How Math, Science, and Star Trek Help Us Understand the Value of Team Diversity

slides.com/fmitchell/**math-science-diversity**/live

Let's play a game...

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3.1 - 3.5

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< 2.4   3.1 - 3.5

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Let's play a game...

A young woman was 3 years old
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What is her college GPA?

< 2.4   2.5 - 3.0   3.1 - 3.5   3.6 - 3.9   > 3.9

This is the definition of bias

No way to "win" or avoid

Hypothesis

Tech will make the world a better place by *requiring* **equity** and **emotional intelligence** integral to it's interoperability.

Perspective

Perspective

How one looks at a problem

Perspective

How one looks at a problem

Heuristic

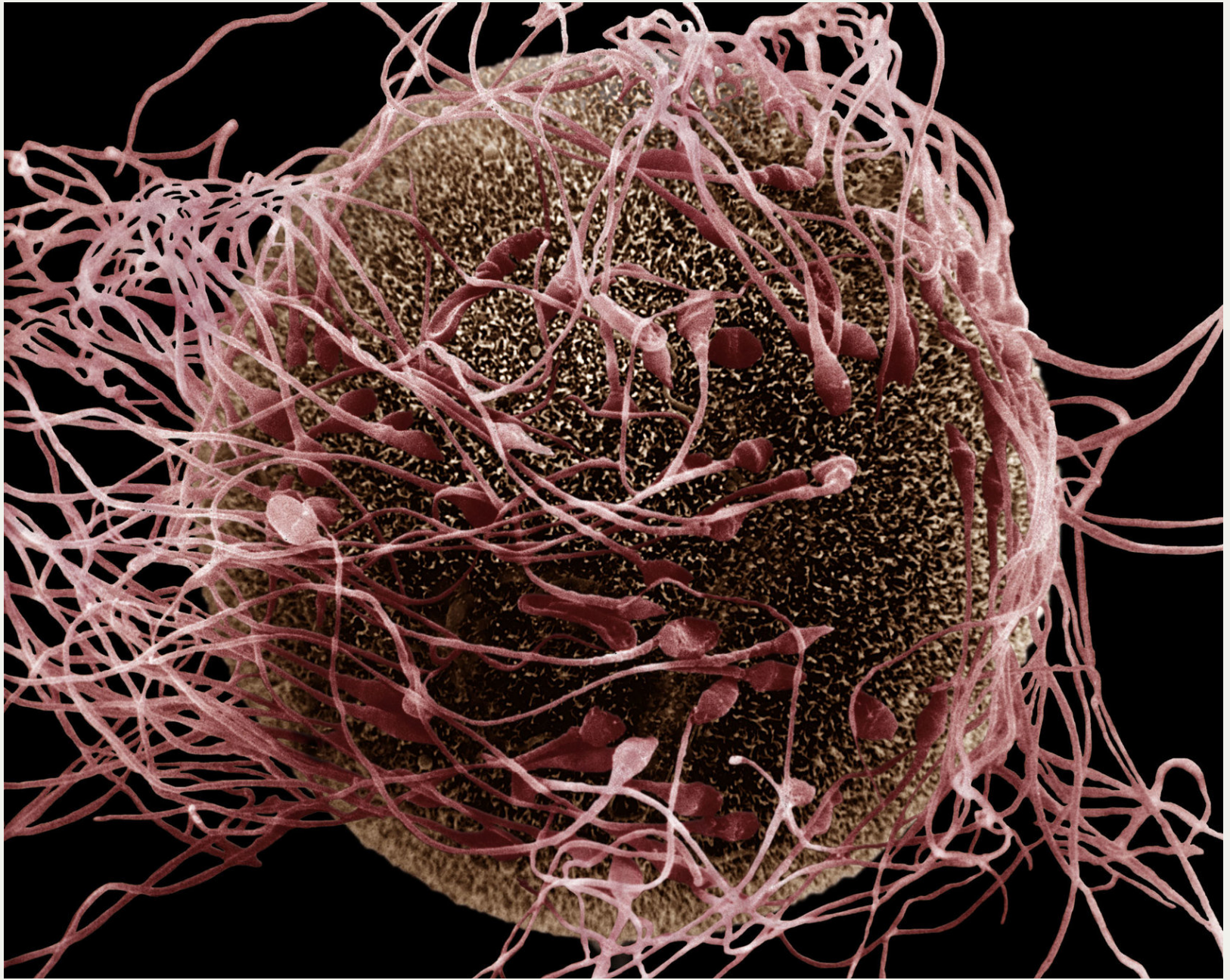# Perspective

How one looks at a problem

Heuristic

How one searches for a solution

Our team is full of superheroes

Diversity Defined

Diversity Defined

- Demographic diversity

Diversity Defined

- Demographic diversity
- Experiential diversity

Diversity Defined

- Demographic diversity
- Experiential diversity
- Cognitive diversity

Star Trek: Voyager

Captain Janeway

"Keep your shirt tucked in; go down with the ship; and never abandon a member of your crew.

