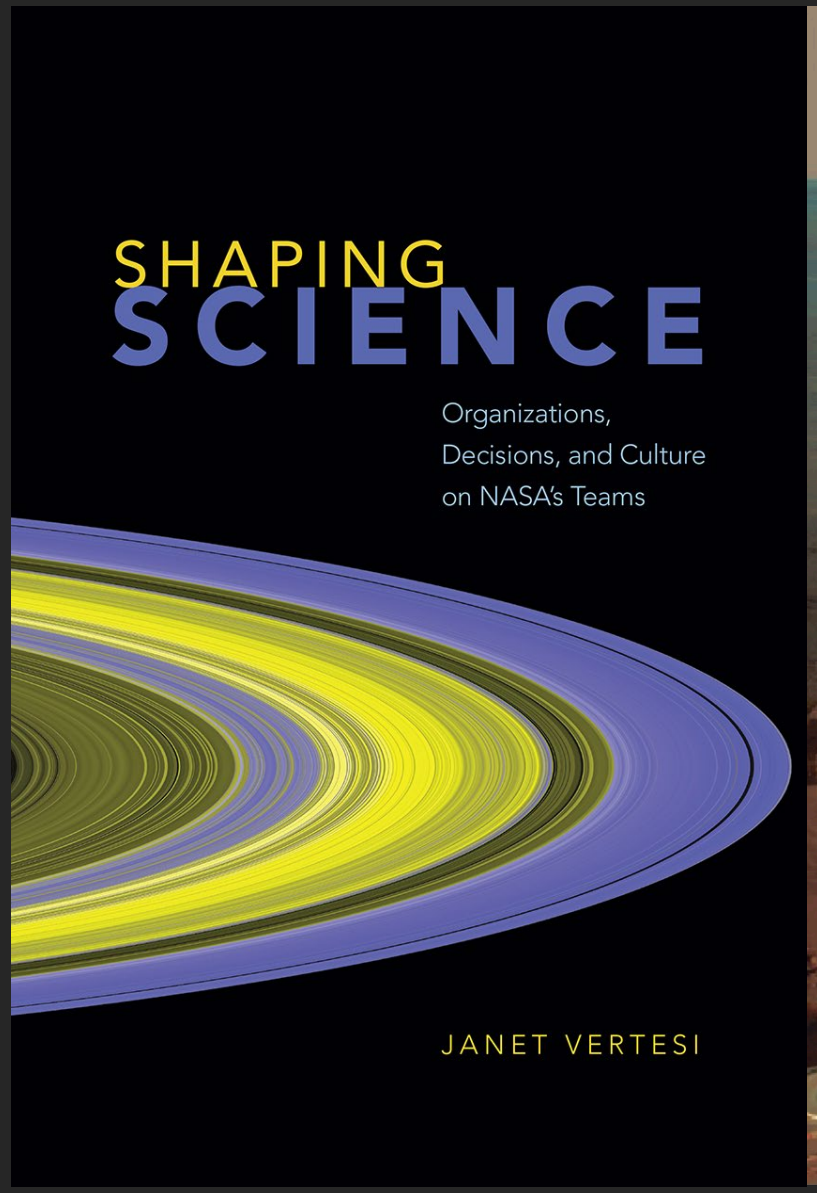

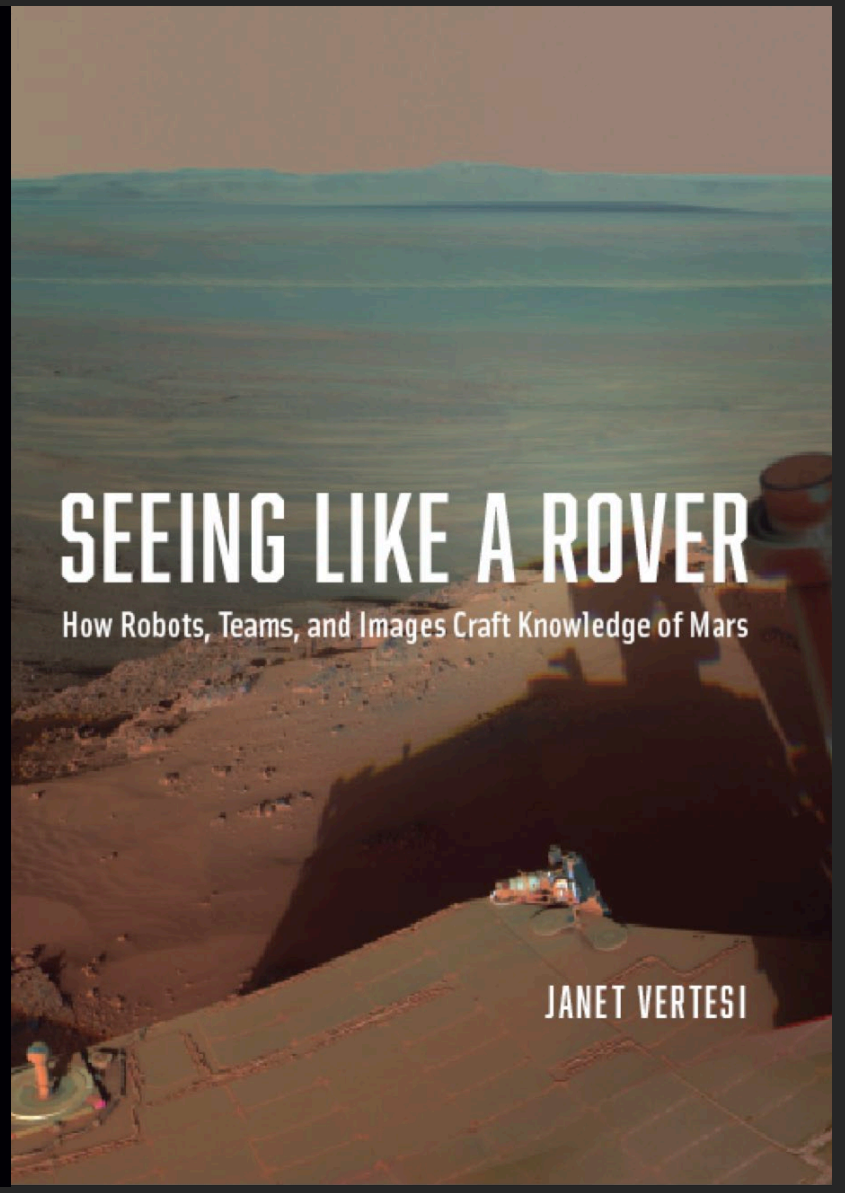

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“Every mission is kind of like a living organism. It has a personality and it has a style and that personality and style is sort of gained at the beginning of the mission and it never changes; even though the people