# Contagion & Diffusion

CRJ 523

Network Criminology

# Learning Goals

- Understand the importance of *weak* ties
- Discuss *diversity/bandwidth tradeoff*
- Discuss *simple* vs. *complex* contagion
- Revisit Network Theory

# The Strength of Weak Ties

- Granovetter (1973)
  - This paper has been cited nearly 65,000 times (as of 2022).
    - On average, that is about 1,300 cites per year!
- So, what is so important? Point he is trying to make?

# The Strength of Weak Ties

- Granovetter (1973)
  - Strong ties are interconnected.
    - A is strongly to B, A is strongly tied to C, therefore B and C should be strongly tied.
  - Logic: strong ties involve time commitments, homophily, and cognitive balance.
    - Otherwise, we have a "forbidden triad".

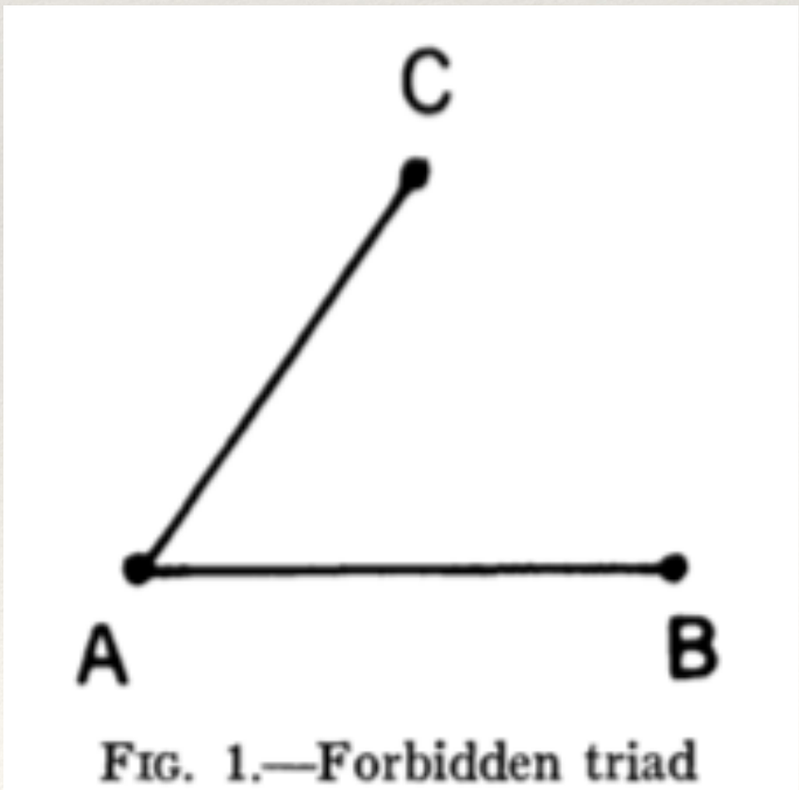


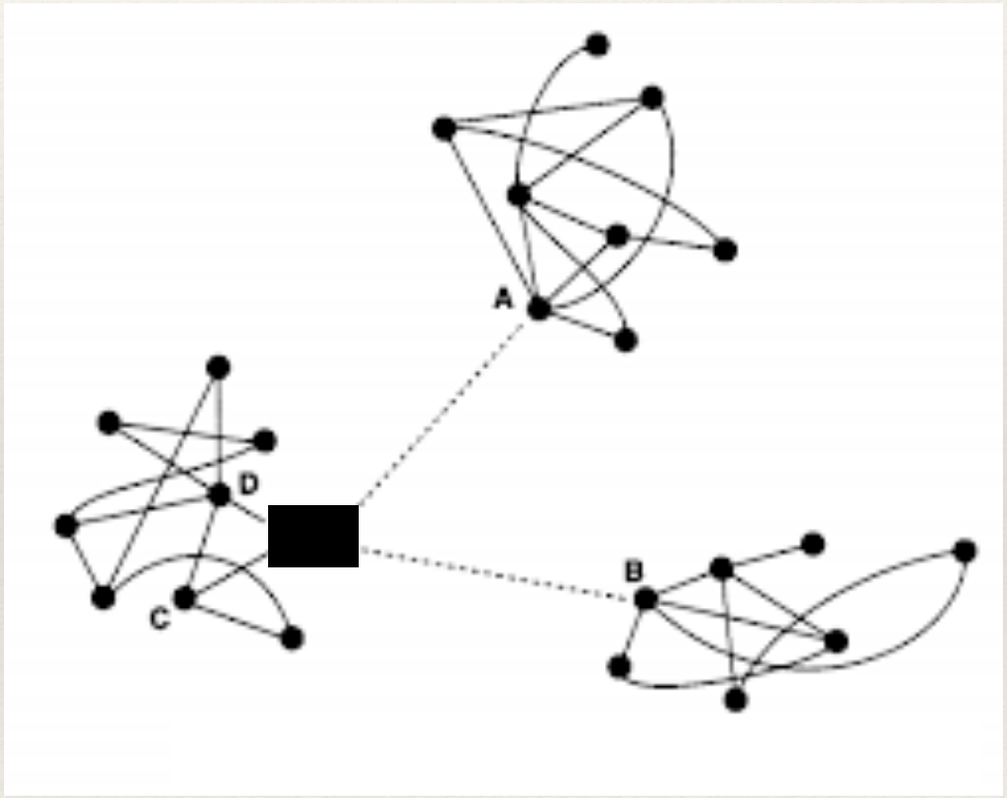
FIG. 1.—Forbidden triad

# The Strength of Weak Ties

- Granovetter (1973)
  - This means strong ties can't be "bridging ties" because there are not "forbidden triads".
  - Bridges (ties that are not strong) play an important role for diffusion.
    - ***All*** bridges are weak ties.
    - ***No*** strong ties are bridges.

# The Strength of Weak Ties

- Granovetter (1973)
  - Empirical examples:
    - Finding out about a job
    - Neighborhoods acting collectively



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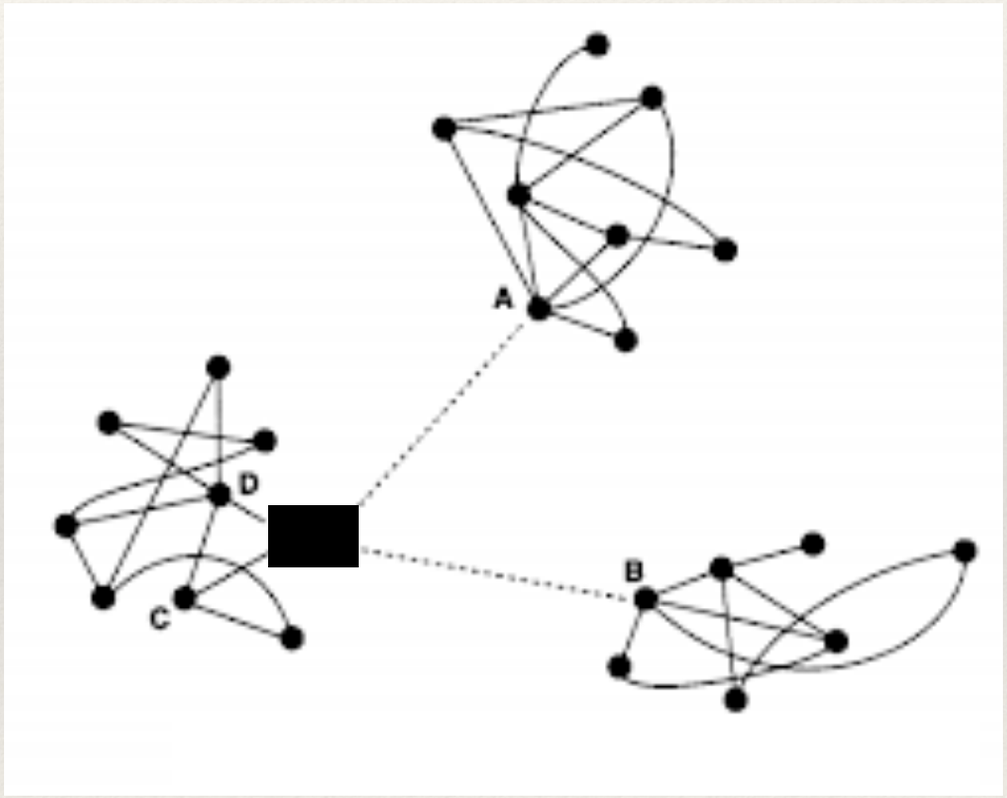
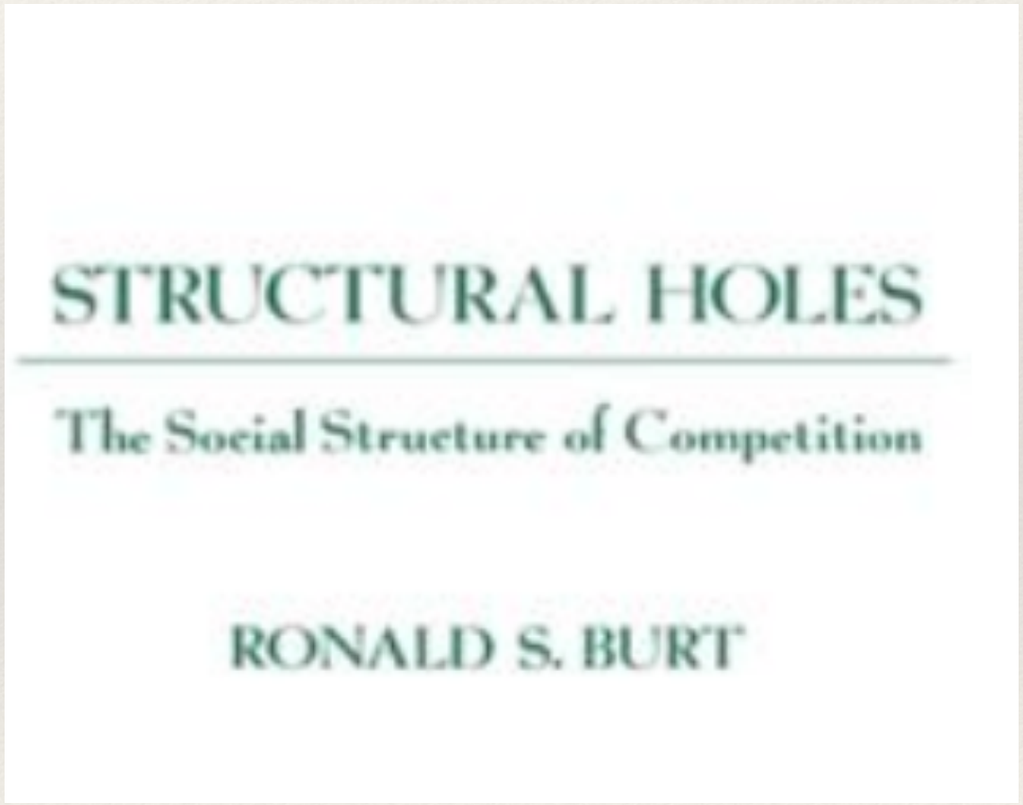



Weak ties have strength!!!!