Am I open to unorthodoxy?

IQ

EQ

IQ

EQ

- Intelligence Quotient

IQ

- Intelligence Quotient

EQ

- Emotional quotient

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EQ

- Emotional quotient
- Ability to recognize one's own emotions and others
- Changes over time

Emotional Intelligence of Groups

Emotional Intelligence of Groups

- Source (HBR): bit.ly/ei-hbr-2001

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- Teams who develop greater emotional intelligence (EQ) boost their overall performance

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- Teams who develop greater emotional intelligence (EQ) boost their overall performance
- EQ: Trust among members, a sense of group identity, and a sense of group efficacy
- At the heart of these three conditions are emotions, like the ability to listen

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Tuvok

" *On the contrary, the demands on a Vulcan's character are extraordinarily difficult. Do not mistake composure for ease.*

What is the logical solution?

" *What do you hear about great groups? Not that the members are all really smart, but that they listen to each other.*

Anita Wooley, *Assistant Professor at Carnegie Mellon*

Women Are Key to Smart Teams

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- Published in HBR 2011: bit.ly/women-hbr-2011

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- Carnegie Mellon and MIT
- Group satisfaction
- Group cohesion
- Group motivation

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"Describe what you can bring to this company."

Why do diverse teams outperform?

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- Teams focus on facts
  - Alter the behavior of a group's social majority

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Why do diverse teams outperform?

- Teams focus on facts
  - Alter the behavior of a group's social majority
- Facts processed more carefully
- More innovation
  - Dodge the costly pitfalls of conformity, which discourage innovative thinking

Bold Statement #1

Bold Statement #1

No such thing as ***common*** sense

B'Elanna Torres

" *If I sprain my ankle, at least I feel something [...] I'm not trying to kill myself! I'm trying to see if I'm still alive.*

How am I evaluating talent?

The Difference

Scott E. Page

THE DIFFERENCE

HOW THE POWER OF DIVERSITY
CREATES BETTER GROUPS, FIRMS,
SCHOOLS, AND SOCIETIES

- Scott Page
- Professor of Complex Systems, Political Science, and Economics
- Published 2007
- bit.ly/scottpage-difference

"I want to hire the most qualified

How do *you* define most qualified?

How do *you* define most qualified?

Hint: What is your perspective and heuristic?

Bold Statement #2

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Bold Statement #2

You must change your perspective
to arrive at a new heuristic

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Innovation

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- Apple HealthKit - No period tracking

"Innovation"

- Ambien - Women are tiny men
- Apple HealthKit - No period tracking
- Harvard - Lauded admission practices
- Facebook - News feed

Seven of Nine

"*But that is irrelevant.*

Why should you care?

Why should you care?

- Vanity

Why should you care?

- Vanity
- Virtue

Why should you care?

- Vanity
- Virtue
- **Fear**

Why should you care?

- Vanity
- Virtue
- **Fear**
- **Profit**

Diversity Trumps Ability Theorem

Conditions

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- The problem must be hard

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Diversity Trumps Ability Theorem

Conditions

- The problem must be hard
- Each solver has a local optima to the problem
- An improvement can be made to a non-optimal solution
- Large pool of solvers to form a decent-size collection

Diversity Trumps Ability Theorem

Diversity Trumps Ability Theorem

$$\#\{i \in \{1, \ldots, N\} : \phi^i(\omega_2) = \phi^*\} > \frac{\mu(\phi^*)N}{2} \geq \bar{n}_1 = N_1,$$

Diversity Trumps Ability Theorem

$$\#\{i \in \{1, \ldots, N\} : \phi^i(\omega_2) = \phi^*\} > \frac{\mu(\phi^*)N}{2} \geq \bar{n}_1 = N_1,$$

Mathematical simulation models
http://bit.ly/div-v-ability

Counter

https://www.thecollegefix.com/post/20375/

http://www.ams.org/notices/201409/rnoti-p1024.pdf

Counter-Counter

http://bit.ly/1juIvFI

http://www.ams.org/notices/201501/rnoti-p9.pdf

What the model tells us

What the model tells us

Think of **people** as **collections of tools**

What the model tells us

Think of **people** as **collections of tools**

Ability is a reflection of the **applicability of those tools** to a given set of problems.