who migrate through it change, you change out the people and you still have the same mission personality.”

Mission sociology

Mission dynamics

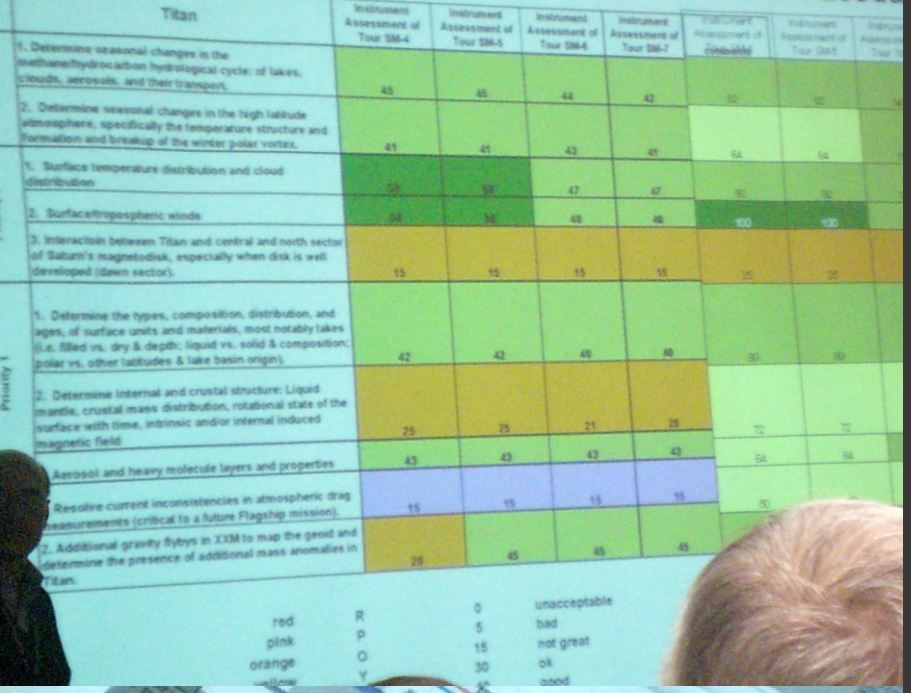
- Mission cultures and impacts
- Challenge 1: Interinstitutional collaboration
- Challenge 2: Longevity
- Challenge 3: Network effects
- Implications for careers

