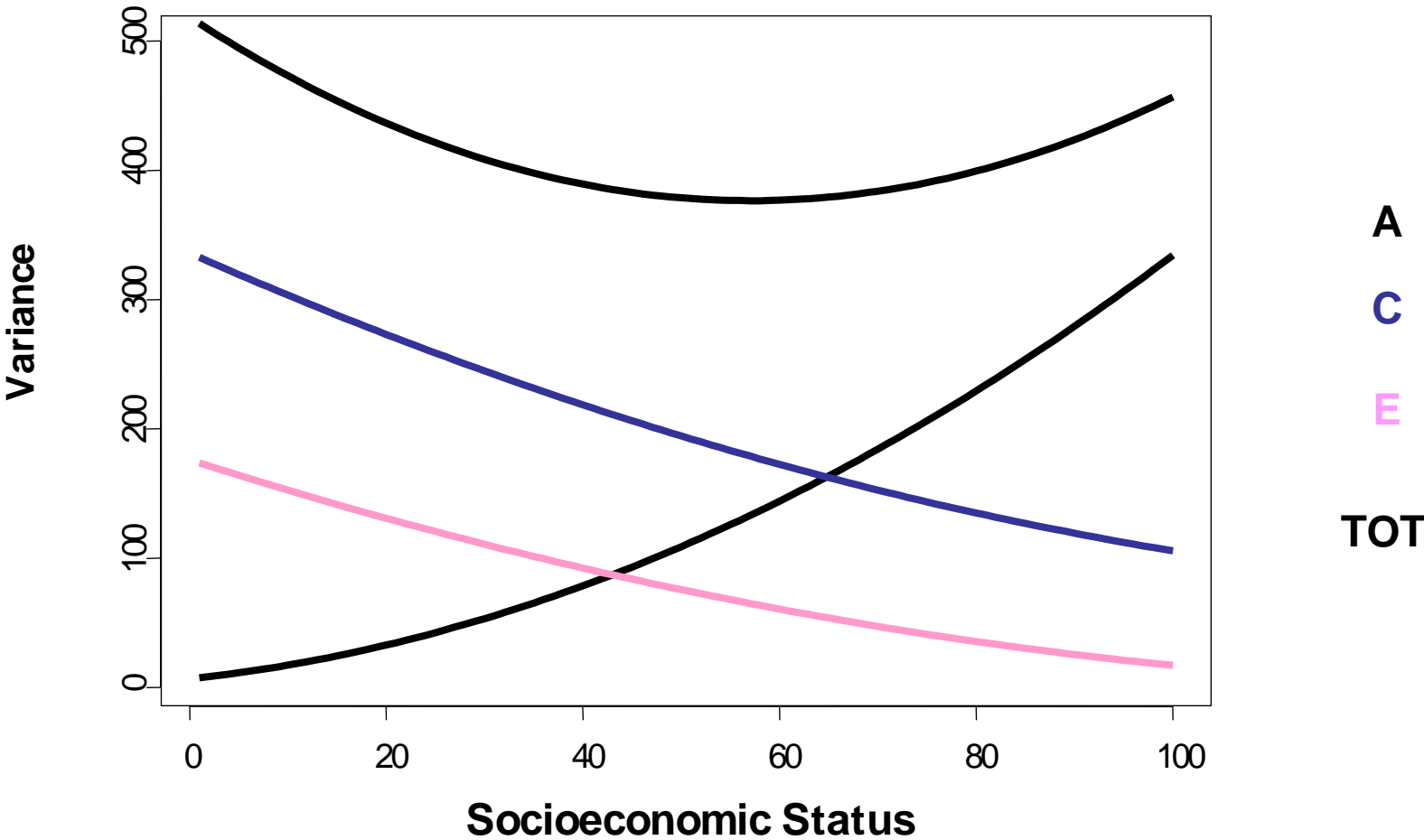


The Costs and Benefits of Using Lousy Measures of the Environment

Eric Turkheimer
University of Virginia

Variance Components by SES

Nature Precedings : doi:10.1038/npre.2008.2655.1 : Posted 13 Dec 2008



Can SES be Decomposed?

- Environmental or genetic?
- Assuming it's environmental....
 - What does it consist of?
 - Can we identify the components of environment that are most important to change?
- No

The Nonshared Environment Project

Three Laws of Behavior Genetics

1. Everything is heritable
2. Families contribute a relatively small portion of the variability in genetically informed studies
3. *Most variability in human behavior cannot be predicted from genes or environment.*

The Non-shared Environment is the Paradigmatic Problem in Human Scientific Psychology