Bold Statement #3

Bold Statement #3

The pipeline problem of talent is actually an **incentive** problem of industry.
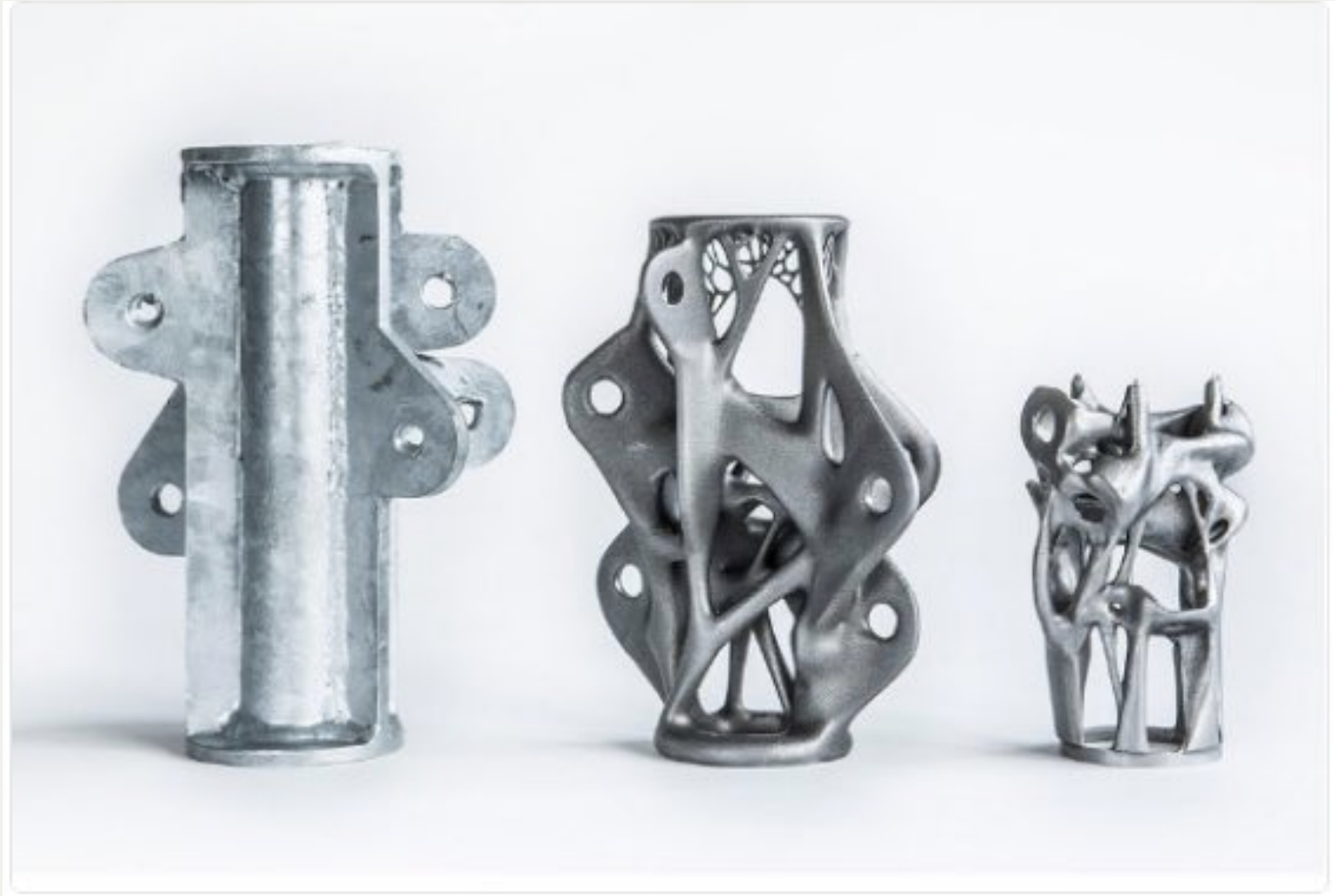
" *Problem solvers with diverse perspectives may have trouble understanding solutions identified by other agents.*

