Inherited = ?

Inherited =

If parents have it, offspring more likely to as well.

Inherited thru transmitted genes

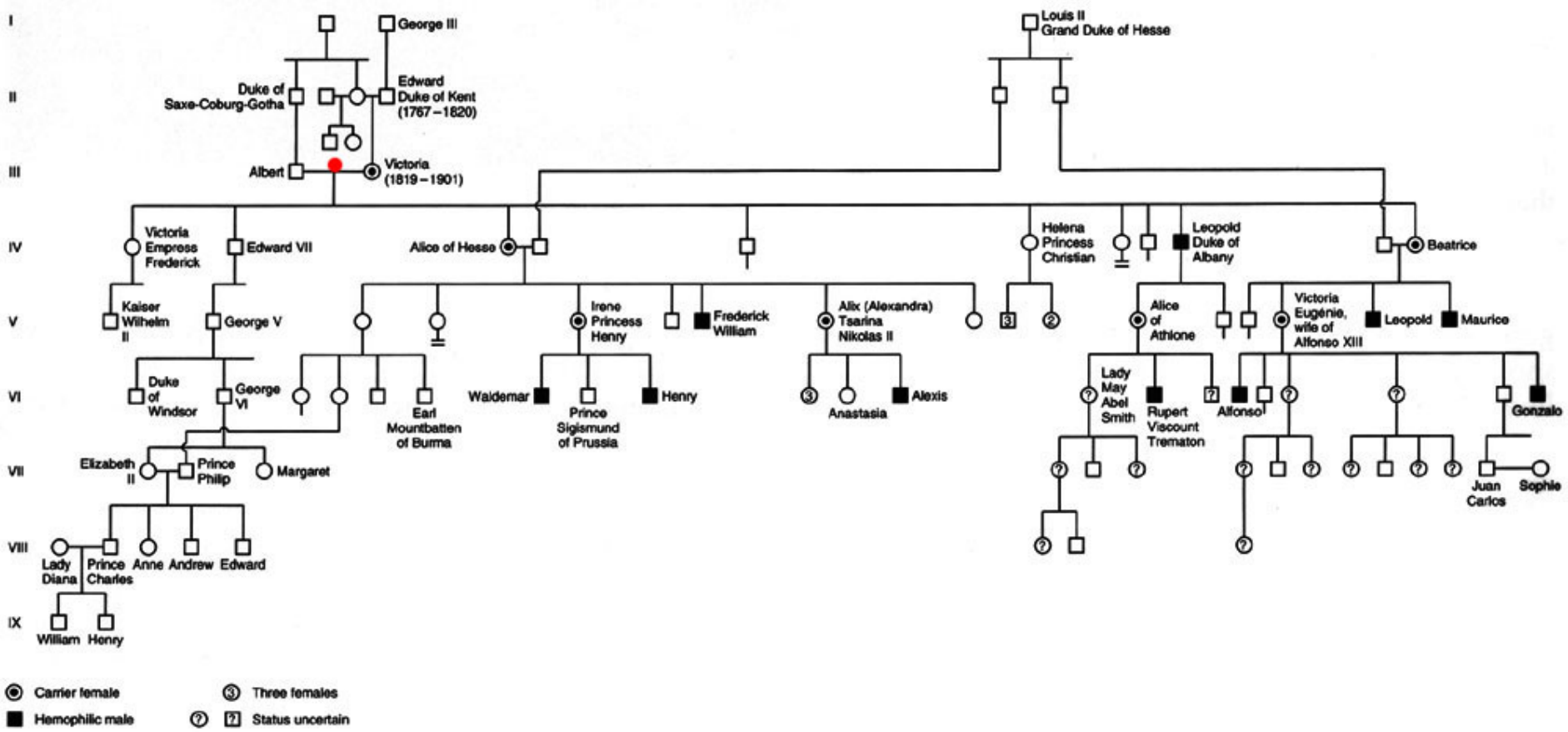