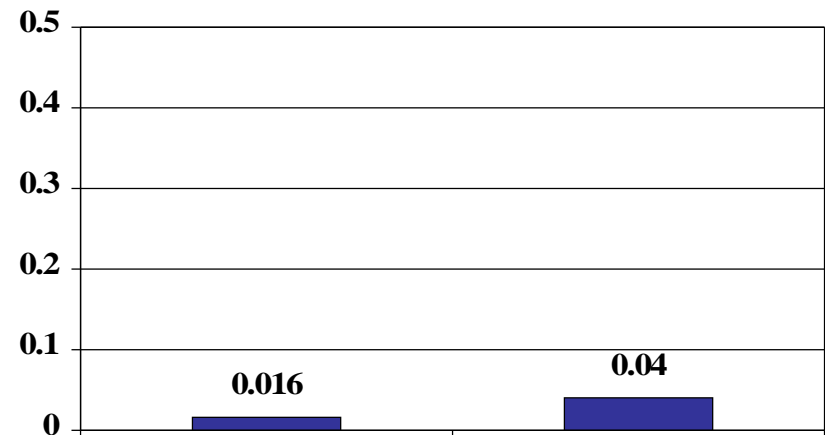
Three step research program

(Plomin and Daniels)

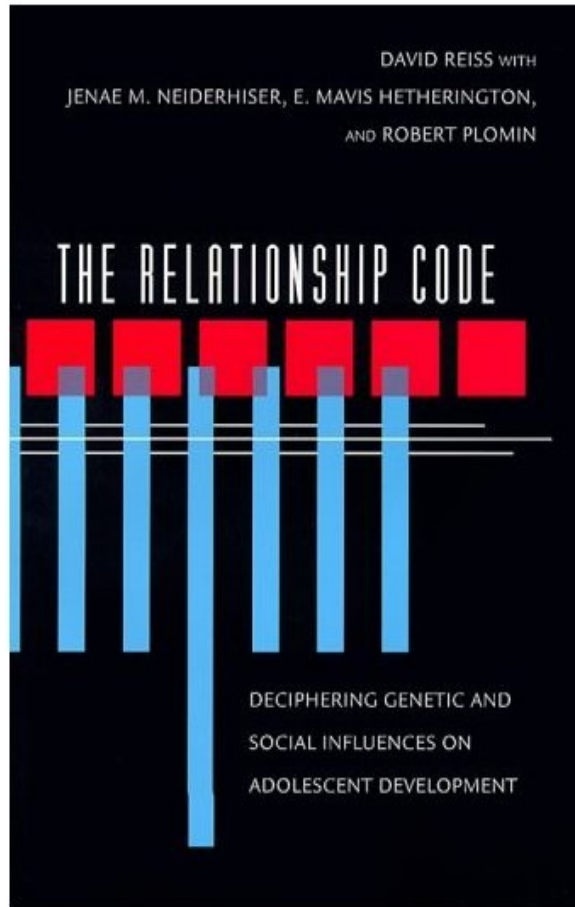
- 1) Quantify Within Family Environment
- 2) Identify Specific Within Family Variables
- 3) Causal Associations between Within Family E and Behavior

Meta-analysis

- Studies including measured nonshared environmental variable.
- Median R^2 about .02
- Conclusion: Measured nonshared effects do not add up to variance component.



The NEAD Study



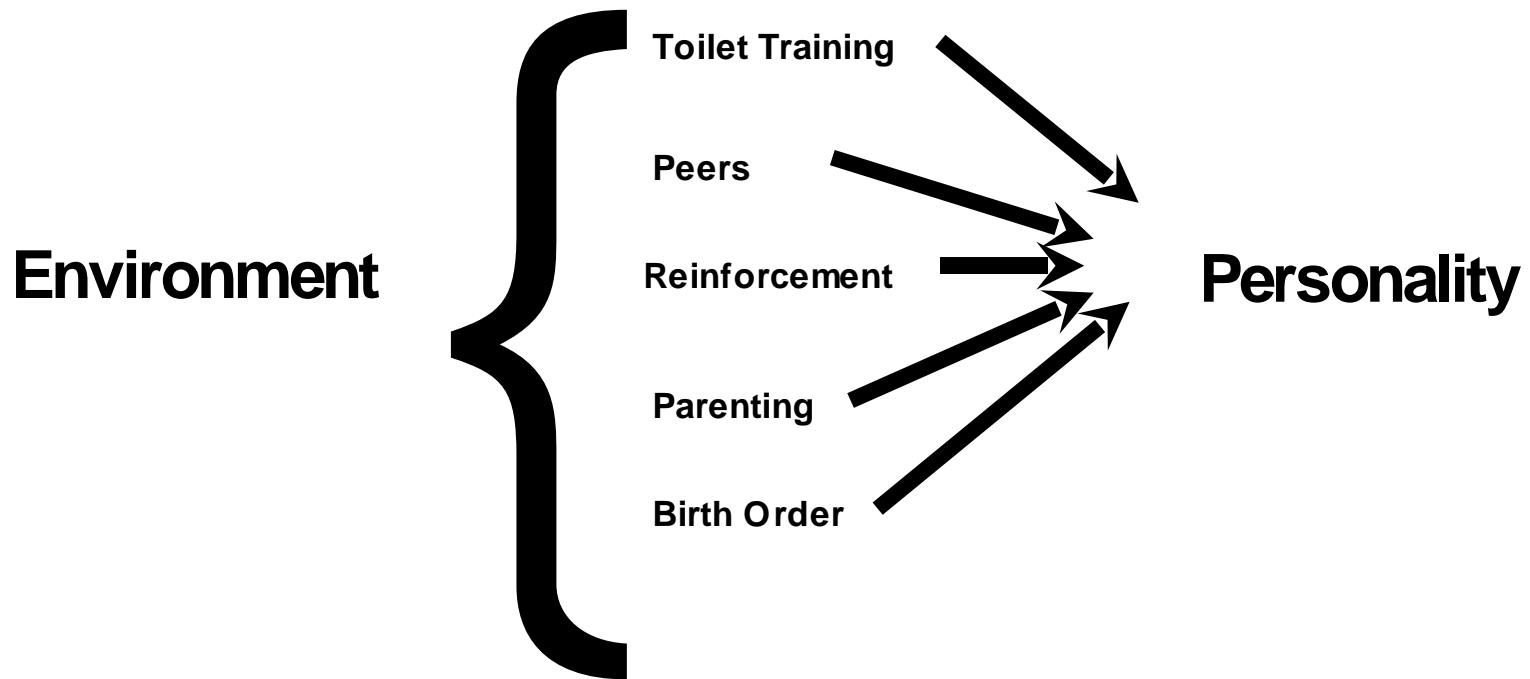
- Families with pairs of MZ and DZ twin, sibling, half sibling and unrelated children
- What makes them different?
- Nothing