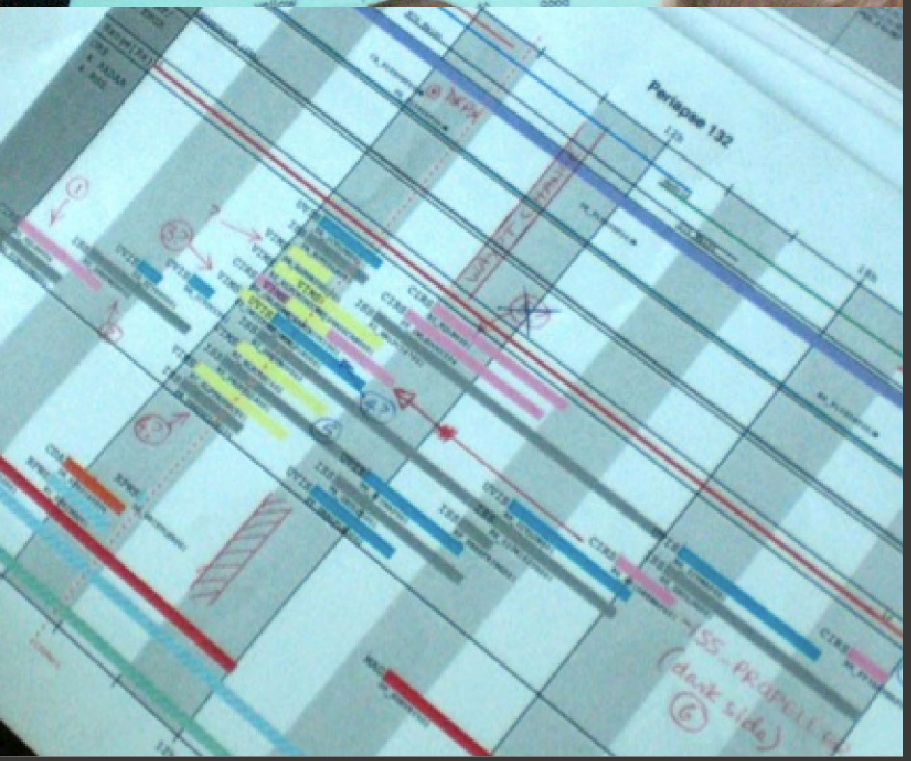
Studying NASA teams sociologically

- Scientists have their own practices, teams, and cultures (Knorr-Cetina, 1999; Shrum et al, 2007; Peterson 2015; Lynch, 1997; Latour & Woolgar, 1979)
- Changes in mission funding produced teaming variations at NASA (McCurdy, 2003; Kaminski 2012)
- Organizational variation produces divergent outcomes (Burawoy, 1985: Lee, 1995; Stark & Vedres, 2011).
- Each team faces the challenge of how to allocate scarce resources (Traweek, 1985; McCray, 2000; Vertesi & Dourish, 2011)
- Culture plays a significant role in communication and decision-making in flat orgs (Kunda 2006; Turco, 2016; Freeland & Zuckerman, 2018)