# Structural Holes

- Burt (1992)
  - Cited over 30,000 times (10,000 per year average)
  - Claim:
    - Cohesive, dense networks have redundant information.
    - *Structural holes* provide access to **diverse**, **novel** information.



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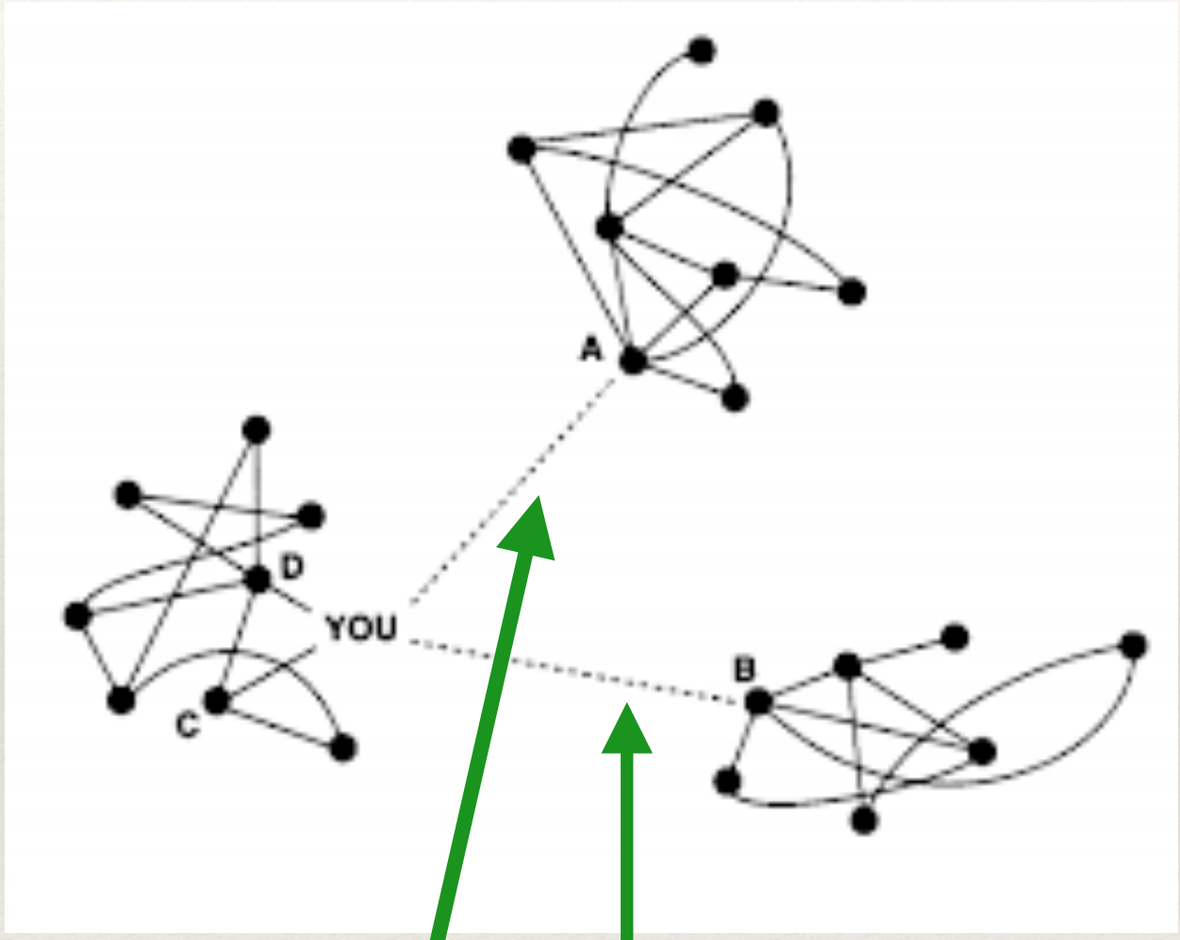



Structural hole

# Structural Holes

- Burt (1992)
  - Individuals occupying such positions will be at an advantage.
    - "Information Benefits" or "Vision Advantages"
      - Example: two research communities

# Weak Ties/Structural Holes

- In sum
  - Weak ties (ties that bridge) are **stronger/better** when it comes to:
    - getting new information, and performing in settings where that information is advantageous
    - and acting collectively

# Diversity/Bandwidth Tradeoff

- Aral & Alstyne (2011)
  - Think of what defines a weak tie…
  - What are we assuming?

# Diversity/Bandwidth Tradeoff

- Aral & Alstyne (2011)
  - Weak ties provide novel information, but at a price.
    - Information travels slowly through weak ties.
    - Weak ties transmit less content/volume/complexity.
  - Strong ties do not provide novel information, but at a benefit.
    - Information travels faster and is a higher content/volume/complexity.

# Diversity/Bandwidth Tradeoff

- Aral & Alstyne (2011)
- **Both** are important, but for different things.
- They call this the “diversity/bandwidth tradeoff”.
  - More diversity, less bandwidth.
  - More bandwidth, less diversity.

# Diversity/Bandwidth Tradeoff

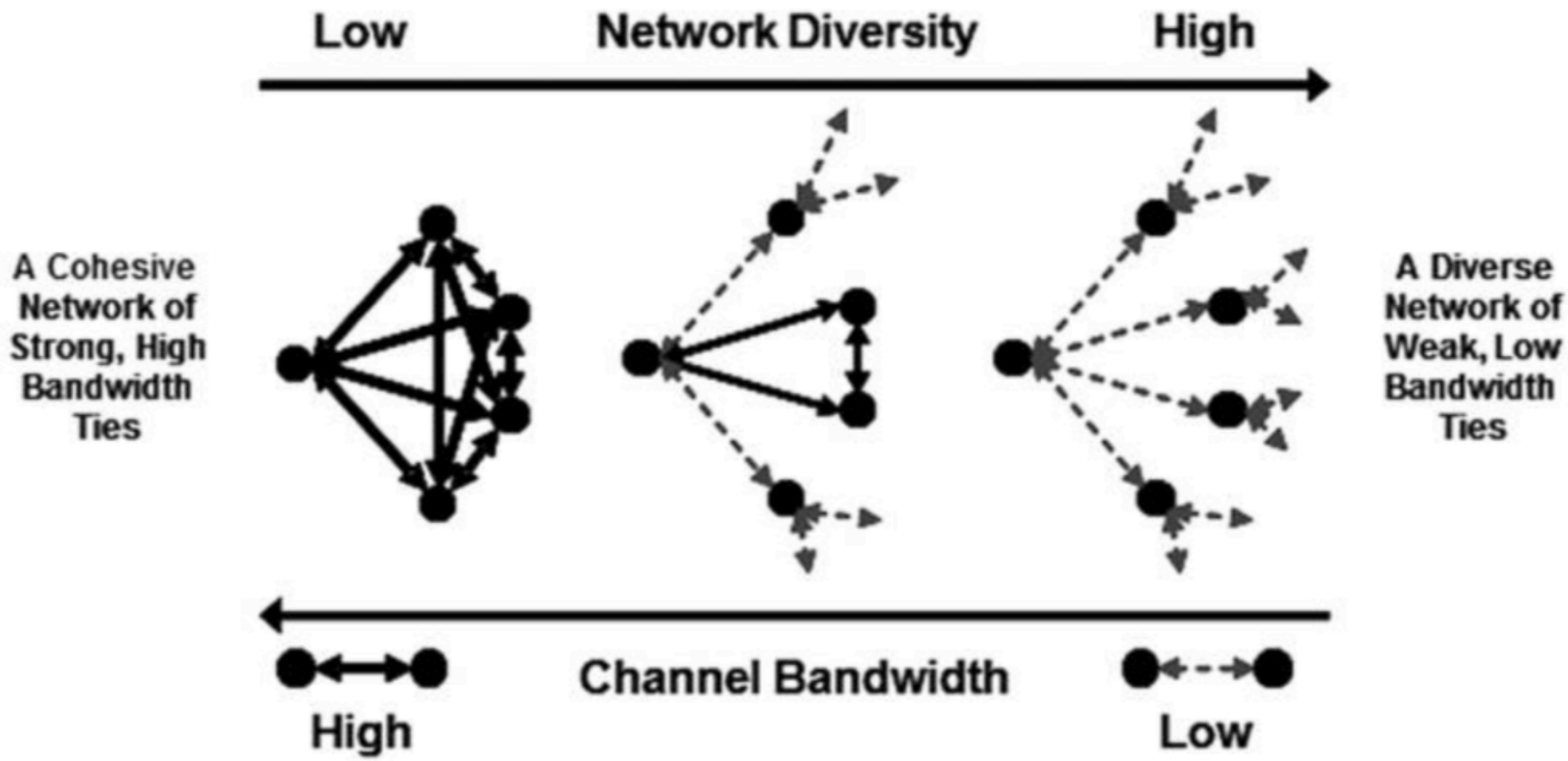
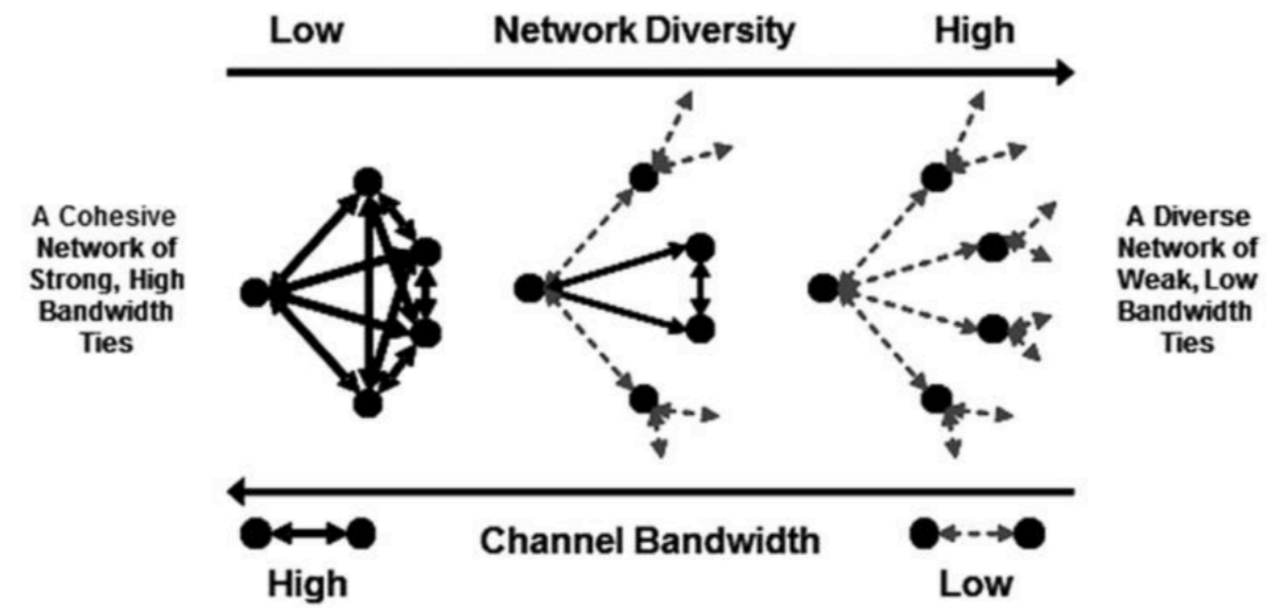



