

Troubled by Heterogeneity?

**Opportunities for Fresh Views
on Long-standing and Recent Issues
in Biology and Biomedicine**

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Troubled by Heterogeneity!

Audience = mix of:

Theoretical biologists

Philosophers of science

Historians & sociologists of science

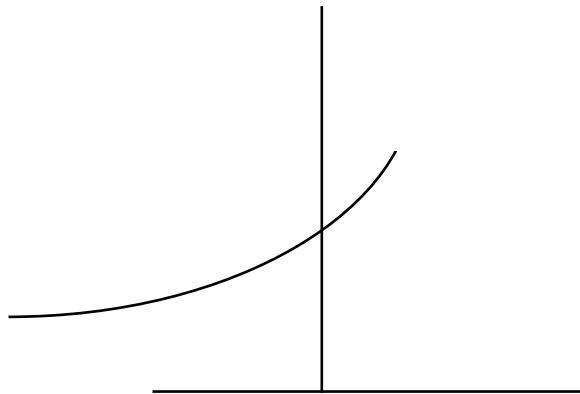
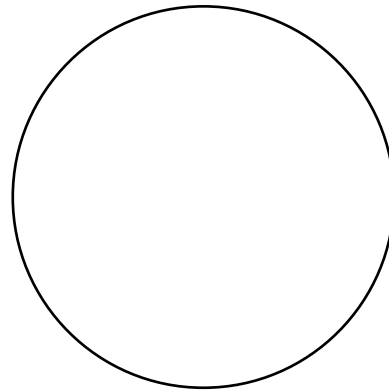
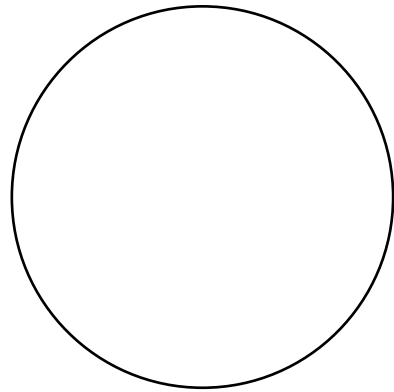
Life scientists

Policy makers

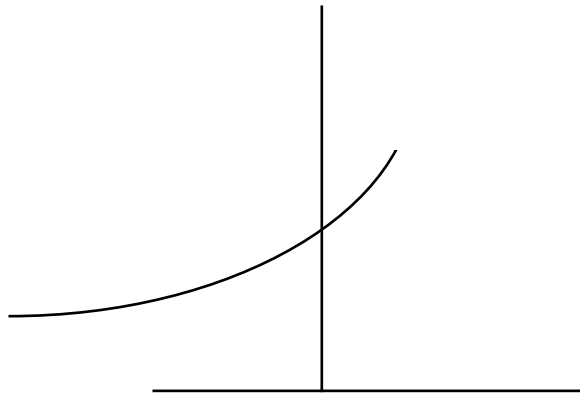
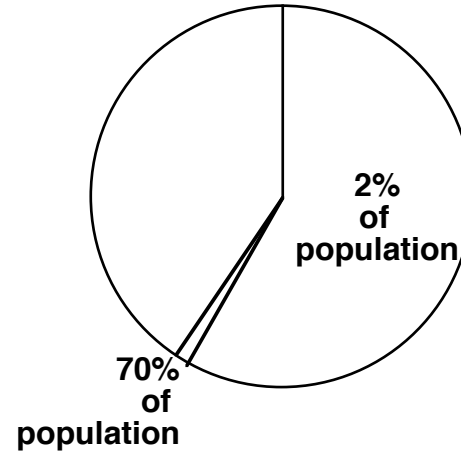
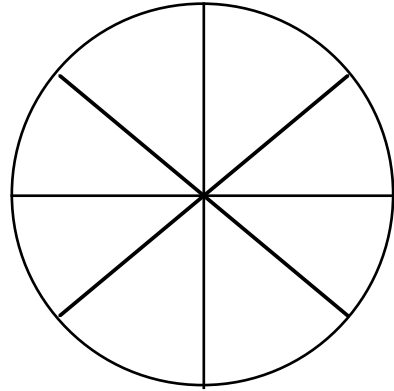
Prologue

**troubling environmental
studies with heterogeneity**

two islands



two islands



**analysis of causes &
implications of the analysis**

change qualitatively

**if uniform units are replaced by unequal
units**

that are subject to further differentiation

as a result of

**their linked economic, social & political
dynamics**

***Unruly Complexity* (U. Chicago Press, 2005)**

= *situations* (in ecology & STS & teaching)

- 1. heterogeneous components**
- 2. built up over time & subject to ongoing restructuring**
- 3. embedded in wider dynamics**

Unruly complexity in ecology ->

**Complexities of biosocial development
(especially social epidemiology)**

Unruly complexity in ecology ->

**Complexities of biosocial development
(especially social epidemiology) ->**

Un/troubled by Heterogeneity?

**Application of human heritability
if “underlying heterogeneity” is possible?**

Heritability

e.g. Heritability of IQ is 60–80%

meaning?

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Heritability

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meaning?