Why?

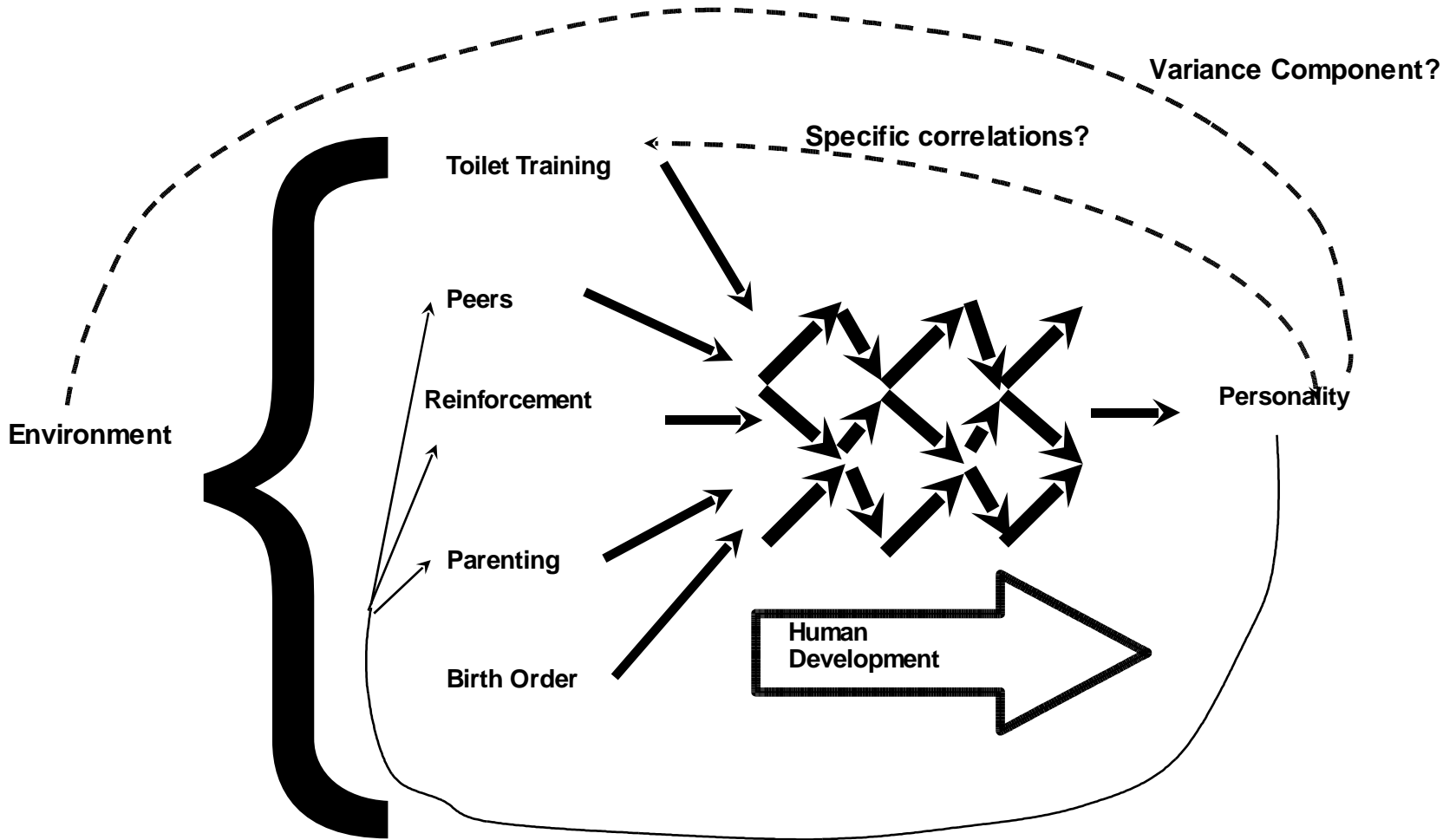
Big Environmental Cause Model

Toilet Training → **Personality**

Complex Environmental Causation Model

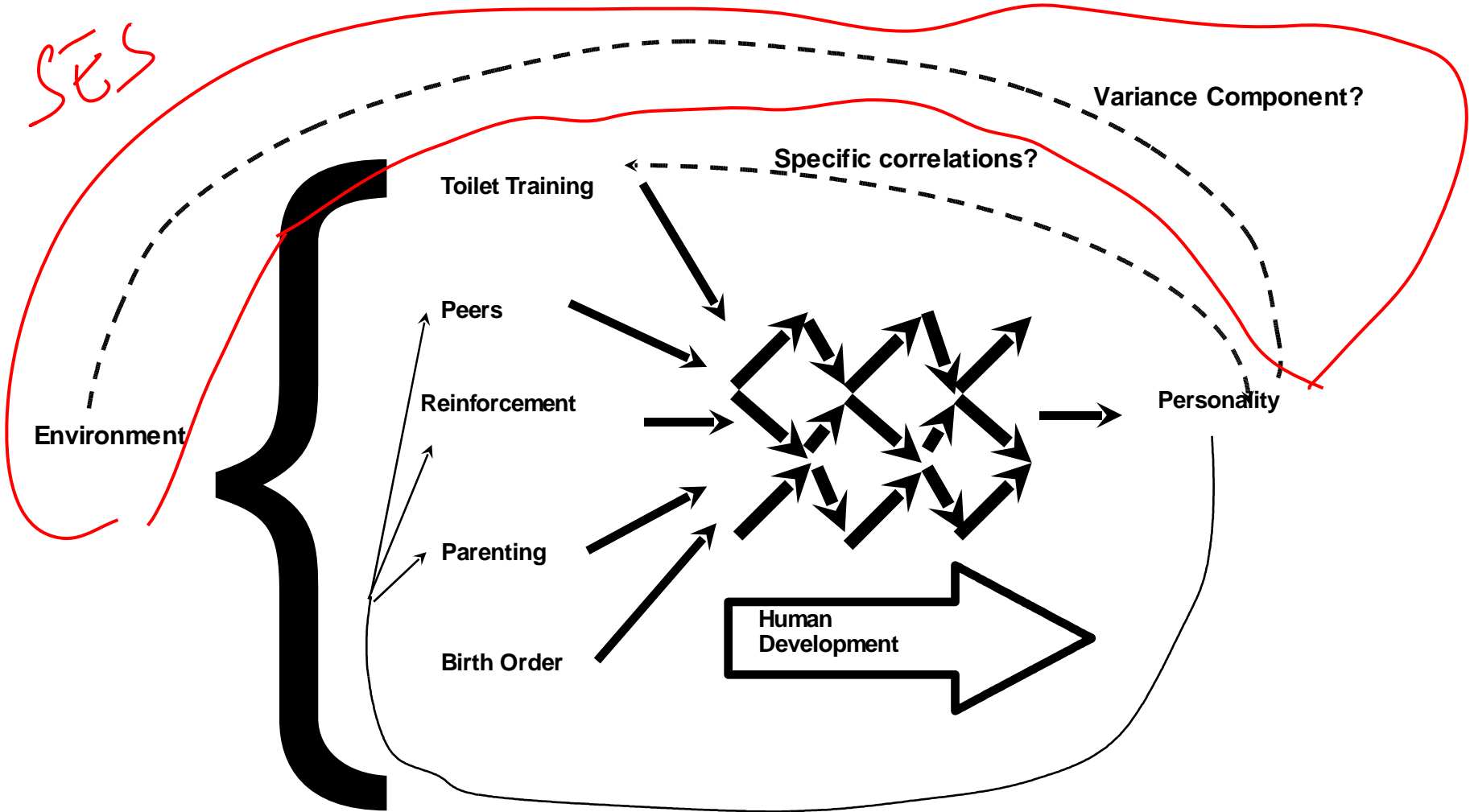


*Complex Environmental Causation



*Complex Environmental Causation

SES



The best scientific model for the molecular genetics of complex behavior comes from the non-shared environment

Nonshared Environment

Three step research program

- 1) Quantify Within Family Environment
- 2) Identify Specific Within Family Variables
- 3) Causal Associations between Within Family E and Behavior

Three step research program

- 1) Quantify Heritability
- 2) Identify Specific Within Family Variables
- 3) Causal Associations between Within Family E and Behavior

Three step research program

- 1) Quantify Heritability
- 2) Identify Specific QTLs
- 3) Causal Associations between Within Family E and Behavior

Three step research program

- 1) Quantify Heritability
- 2) Identify Specific QTLs
- 3) Causal Associations between Within Family E and Behavior

The Human Genome Project

- 1) Quantify Heritability
- 2) Identify Specific QTLs
- 3) Causal Associations between QTLs and Behavior

