ETH Workshop: Opening

**Measuring, Modeling and Mitigating
Opinion Polarization and Political Cleavage**
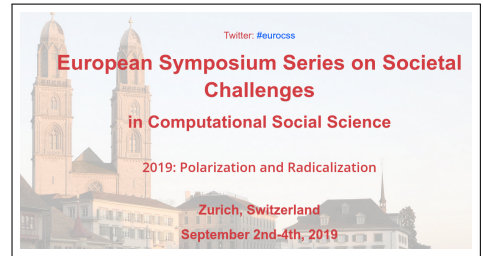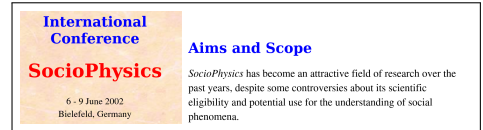
Frank Schweitzer

A story continues ...

- **2002: ZIF Bielefeld:** "Sociophysics"
  - Small scale, but novel scientific development
  - Opinion dynamics: Consensus vs. "coexistence"
  - Participants: ... *Hegselmann*, *Helbing*, *Holyst* ...
- **2019: ETH Zürich:** "Polarization and Radicalization"
  - 200 international participants
  - Organizers: ... *Garcia*, *Brandenberger* ...
  - Keynote speakers: ... *Flache*, *Leifeld* ...
- **2022: ZIF Bielefeld** (rejected)
  - wurden. Zum einen wurde hinterfragt, wie und mit welchem Ziel ein in den USA populäres Thema auf den europäischen Forschungs- kontext angewendet werden soll. Hierzu wäre etwas mehr Reflexion
- **2023: ETH Zürich**
  - Financial support: *Swiss National Science Foundation* and *Chair of Systems Design* (ETH Zurich)

International Conference

SocioPhysics

6 - 9 June 2002
Bielefeld, Germany

Aims and Scope

SocioPhysics has become an attractive field of research over the past years, despite some controversies about its scientific eligibility and potential use for the understanding of social phenomena.

Twitter: #eurocss

European Symposium Series on Societal Challenges

in Computational Social Science

2019: Polarization and Radicalization

Zurich, Switzerland
September 2nd-4th, 2019
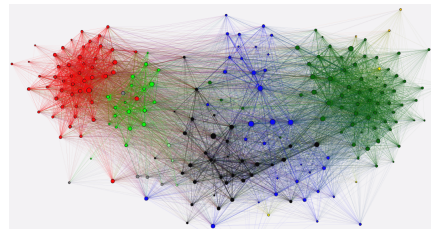
Political Science

- **Theoretical foundation**
  - Ideology, political strategies, coalitions, alliances
  - Historical, cultural embedding
- **Data**
  - Surveys, votes (roll call, elections), case studies
 - Analysis of primary sources (bills, ...)
- **Methods**
  - Quantifying political positions
 - Relational event models, Discourse network analysis

Co-Sponsorship network Nationalrat 2007-2011

(Garcia, D., Mendez, F., Serdult, U., & Schweitzer, F. [2012a]. Political polarization and popularity in online participatory media : An integrated approach. *In Proceedings of the Proceedings of the first edition workshop on Politics, elections and data - PLEAD '12*, 3–10)

(Garcia, D., Abisheva, A., Schweighofer, S., Serdult, U., & Schweitzer, F. [2015]. Ideological and temporal components of network polarization in online political participatory media. *Policy and Internet, 7*[1], 46–79)

(Brandenberger, L. [2019]. Predicting network events to assess goodness of fit of relational event models. *Political Analysis, 27*[4], 556–571)

(Metz, F., & Brandenberger, L. [2022]. Decision-making networks across political systems. *American Journal of Political Science*, 1–18)

(Brandenberger, L., Casiraghi, G., Andres, G., Schweighofer, S., & Schweitzer, F. [2022]. Comparing online and offline political support. *Swiss Political Science Review, 28*[4], 604–623)
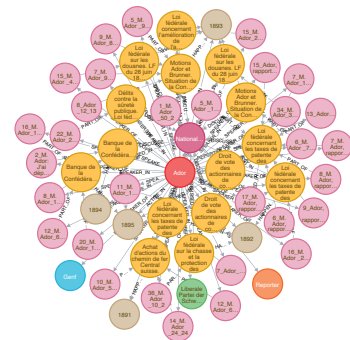
Computational Social Science

- **New ways of quantifying "social"**
  - Emotional influence (EU project CYBEREMOTIONS)
  - Homophily, reciprocity, friendship, ...
- **Data**
  - Vast, high resolution data (`Twitter`, mobile)
  - Data crawling/algorithms: Access online social universe
- **Methods**
  - NLP: Language models, Topic modeling
 - Sentiment analysis, Bayesian inference
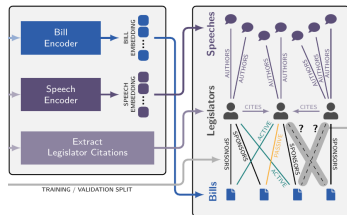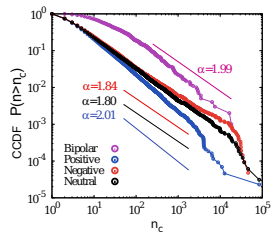
- (Garcia, D., Mendez, F., Serdult, U., & Schweitzer, F. [2012b]. Political polarization and popularity in online participatory media : An integrated approach. *In Proceedings of the Proceedings of the first edition workshop on Politics, elections and data - PLEAD '12*, 3–10)
- (Garcia, D., & Thelwall, M. [2013]. Political alignment and emotional expression in spanish tweets. *Workshop on Sentiment Analysis at SEPLN*, 151–159)
- (Alvarez, R., Garcia, D., Moreno, Y., & Schweitzer, F. [2015]. Sentiment cascades in the 15m movement. *EPJ Data Science, 4*[6])
- (Garcia, D., Kappas, A., Kuster, D., & Schweitzer, F. [2016]. The dynamics of emotions in online interaction. *Royal Society Open Science, 3*[160059])
- (Russo, G., Gote, C., Brandenberger, L., Schlosser, S., & Schweitzer, F. [2023]. Helping a friend or supporting a cause? Disentangling active and passive cosponsorship in the U.S. congress. *Proceedings of the 61st Annual Meeting of the Association for Computational Linguistics (Volume 1: Long Papers)*, 2952–2969)