- **genes have more influence on IQ than environment?**
- **changing genes has more influence on IQ than changing environment?**
- **variation among means of genetic varieties (averaged across all locations) > variation of means of locations (averaged over all varieties)**

**underlying heterogeneity =
heterogeneity of genetic & environmental
factors underlying development of trait**

Location → L1 L2 L3 L4 L5 L6 L7 L8

Twin Pair

↓
TP1

{ DZT

TP2

{ MZT AAbbccDDee // FghiJ

TP3

{ MZT

genetic factors
(pairs of alleles)

TP4

{ DZT

sequence of
environmental
factors

TP5

{ DZT

TP6

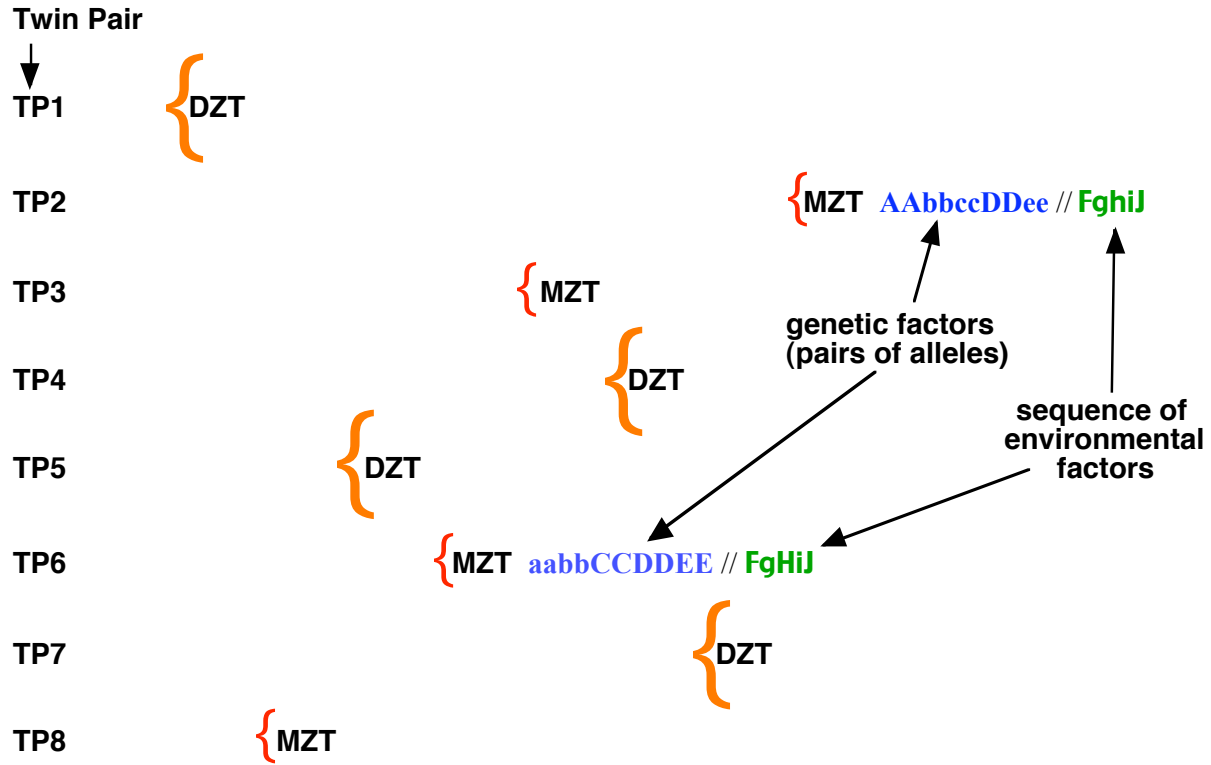
{ MZT aabbCCDDEE // FgHiJ

TP7

{ DZT

TP8

{ MZT



Application of human heritability if underlying heterogeneity is possible??

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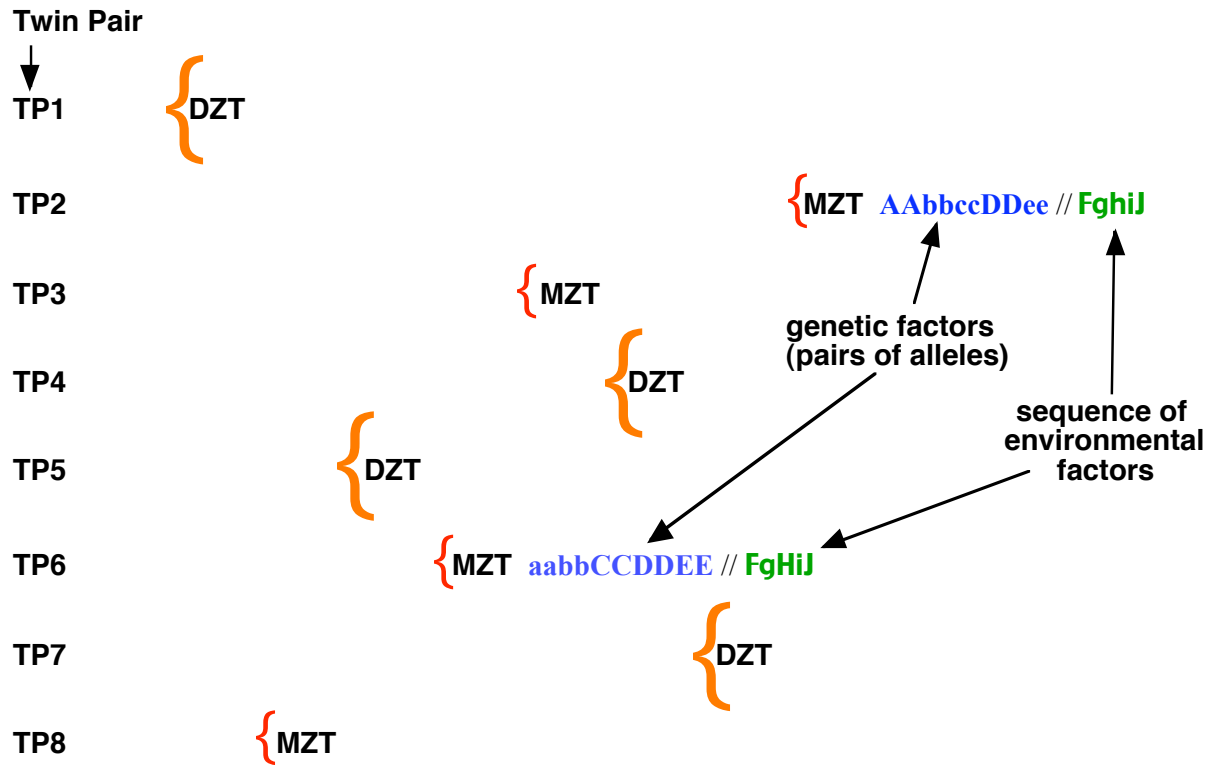
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TP7

