  - Local regions become homogenous over time ⇒
  - Differentiation from neighboring regions ⇒
  - No more influence between local regions ⇒
  - Stable diversity

Equilibrium state
(F=5, Q=15, N=10x10)

cultural region = "set of contiguous sites with identical culture"
A complication: metric features and blending

- Axelrod etc assume nominal opinion space
  - Either you agree or you don’t: direction and degree of influence on an issue can not be expressed
- Metric scaling may often be more adequate
  - “What should be the age at first marriage”
  - Many traditional opinion formation models use metric scaling of opinions...(French, Abelson...)
- Metric features allow “blending”: gradual compromising

0 \rightarrow \text{convergence} \rightarrow Q-1
Bringing Axelrod’s solution back in: Interaction thresholds

› “Bounded confidence” models
  • Weissbuch, Deffuant, Hegselmann, Krause...
  • If disagreement is too large, agents do not influence each other any more (“confidence threshold”).
  • Lack of confidence, communication costs...

› Bounded confidence resurrects Axelrod’s assumption that influence goes to zero if differences are too large.
  • But now in a metric (or continuous) framework
- The BC-model can explain stable diversity and clustering
- However, small perturbation of opinions (white noise) is a problem.

(Mäs, Flache & Helbing 2011, PLoS Comp Biol)
Some conclusions

› Agent-based models give a better understanding of how fundamental behavioral mechanisms relate to macro-level: social networks and social diversity
› Micro process can matter decisively: wide range of models
› Structure of social networks matters
  ⇒ Small worlds do not necessarily foster consensus!
  ⇒ But that depends again on micro process
⇒ So far much modelling, but little empirical work
⇒ We need more empirical research on micro processes
⇒ ... and theoretical research on how they “scale up” to macro level behavior
We conducted a series of 4 experiments with in total 443 subjects.

**Overall design:**

- Measure subjects’ opinions on pre-selected issues.
  - E.g. “0..100 percent of immigrants who come to the Netherlands for economic reasons should receive a residence permit.”
- Pair subjects varying distance on opinions and other characteristics.
- Repeated sequence of
  - exposure to others’ opinions,
  - (exchange messages to influence each other)
  - adjust opinions.
- Attractions ("weights") were also measured repeatedly
- In some conditions, we manipulated initial attraction
  - E.g. dictator games, football support, different moral positions
Results experiments (1)

No effect initial opinion distance on direction of influence
Results experiments (2)

Also no effect of (induced) initial disliking

\[ \Rightarrow \text{No evidence for negative influence in lab.} \]
Polarization without negative influence

A model based on persuasive argument theory


› Agents differ by demographic characteristics and by opinion
› Opinion is constituted by number of pro- and con arguments held by agents (e.g. \( arg\_vector \) \(+-----\) \( \Rightarrow \) \( \text{opinion} = -0.33 \) )
› Homophily: the more similar agents, the more likely they interact
› Influence: if agent \( i \) interacts with \( j \), then \( i \) adopts one of the arguments currently held by \( j \) and ‘forgets’ another argument previously held.
Polarization with maximal faultline strength

<table>
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<tr>
<th>Event</th>
<th>Polarization</th>
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<tr>
<td>1st event</td>
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<tr>
<td>67th event</td>
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<td>3149th event</td>
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<tr>
<td>3400th event (equilibrium)</td>
<td>1.00</td>
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But this only happens when initial opinion is sufficiently correlated with demographic attributes

(demographically biased opinions)
How “criss-crossing” agents prevent polarization

A “criss-crossing” agent shares at least one demographic attribute with each of the subgroups

⇒ a small probability of interaction between subgroups always remains

⇒ The faultline can never be maximal

⇒ Sooner or later arguments will be communicated between opposing subgroups and the system moves into consensus eventually
Strong faultline with three ‘criss-crossing’ agents (N=20)

Polarization in the short run

Consensus in the long run