

Intelligence: One or Many?

Linda S. Gottfredson
School of Education
University of Delaware

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4 Theories

Agree: An “intelligence” is a very broad, important, and enduring ability
 Maybe agree: Intelligences are potentials for later achievement
 Disagree: How broad and content-specific “intelligences” are

Number	Name	Content domains
7+	Multiple intelligences Gardner, 1983	“Psychobiological potential to solve problems or fashion products that are valued in at least one cultural context” Linguistic Logical-mathematical Spatial Musical Bodily-kinesthetic Interpersonal Intrapersonal
3	Triarchic Sternberg, 1985	“Process domains” Analytical Creative Practical
1	<i>g</i> (~IQ) Spearman, 1904 Jensen, 1998	General facility for learning and reasoning in all domains <i>g factor</i>
0	Specificity Guilford, 1967	Many specialized abilities with narrow domain coverage 150+

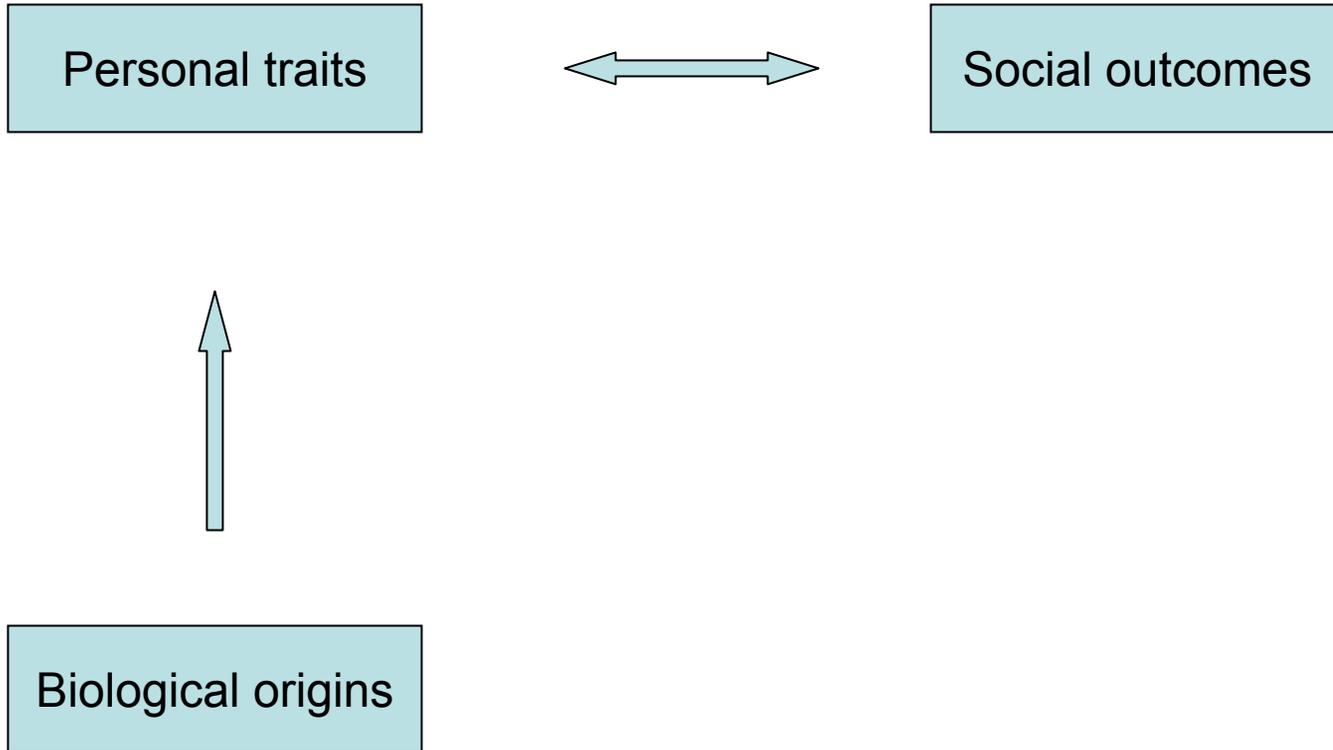
Which One Should Psychology Teach?

1. Which is most accurate, and how do we know?
 - 4 hypotheses/counter-hypotheses (of many)
2. What, then, should we teach?
3. How can we best teach it?

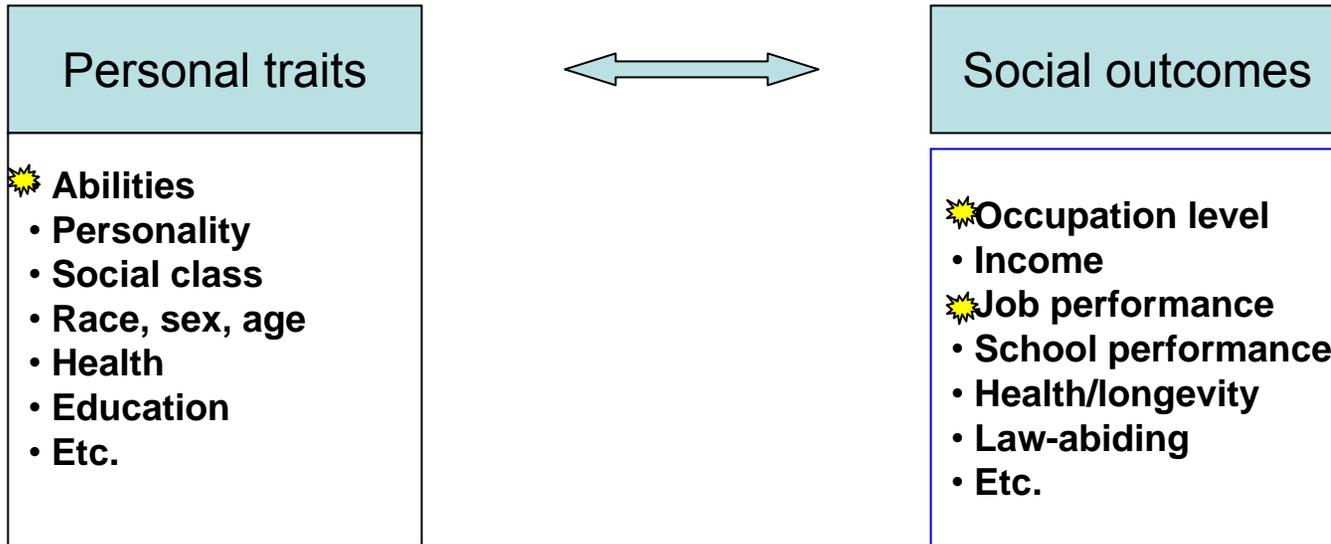
Common Impressions

- For “one intelligence”
 - People who do well on one test tend to do well on all others
 - Some people are “faster” learners than others
- For “multiple intelligences”
 - People tend to be stronger in some areas than others (verbal vs. quantitative, etc.)
 - There are different kinds of prodigies and geniuses