FIG. 1.—The diversity-bandwidth trade-off. As structural diversity increases, channel bandwidth decreases.

# Diversity/Bandwidth Tradeoff

- How do norms work?

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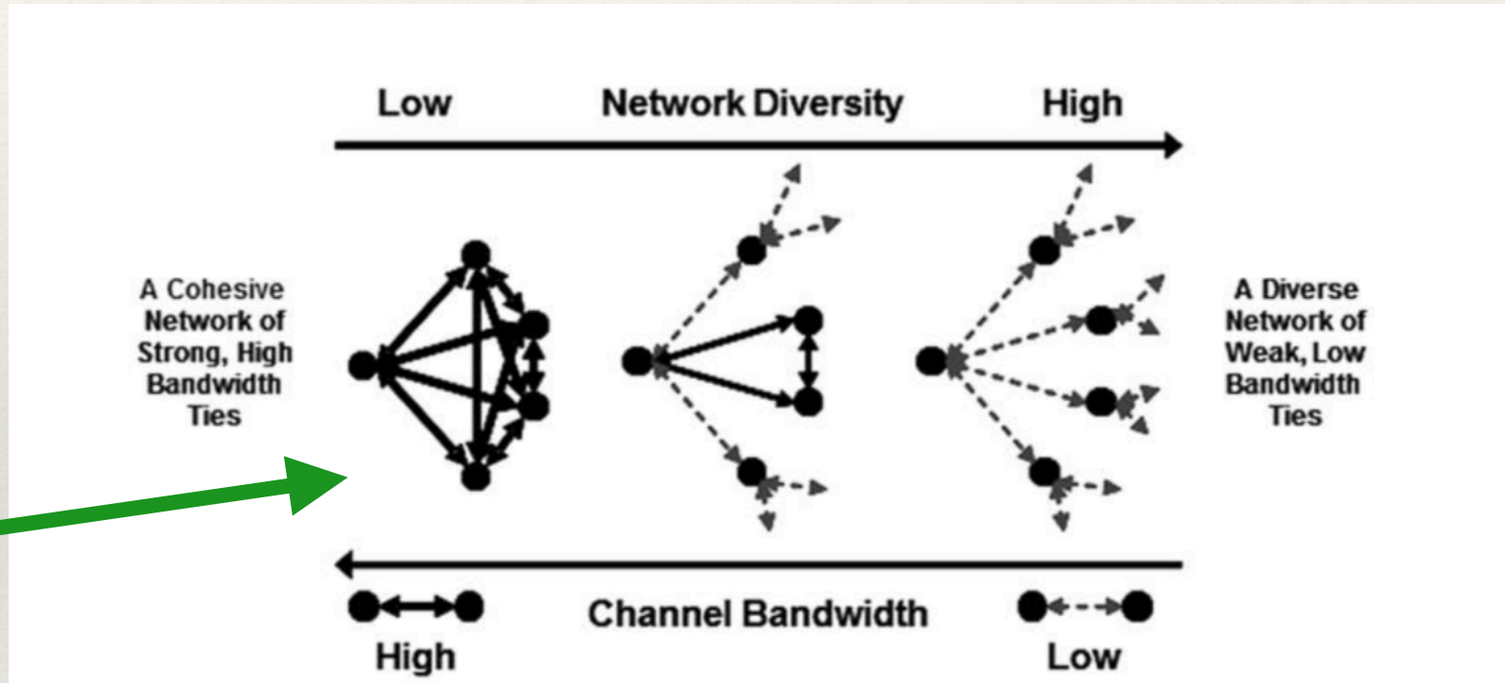


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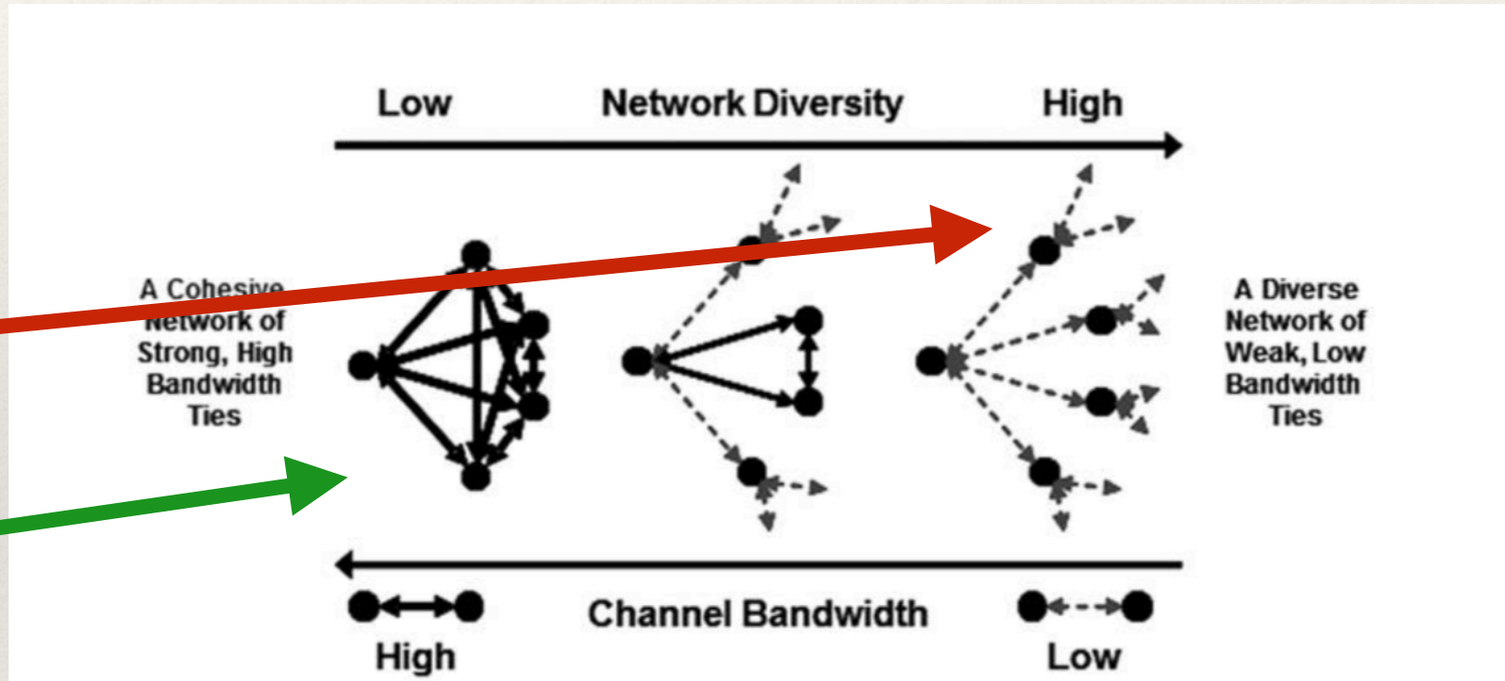


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# Diversity/Bandwidth Tradeoff