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TP8

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Application of human heritability

if underlying heterogeneity is possible??

- Undertake research w/o reference to trait's heritability
- Use high heritability => trait is potentially worthwhile candidate for molecular research
- Restrict attention to variation within a set of relatives
- Focus on heritability as a fraction of the variation (useful in ag. & lab. breeding)
- Restrict range of varieties or locations

**Underlying heterogeneity
not (yet) recognized as significant**

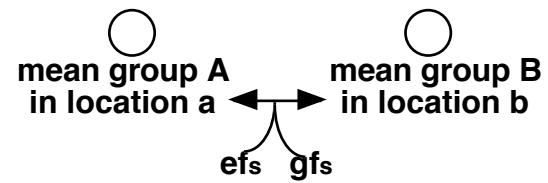
Underlying heterogeneity

not recognized as significant

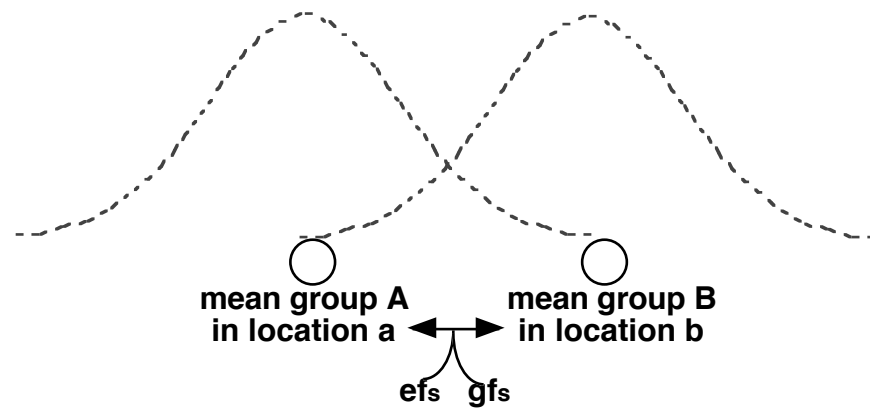
-> deeper social/historical & conceptual roots?

-> opportunities for fresh views on long-standing & recent issues in biology & biomedicine?

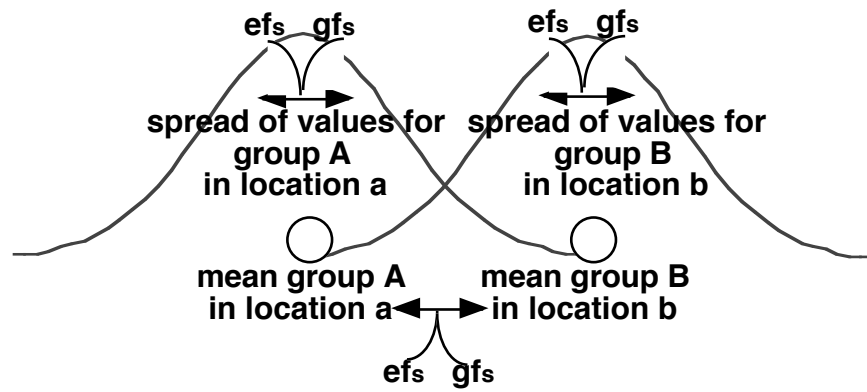
Conceptual: from typological thinking to recognizing possible underlying heterogeneity