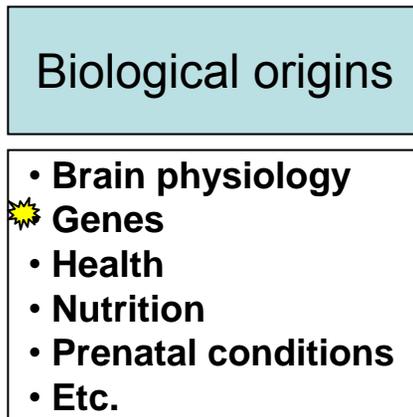
Large Network of Evidence



Large Network of Evidence



☀ Today's illustrations



Guiding question:
Which theory is most consistent with, best explains, and is least often contradicted by the totality of evidence?

My Unintended Journey Begins: Helping Career Counselors Help Clients (1980s)

Personal traits

Social outcomes

- Social class
- Interests

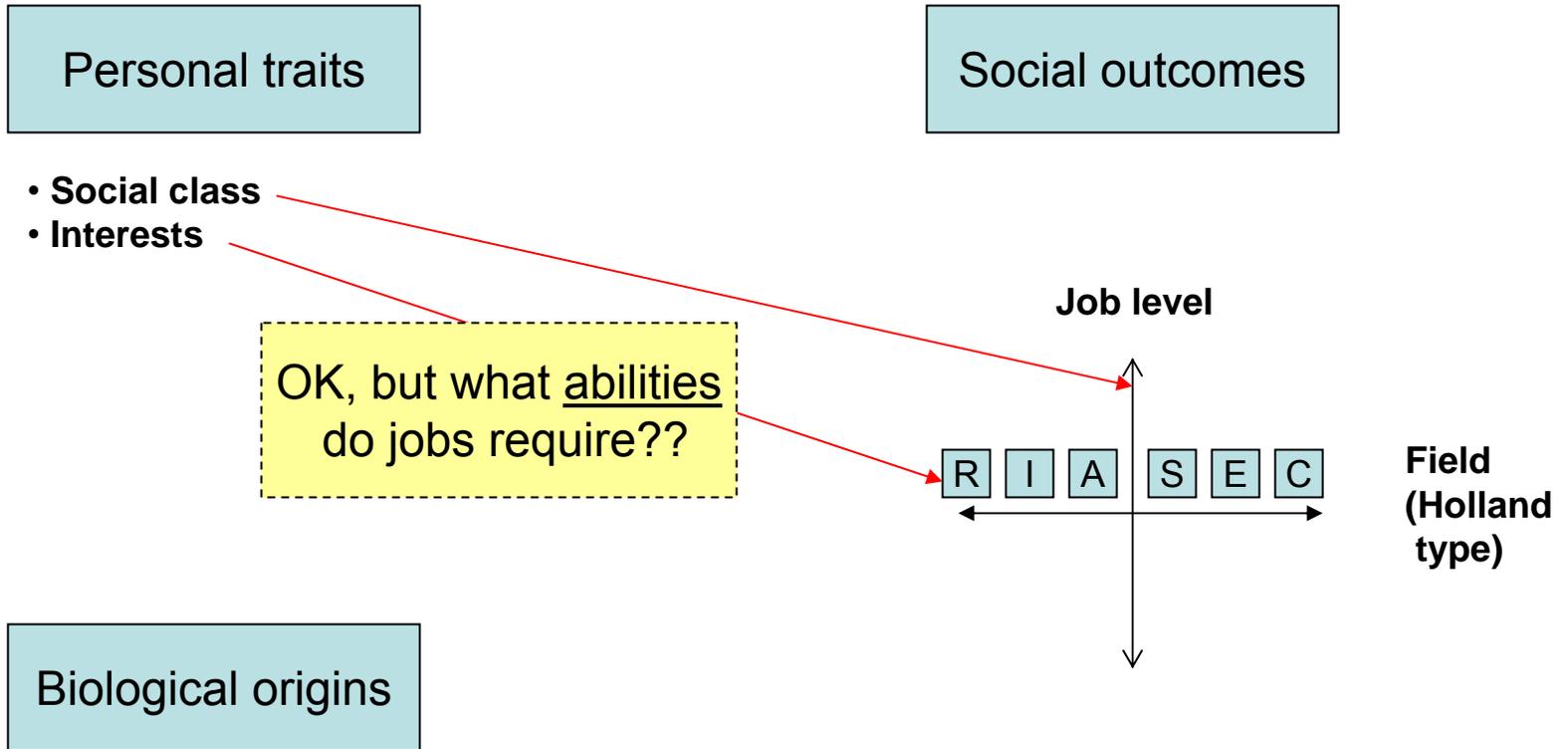
OK, but what abilities
do jobs require??