Inherited thru transmitted genes

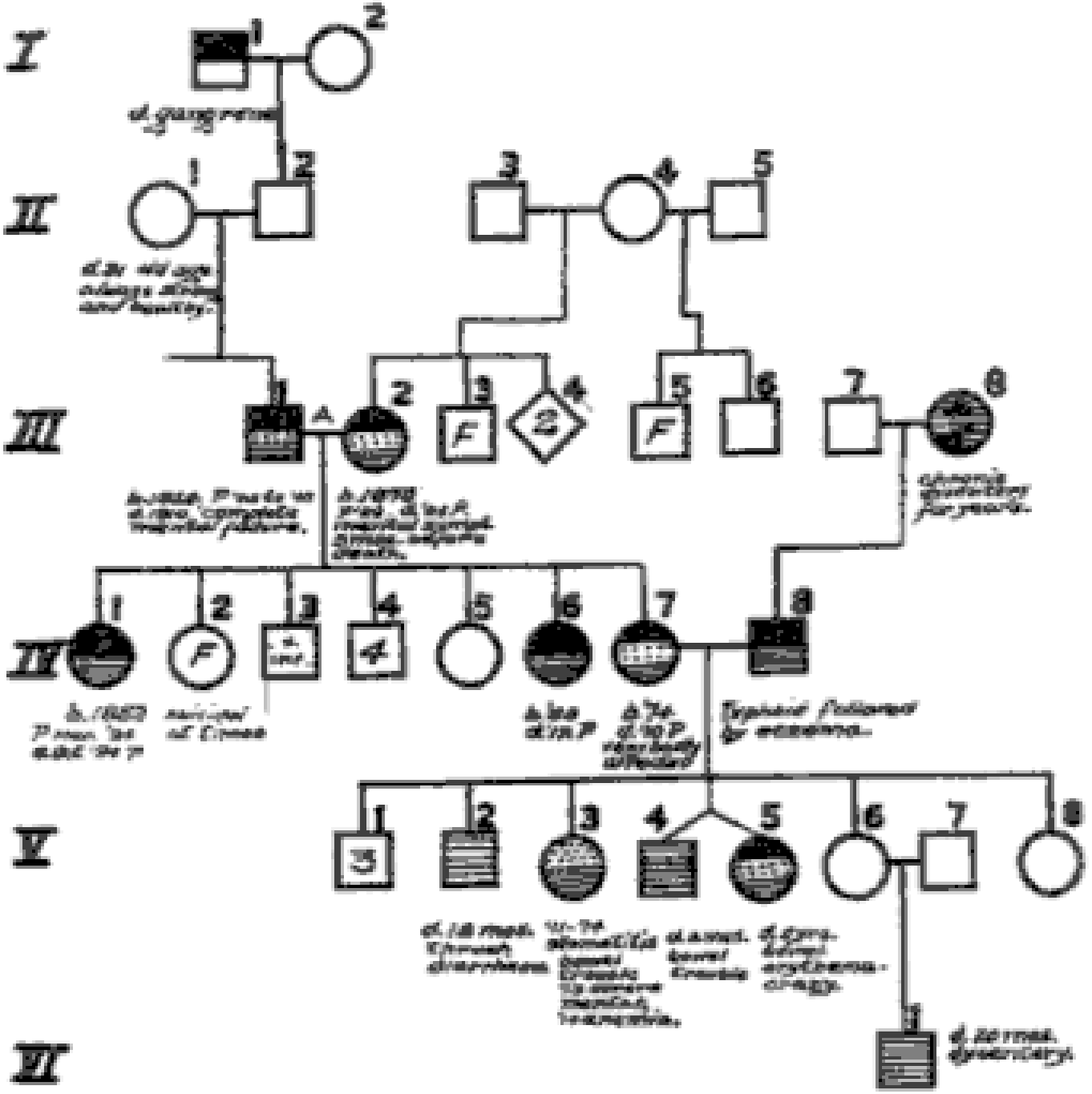
evidence = ?

Inherited thru transmitted genes

evidence = ?