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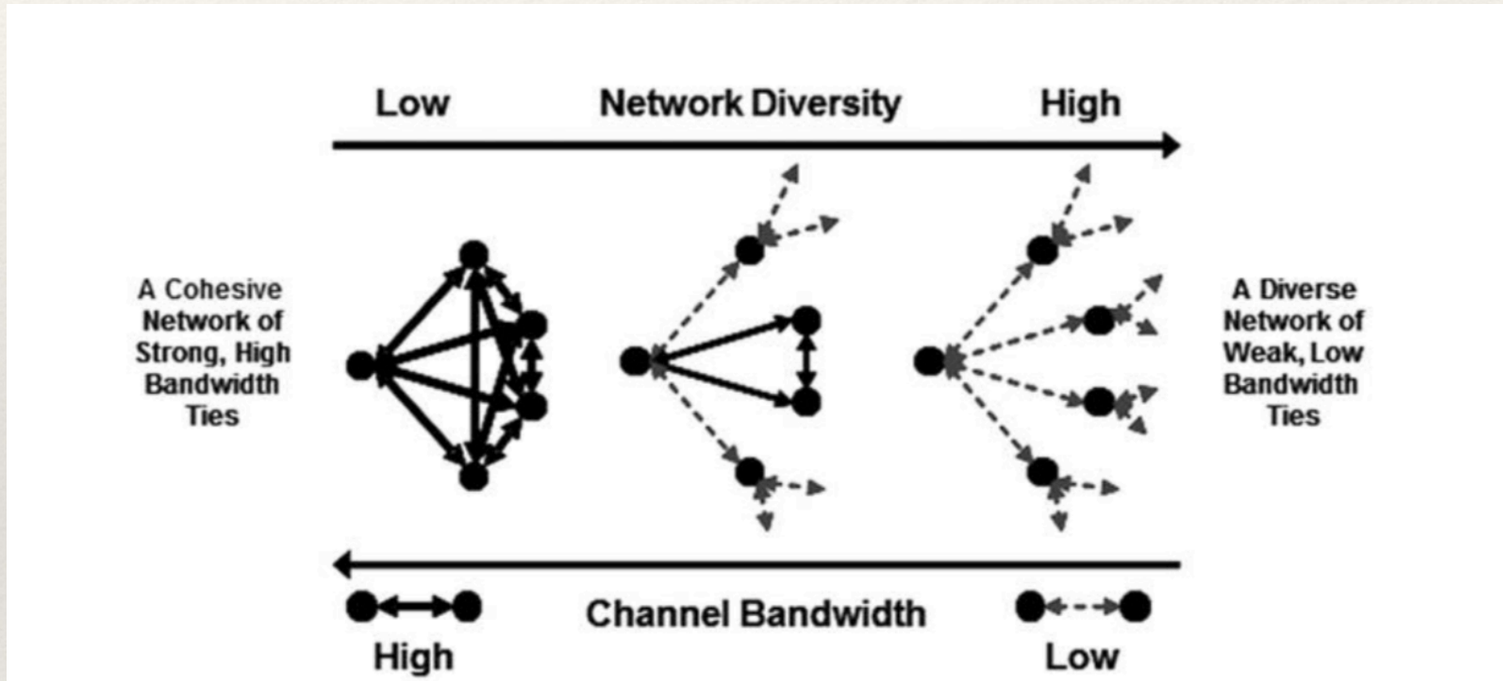


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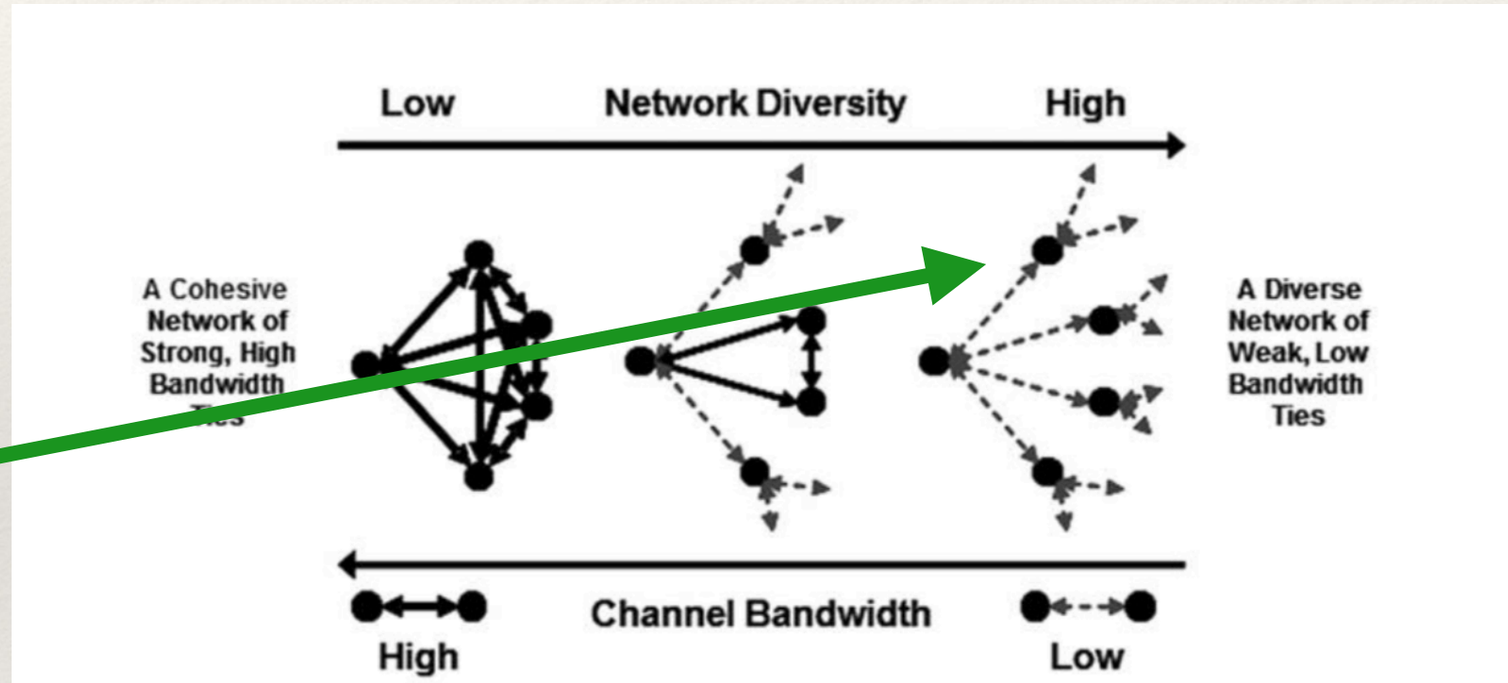


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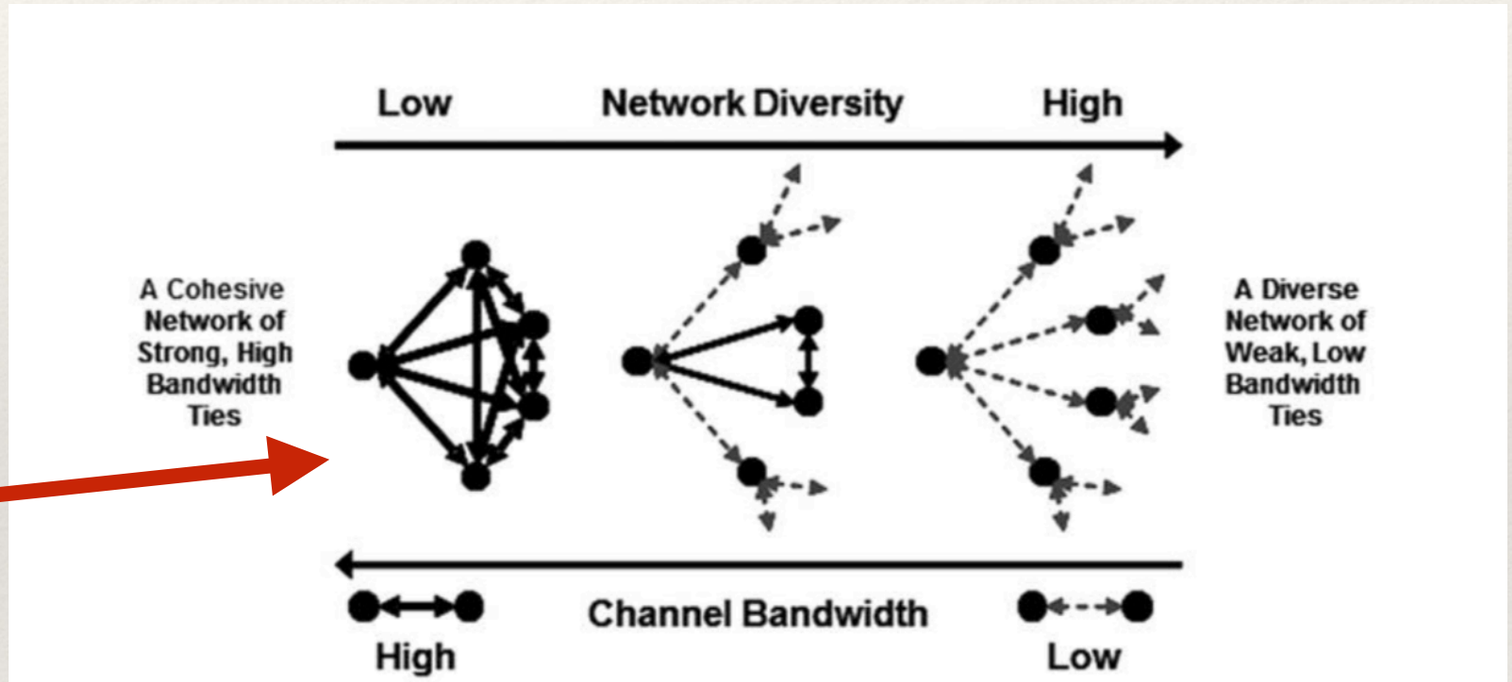