Job level

R I A S E C

Field
(Holland
type)

Biological origins



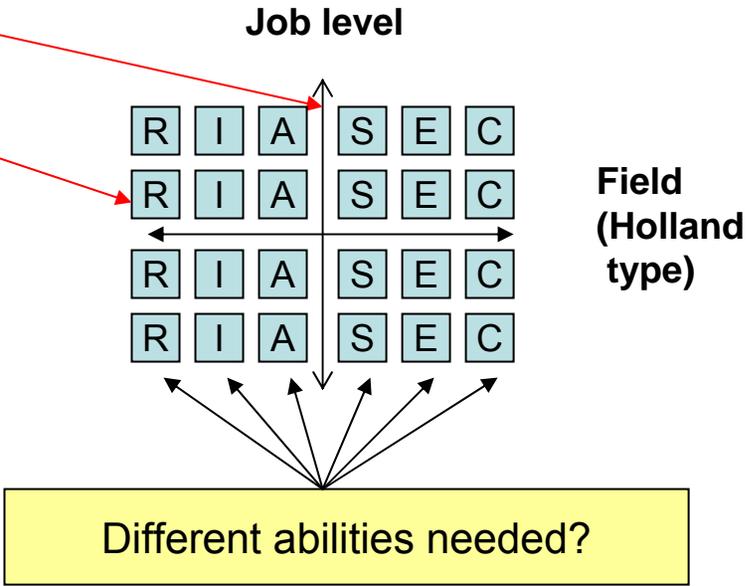
First Step in My Journey (Pre-MI)

Personal traits

Social outcomes

- Social class
- Interests

Biological origins



My Analyses of Labor Dept. Job Aptitude Profiles

Personal traits

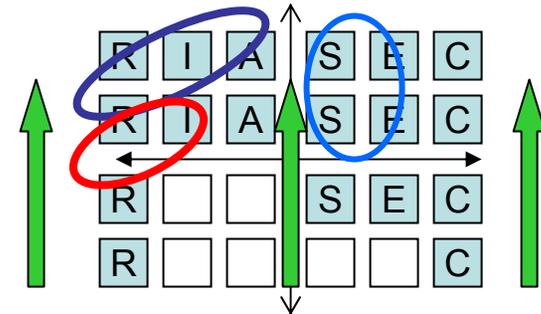
- Social class
- Interests

Social outcomes

Aptitude Demands

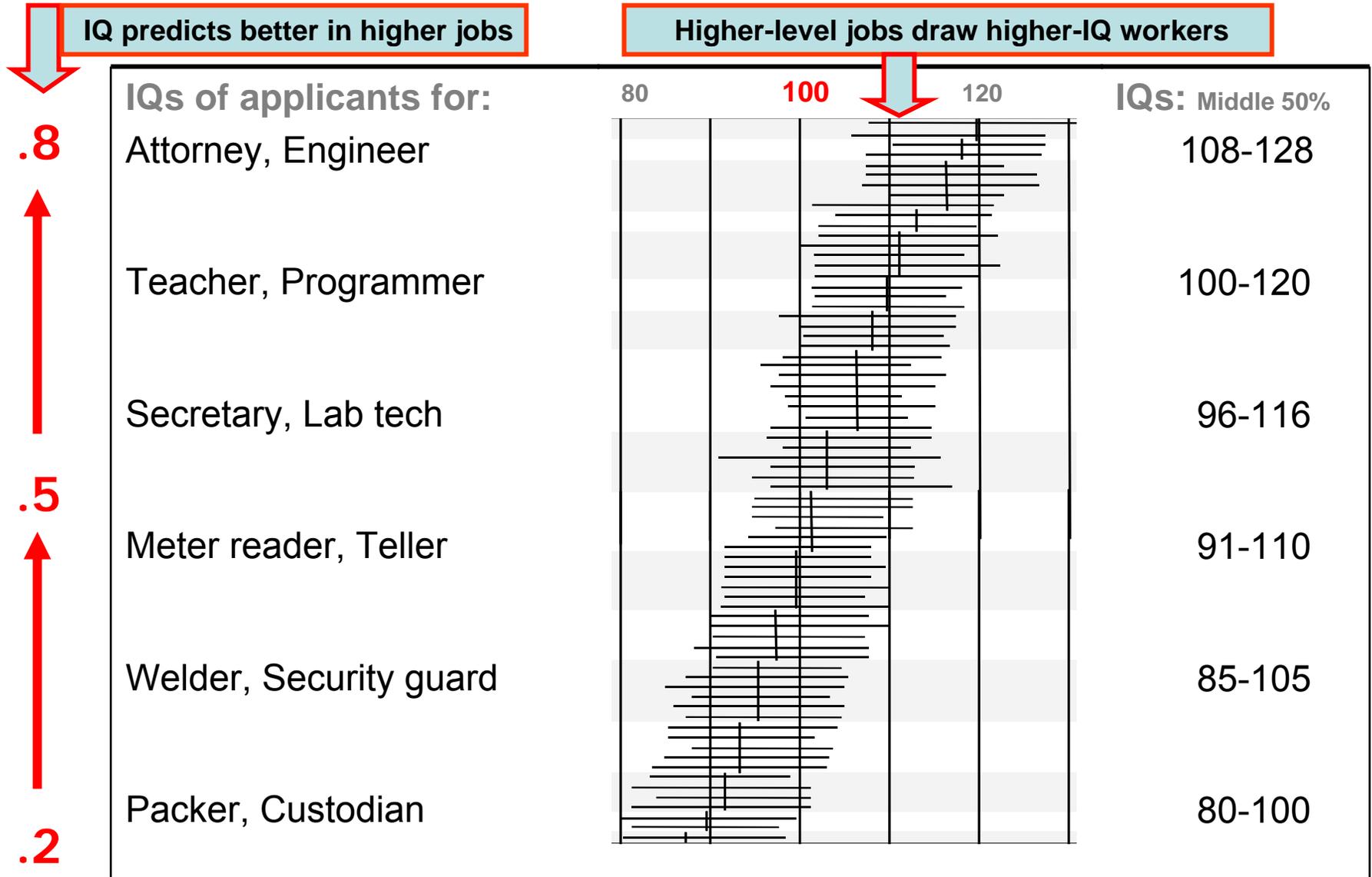
Spatial Verbal
Psychomotor IQ

Biological origins



Results: IQ more important in higher jobs (in all domains).
Narrower abilities useful in certain content domains.

Converging Evidence on IQ's Import (Employment Test Studies)



Converging Evidence for Limited Import of “Broad” Abilities (More Test Studies)

- Broad cognitive abilities (spatial, verbal, math, etc.)
 - Don’t predict much better in own domain than others
 - Don’t add much to IQ’s prediction, either singly or all together
- Same for performance in:
 - Jobs
 - Job training
 - School subjects

Inference: One general ability dominates all the narrower ones.

Counter-Hypothesis #1

(Sociology, 1970s)

- Higher IQ does *not* have functional value, because
 - Employers favor high IQ because they are irrational or favor “their own kind.”
 - Most job performance research relies on subjective ratings by supervisors.
 - IQ measures social class, not “merit.” “Intelligence” is a smokescreen for justifying privilege.
- How would you test this hypothesis?

