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# ***Mass Media Effects in Cultural Dynamics:***

***The power of being subtle***



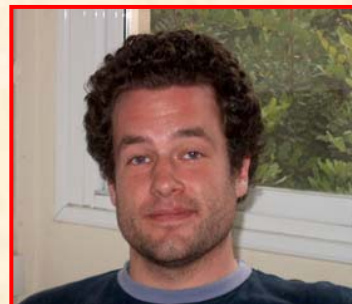
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# Axelrod's model of social influence (J. Conflict Res. 41, 203 (1997))

**Proposal:** Model to explore mechanisms of competition between *globalization* and persistence of *cultural diversity ("polarization")*

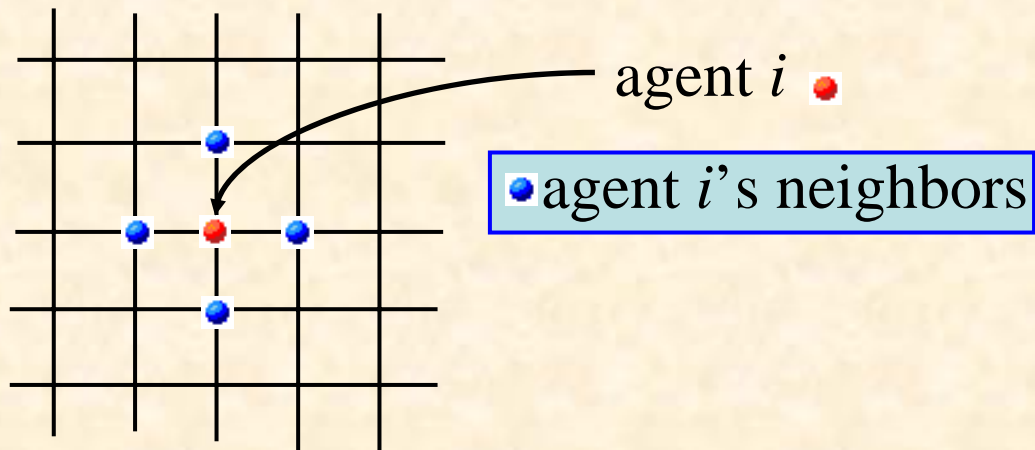
**Definition of culture:** Set of individual attributes subject to social influence

**Principle of Homophily:** Promotes interaction between similar.  
*"like attracts like"*

**Principle of Social Influence:** Promotes cultural similarity. *The more two interact the more similar they become. But they become more unlike that someone else: Cleavages.*

**Axelrod's conclusion:** Combination of homophily and social influence produces and sustains polarization (cultural diversity)

# Axelrod's agents based model: interaction



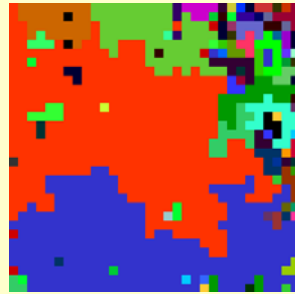
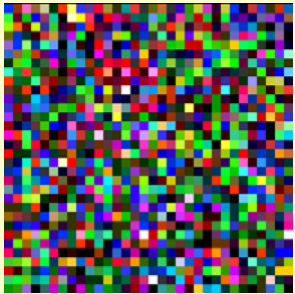
$\sigma_{i1}$	$F = \# \text{Features}$
$\sigma_{i2}$	$q = \# \text{Traits per feature}$
$\vdots$	
$\sigma_{iF}$	$\sigma_{if} \in \{0, \dots, q-1\}$

$F=3; q=10$        $q^F (10^3)$  equivalent cultural options.