Mission cultures have shared …

Authority for decisions
Resource Allocation
Forms of Talk
Problem Solving



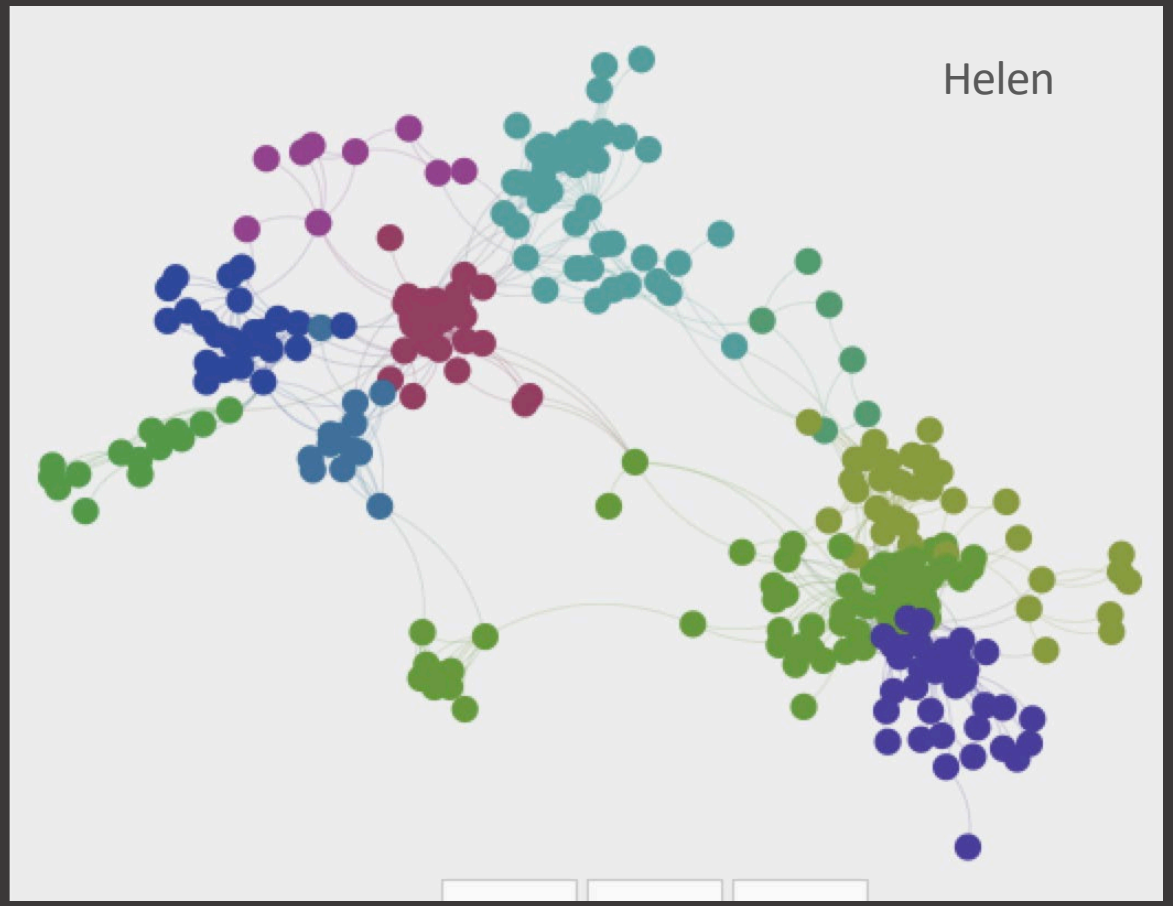


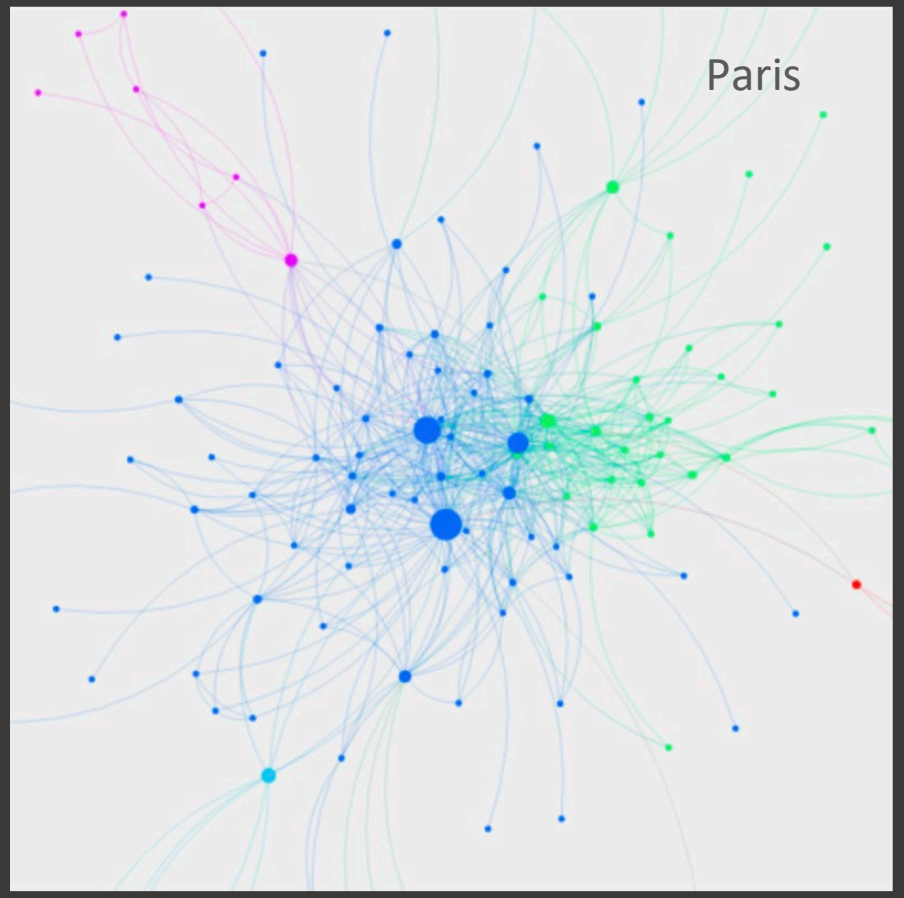
Helen: A 21st c. Flagship

- Authority for decisions: Matrix team
  - Largely autonomous instrument teams and cross-cutting planning groups. Early leadership placed observation planning, decision-making, and prioritization amid the matrix, not among an executive team.
- Resource allocation: *integration* and *polyvocality:*
  - "I don't think the process of science is well served if a bunch of people come together and say, let's agree not to disagree."
- Forms of talk: Battle or political metaphors
  - "It's like Congress… sometimes you wanna align yourself with this guy to get this observation, sometimes you need to align yourself with those other people…"
- Problem solving: through fairness:
  - "We can't make everyone happy but we can make everyone equally unhappy."