Counter-Hypothesis #1

(Sociology, 1970s)

- It would predict that:
 - IQ predicts supervisor ratings better than *objectively* measured job performance
 - Results?—just the opposite
 - Work in high-level jobs is *not* more cognitively demanding (job analysis data)
 - Results?— the higher the job level, the more complex the work
 - analysis, reasoning, decision-making, updating knowledge, self-direction, change and ambiguity
 - vs.
 - set procedures, routine tasks, much supervision, physical demands

No evidence here against a “one-intelligence” theory

Counter-Hypothesis #2

(1980s MI Theories)

- Multiple intelligences exist, but Western society rewards only one.
 - IQ tests are paper-and-pencil tests ← **False: Most are not**
 - Paper-and-pencil tests privilege linguistic (Gardner) or analytical (Sternberg) intelligence
 - Other cultures value other achievements not measured by those tests ← **True, but achievements not the issue; potentials are.**
- **How would you test this hypothesis?**

Wrong reasons, but still a good hypothesis.

Counter-Hypothesis #2

- It would predict:
 - You will find them if you try to assess them
 - They will be mostly independent of each other
 - There will be no superordinate general intelligence
 - IQ will coincide with one of the multiple intelligences
- To verify, we need:
 - Ways to measure the proposed intelligences
 - Have people take those tests
 - Have them take IQ test at the same time
 - Observe that different intelligences don't correlate much with each other or IQ tests

Constraints & Options in Testing It

Bad

- No tests available for Gardner's MIs
- STAT test for Sternberg's Triarchics, but not much data

Good

- But many hundreds of studies with other tests
- Those tests quite varied in nature
- Effort in mid-century to create tests that don't correlate
- John Carroll (1993) reanalyzed all this evidence!

Results: Many Mental Abilities, but All Systematically Related

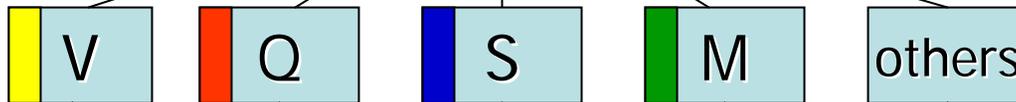
- All abilities correlated
- Differ in generality (scope)
- Only one at apex (g)
- g is backbone of all others
- Broad abilities (II.) are “flavors” of g

Stratum

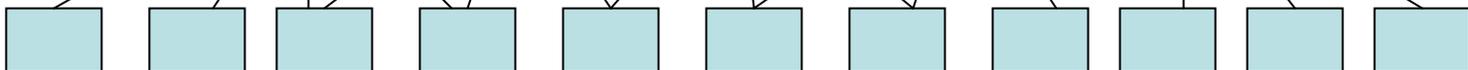
III.

$g \approx \text{IQ}$

II.



I.

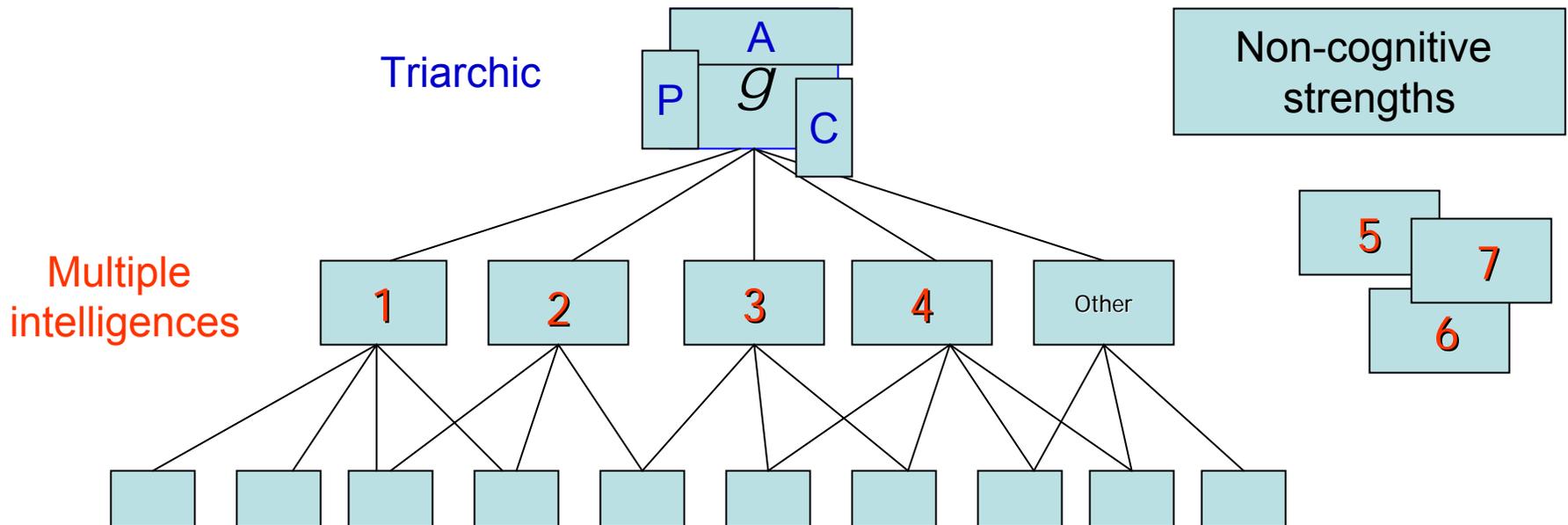


All Theories on Same Map

Best guesses:

Sternberg's Triarchic (see Brody, 2003)

Gardner's MI (see Carroll, 1993).



Counter-Hypothesis #3

- IQ/g is just a narrow academic ability
 - IQ tests were created to measure academic ability
 - IQ items can't measure practical or creative abilities
 - well-defined, with one right answer
 - decontextualized, and of no intrinsic interest
 - “Virtual simulations” needed for non-academic abilities
- How would you test that?