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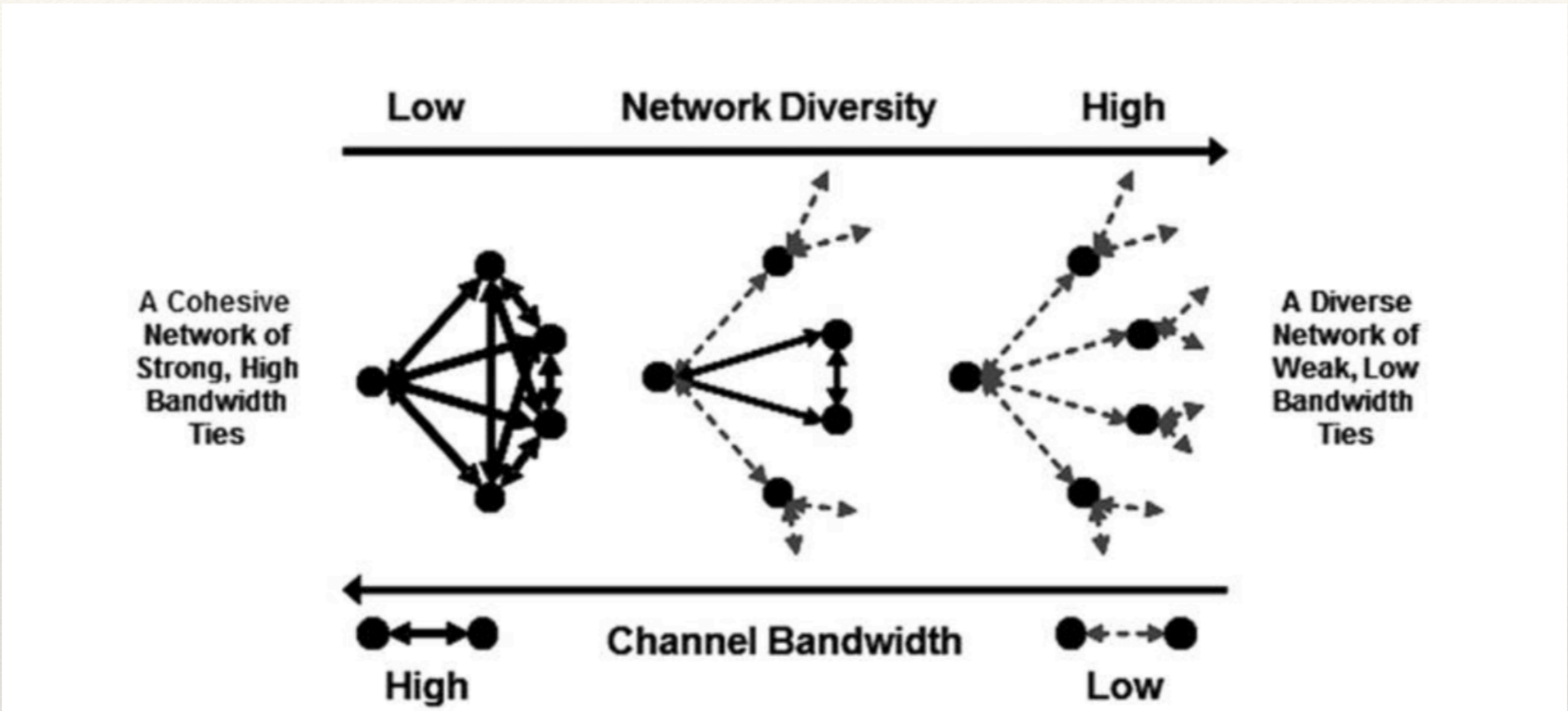


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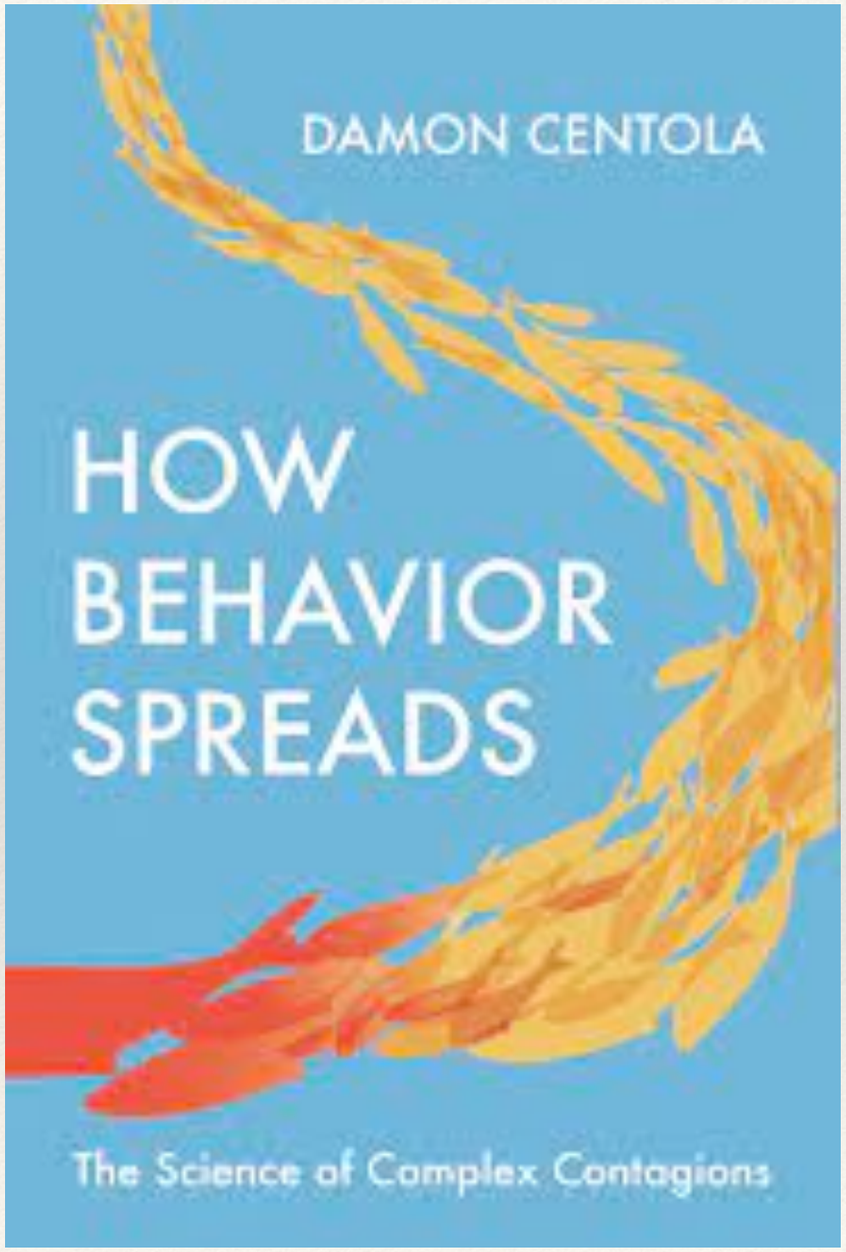
It's a trade off!

# How Behavior Spreads

- Centola (2018)
  - Research on diffusion assumes a **viral** model of transmission:
    - A single exposure, and you get it.
    - Weak ties facilitate spread.



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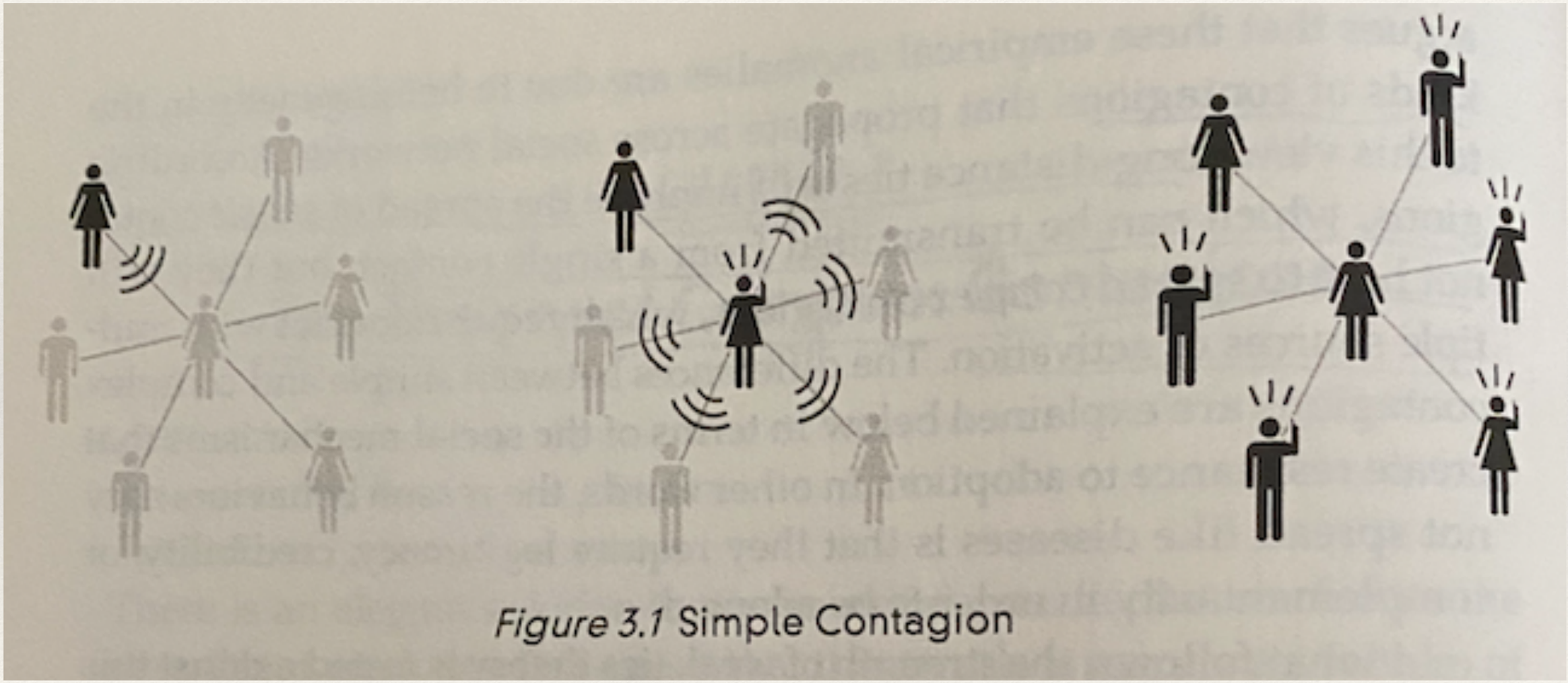