1. genealogies


I
II
III
IV
V
VI
VII
VIII
IX
George III
Duke of Saxe-Coburg-Gotha
Edward Duke of Kent (1767–1820)
Albert
Victoria (1819–1901)
Louis II Grand Duke of Hesse
Victoria Empress Frederick
Edward VII
Alice of Hesse
Helena Princess Christian
Leopold Duke of Albany
Beatrice
Kaiser Wilhelm II
George V
Irene Princess Henry
Frederick William
Alix (Alexandra) Tsarina Nikolas II
Alice of Athlone
Victoria Eugénie, wife of Alfonso XIII
Leopold
Maurice
Duke of Windsor
George VI
Earl Mountbatten of Burma
Waldemar
Prince Sigismund of Prussia
Henry
Anastasia
Alexis
Lady May Abel Smith
Rupert Viscount Trematon
Alfonso
Gonzalo
Elizabeth II
Prince Philip
Margaret
Juan Carlos
Sophie
Lady Diana
Prince Charles
Anne
Andrew
Edward
William
Henry
Carrier female
Hemophilic male
Three females
Status uncertain


I
II
III
IV
V
VI
F
F

Inherited thru transmitted genes

evidence = ?

1. genealogies

+ background K re: independence of envtl. factors

Inherited thru transmitted genes

evidence = ?

1. genealogies

+ background K re: independence of envtl. factors

2. single “major” gene

Inherited thru transmitted genes

evidence = ?