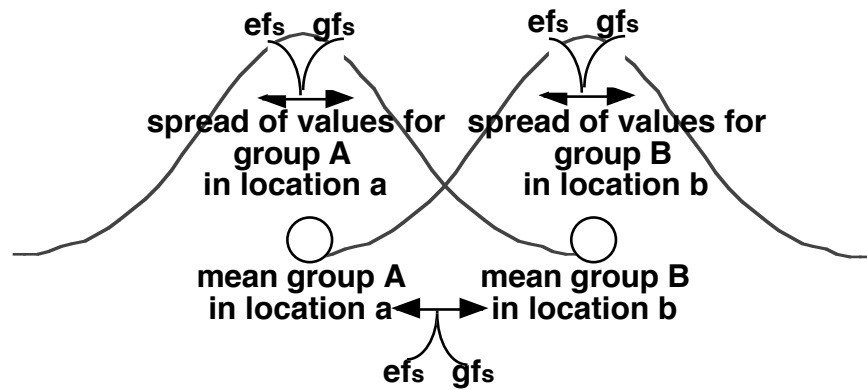
From typological thinking to recognizing possible underlying heterogeneity



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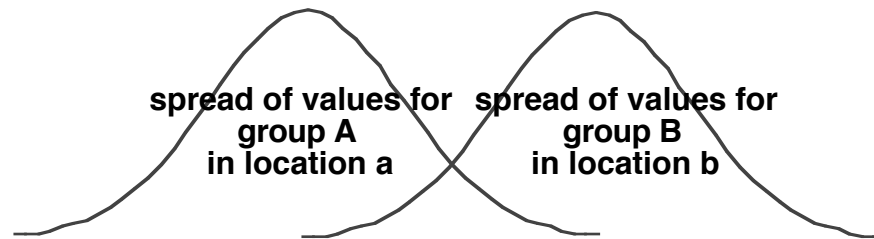


From typological thinking to recognizing possible underlying heterogeneity

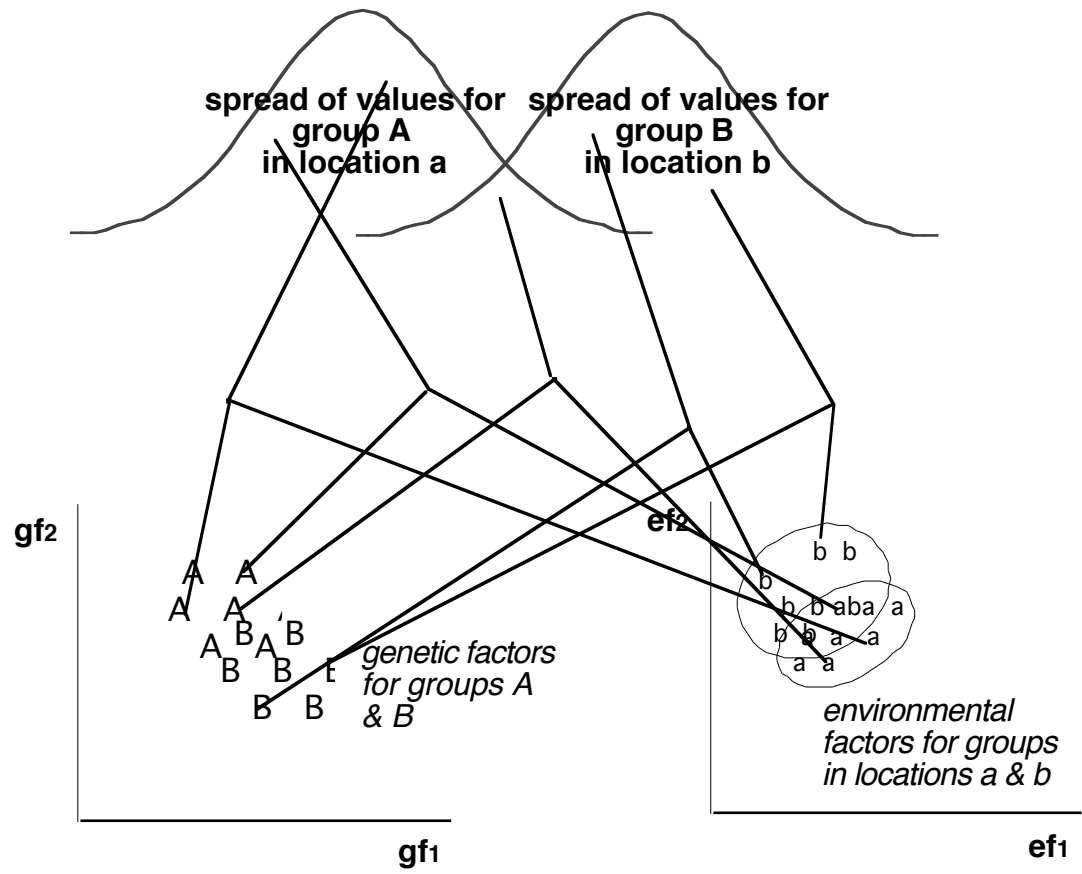


Q: Why treat observations this way?