Counter-Hypothesis #3

- IQ/*g* is just a narrow academic ability
 - IQ tests were created to measure *g* Yes, but a non-sequitur
 - IQ items can't measure practical or creative abilities
 - well-defined, with one right answer Plausible, let's check
 - decontextualized, and of no intrinsic interest
 - “Virtual simulations” needed for non-academic abilities
- How would you test that?
 - Prior studies of practical tasks say not—all tapped mostly *g* despite their intent not to
 - Adult functional literacy
 - Health literacy
 - Army simulations of actual work

Recall: IQ Predicts Better in Less Structured Jobs

g

Social outcomes

IQ

- Standardized academic achievement .8
- Job performance-complex job .8
- Years of education .6
- Occupation level .6
- Job performance-middle level job .5
- Income .3-.4
- Law-abidingness .25
- Job performance-simple job .2
- Happiness ~.0 (?)

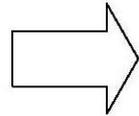
Biological origins

Health self-care is also a complex, unstructured job

Complexity: How IQ Tests (and Life) Tap g

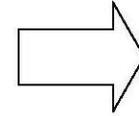
Behavioral signs of g

Learn
Reason
Solve problems



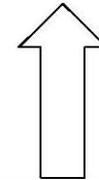
Mental manipulation

See connections
Make distinctions
Draw inferences
Fill in gaps
Turn things over
in your mind



Practical meaning of g

"Deal with complexity"



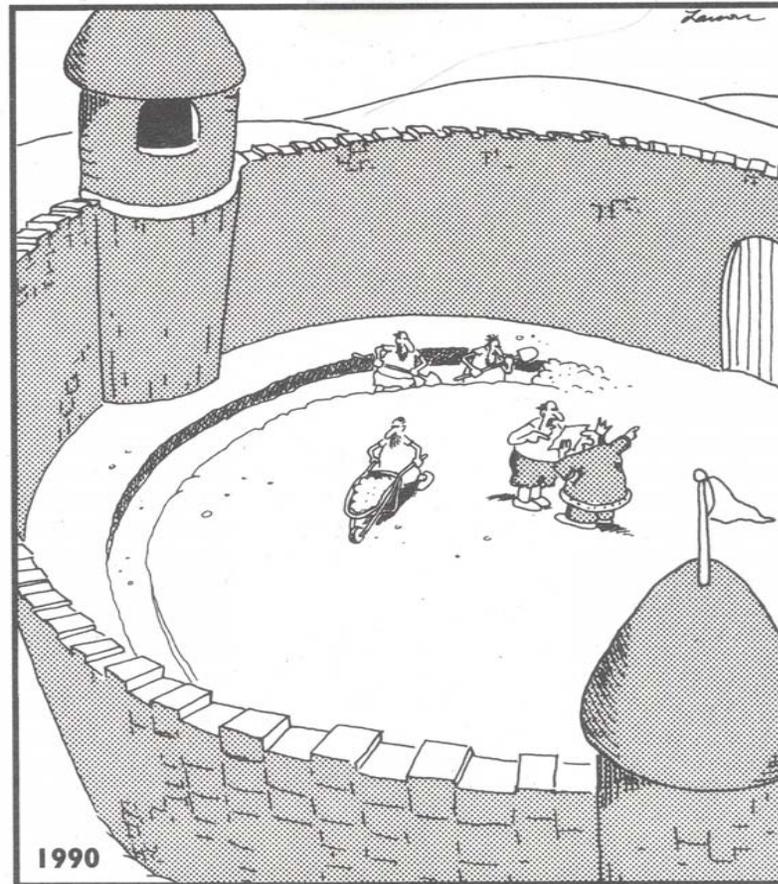
IQ items require

Number series 2, 4, 6, __, __	1, 3, 6, 10, __, __
Similarities dog-lion	air-water

More complexity if:
unpredictable
changing
means-ends unclear
multifaceted
many alternatives
ambiguous

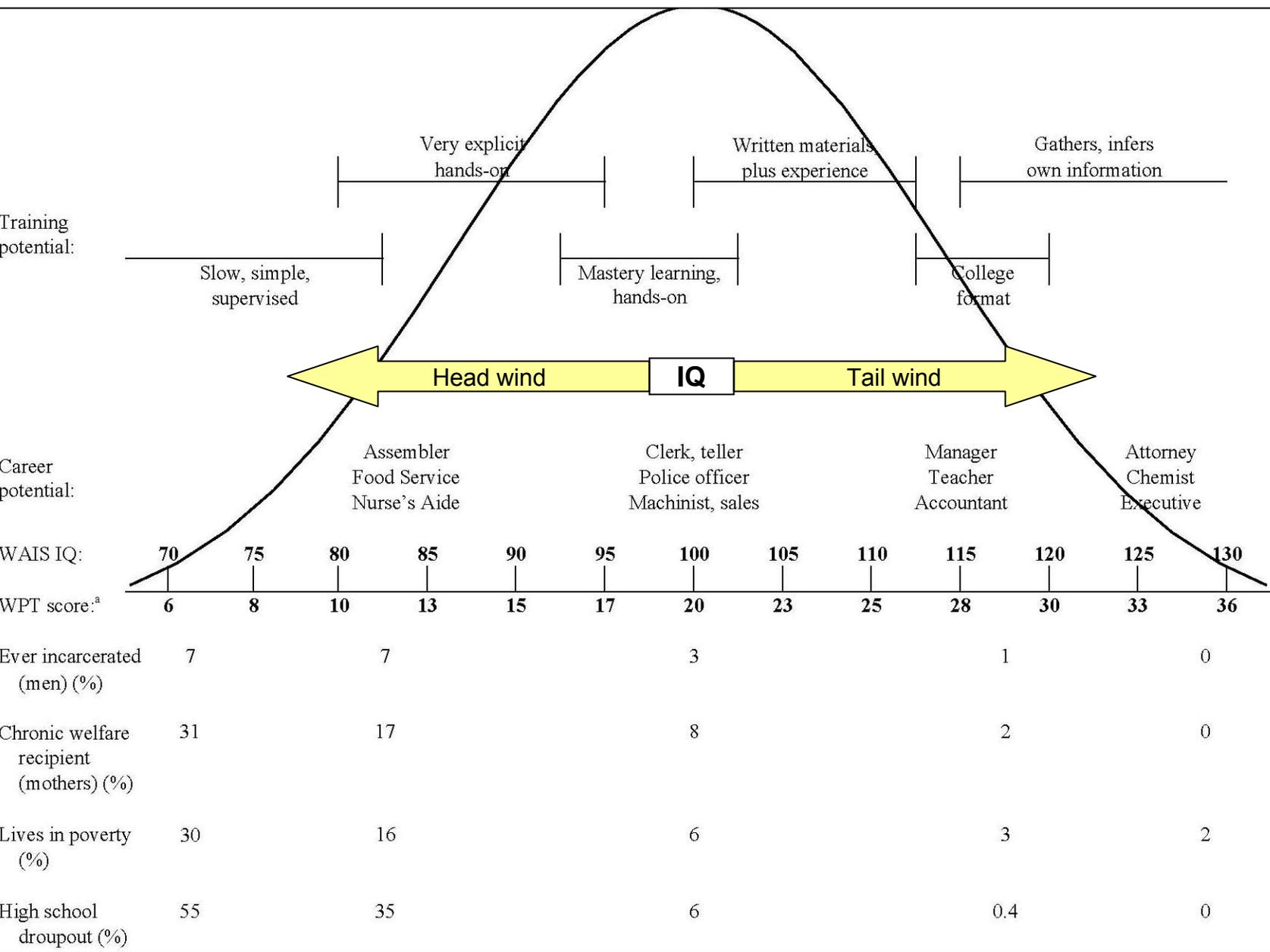
LIFE!