Big Environmental Cause Model

Toilet Training → **Personality**

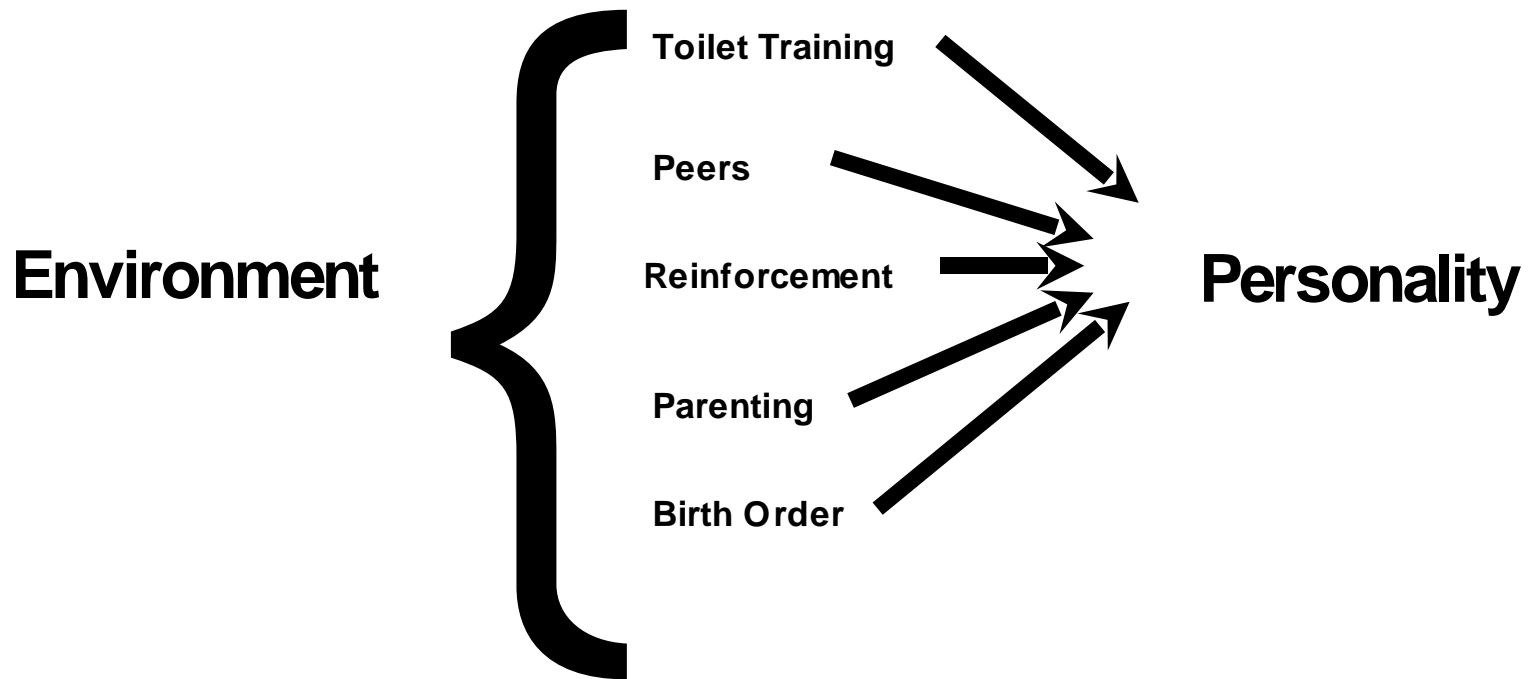
One Gene One Disorder (OGOD) Model

**Single Major
Locus**

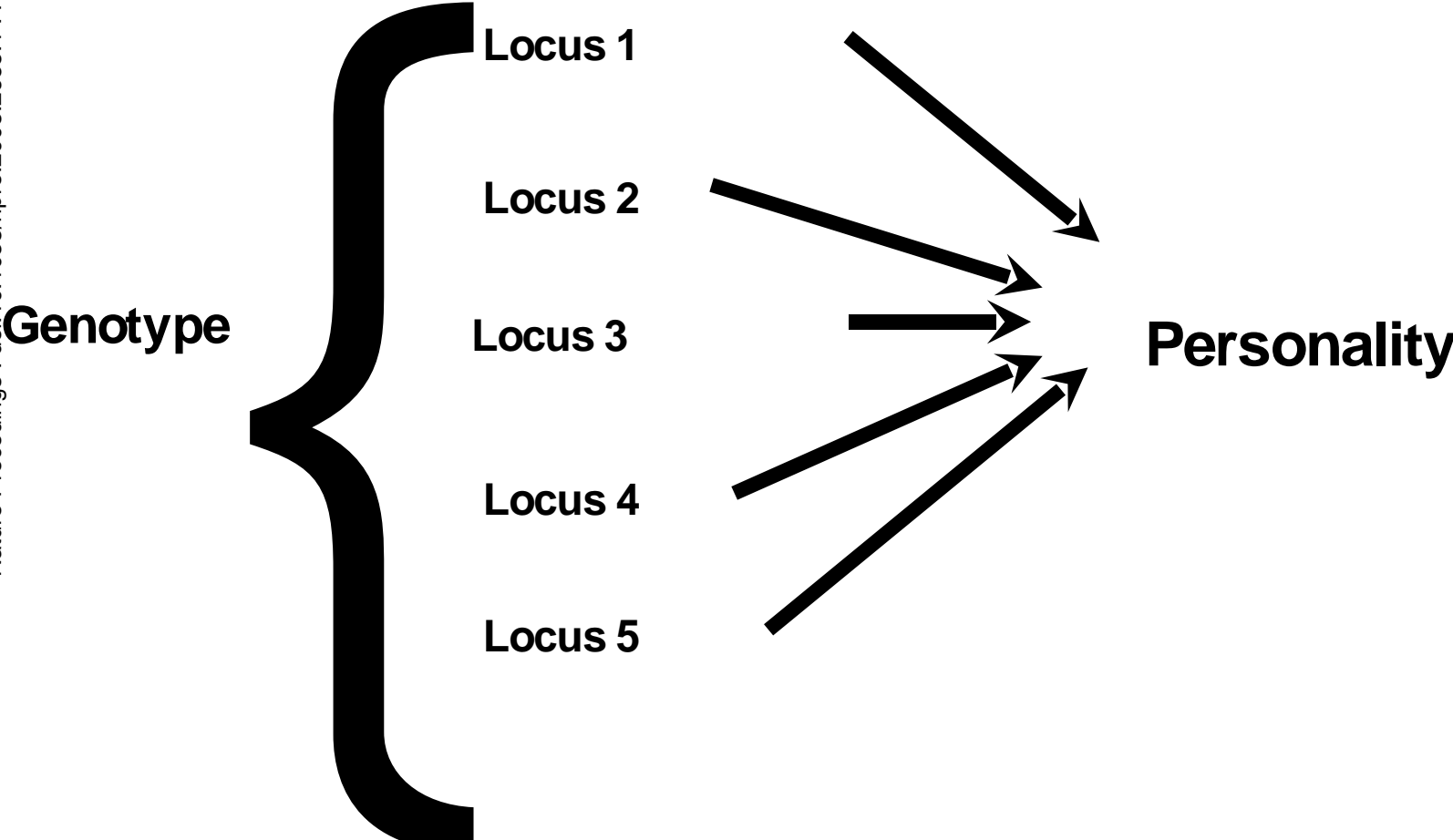


OCEAN

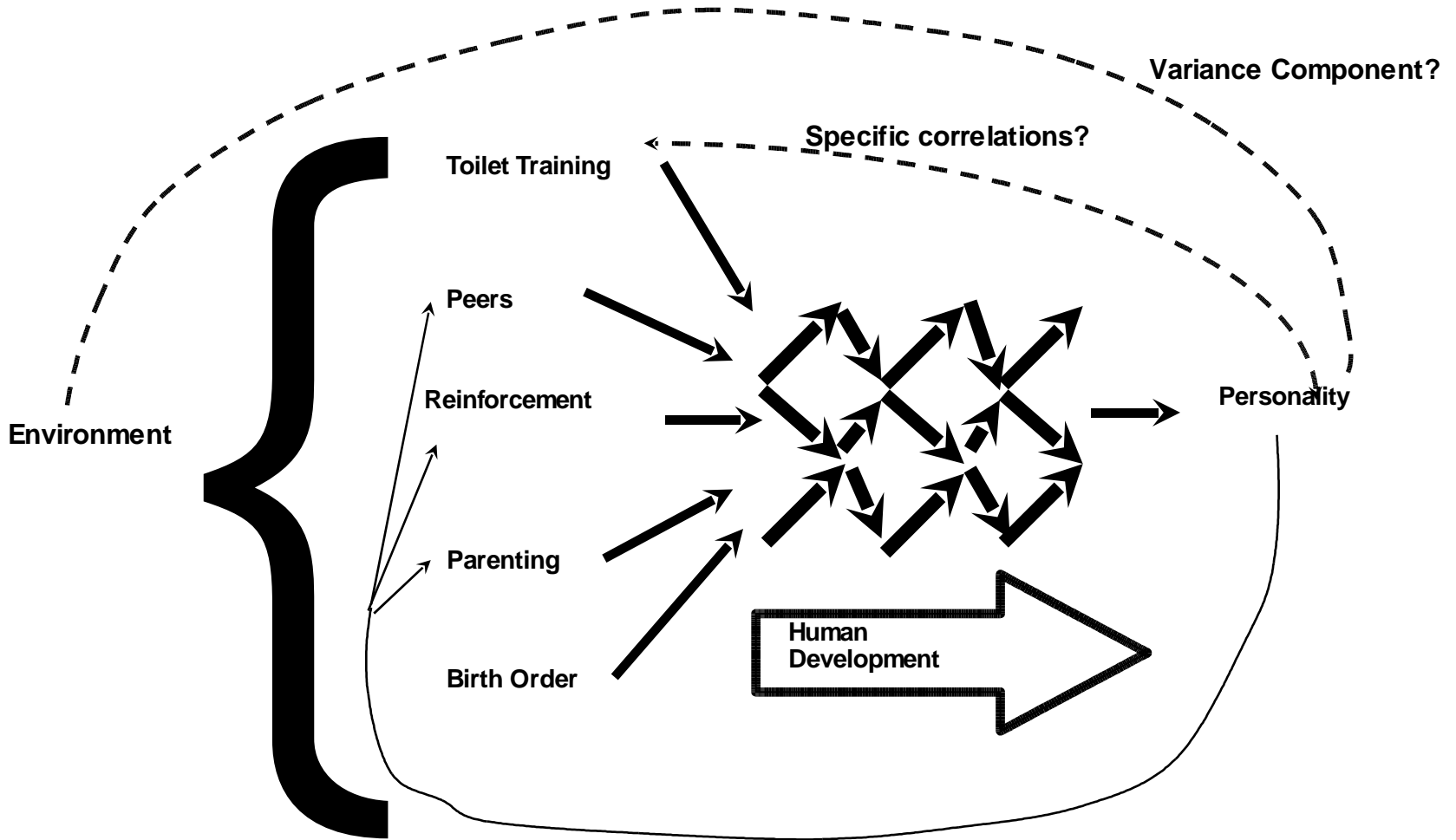
Complex Environmental Causation Model



Complex Genetic Cause (QTL) Model