$\begin{pmatrix} 0 \\ 0 \\ 7 \end{pmatrix}$	$\begin{pmatrix} 5 \\ 9 \\ 7 \end{pmatrix}$	<p><b>Mechanism of local convergence:</b></p> <p>Prob to interact =</p> <hr/> <p>Common features = <math>\frac{1}{3}</math></p>	$\begin{pmatrix} 5 \\ 0 \\ 7 \end{pmatrix}$
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# Axelrod's Dynamics

$$F = 3, q = 10$$



$t = 0$  →

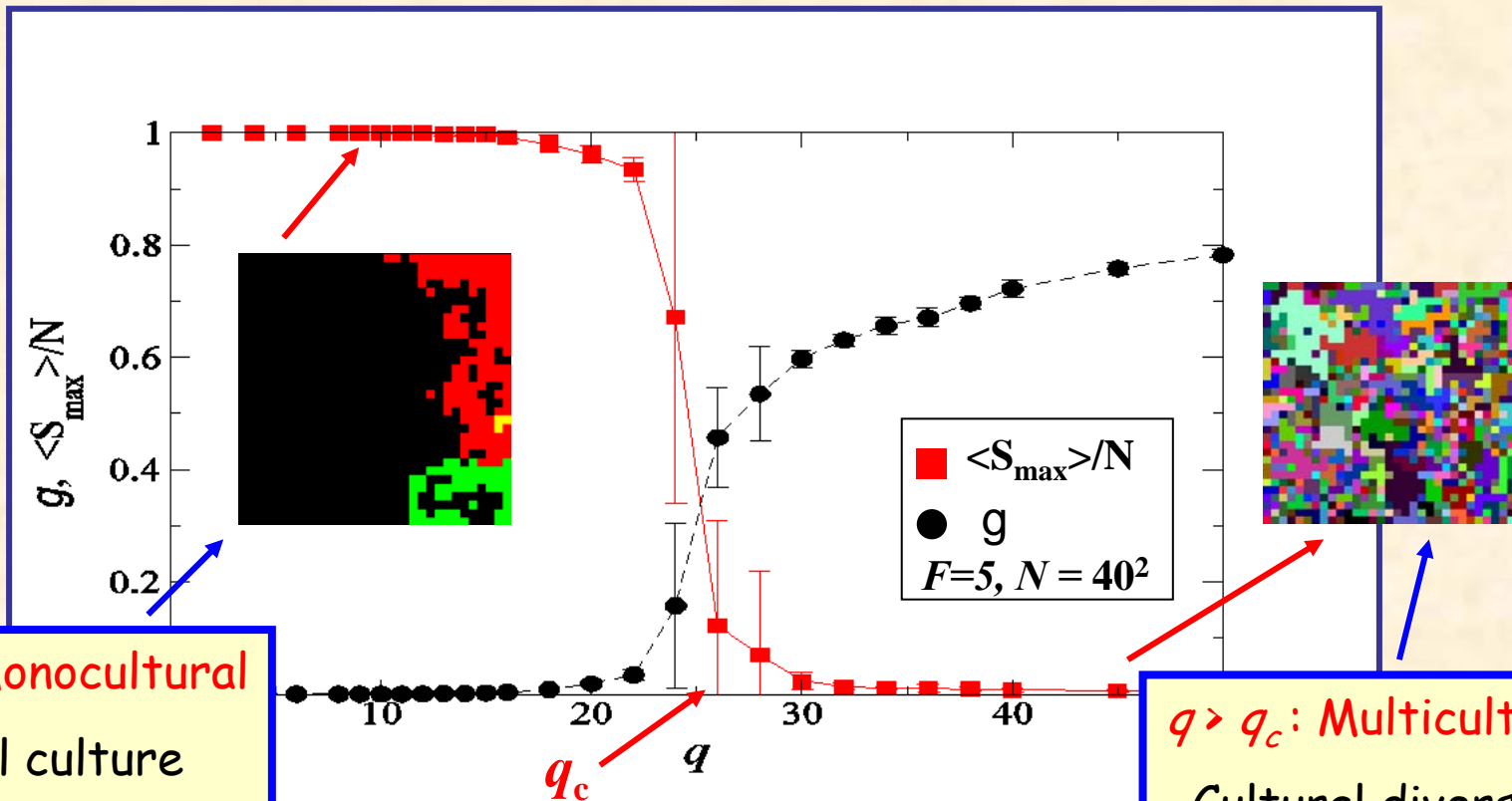
System freezes in  
an absorbing  
multicultural state