Dr. Scott Page, *Professor at Univ. of Michigan*

EQ

" *Talent hits a target that no one else can hit; genius hits a target no one else can see.*
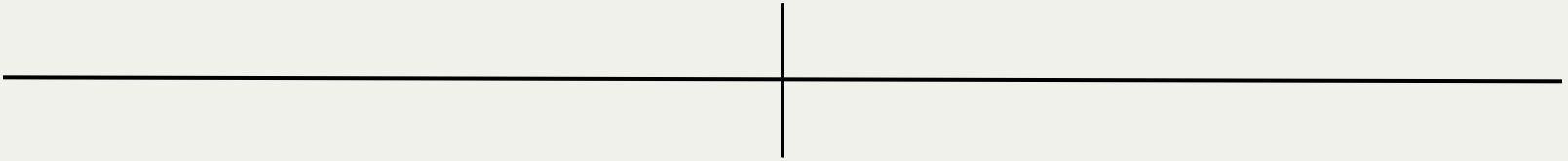
Arthur Schopenhauer, German Philosopher

- Diversity is a fact

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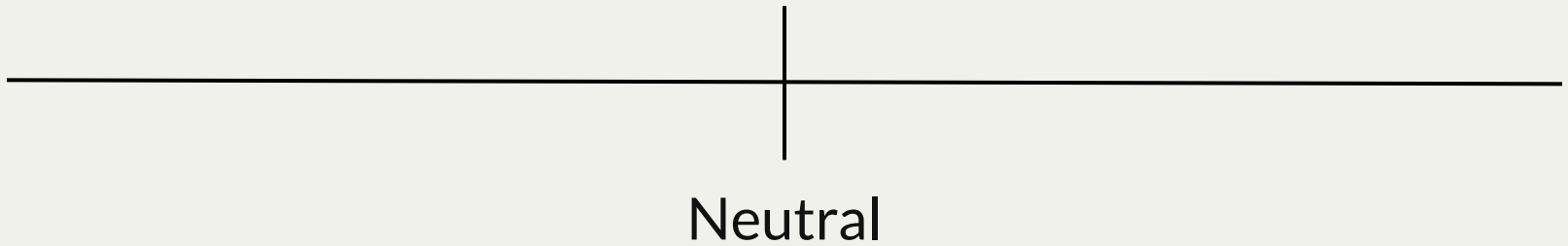- Inclusion is a practice