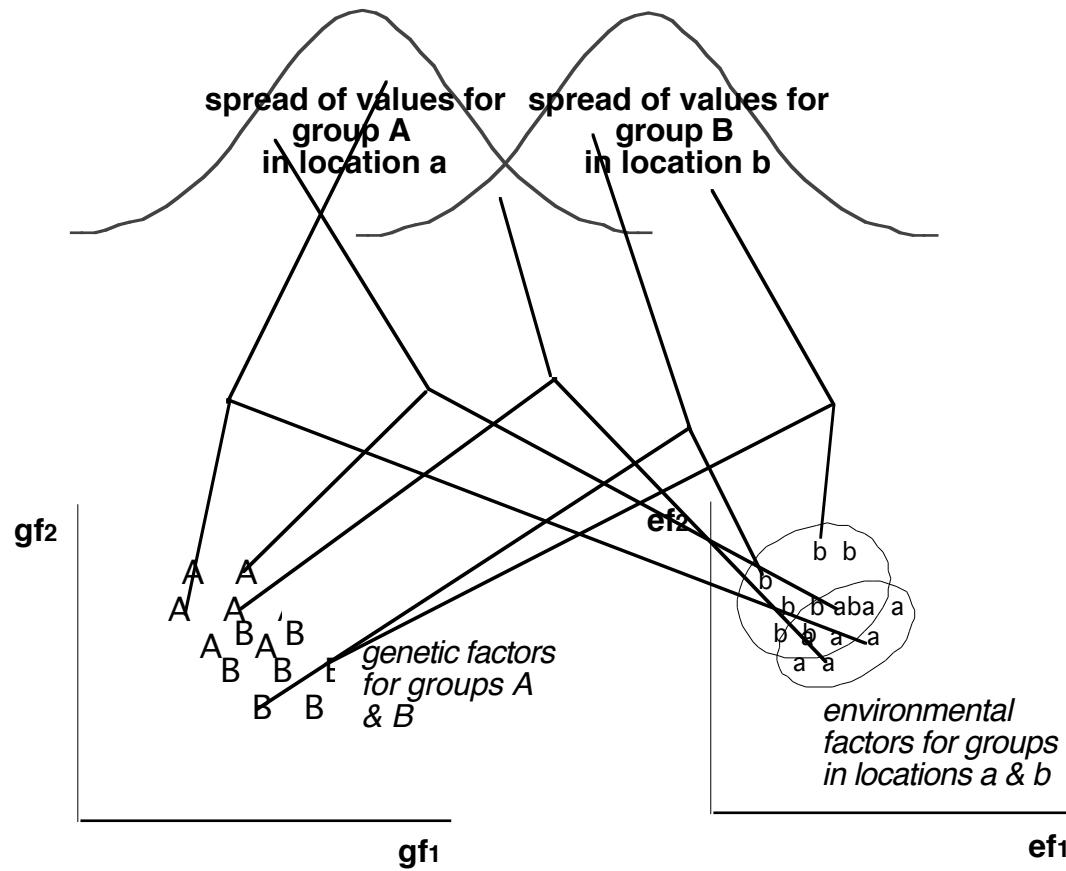
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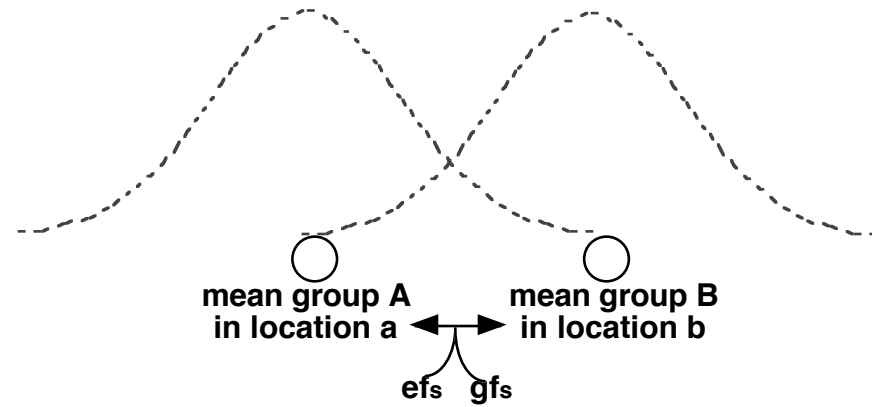
From typological thinking to recognizing possible underlying heterogeneity



Q: How to expose these factors?

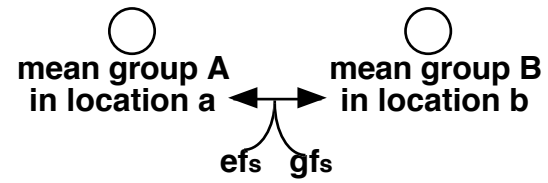
Social-historical underpinnings:

heterogeneity-control-infrastructure-participation

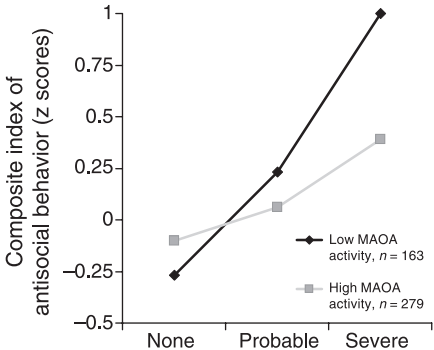


Social-historical underpinnings:

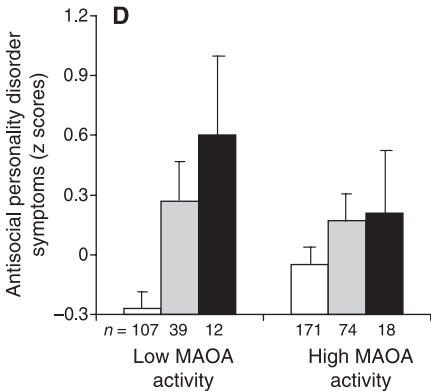
heterogeneity-control-infrastructure-participation

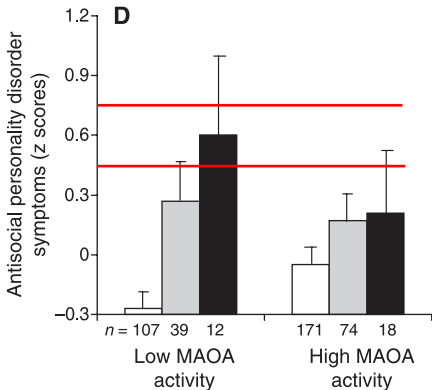


Caspi, A., et al. (2002)
"Role of Genotype in the Cycle of
Violence in Maltreated Children."
Science 297: 851-854.