Planning, Spotting Problems

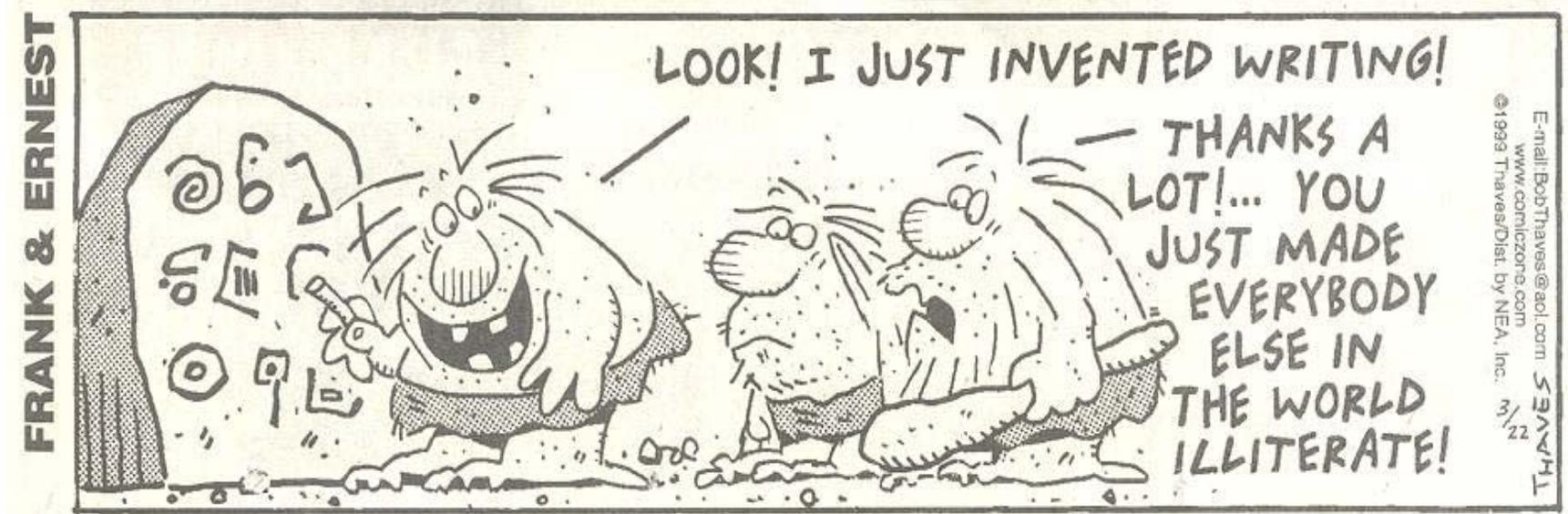


Suddenly, a heated exchange took place between the king and the moat contractor.

Impact of g Varies, But Is Pervasive



High-IQ People Make Life More Complex for Everyone



Counter-Hypothesis #4

- The hierarchical structure is an artifact of (a) the kinds of tests used, (b) factor analysis, or (c) Western culture.
 - It is “socially constructed.”
 - It is not writ in the genes.
 - The brain has different modules corresponding to the MIs.
- **Behavior genetics provides a test:**
 - Do broad abilities overlap because they share the same genetic roots? (genetic covariance analysis, say, using twins)