*Figure 3.1* Simple Contagion

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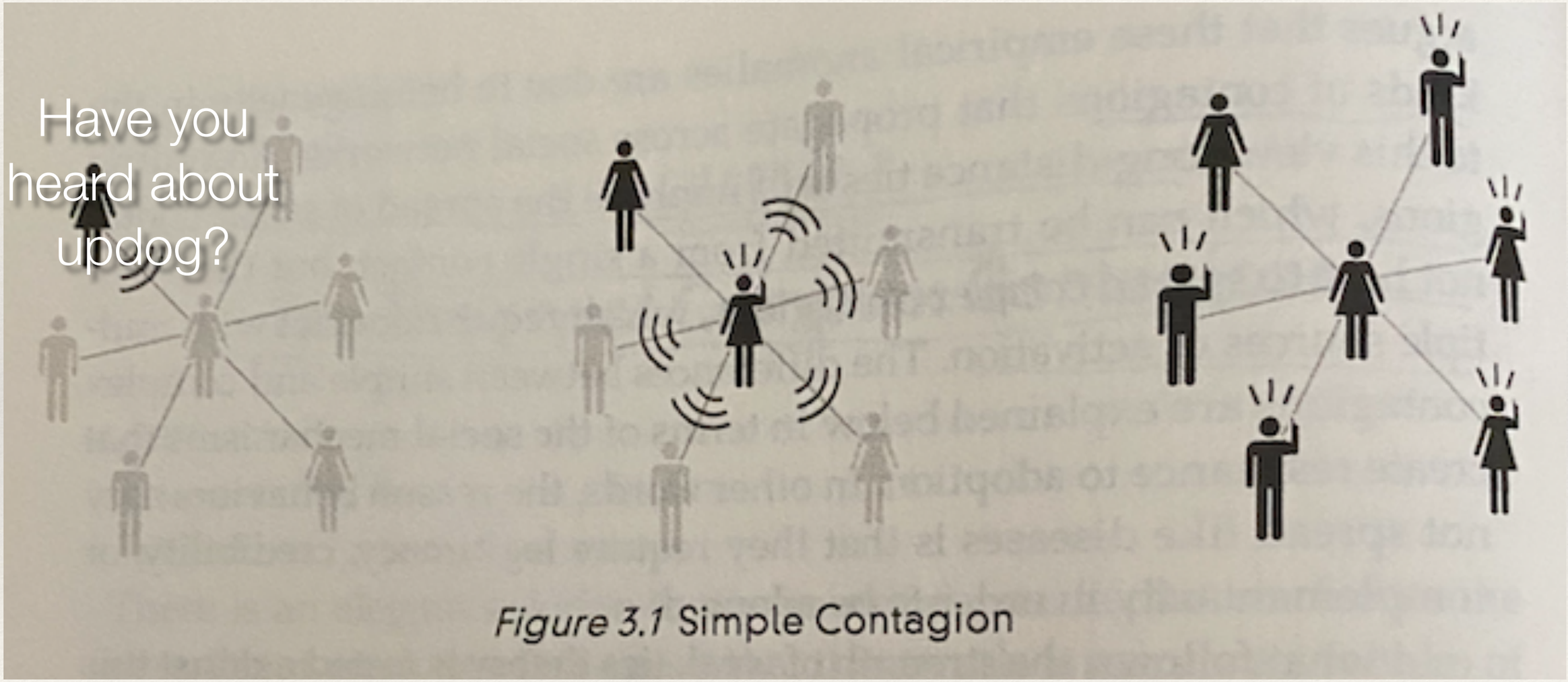


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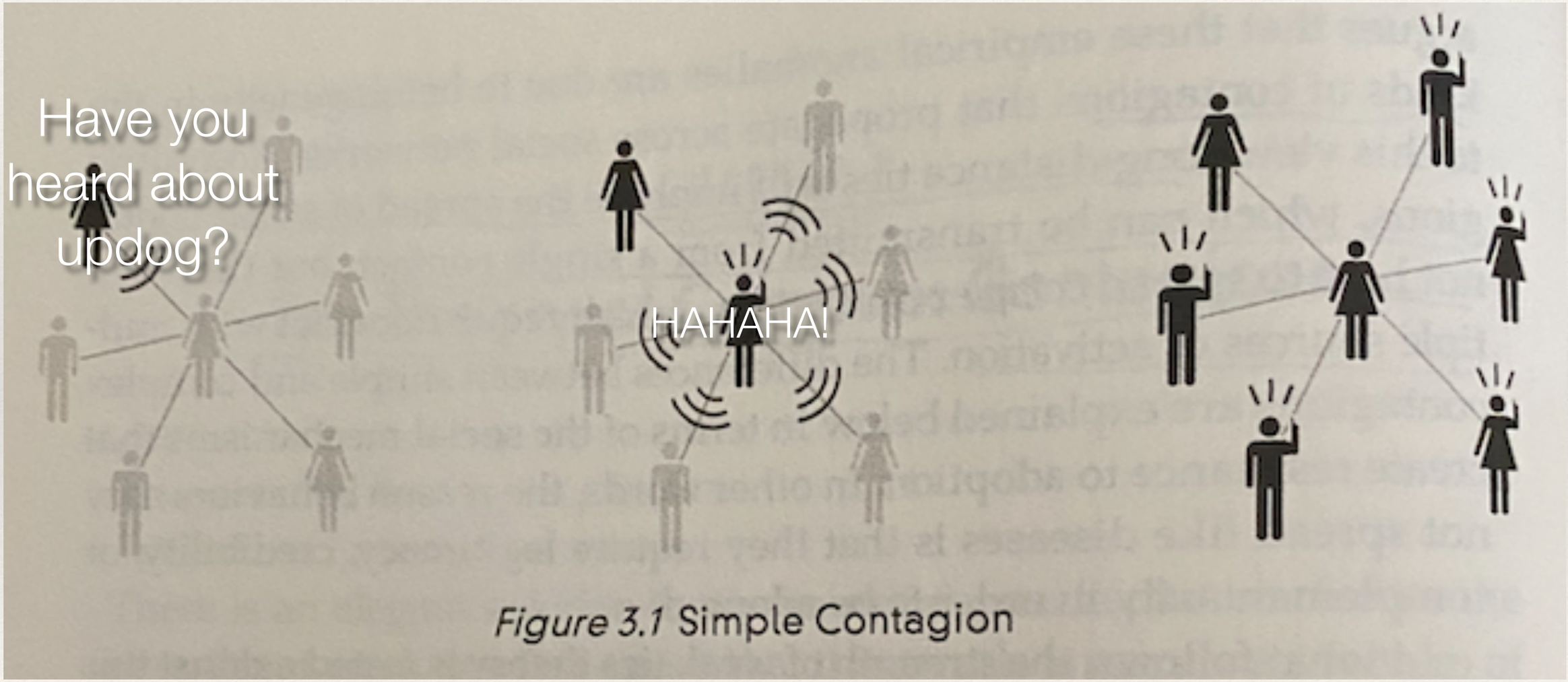


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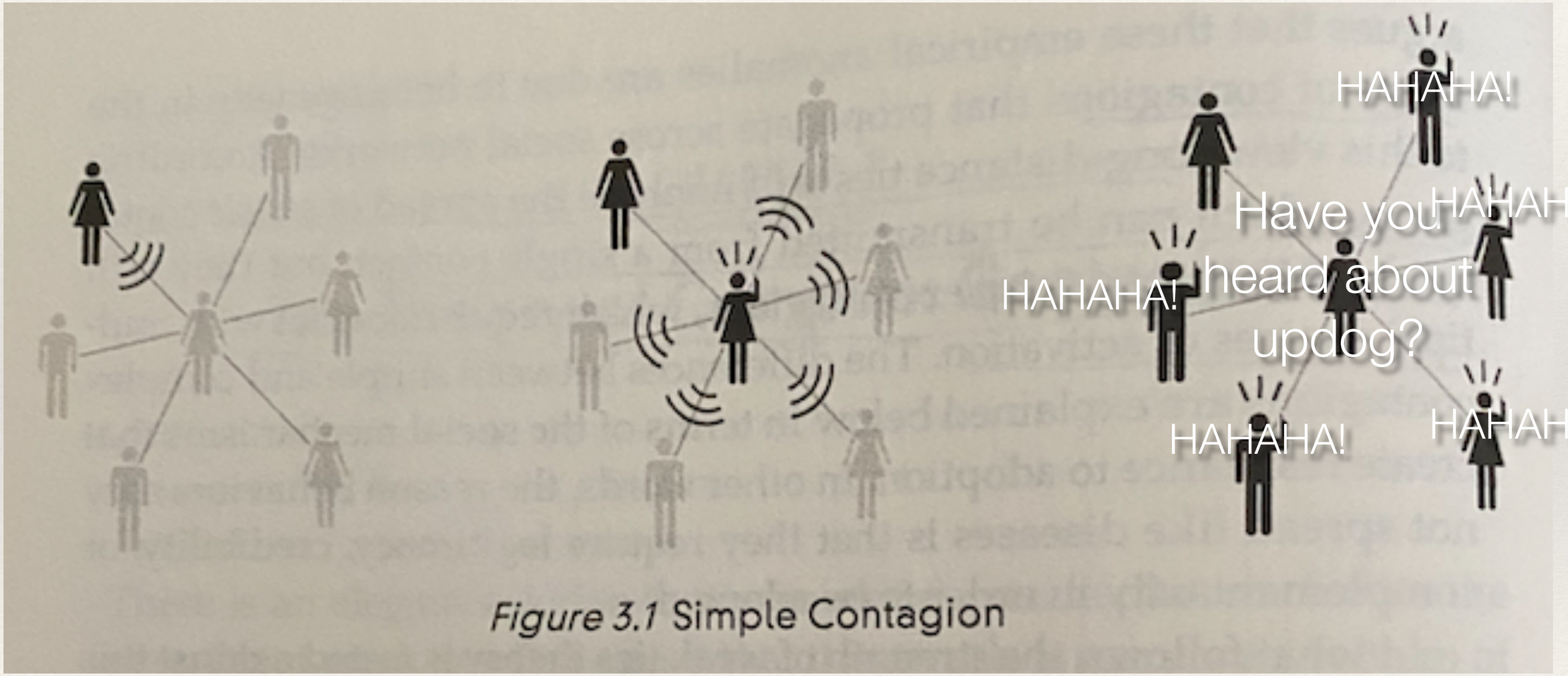