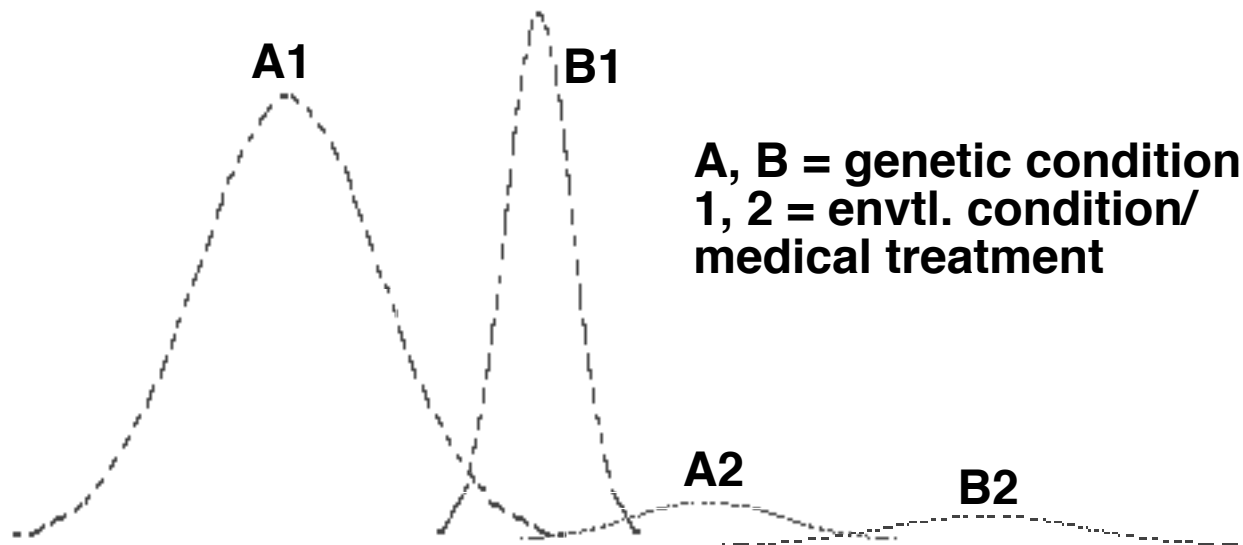


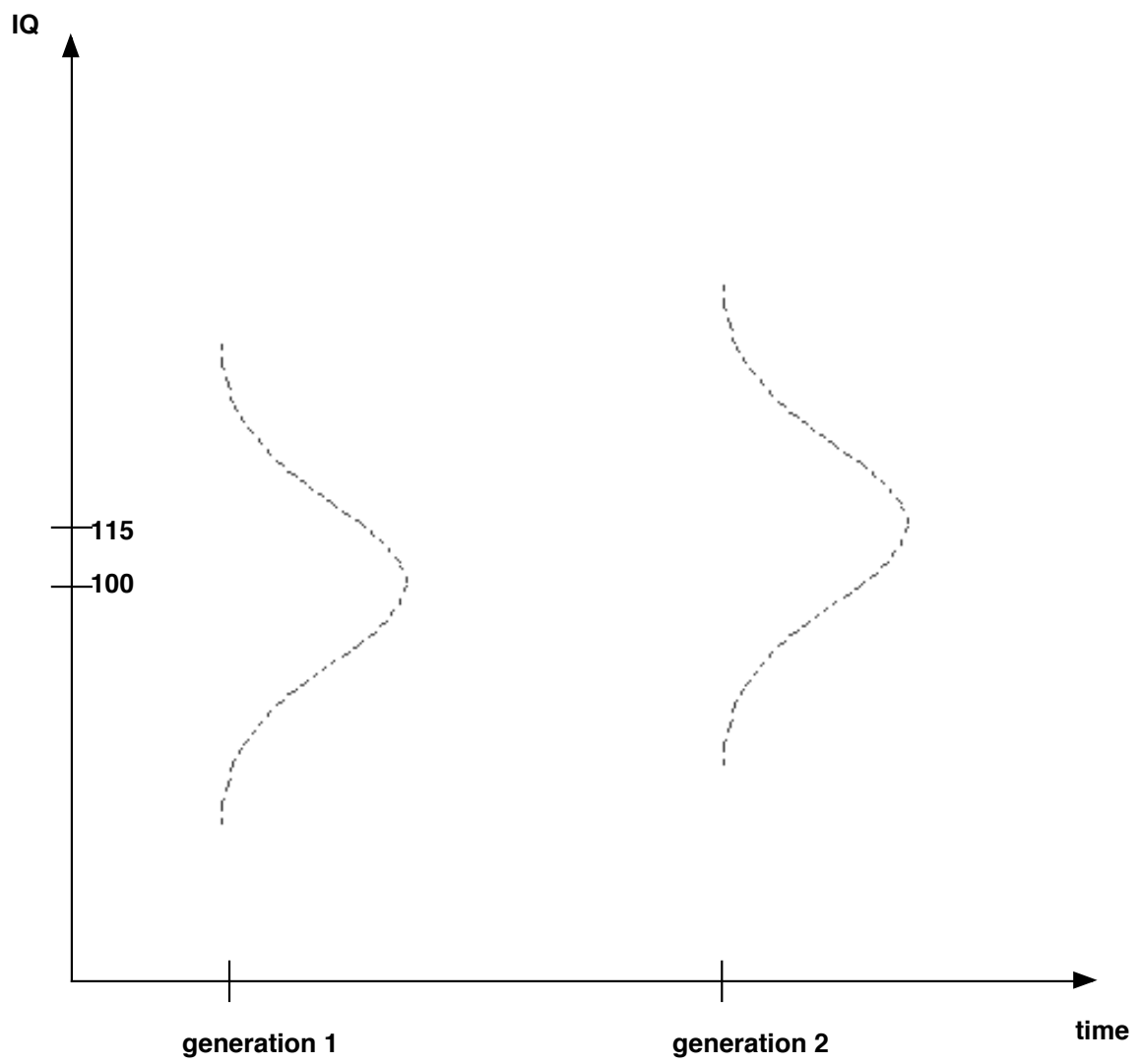
Childhood Maltreatment	MAOA	
	low	high
No or Probable	low anti- social	low anti- social
Severe	HIGH ANTI- SOCIAL	low anti- social