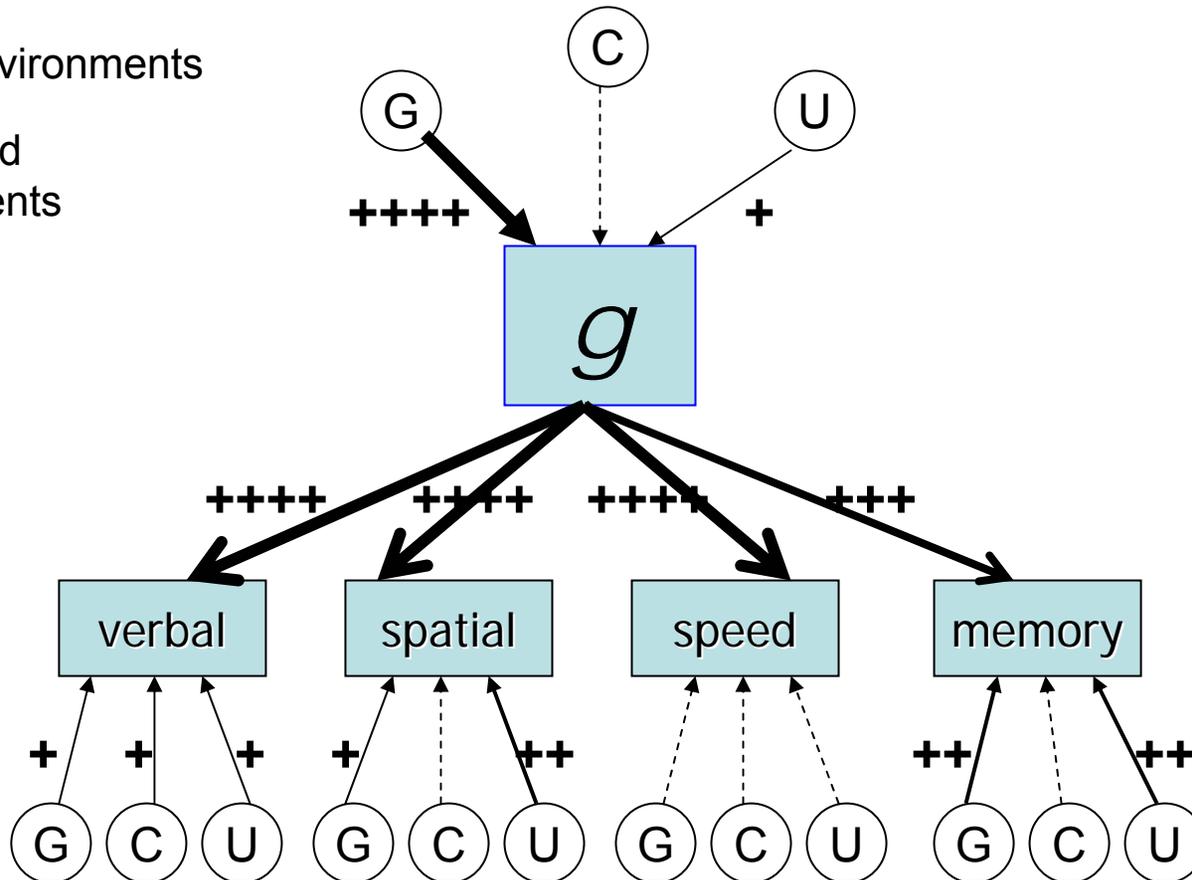
Results: Prime MI Suspects Are Mostly Genetic g