[http://www.imedea.uib.es/PhysDept/research\\_topics/socio/culture.html](http://www.imedea.uib.es/PhysDept/research_topics/socio/culture.html)

- The model illustrates how **local convergence** can generate **global polarization**.
- Number of domains taken as a measure of cultural diversity
- Uniform state always prevails without similarity rule (*Kennedy 1998*)

# Polarization-Globalization transition in Axelrod's model

Order parameters: a)  $S_{\max}$  size of the largest homogeneous domain  
 b)  $g = \langle N_g \rangle / N$ ,  $N_g = \#$  cultural groups



$q < q_c$ : Monocultural  
 Global culture  
 $\frac{\langle S_{\max} \rangle}{N} \rightarrow 1$        $g \rightarrow 0$

$q > q_c$ : Multicultural  
 Cultural diversity  
 Global polarization  
 $\frac{\langle S_{\max} \rangle}{N} \rightarrow 0$        $g \rightarrow 1$

Castellano, Marsili, Vespignani, *Phys. Rev. Lett.* **85**, 3536 (2000).  
 Klemm, Eguluz, Toral, San Miguel, *Phys. Rev. E* **67**, 045101R (2003); *Physica A* **327**, 1 (2003)

# Questions on mass media effects

*"The mass media (plurality information feedback), contrary to lay beliefs of their strong uniforming power, would rather contribute to creating differences in the long run"*

*Shibanai et al., J. Conflict Resolution. 45, 80 (2001)*

**General question:** Identify the mechanisms, and their efficiency, by which different forms of mass media modifies processes of cultural dynamics based on local agent interaction

## **Specific questions to be addressed:**

- Q1. What is a more important influence in making up your mind: what your acquaintances tell you (viral marketing) or TV and newspapers ?
- Q2. Are you influenced by mass media messages on, say perfumes, if you do not use perfumes?
- Q3. Do you follow insistent and recurrent mass media messages or occasional apparently weak messages are more influential?
- Q4. What is more efficient in producing cultural homogeneity, local mass media or global mass media ?

# Modelling Mass Media

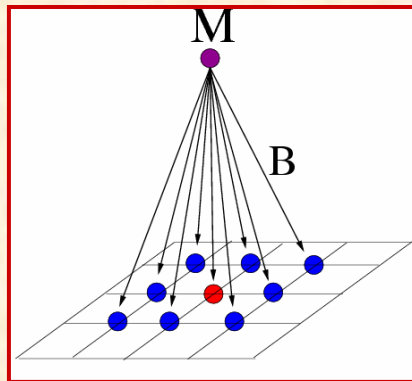
Mass Media message or field:  $M = (\mu_1, \mu_2, \dots, \mu_f, \dots, \mu_F)$   $\mu_f \in \{0, \dots, q-1\}$

## External media:

*(Big brother)*

$\mu_f$  given

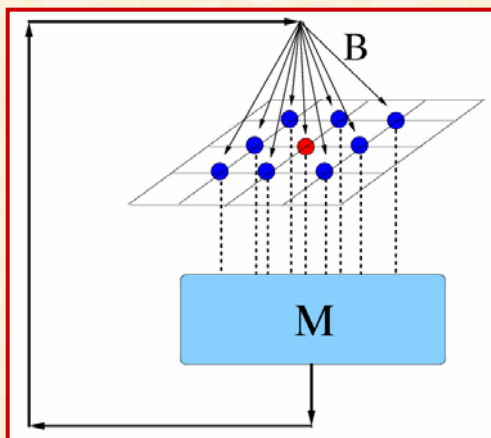
- Uniform for all agents  $i$
- Fixed for all times