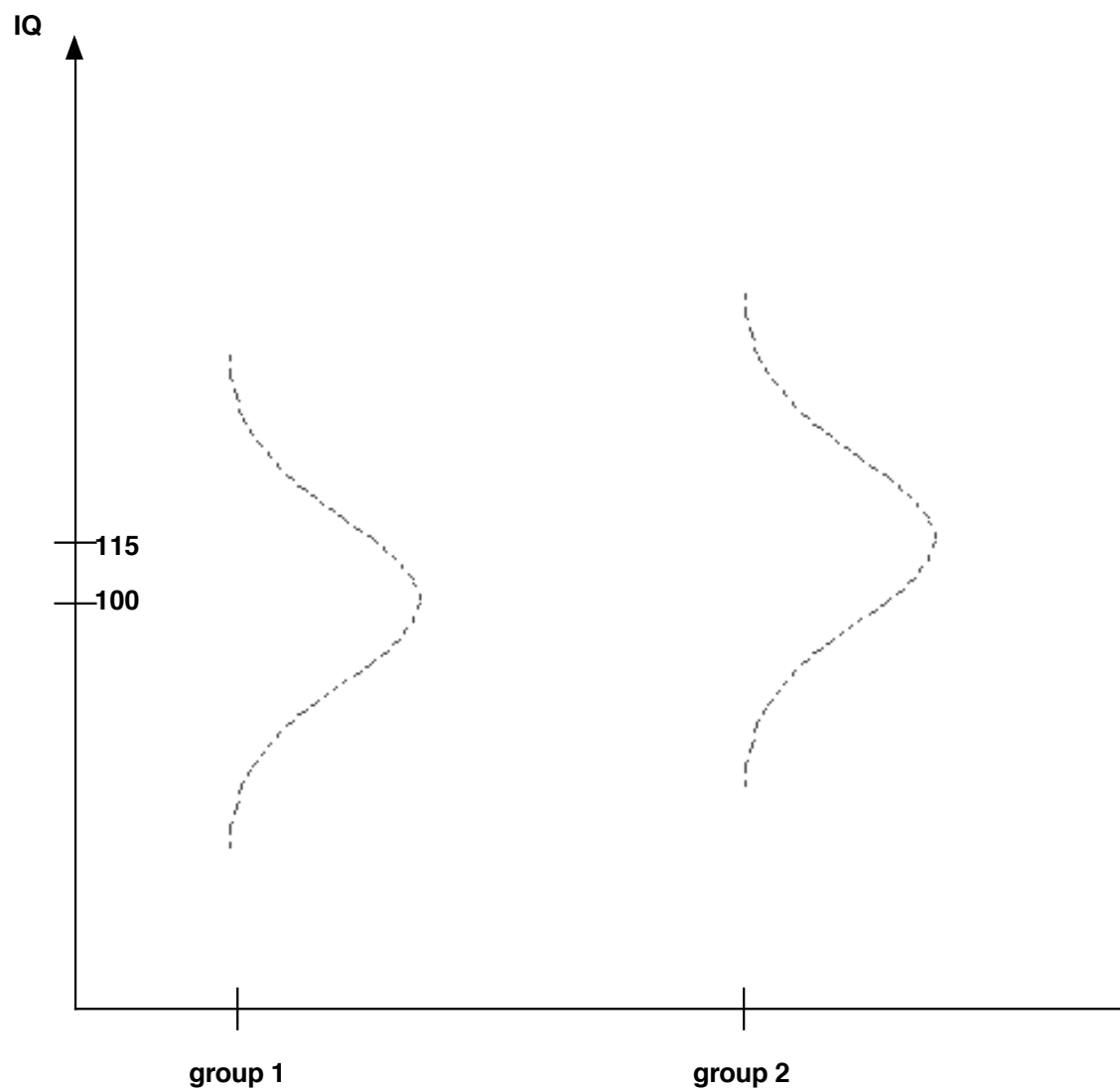




Childhood Maltreatment	MAOA	
	low	high
No or Probable	low anti-social	low anti-social
Severe	HIGH ANTI-SOCIAL	low anti-social