Paris: A PI-led mission

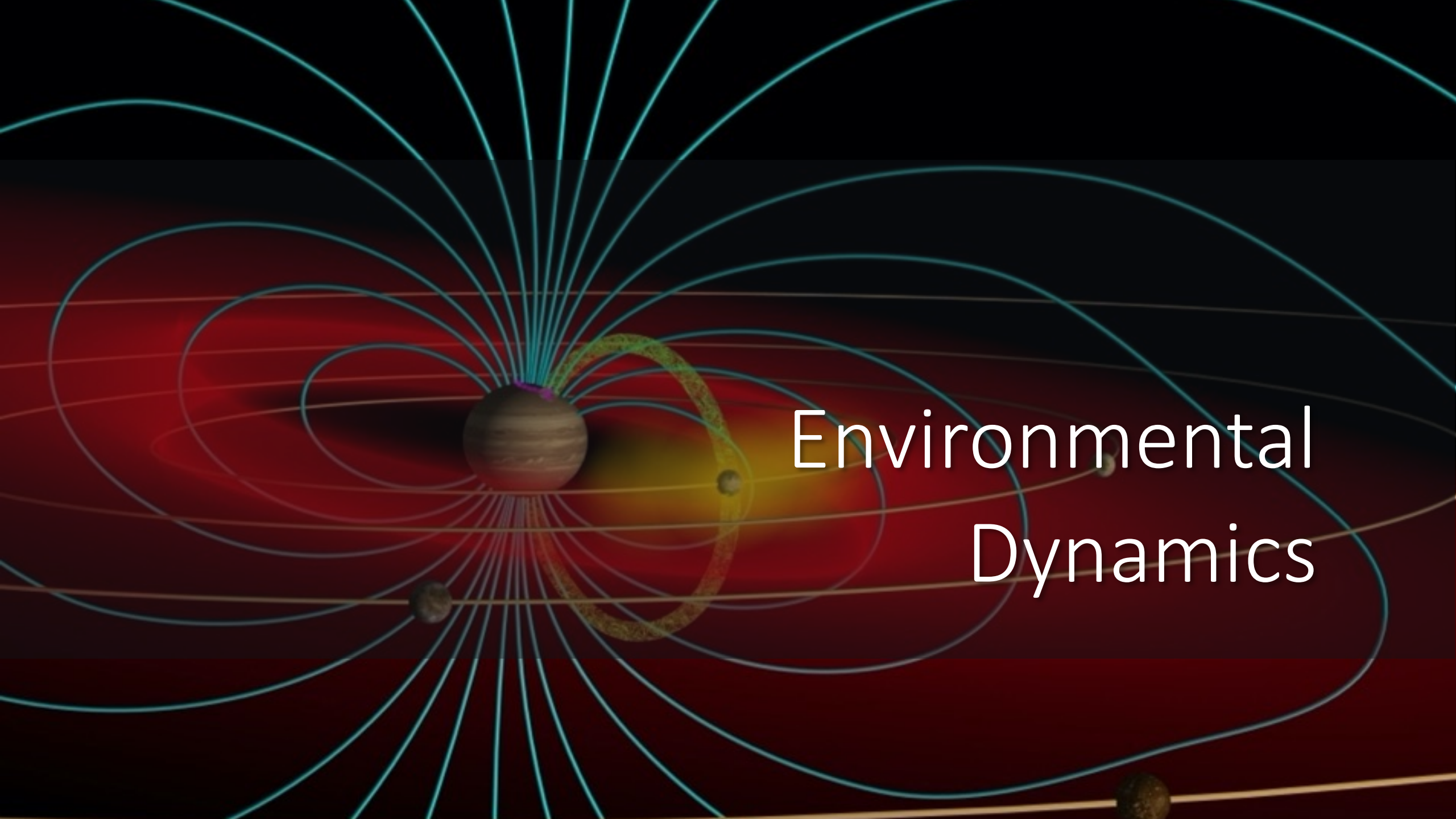
- Authority for decisions: collective
  - Led by single PI, who reinforces a flat hierarchy and bottom-up decision making among participating team members with rotating roles
- Resource allocation: *consensus* and *unilateralism*
  - "What the team decides together is what's best for [the science/spacecraft]."
- Forms of talk: Happiness and participation
  - "At the end of the meeting you want everyone to have a sense of ownership of the plan." "This whole thing is negotiation, it helps to sound enthusiastic." "Are you happy?" / "I'm happy."
- Problem solving: through collective ownership:
  - ""The robot is like a swiss army knife." "I want all hands on deck …" "You shouldn't limit yourself to one instrument, it's the most foolish thing you can do." "Two-for-one science."