*Propaganda or advertising*

## Global media

**Broadcast:** Feedback of dominant global cultural trend



$\mu_f = \sigma_{jf}$  most abundant in system

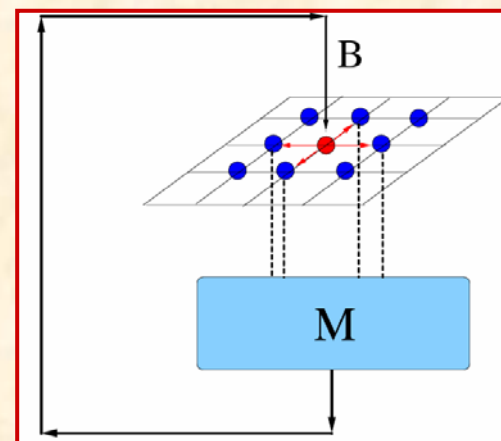
- Uniform
- Time dependent

## Endogenous media:

*(4th democratic power)*

## Local media

**Narrowcast:** Feedback of dominant local cultural trend



$\mu_f = \sigma_{jf}$  most abundant in neighborhood

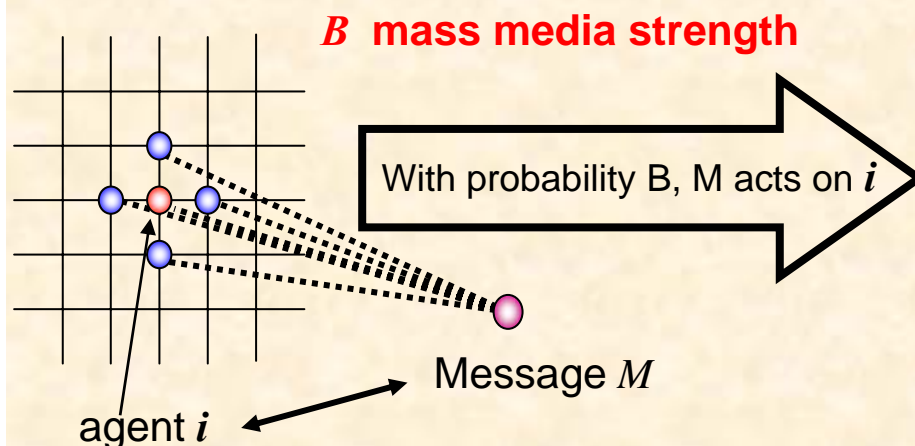
- Non-uniform
- Time dependent

# Dynamics of interaction with mass media field

Agent  $i$ :  $C_i = (\sigma_{i1}, \sigma_{i2}, \dots, \sigma_{if}, \dots, \sigma_{iF}) \longleftrightarrow$  Mass media:  $M = (\mu_1, \mu_2, \dots, \mu_f, \dots, \mu_F)$

Parameter  $B \in [0, 1]$ : probability that  $M$  acts on element  $i$  in one time step: "*strength*" of mass media

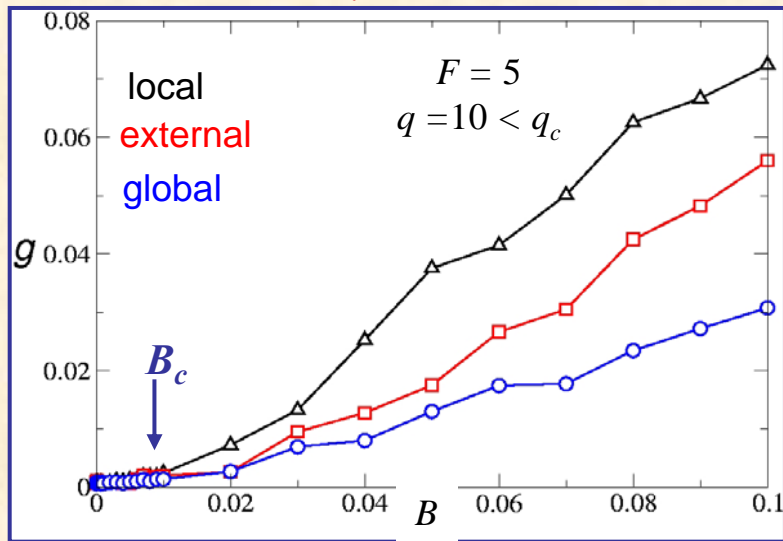
1 -  $B$ : probability to interact with  $j$  selected at random among nearest neighbors of  $i$ .  $\Rightarrow M$  acts as a 5<sup>th</sup> effective neighbor of  $i$ .