(G) genes

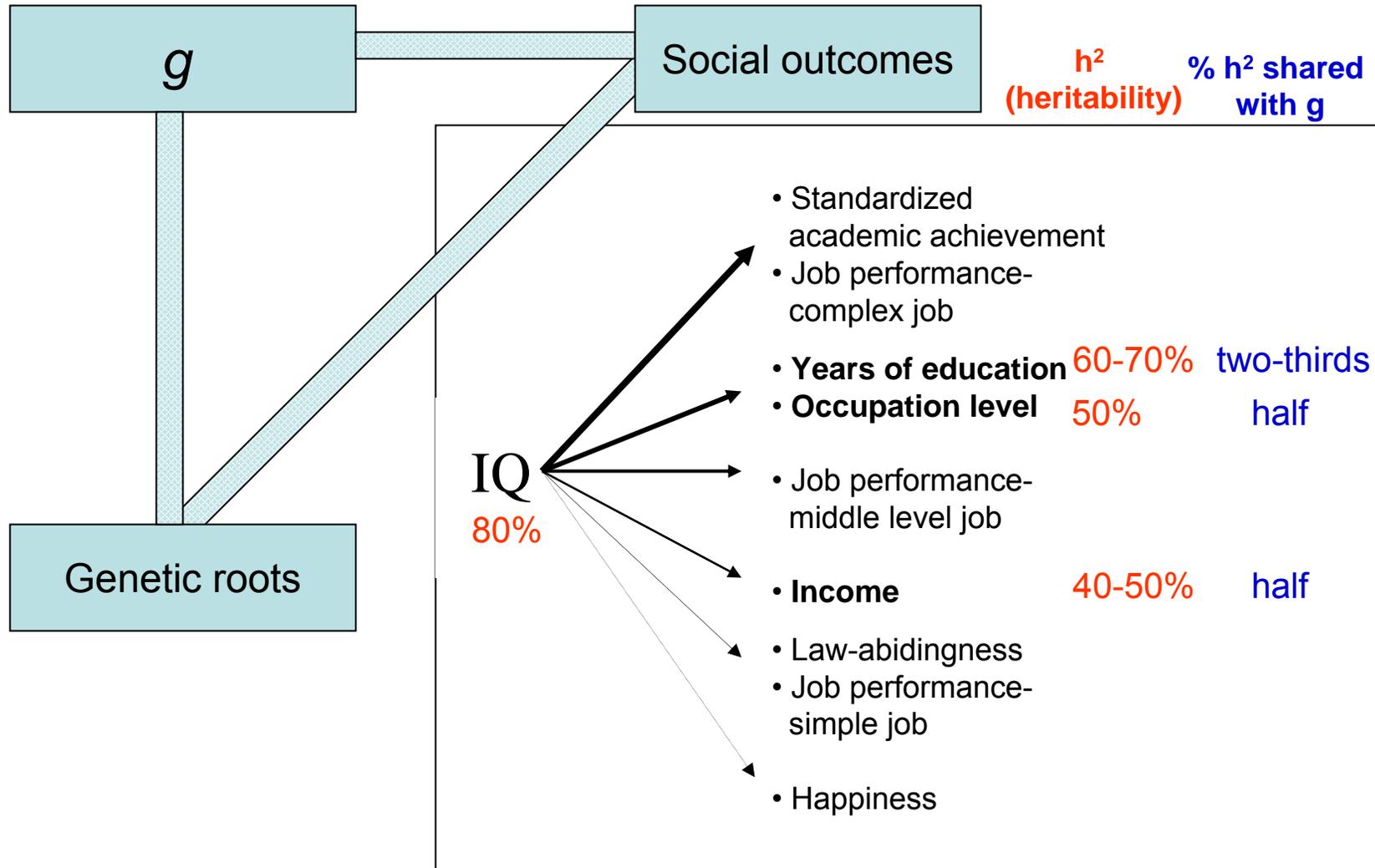
(C) shared environments

(U) non-shared environments

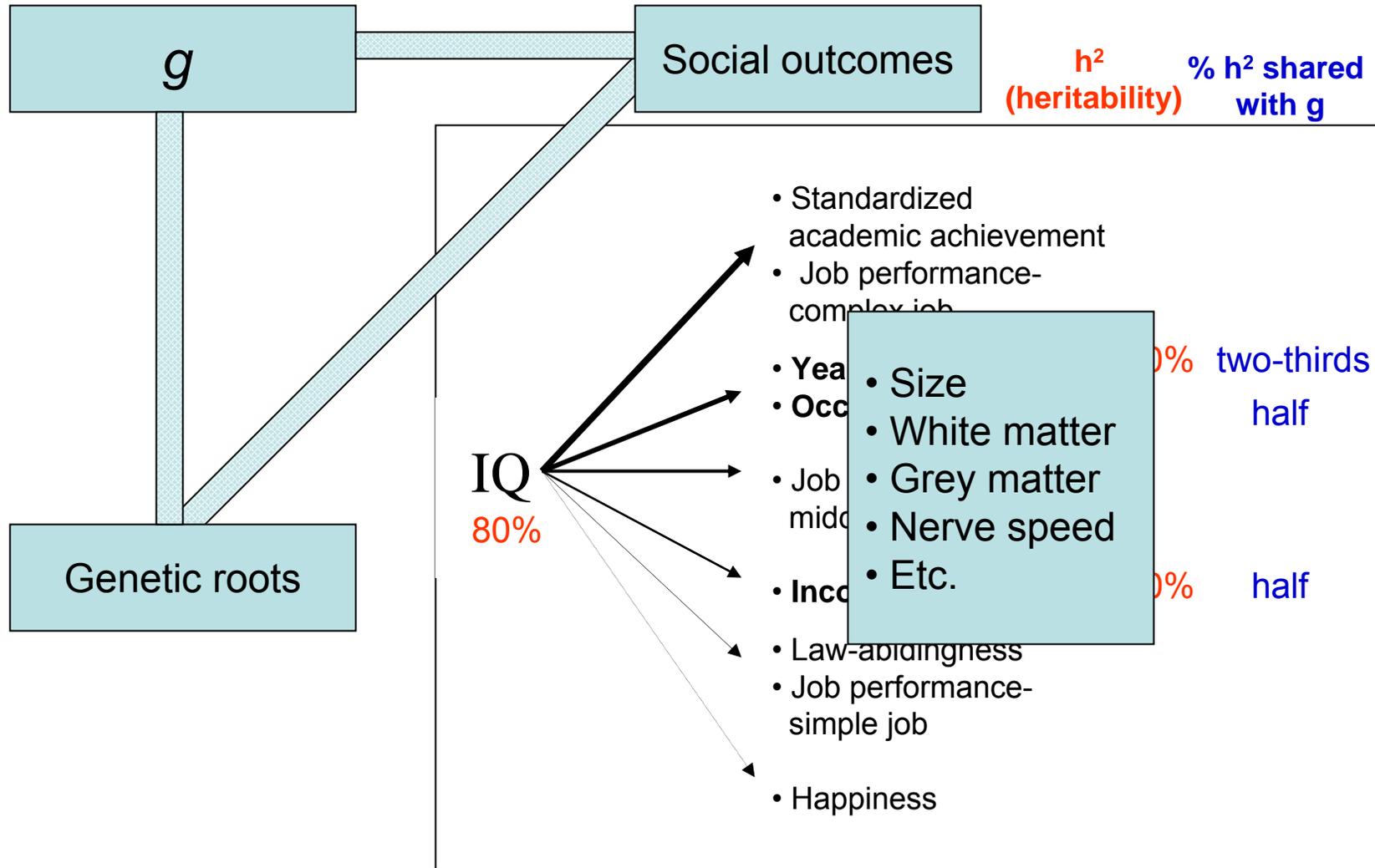
(adults)



Genetic Overlap With Outcomes Too



Same Being Found for Brain



Other Evidence Dovetails

Personal traits

- **Abilities**
- **Personality**
- **Social class**
- **Race, sex, age**
- **Health**
- **Education**
- **Etc.**

Social outcomes

- **Occupation level**
- **Income**
- **Job performance**
- **School performance**
- **Health/longevity**
- **Law-abiding**
- **Etc.**

Biological origins

- **Brain physiology**
- **Genes**
- **Health**
- **Nutrition**
- **Prenatal conditions**
- **Etc.**

Current Place in My Journey?

- Interim judgment
 - *g* theory: better tested, more consistent with totality of evidence
 - MIs probably known traits, some outside the cognitive realm
 - Triarchics: all mostly *g*
- Current steps
 - Cognitive demands in preventing and managing accidental injury and chronic disease
 - Pedagogical demands in communicating the science

What, Then, Should We Teach?

- Evidence matters
 - Anecdotes don't count
 - Single studies rarely do
 - Robust, replicated patterns matter most
- Weight of evidence matters
 - Explanations must go head-to-head
 - Practice healthy skepticism
 - Listen hard to other side (especially when you don't want to)
- Is \neq ought; ought \neq is
 - Facts reveal moral choices, not make them

What, Then, Should We Teach?

- Focus on strata most relevant to your purpose
 - Explaining social inequality? III. (g)
 - Career counseling? II. (but can't ignore III.)
 - Skills training? I. (but can't ignore III.)
- What we don't yet know
 - Specific genes and environments that affect broad abilities 
 - Neural basis of g
 - Why shared family influences on IQ vanish with age 
 - Why IQ scores have been rising in recent decades 
 - How to raise low IQs permanently
 - Whether results hold in all times, places, extremes

 Surprising puzzles

How Should We Teach It?

- Clear underbrush of confusions & misconceptions
 - IQ is rank within age, not raw horsepower
 - Phenotype vs. genotype
 - Genetic does not mean fixed (it limits elasticity)
 - Intelligence is useful tool, not human worth
 - IQ differences not “against the Declaration of Independence”
- Anticipate emotion, urge to self-censor
 - Be matter-of-fact
 - Set up debates on policy implications (the “mights” & “oughts”)
 - Make classroom safe and civil
- Push to dig beneath the surface
 - “What’s behind that label?”
 - “Change one fact and probe the consequences”
 - “Spy the implicit message: God words & devil words”

How Should We Teach It?

- Have bag of tricks for clarifying new concepts
 - Mental manipulation (what is g)
 - Task complexity (what calls it forth)
 - Heritability/environmentality
- Explore g in everyday life (Open the black box)
 - Functional literacy items
 - Spotting hazards
 - Managing a chronic disease
- Explore its limits (Other things matter, too)

Give g its due, but put it in its place

Thank You

- gottfred@udel.edu
- www.udel.edu/educ/gottfredson