Variations in Outcomes

- Co-publication matrices reflect teaming architecture and organizational culture
- Demonstrate primary collaborative units, intercohesion and bridging
- Also visible: leadership changes and interventions (new bridging ties)



Environmental Dynamics

1. Interinstitutional collaboration

- NASA institutions and universities represent a "federation of cultures" (McCurdy, 1994)
- Teams experience intercultural communication challenges akin to international teams (Ting-Toomey & Oetzel, 2001; LeBaron & Pillay, 2006)
- Project managers, joint development teams, facility team leaders must manage across institutions, where chains of command are variable, visibility is limited, and stakes are high
- Structural powerlessness (Kanter, 1977): Individuals placed in positions with great responsibility but no authority are decried for micromanaging and poor relational skills.

2. Longevity

- With precious few missions and interplanetary timelines, teams work together for multiple decades on the same project
- Lifetime appointments in the same positions do not allow for organizational or intergenerational mobility
- Few institutional or culturally acceptable mechanisms to move up or out of the mission
- Participating scientist programs vary in effectiveness based on the local culture (Prockter et al., 2016)

3. Network effects

- Women and minorities do better in **hierarchies** than in flat organizations (Blau, 1958; Freeman, 1972)
- In flatter orgs we conflate judgments of "**merit**" with "**fit**" (Rivera, 2012; Castilla & Bernard, 2010)
- Relationships matter: PI-led missions **reduce costs up to 30%** by relying on existing ties (NAP, 2006)
- Minorities or outsiders may be subject to **tokenism** (Kanter, 1977) or **backlash** (Rudman & Glick 2001), leading to continued **low representation** (Correll, 2004; Rathbun et al., 2018; Rivera-Valentin, 2020)
- Strong mentorship networks (Smith-Doerr, 2015) and bridge ties between powerful and minority networks matter: "**the work uncle**" phenomenon (Brass, 1985; McDonald, 2011)

“Personality”

“I have to act this way … You develop a reputation.”

(Merton 1968; Traweek 1988; Daston 1995; Lincoln et al. 2012)

Mission team dynamics

- Mission cultures and structures
- Challenge 1: Interinstitutional collaboration
- Challenge 2: Longevity
- Challenge 3: Network effects
- Implications for careers