P/H

PKU posed
~~PKU~~ Consider
~~diagnosis~~

low IQs & other deficits

teratogenic
~~maternal~~ ~~causes~~
fetus

diagnosis & care

neo natal

diet

hard to maintain

improvement

decrease

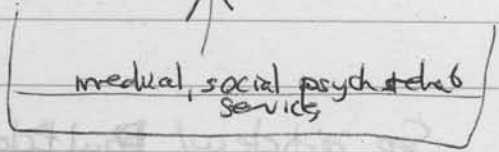
improvement

social support

mandated testing

subsidy + drug classification (till 1972)

religious + ethnic identity



wider social context

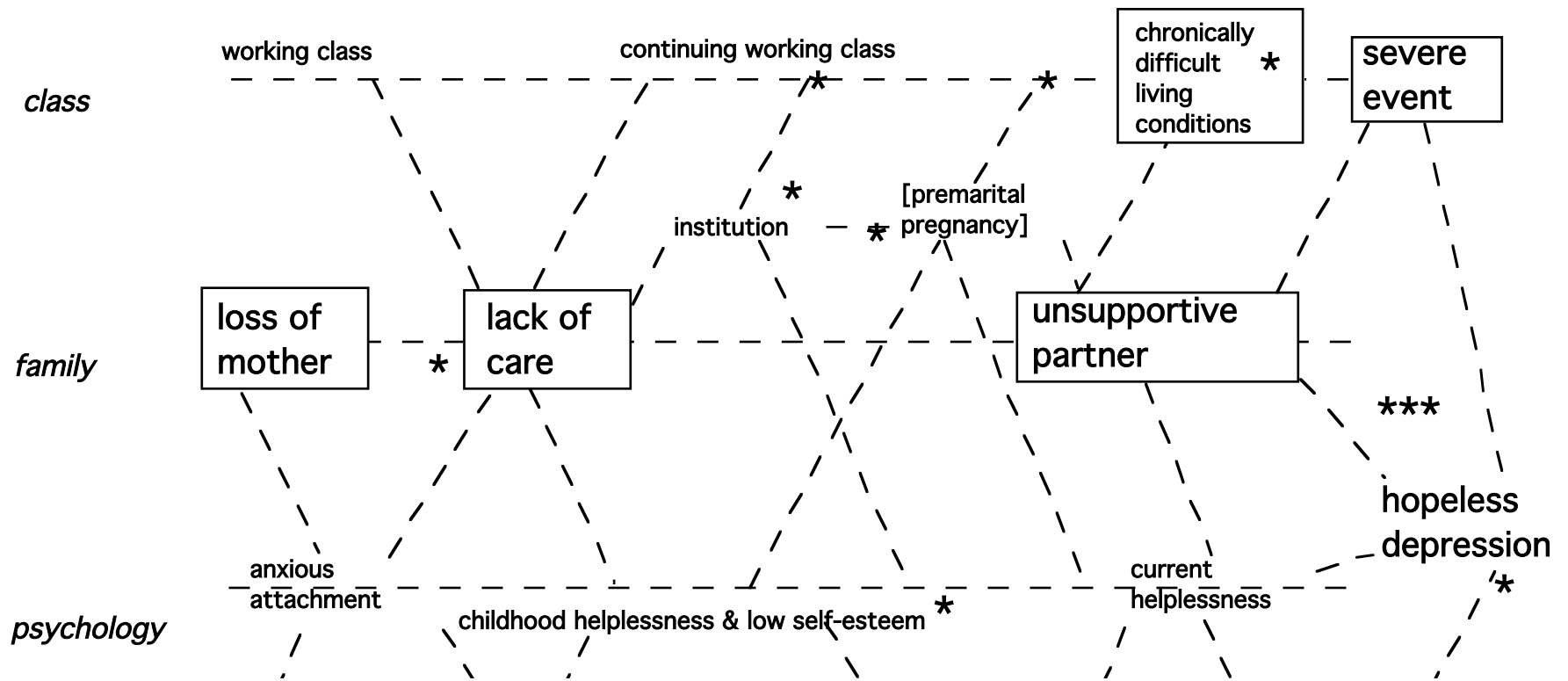
bio-medical vs psychological curing + care of change

0

s/6

teenager

young adulthood



*hypothetical
genetics/
biochemistry*

* = point of
possible
intervention



Troubled by Heterogeneity?

Theoretical biologists?

Philosophers of science?

Historians & sociologists of sci.?

Life scientists?

Policy makers?


research and application of resulting knowledge

not troubled by  *pay more attention to*

variation, particularity, heterogeneity

to the extent that

populations are well controlled

 possibilities for participation

*established and
maintained through*

inviting more attention to

considerable effort or social infrastructure