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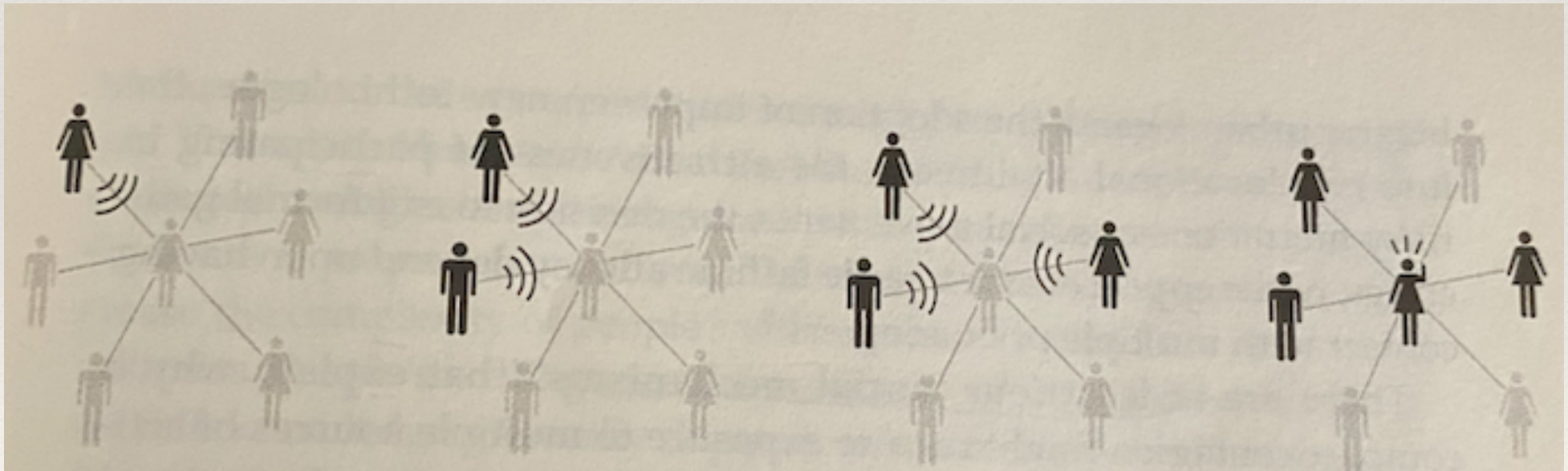
# How Behavior Spreads

- Centola (2018)
  - But, research on *behavior* spread does not spread this way.
    - Behavior requires a “threshold" of exposure.



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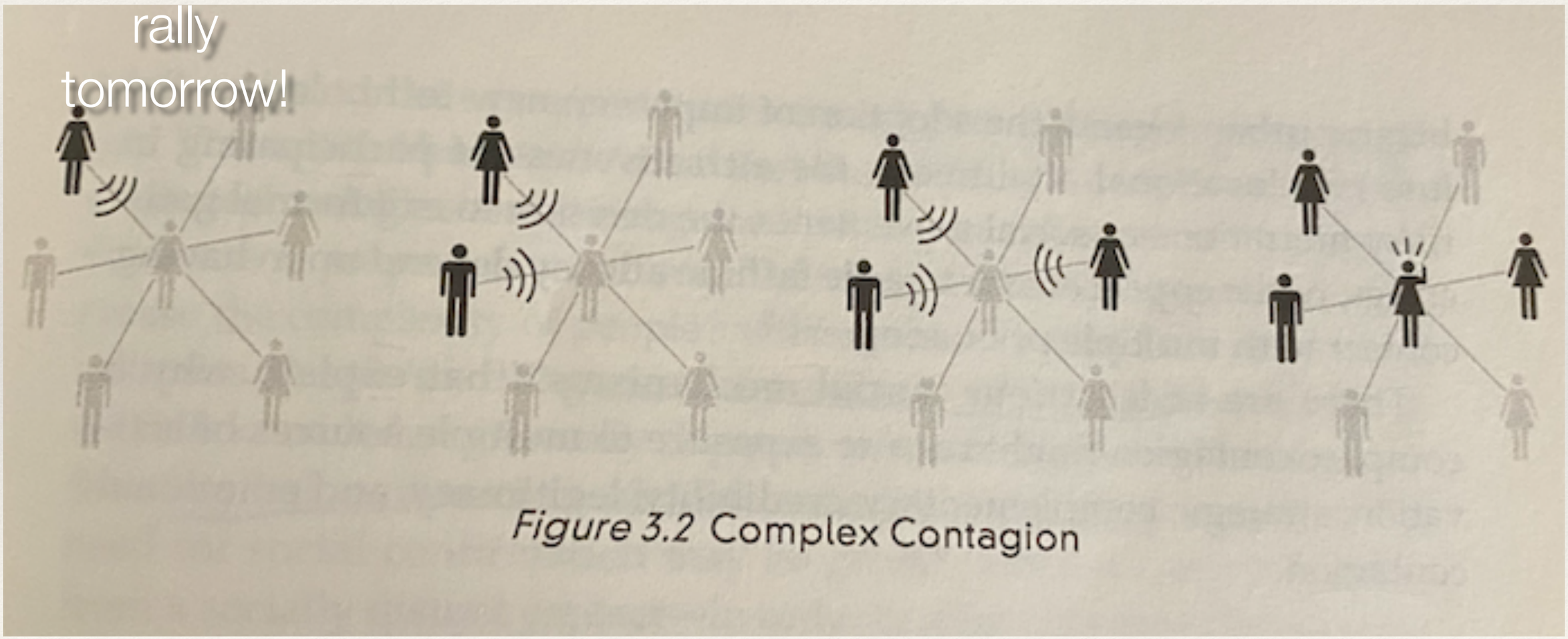


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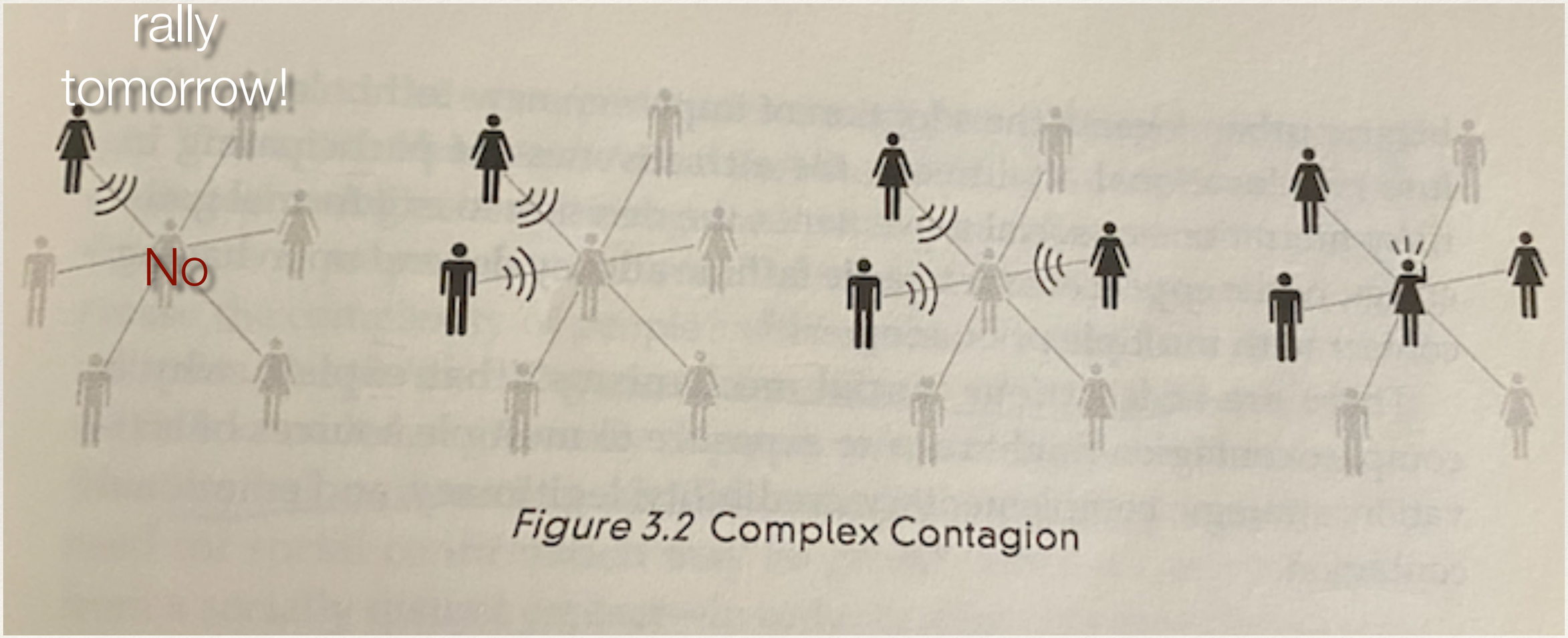