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- (Kanter, 1977) or backlash (Rudman & Glick 2001), (Correll, 2004; Rathbun et al., 2018; Rivera-Valentin, 2020)
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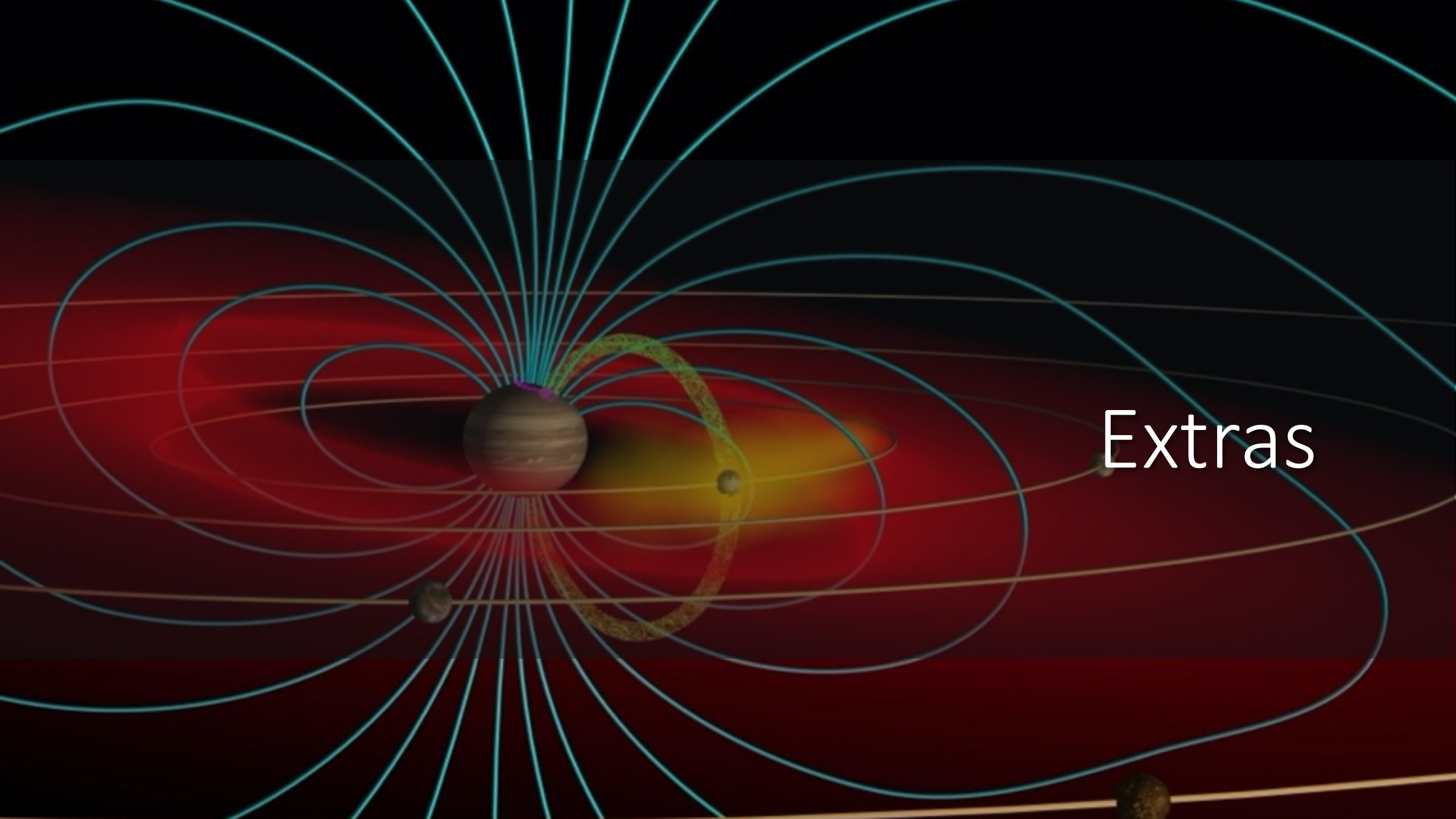
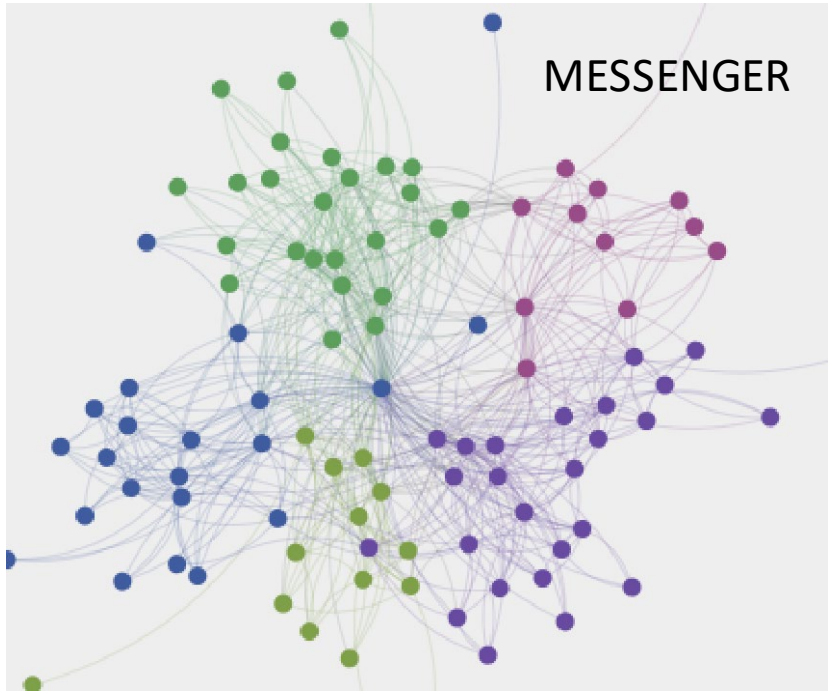
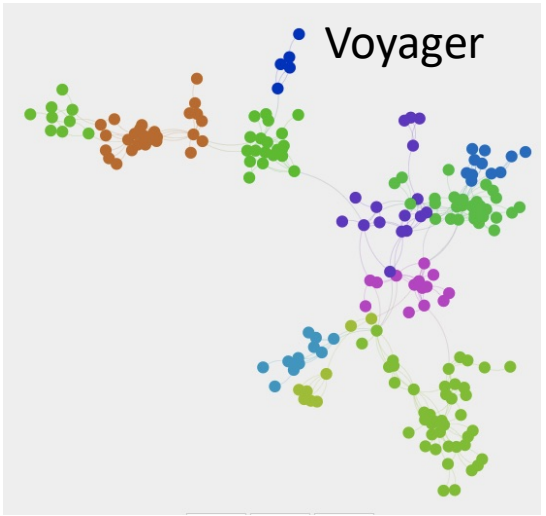
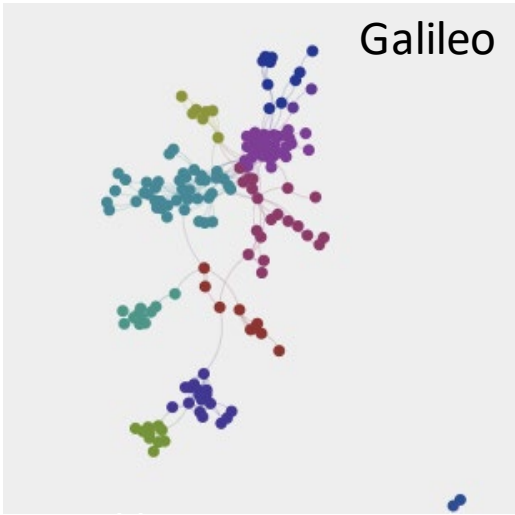