Sociophysics/ Complexity Science

▶ **New ways of formalizing "dynamics"**
  ▶ Opinion dynamics, segregation
  ▶ Structural balance, social contagion

▶ ~~Data~~ → **Simulations**
  ▶ Lattices, complex networks
  ▶ Generative models: agent-based interactions

▶ **Methods**
  ▶ Inference of signed relations, network regression
  ▶ Formal derivation of systemic dynamics from interactions

📑 (Groeber, P., Lorenz, J., & Schweitzer, F. [2014]. Dissonance minimization as a microfoundation of social influence in models of opinion formation. *The Journal of Mathematical Sociology, 38*[3], 147–174)

📑 (Brandenberger, L., Casiraghi, G., Nanumyan, V., & Schweitzer, F. [2019]. Quantifying triadic closure in multi-edge social networks.)

📑 (Schweighofer, S., Garcia, D., & Schweitzer, F. [2020a]. An agent-based model of multi-dimensional opinion dynamics and opinion alignment. *Chaos, 30*[9])

📑 (Schweighofer, S., Schweitzer, F., & Garcia, D. [2020b]. A weighted balance model of opinion hyperpolarization. *Journal of Artificial Societies and Social Simulation, 23*[3])

📑 (Schweitzer, F., Krivachy, T., & Garcia, D. [2020]. An agent-based model of opinion polarization driven by emotions. *Complexity, 2020*)
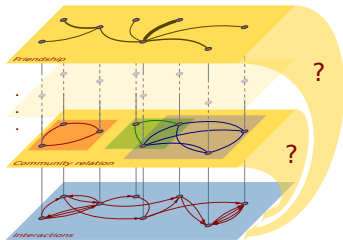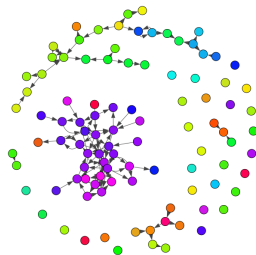
Measuring ✔?, Modeling ✔? and Mitigating ??

▶ **Understand mechanisms**
  ▶ Feedback between group formation and opinion formation
  ▶ Propagation of pressure, "spiral of silence", self-organized criticality

▶ **Understand behavior**
  ▶ Social science (behavioral science, psychology)
  ▶ Relation between dissonance, attention, influence

▶ **Understand governance**
  ▶ Role of interventions, social/cultural norms
  ▶ Role of legislators, agencies, parties
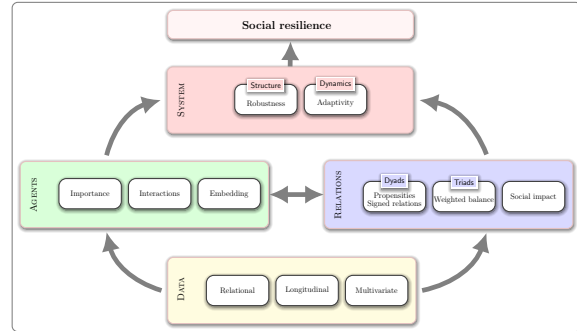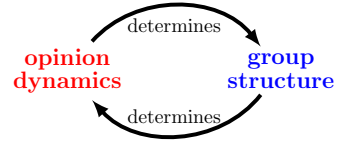
📄 (Schweitzer, F., Andres, G., Casiraghi, G., Gote, C., Roller, R., Scholtes, I., Vaccario, G., & Zingg, C. [2022]. Modeling social resilience: Questions, answers, open problems. *Advances in Complex Systems, 25*[8], 2250014)

TRANSdisciplinarity is key

- ▶ **... a BETTER Science:** Not between, but across
  - ▶ Not driven by available **theory**
    aim: *test propositions* instead of arguing
  - ▶ Not driven by available **data**
    aim: *interpretation*, data has no "message"
  - ▶ Not driven by available **methods**
    aim: *understanding*, not applying "tools"

- ▶ **"Why?"** Focus on *research questions*
  - ▶ complement/is complemented by existing social science

- ▶ **"How?"** Focus on *data-driven modeling*
  - ▶ models of *interacting agents*, calibration and validation
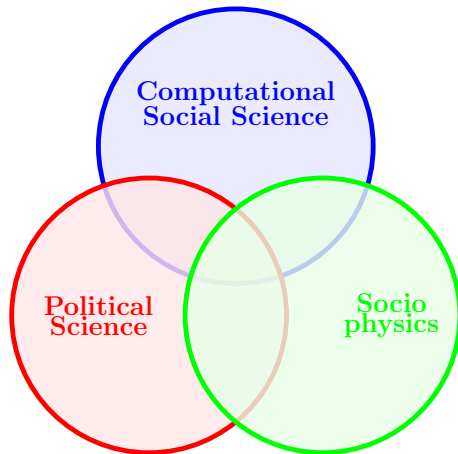
Introduction of participants

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In **90 seconds** you please inform us about

► Your name and institution …
► Your belonging to …
  ► Political science
  ► Computational social science
  ► Sociophysics/Complexity Science
► What you are best known for …
► What you offer for collaboration …
► What you expect from the workshop …