

Annual Report: IBSS and CDI (NSF)

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School of Communication
SDSU 2015



**Spatiotemporal Modeling of Human Dynamics Across Social Media and Social Networks
Interdisciplinary Behavioral and Social Science Research, National Science Foundation**



Primary Activities: 2014-2015

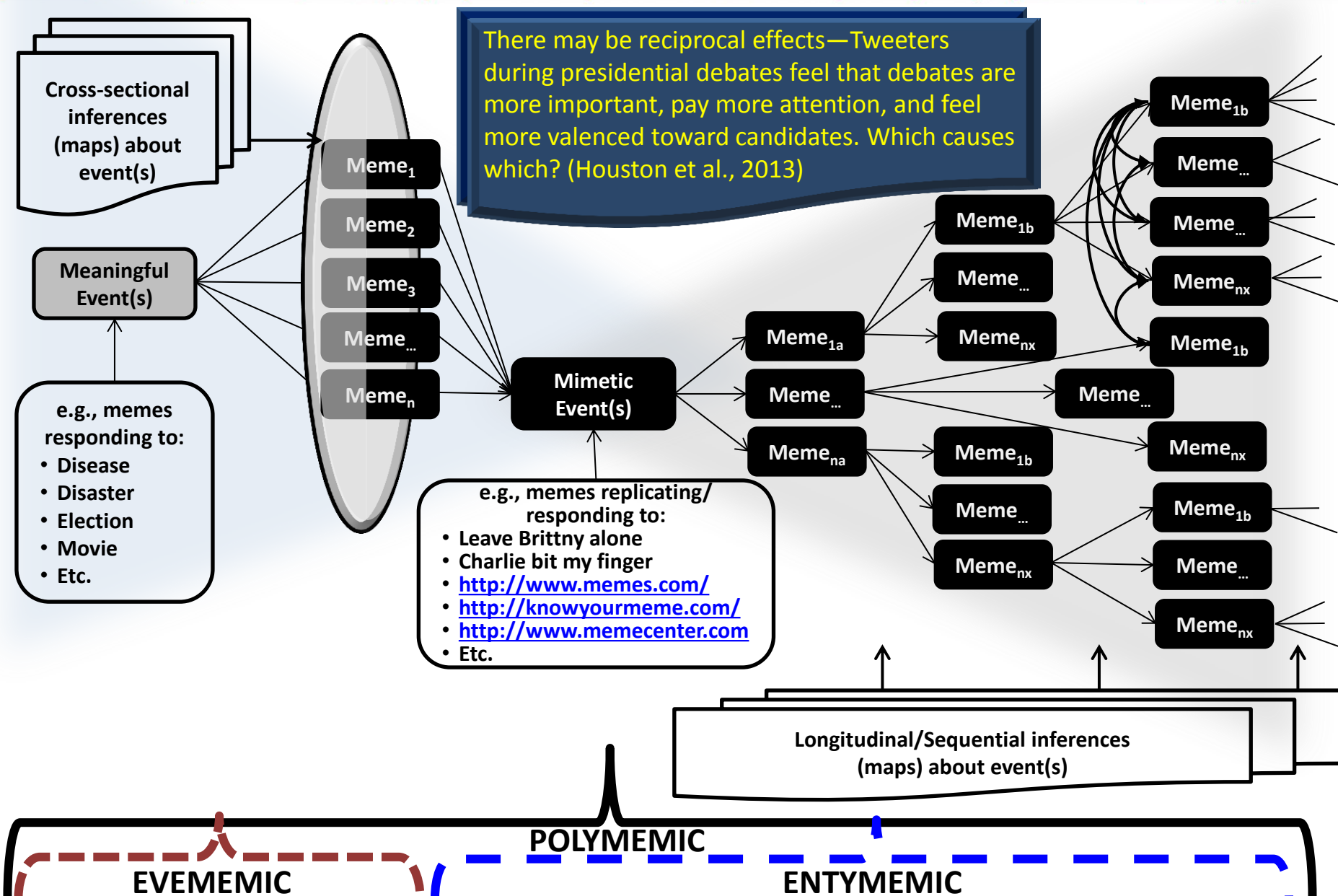
- **Collaboration in monthly meetings**
 - **Topic selection & refinement (social media: disasters, crises, emergencies, wildfires, political policy & elections)**
 - **Current events feedback**
- **Bibliographic background research**
- **Manuscript co-authoring & co-editing**
- **Theoretical model-fitting**
 - **To date, most progress on anti-vaccination and SB277**
 - **Exploring possibilities re: celebrity typology, marijuana legalization, patient safety**
- **Assessment instrument development & analyses**

MEMES & EVOLUTION—BASIC AXIOMS:

Meme: A *meme* is an act or meaning structure that is capable of *replication*, which means imitation (Dawkins, 1976), requiring:

- Variation
- Selection
- Retention

Asymmetric adaptiveness: “selfishness [i.e., competitiveness] beats altruism within groups. Altruistic groups beat selfish groups. Everything else is commentary” (Wilson & Wilson, 2007).