- Diversity is a fact
- Inclusion is a practice
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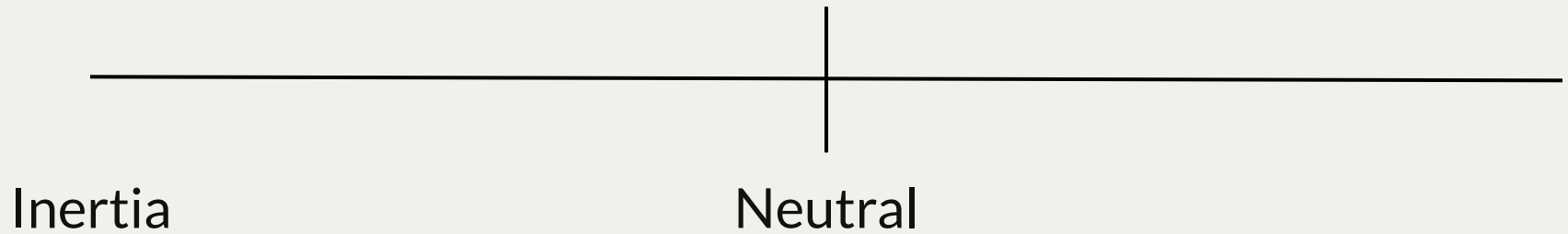- Inclusion is a practice
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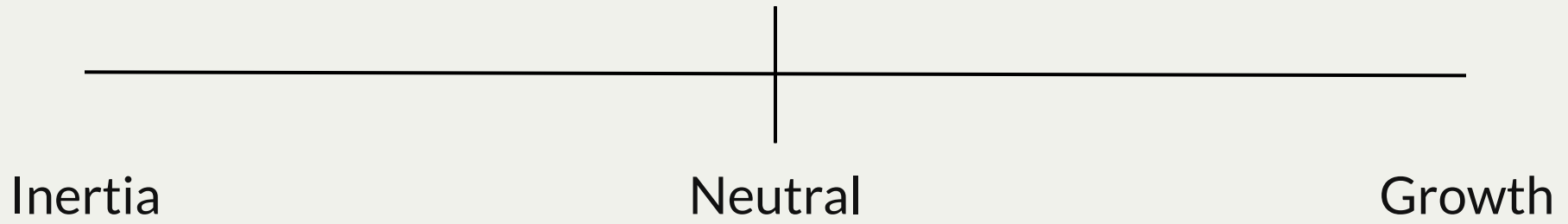- Inclusion is a practice
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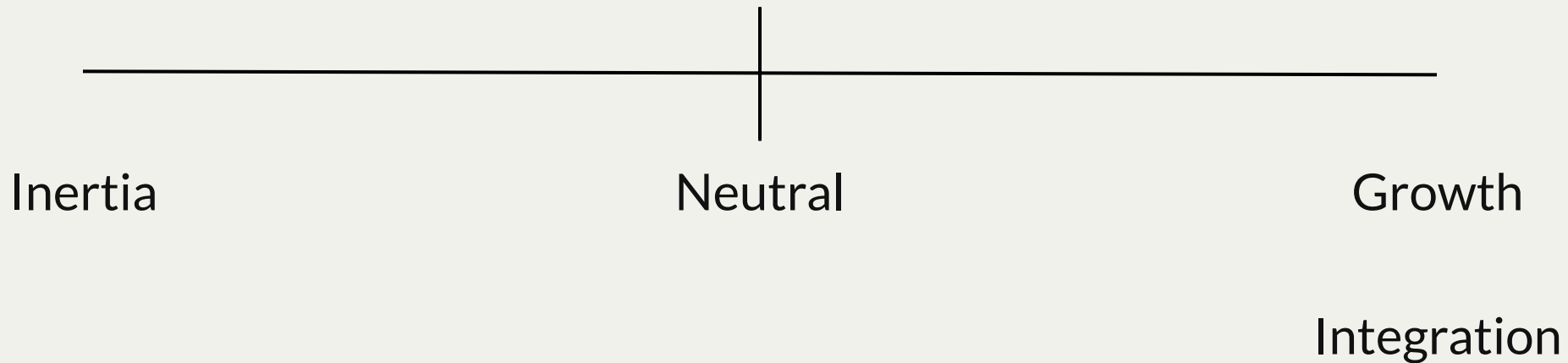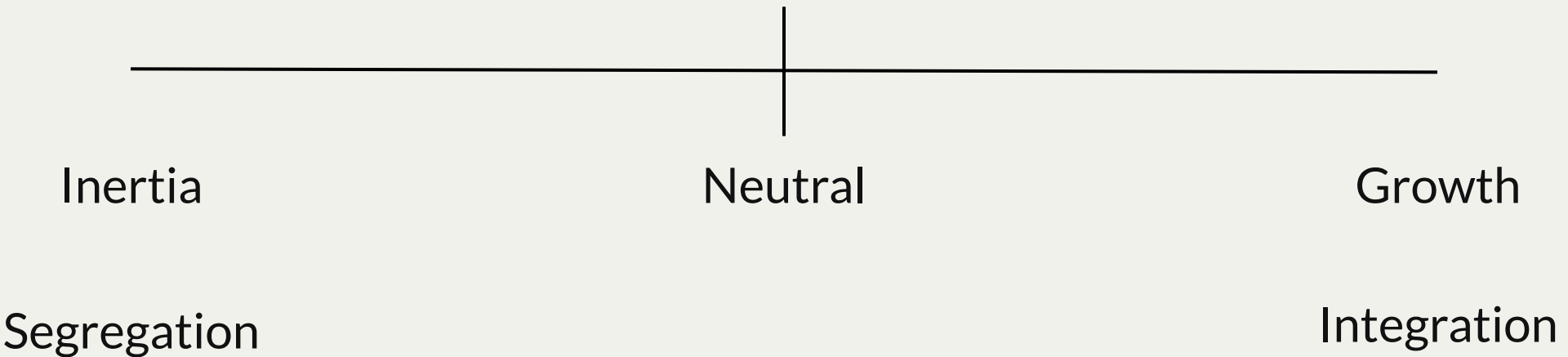- Inclusion is a practice
- Equity is a goal