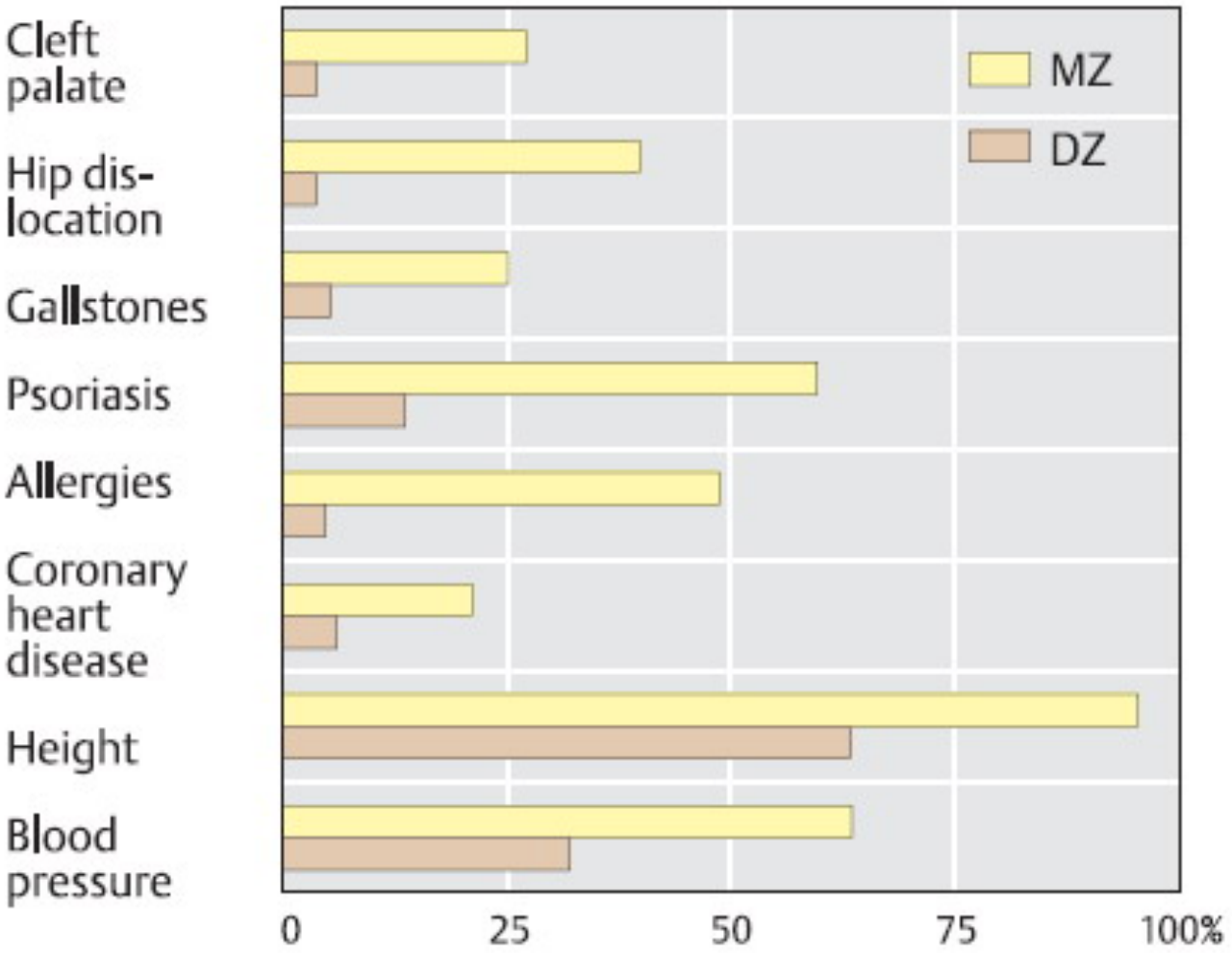
1. genealogies

+ background K re: independence of envtl. factors

2. single “major” gene
3. closer relatives more similar

Category	% chance
General population	0.85
With one parent schizophrenic	13.90
With 2 parents schizophrenic	46.30
With mz twin schizophrenic	47.40
With dz twin schizophrenic	15.00
With sibling schizophrenic	10.20
Parents of schizophrenic children	4.40
With Uncles, Aunts schizophrenic	3.60
With nephews, nieces schizophrenic	2.80
Grandchildren of schizophrenics	3.50
1st cousins of schizophrenics	3.50

http://www.simplypsychology.pwp.blueyonder.co.uk



(after Connor & Ferguson-Smith, 1991)

C. Concordance of some traits in monozygotic (MZ) and dizygotic (DZ) twins

Inherited thru transmitted genes