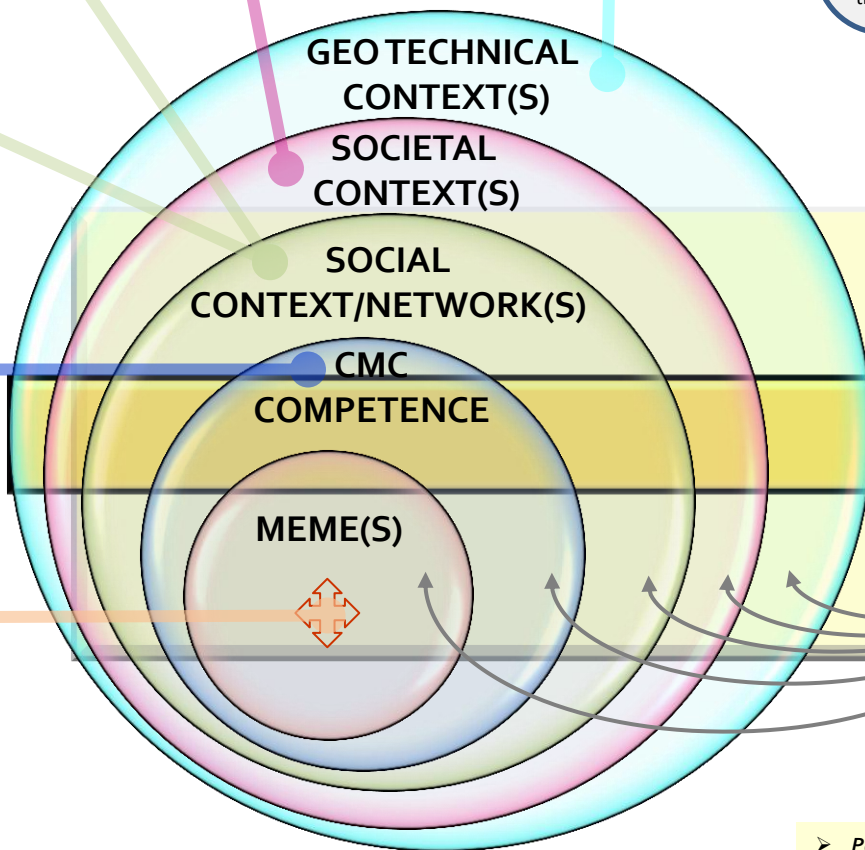


MULTILEVEL MODEL OF MEME DIFFUSION (M³D)

NETWORK LEVEL
'ALTRUISM' FACTORS:
SUBJECTIVE/RECEPTIVENESS
Counter-Memes & Frames
Frame/Narrative Fidelity
Subjective Homophily
Niche: Relative Advantage
Cascade Threshold(s)
NETWORK LEVEL
'ALTRUISM' FACTORS:
OBJECTIVE/STRUCTURAL
N past memes (e.g., tweets)
N nodes (communicators)
Network Interdependence
N/Centrality of Influencers
Network Homophily
Network Edge Heterophily
INDIVIDUAL LEVEL
COMPETENCE FACTORS:
Motivation/Knowledge/Skills
Source Credibility
Actor Centrality/Proximity
Message/Media Adaptability
MEME LEVEL
ADAPTIVE FACTORS:
Distinctiveness/Entropy
Reproduction/Redundancy
Simplicity/Trialability
Media Convergence
Media Expressivity/Richness
Trope/Frame/Appeal Credibility

SOCIETAL LEVEL	GEO-TECHNICAL LEVEL
Rival Social Networks	System Limitation/Trauma
Counter-Memes & Frames	Geospatial Scope/Span
Diffusion Stage Exhaustion	Proximity/Density Facilitation
Mitigating Publicity	
Media Inaccessibility	

An approach to modeling meme diffusion, drawing on insights from meme theory, narrative rationality theory, frame analysis, general systems theory, evolutionary theory, information theory, social identity theory, communicative competence theory, social network analysis, and diffusion of innovations theory. The model proposes that memes compete at multiple levels to occupy information niches. The purpose is to provide a heuristic framework for organizing manifold investigations into the roles that new media are playing in the diffusion of ideas in cyberspace and their representation or cause of realspace events. The result is a multilevel meme diffusion (M³D) model, which seeks to integrate theories and stimulate new theory development in the fields of big data and new media.



MEME FITNESS
 Popularity
 Velocity
 Longevity
 Fecundity

Topic-Relevant Outcomes

- **Popularity:** % of potential population touching meme
- **Velocity:** Rapidity of market diffusion
- **Longevity:** Duration of meme circulation
- **Fecundity:** Span & Popularity of meme derivations

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SOCIETAL LEVEL	GEO-TECHNICAL LEVEL

Anti-vax web tactics (Kata, 2012):
 "in a network of almost 40,000 opinionated users of an online social media service, there was significantly more information flow between users who shared the same sentiments than expected if the sentiments were randomly distributed. We also found that most communities were dominated by either positive or negative sentiments towards the novel vaccine" (Salathé & Khandelwal, 2011, p. 3)

"Anti-vax we can't see in less updated. Lots of people perceiving a long distance as a barrier to vax ↓ actual vaccination status (Danis et al., 2010)

CONTEXT(S)
 An informatics study of vaccination (HPV) tweets & blogs found a high concentration of message sources directionally connected to most other infrequent contributors (Huesch et al., 2013) (Salmon et al., 2004)

with vaccine attitudes (Ryan et al., 2012, p. 304)

al., 2002; see also: Lau et al., 2012)
 Logistical agency of vax ↑ belief in mandatory vaccination policies (Bell et al., 2014)

MEME EFFICACY
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 Velocity
 Longevity
 Fecundity



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