- 1) If  $M$  acts on agent  $i$ , the probability of interaction  $p_{iM}$  is proportional to the cultural overlap between  $i$  and  $M$
- 2) Agent-Mass Media interaction results in agent  $i$  adopting a cultural feature of  $M$

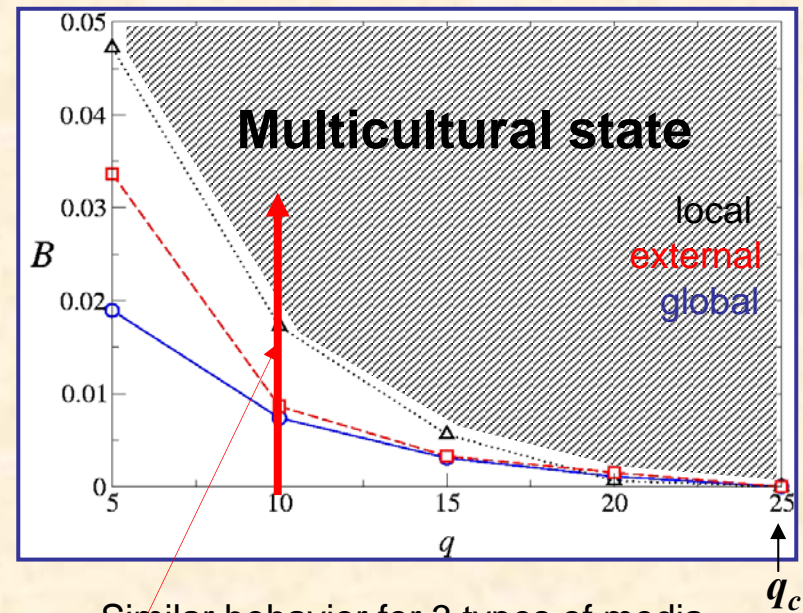
# Mass media effects: monocultural state ( $q < q_c$ )

## Globalization-polarization transition induced by mass media:



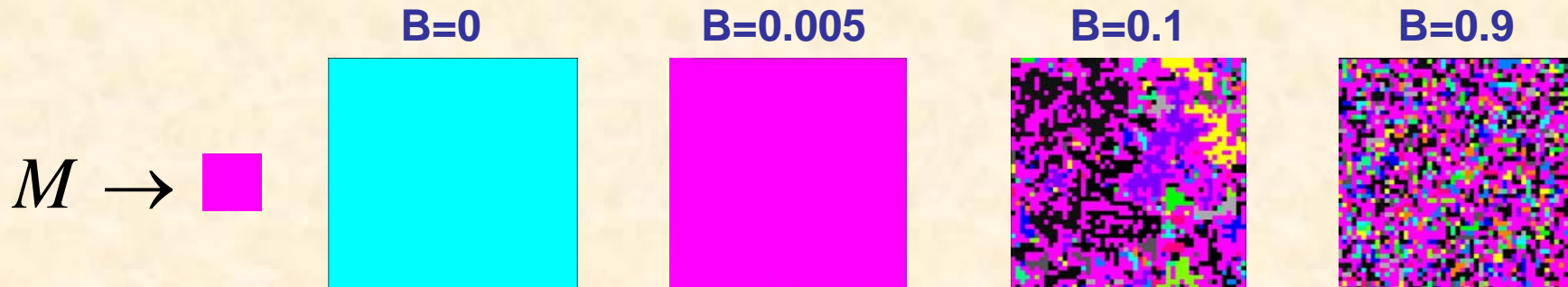
$B > B_c$ : any Mass Media leads to cultural diversity