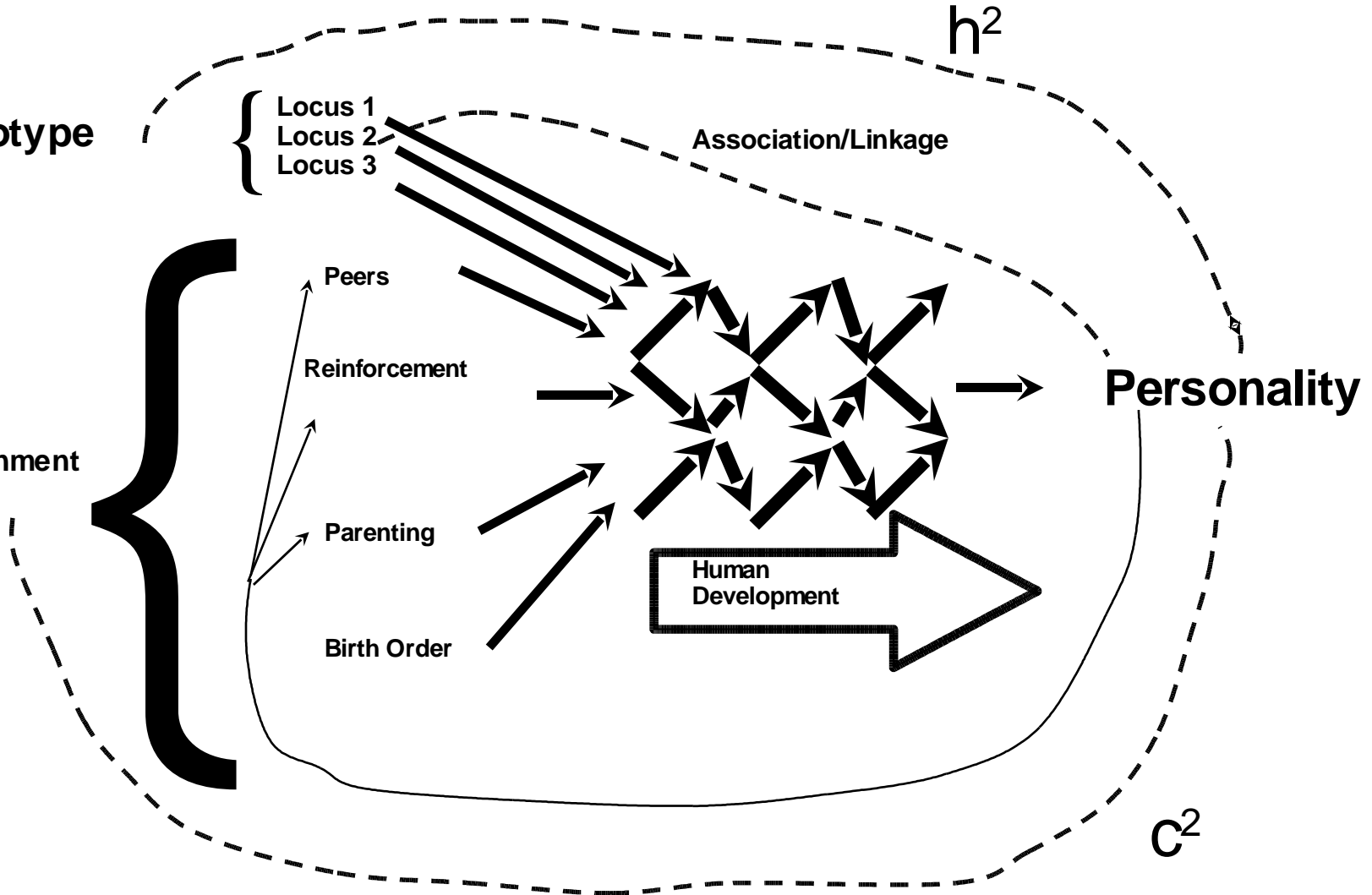


*Complex Environmental Causation



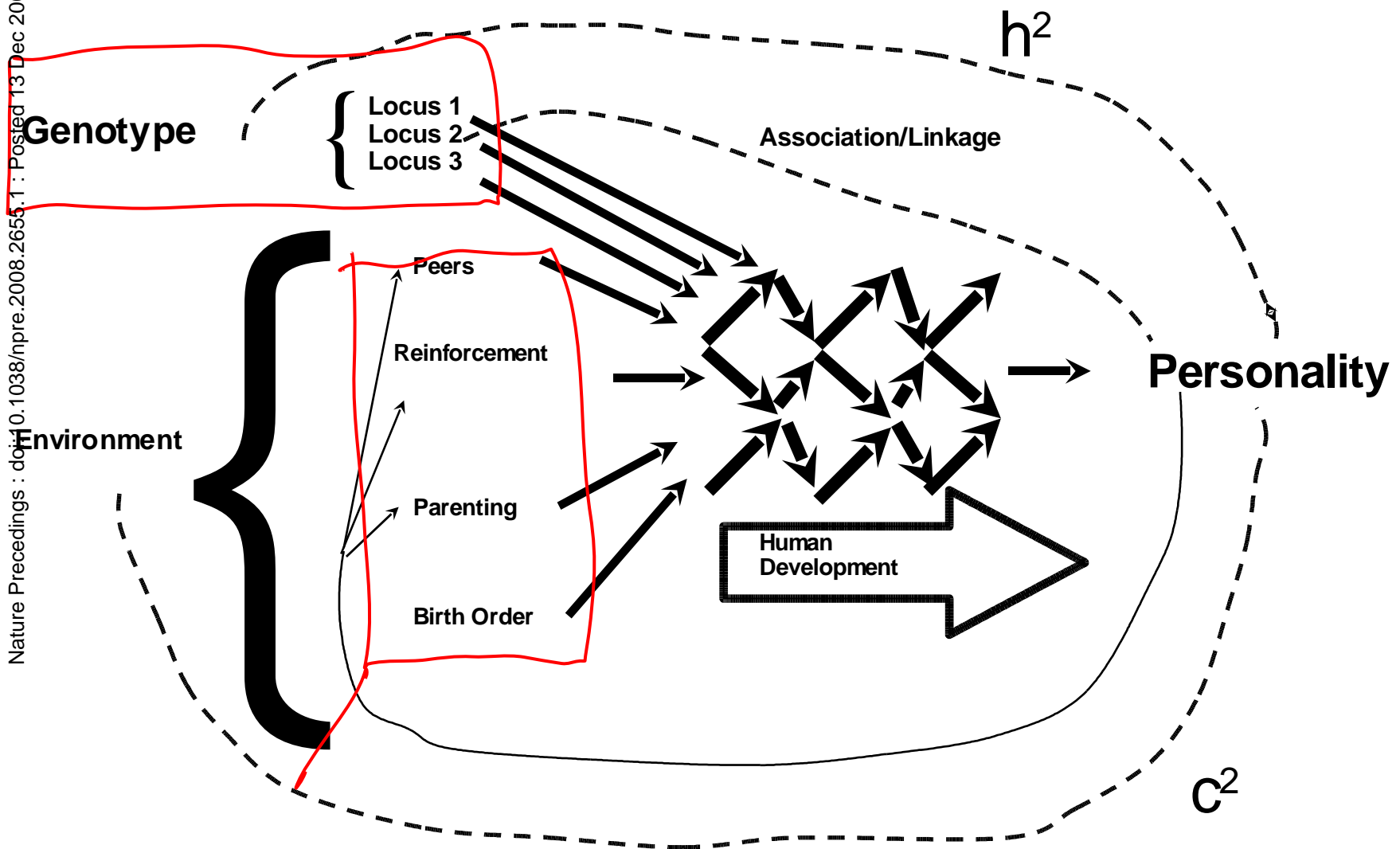
*Complex Genetic Causation

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*Complex Genetic Causation

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Conclusion

- Environmental and genetic causation are more alike than different
- Both are detectable when measured coarsely
 - Twins; SES
- Both are hard to detect when measured well

The Gloomy Prospect is True

One gloomy prospect is that the salient environment might be unsystematic, idiosyncratic, or serendipitous events such as accidents, illnesses, or other traumas... Such capricious events, however, are likely to prove a dead end for research. More interesting heuristically are possible systematic sources of differences between families. (Plomin & Daniels, p. 8)

Rowe's Rule

- If small genetic associations are inevitable, not surprising
- How will we know when we are getting somewhere?
 - When the prediction of behavior from allelic data approaches prediction from parental phenotypes