evidence = ?

1. genealogies

+ background K re: independence of envtl. factors

2. single “major” gene
3. closer relatives more similar

heritability in twin studies

increases as
similarity of MZ twins exceeds similarity of DZ twins

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$h^2 = 2 (I_{MZ} - I_{DZ})$

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good candidate for inquiry into its underlying molecular

genetic basis

heritability in twin studies

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similarity of MZ twins exceeds similarity of DZ twins

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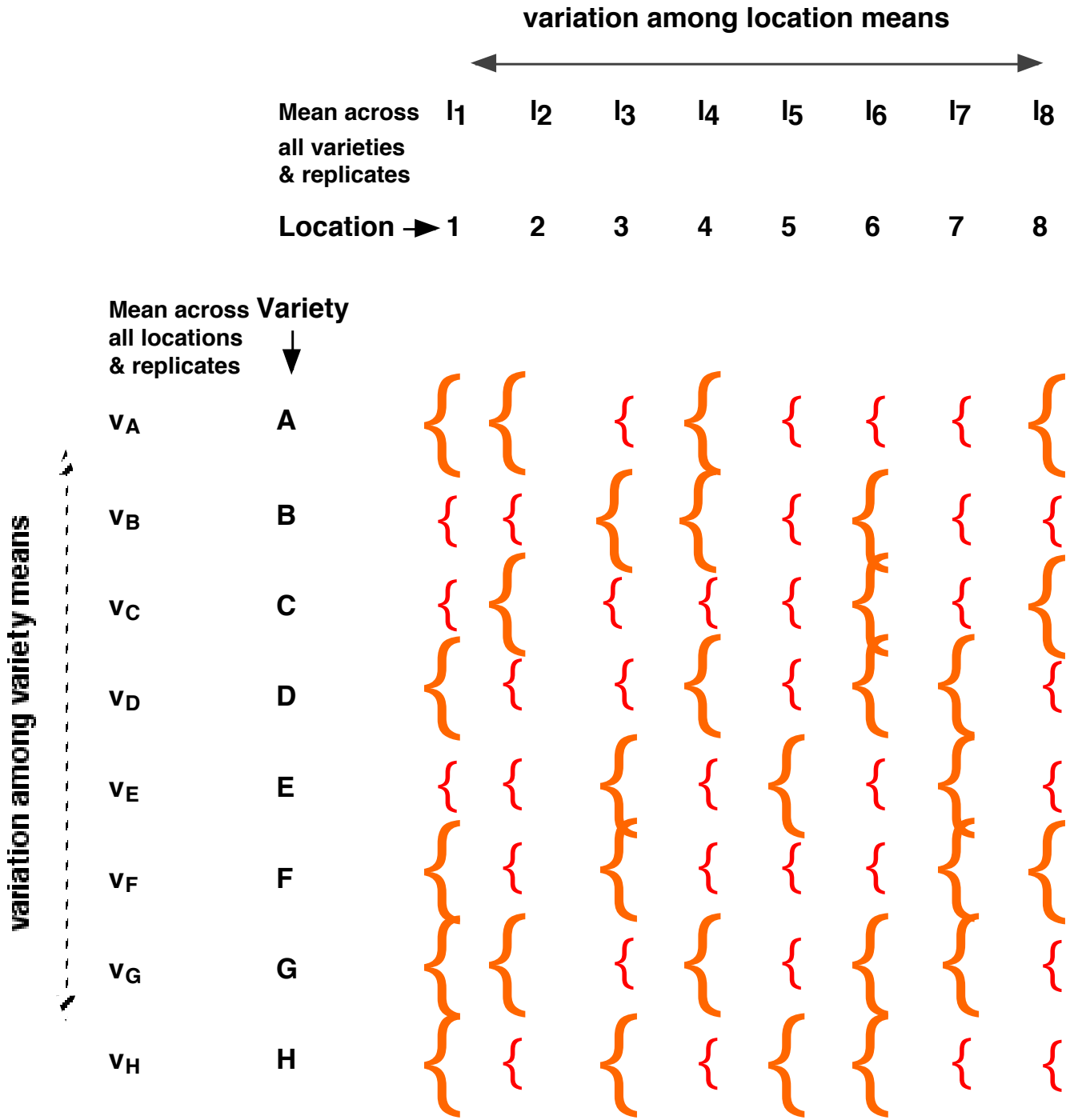
good candidate for inquiry into its underlying molecular genetic basis