## Phase Diagram

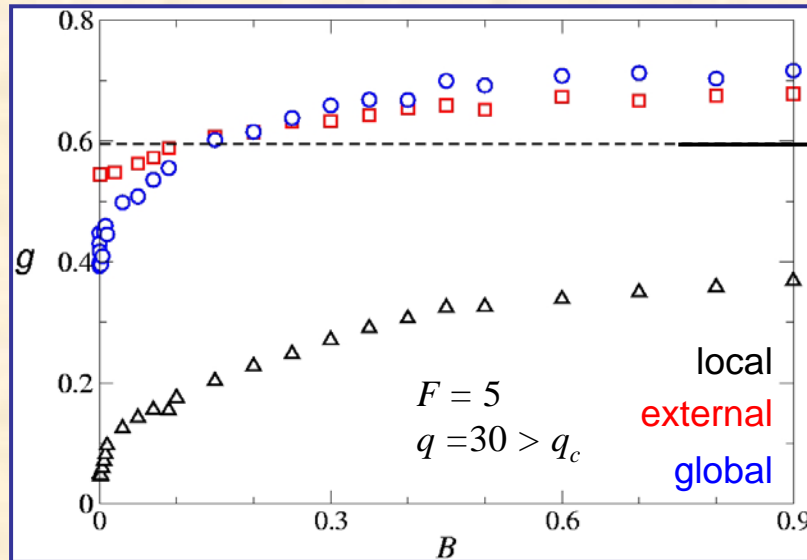


Similar behavior for 3 types of media

## Asymptotic states for external mass media

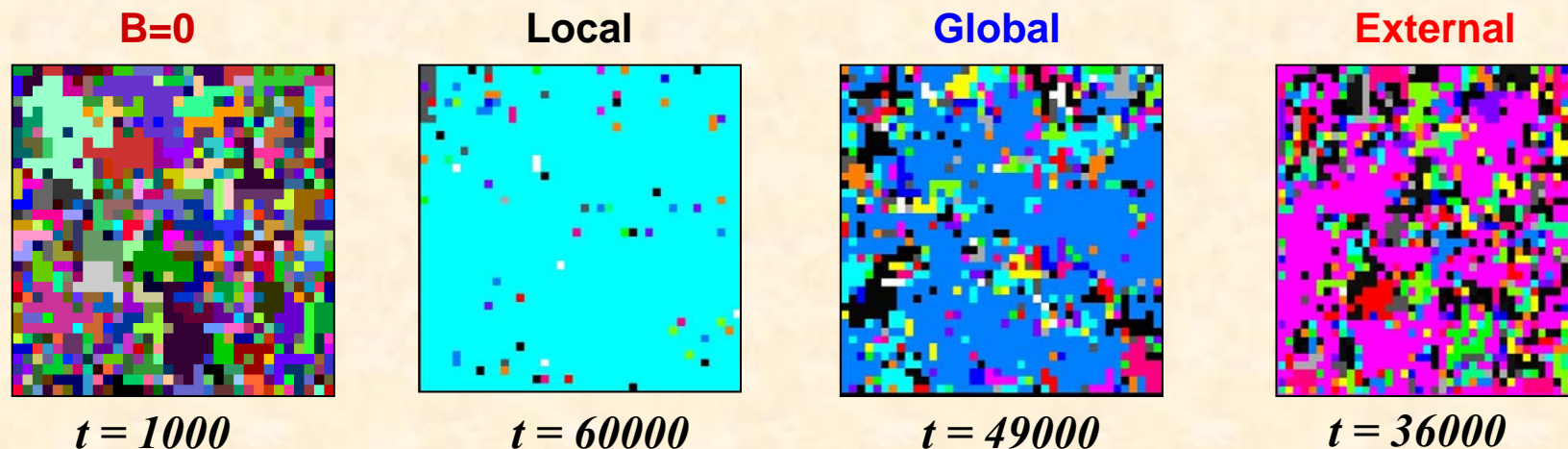


# Mass media effects: multicultural states ( $q > q_c$ )

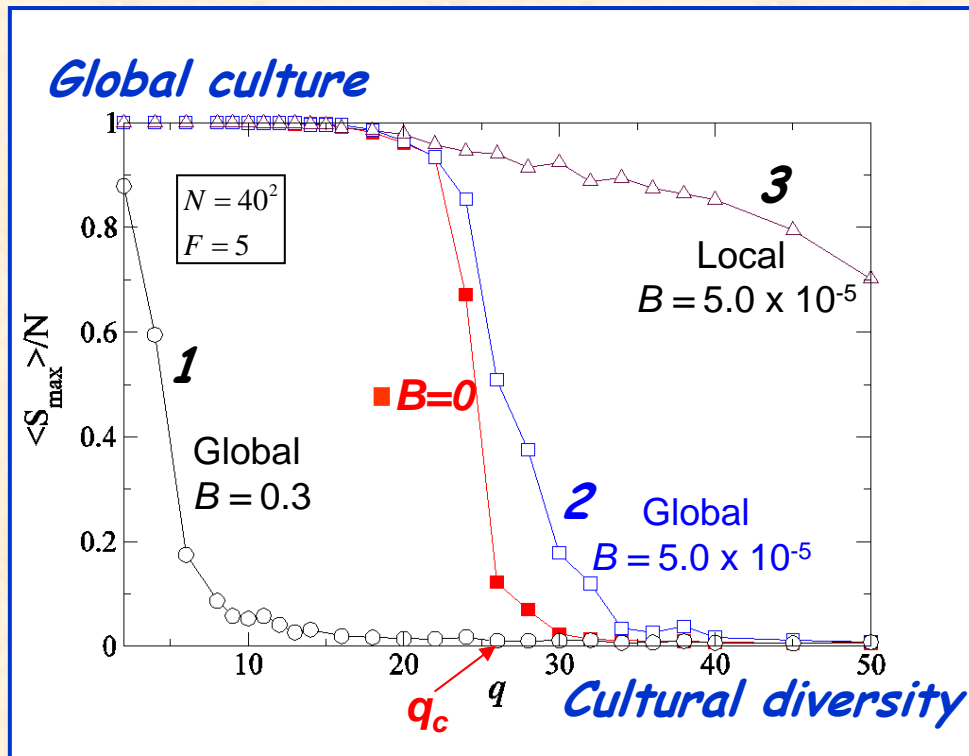


- For  $B$  small,  $g < g(B=0) \forall M$ :  
*Cultural homogenization by weak media*
- Discontinuity for  $B \rightarrow 0$   
*Cultural homogenization produced by same mechanism than cultural drift*
- $\forall M$ , increasing  $B$  enhances diversity
- Local M more efficient in cultural homogenization

## Dynamics of cultural homogenization for weak ( $B=0.0005$ ) mass media:



# Global picture of mass media effects



1) Polarization caused by strong media ( $B > B_c$ )

\* Competition of similarity rule applied to agent-agent and agent-media interactions

\* Limiting case  $B=1$ : agent-agent interaction negligible and no agent-media interaction for zero overlap. No mechanism of cultural dissemination at work

2) Cultural homogenization is caused by weak media

3) Local media (feedback at regional levels) are more efficient in the cultural globalization path.

*Mass media is only efficient in producing cultural homogeneity in conditions of weak broadcast of message, so that agent-agent interactions can be still effective in constructing some cultural overlap with the mass media message. Strong media messages do not homogenize because agent-agent interactions become inefficient:*

*The power of being subtle (and local)*

# Answers to questions

Q1. What is a more important influence in making up your mind: what your acquaintances tell you (viral marketing) or TV and newspapers ?

A1. Delicate compromise and feedback processes: Mass media reflects local or global cultural trends created by local interactions. **Media information processed by agent interaction in a social structure.**

Q2. Are you influenced by mass media messages on, say perfumes, if you do not use perfumes?

A2. Present modeling requires cultural overlap with the message for the interaction with the agent to be possible.

Q3. Do you follow insistent and recurrent mass media messages or occasional apparently weak messages are more influential?

A3. Weak coupling to the message is more efficient: ***The power of being subtle***

Q4. What is more efficient in producing cultural homogeneity, local mass media or global mass media ?

A4. Local mass media (regional TV) appear to be more effective in producing cultural homogeneity than global uniform broadcasts (CNN).