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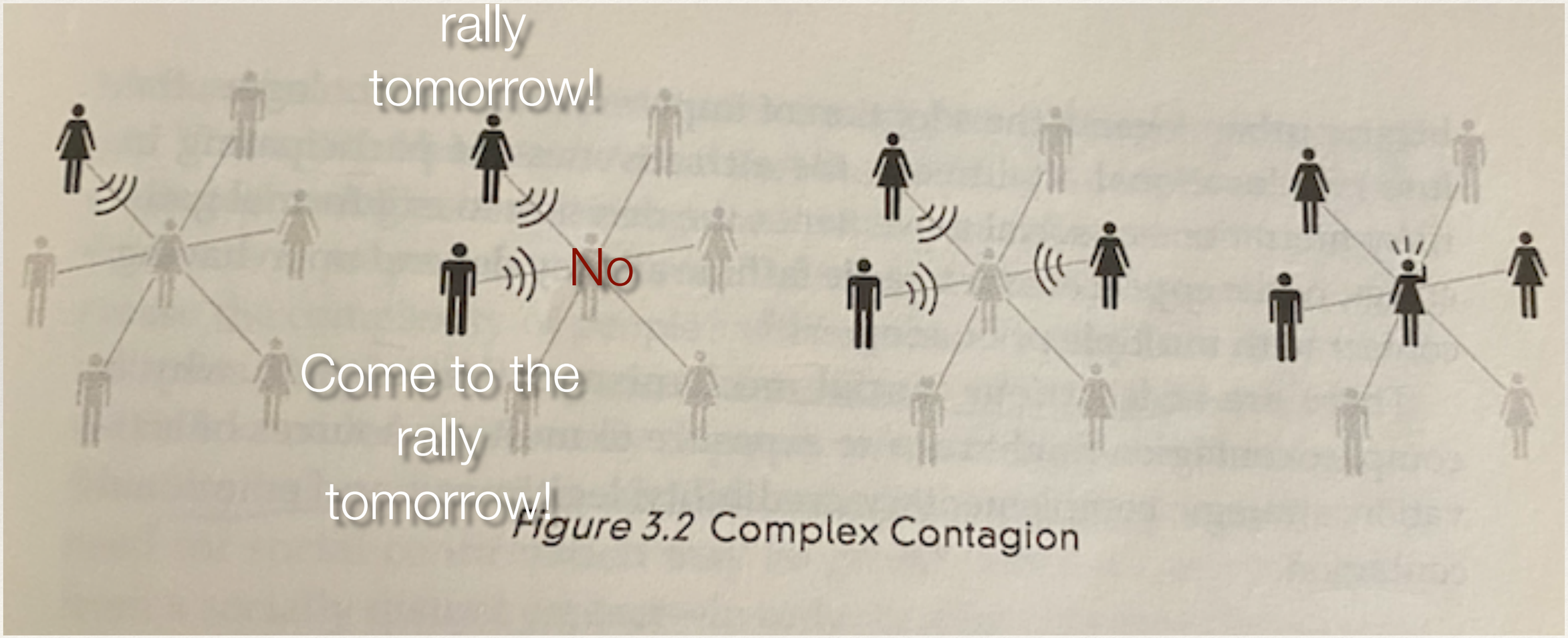


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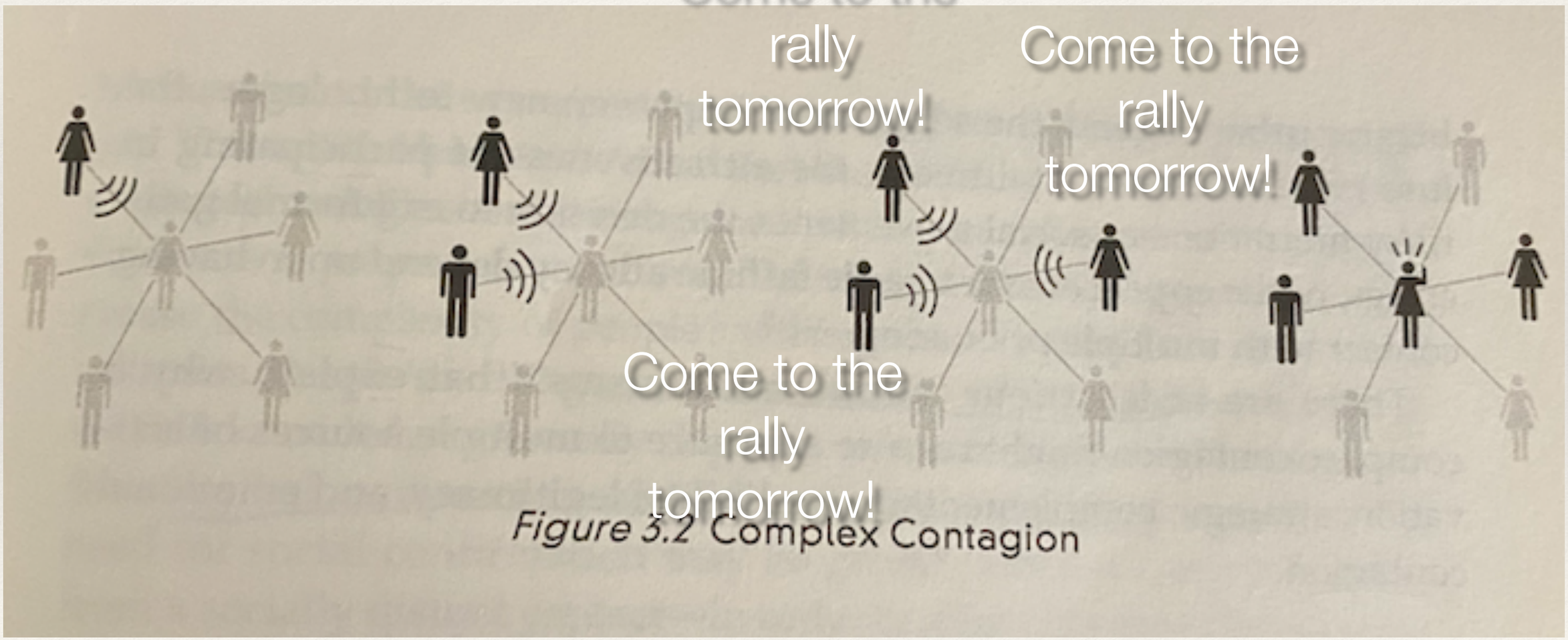


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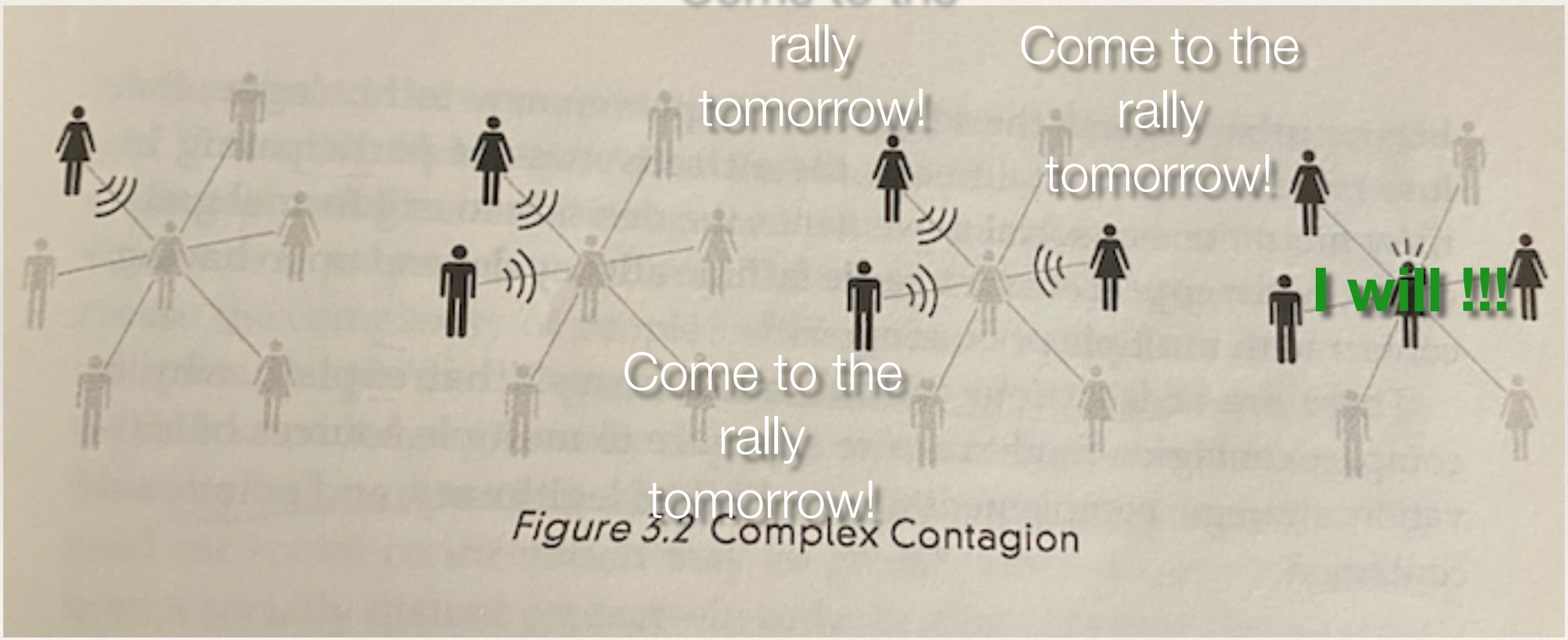


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# Network Theories

- **Dimensions**
  - Explanatory model (metaphor)
    - *Flow*: "stuff" flows through ties like pipes.
    - *Coordination*: ties are like bonds in that they coordinate action or "prisms" in that the reveal differences in roles.
  - Explanatory goal
    - *Social Capital/Performance*: what are the benefits of a position? How does it concur advantage?
    - *Homogeneity*: why are nodes similar?

## Network Theories and Theories of Networks*

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|---|---|---|---|
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# Questions?

# Break

# Discussion

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