Q: How to hypothesize what the relevant genes are?

heritability in ag & lab trials

based on analysis of observation of trait,
not underlying genetic or environmental factors


variation among location means
Mean across all varieties & replicates
l1 l2 l3 l4 l5 l6 l7 l8
Location → 1 2 3 4 5 6 7 8
Mean across all locations & replicates
Variety
vA A
vB B
vC C
vD D
vE E
vF F
vG G
vH H
variation among variety means

heritability in ag & lab trials

based on analysis of observation of trait,
not underlying genetic or environmental factors

h^2 = variance of variety ("genetic") effects /
total variance

heritability in ag & lab trials

based on analysis of observation of trait,
not underlying genetic or environmental factors

h^2 = variance of variety ("genetic") effects /
total variance

useful for making predictions in selective breeding

heritability in twin studies

problems

$h^2 = 2 (I_{MZ} - I_{DZ})$ -- not a reliable estimator of true heritability

heritability in twin studies

problems

$h^2 = 2 (I_{MZ} - I_{DZ})$ -- not a reliable estimator of true heritability

(ignores variety-location interaction
assumes that DZ are half as similar as MZ)

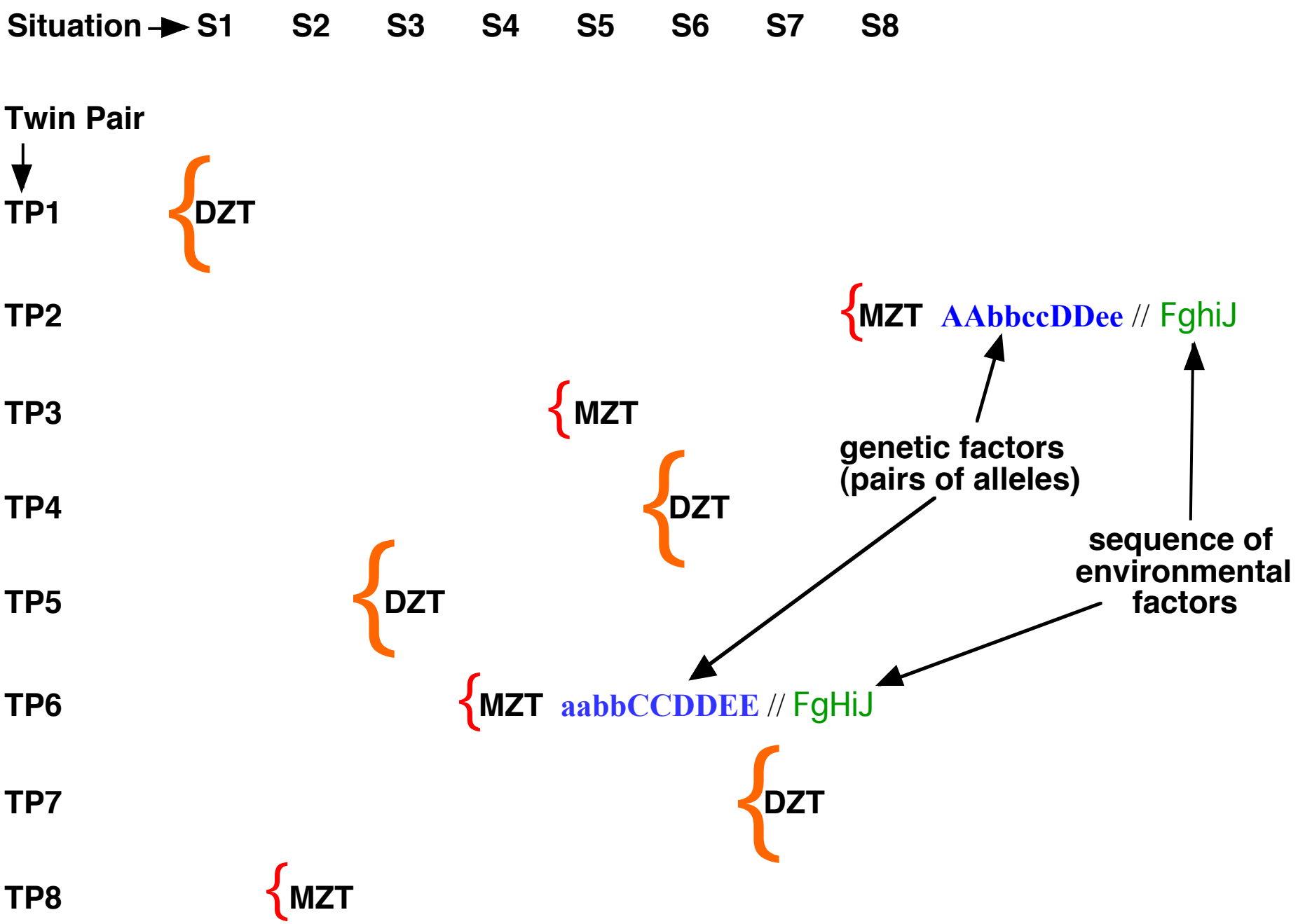
heritability in twin studies

problems

$h^2 = 2 (I_{MZ} - I_{DZ})$ -- not a reliable estimator of true heritability

(ignores variety-location interaction
assumes that DZ are half as similar as MZ)

possibility of underlying heterogeneity


Situation → S1 S2 S3 S4 S5 S6 S7 S8
Twin Pair
TP1
DZT
TP2
MZT AAbbccDDee // FghiJ
TP3
MZT
TP4
DZT
TP5
DZT
TP6
MZT aabbCCDDEE // FgHiJ
TP7
DZT
TP8
MZT
genetic factors
(pairs of alleles)
sequence of
environmental
factors

heritability

problems

depends on the sample of varieties & locations

high heritability within one group ≠> high within another

heritability

problems

depends on the sample of varieties & locations

high heritability within one group ≠> high within another

put heritability to the side

Q: genetic factors, changeability, group differences?

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genetic factors ≠> unchangeable

Q: genetic factors, changeability, group differences?

genetic factors ≠> unchangeable

genetic factors w/in one group ≠>
same genetic factors w/in 2nd group ≠>
same genetic factors “explain” difference b/w groups

Q: genetic factors, changeability, group differences?

genetic factors ≠> unchangeable

genetic factors w/in one group ≠>
same genetic factors w/in 2nd group ≠>
same genetic factors "explain" difference b/w group averages

Q: meaning of difference between averages?