Neutral

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral   Growth

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral   Growth

Integration

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral   Growth

Segregation   Integration

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral   Growth

Segregation   Integration

Privilege

- Diversity is a fact
- Inclusion is a practice
- Equity is a goal

Inertia   Neutral   Growth

Segregation   Integration

Oppression   Privilege
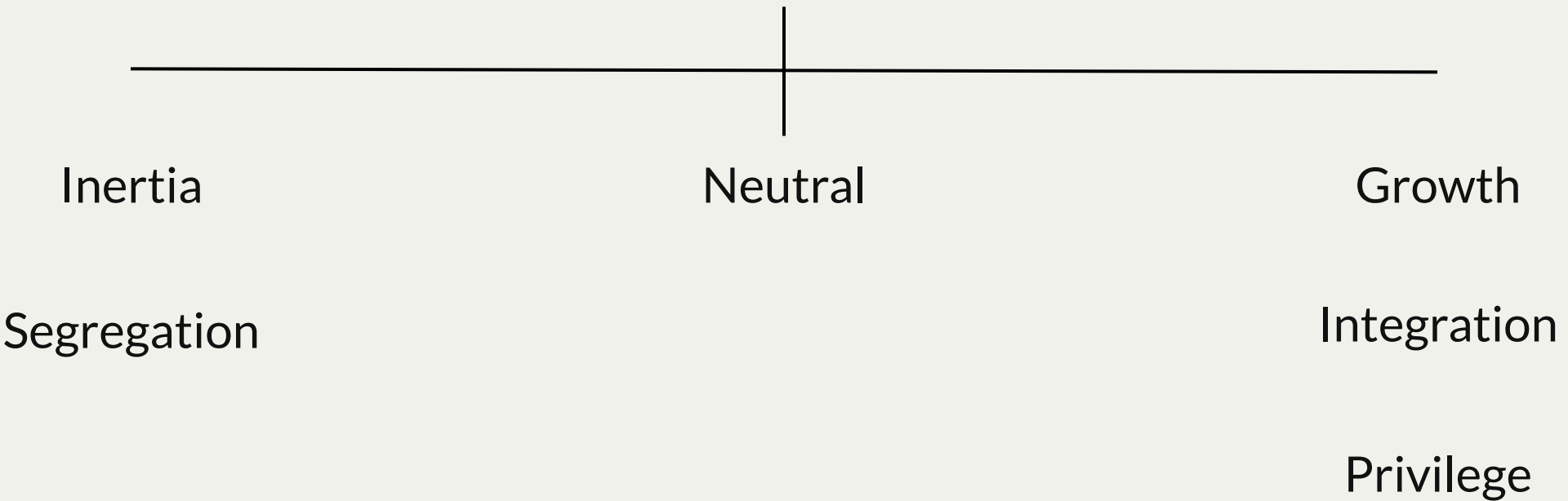
How to grow?

Team S.M.A.R.T. goals

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- Connect various recruiting metrics to compensation each quarter

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- Send a monthly "top 3 challenges and tech stack used" to a NSBE and SWE chapter president as part of 'Free code Fridays'

Team S.M.A.R.T. goals

- Connect various recruiting metrics to compensation each quarter
- Send a monthly "top 3 challenges and tech stack used" to a NSBE and SWE chapter president as part of 'Free code Fridays'
- Follow at least 3:
    - Devs of color, Women, Non-binary
    - Group lunch discussion monthly of one of their topics

Personal S.M.A.R.T. Goals

Personal S.M.A.R.T. Goals

~~Prove me wrong~~

What am I missing?

Personal S.M.A.R.T. Goals

~~Prove me wrong~~

What am I missing?

~~Being right.~~

Being successful.

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In Conclusion...

In Conclusion...

Solve difficult problems

Ability - people with lots of tools

Diversity - people with distinct tools

In Conclusion...

Solve difficult problems

Ability - people with lots of tools

Diversity - people with distinct tools

Efficiently collaborate

Develop emotional intelligence

Additional Stories

- Bring on the female superheroes
- We got it from here, thank you for your service
- The gender ambition myth

Thanks for listening

IDIC

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Sources @fredricmitchell

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Group Intelligence Correlates More with Social Aptitude than IQ - http://blogs.hbr.org/2012/10/collective-intelligence-and-th/

Being an Ally as a Person with Privilege - http://www.scn.org/friends/ally.html

Risk of Speaking Up - http://www.ashedryden.com/the-risk-in-speaking-up

21st Century Talent Spotting: Potential Trumps Brains, experience, and competencies -

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Mathematical Model of Diversity - http://www.nytimes.com/2008/01/08/science/08conv.html

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