Extras


MESSENGER


Voyager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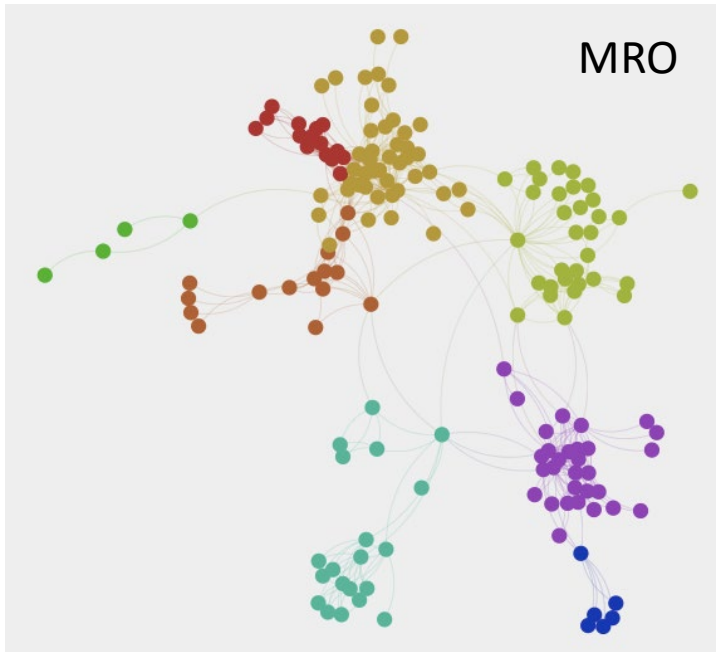
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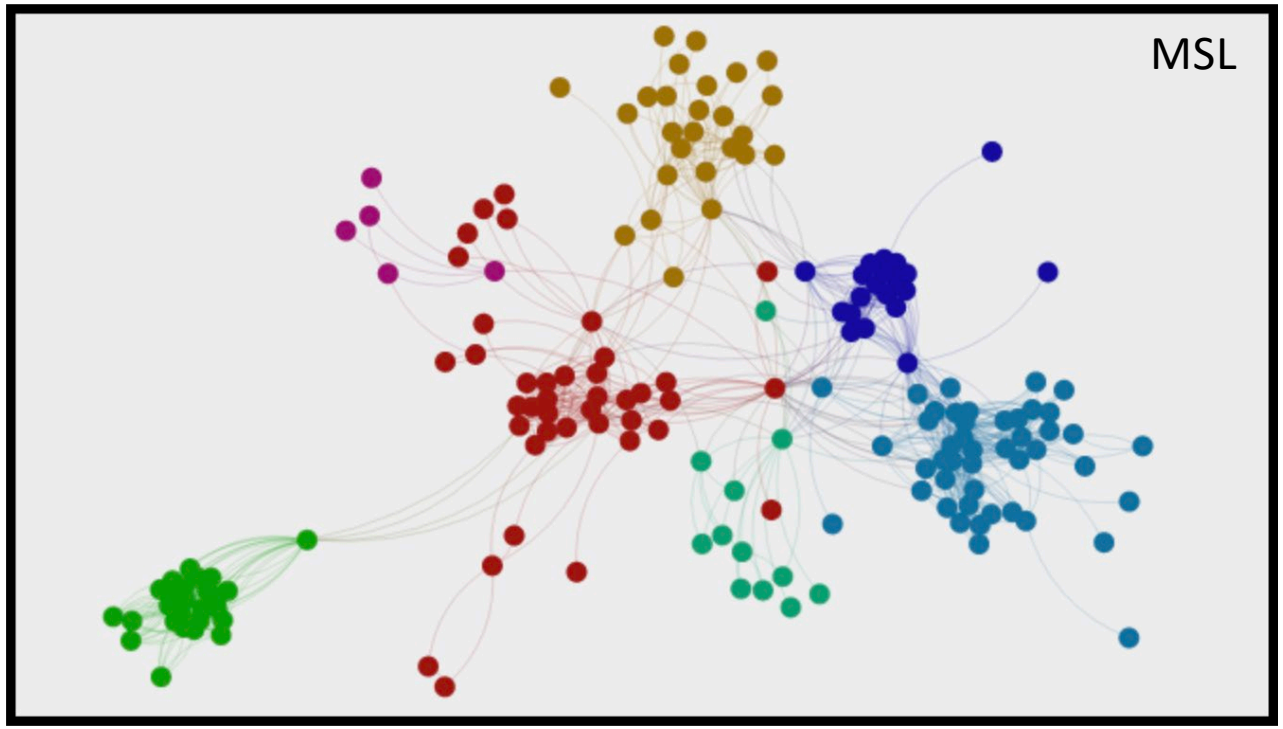
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