back to heritability
mixed w/ genetic factors,
changeability,
group differences

Jensen, A. R. (1969)
"How much can we boost IQ and scholastic achievement?"
Harvard Educational Review 39: 1-123

within group variation

high heritability

gap between group means

within group $\not\Rightarrow$ between group

social policy $\not\rightarrow$ sustained IQ increase

sociological factors can't explain all of gap

plausible: significant genetic component (w/in & b/w)
=> do not dismiss innate differences
(e.g., abstract vs. rote) & educate accordingly

25 April 2005

Black-White-East Asian IQ differences at least 50% genetic, scientists conclude in major law journal

A 60-page review of the scientific evidence, some based on state-of-the-art magnetic resonance imaging (MRI) of brain size, has concluded that race differences in average IQ are largely genetic. The lead article in the June 2005 issue of Psychology, Public Policy and Law... examined 10 categories of research evidence from around the world to contrast "a hereditarian model (50% genetic-50% cultural) and a culture-only model (0% genetic-100% cultural)."

The paper, "Thirty Years of Research on Race Differences in Cognitive Ability," by J. Philippe Rushton of the University of Western Ontario and Arthur R. Jensen of the University of California at Berkeley...

"Neither the existence nor the size of race differences in IQ are a matter of dispute, only their cause," write the authors...

Dickens, W. T. and J. R. Flynn (2001)
"Heritability estimates versus large environmental effects: The IQ paradox resolved."
Psychological Review 108(2): 346-369.

within group variation

high heritability

generational

gap between group means

within group ⇏ between group

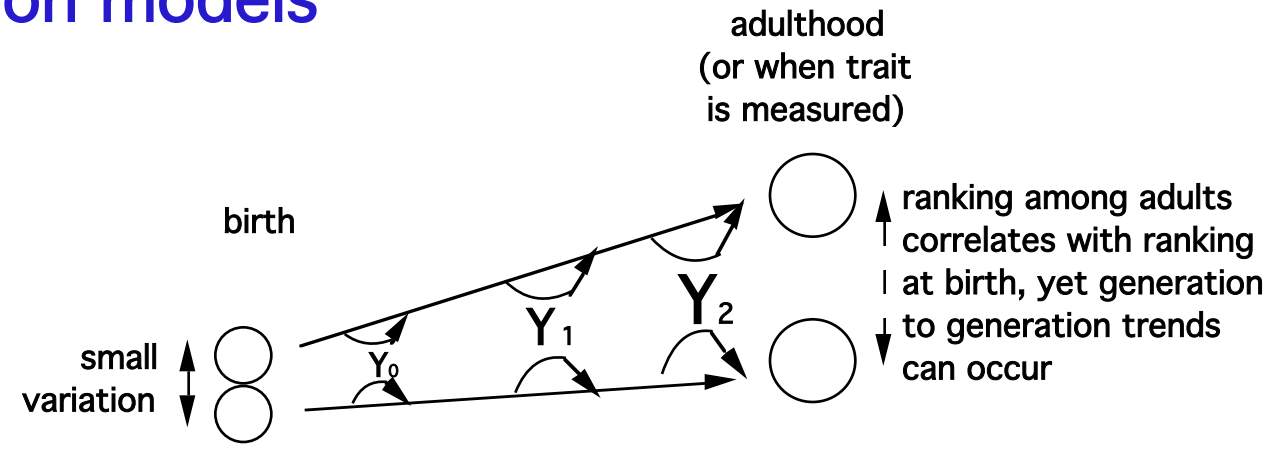
social policy ↛ sustained IQ increase

sociological factors can't explain all of gap

plausible: significant genetic component (w/in & b/w)

logic must be wrong for racial mean gap as well

reciprocal causation models



Matching and Reciprocal causation

growing up in environments whose differences (Y_0...Y_1...Y_2...) in part match differences in the trait (or in underlying traits) at each stage of life & in part are given by transient non-matching influences.

In addition, every individual's environment (Ys) follows society-wide trends that result from average of all individuals' changes.

matching of environments

+

social multiplier

Contra Jensen-Rushton & Dickens-Flynn

Taylor: heritability should not be mixed w/ genetic factors, changeability, group differences

Unresolved problems

possibility of underlying heterogeneity

heritability ≠ genetic factors

how to hypothesize what the relevant genes are?

twins studies heritability
not reliable estimator of true heritability