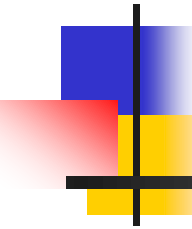
Frank and Ernest



Genius, Creativity, and Talent

Definitions and Manifestations

What is genius?

- High-IQ Definition:
  - "A person who has an exceptionally high intelligence quotient, typically above 140."
- High-Achievement Definition:
  - "an exceptional natural capacity of intellect, especially as shown in creative and original work in science, art, music, etc. … a person having such capacity."

High-IQ Definition

- Origins of the IQ Test
  - Galton's anthropometric measures
  - Binet-Simon's intelligence scale

3 years

Show eyes, nose, mouth
Name objects in a picture
Repeat 2 figures
Repeat a sentence of 6 syllables
Give last name

6 years

Repeat a sentence of 16 syllables
Compare two figures from an aesthetic point of view
Define by use only, some simple objects
Execute 3 simultaneous commissions
Give one’s age
Distinguish morning and evening

High-IQ Definition

- Origins of the IQ Test
  - Galton's anthropometric measures
  - Binet-Simon's intelligence scale
  - Stern's IQ = 100*MA/CA
  - Terman's Stanford-Binet
  - Wechsler Adult Intelligence Scale, etc.
  - Definition in terms of the normal curve

High-IQ Definition

- 110 = top 1/3rd of population; about average for HS grads, but only 50-50 chance of college graduation
- 115 = superior IQ (top 1/6th); approximate average for individuals in professional occupations
- 120 = potentially gifted (top 10%); average for college graduates
- 130 = borderline genius; eligibility for Mensa (top 2%); average IQ of most PhD recipients

High-IQ Definition

- 140 = genius level IQ (top 1%); about average for PhD's in physics or who graduate Phi Beta Kappa
- 150 = Fewer than 1 in 10,000 this high
- 160 = eligibility for Four Sigma Society; 1 out of 30,000 score this high
- 165 = 1 in a million; eligibility for Mega Society
- 228 = Record IQ claimed by columnist Marilyn Jarvik (née Vos Savant)

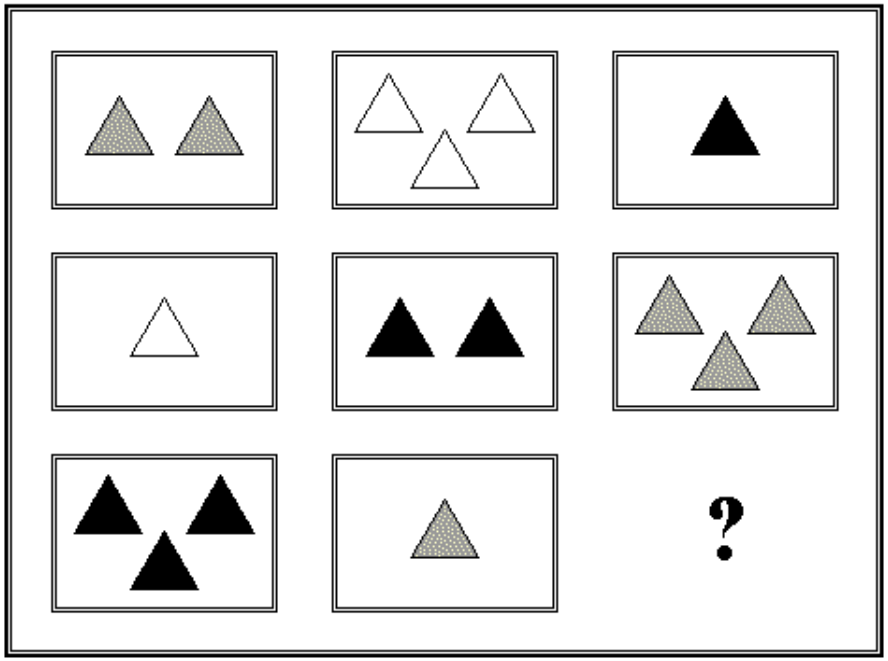
High-IQ Definition

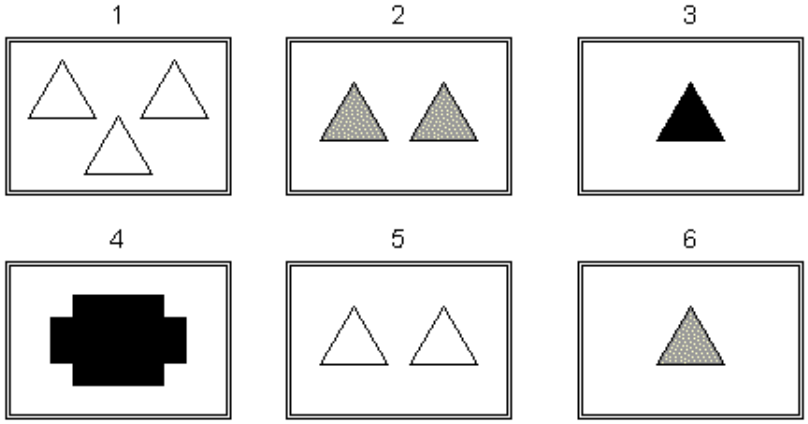
- Applications of the IQ Test
  - Terman's *Genetic Studies of Genius*
    - The IQ = 140 threshold: *M* = 151
    - The aftermath
  - Roe's 64 eminent scientists
    - Verbal IQs 163 (121-177)
    - Spatial IQs 140 (123-164)
    - Math IQs 160 (128-194)
    - [N.B.: Physicists excluded from last]

High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
    - e.g., Raven's Progressive Matrices

Which answer fits in the missing space to complete the pattern?





High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
  - Intelligence actually multiple dimensional rather than a single dimension
    - e.g., …

GARDNER'S 7 INTELLIGENCES

- Linguistic
- Logical-mathematical
- Spatial
- Bodily-kinesthetic
- Musical
- Intrapersonal
- Interpersonal

- T. S. Eliot
- Einstein
- Picasso
- Martha Graham
- Stravinsky
- Freud
- Gandhi

High-IQ Definition

- Criticisms of the IQ Test
  - Narrowly defined intelligence assessment
  - Intelligence actually multiple dimensioned rather than a single dimension
  - Although positively associated with occupational attainment, not strongly correlated with the magnitude of within-occupation achievement
  - High IQ can even be largely useless!

Ask Marilyn

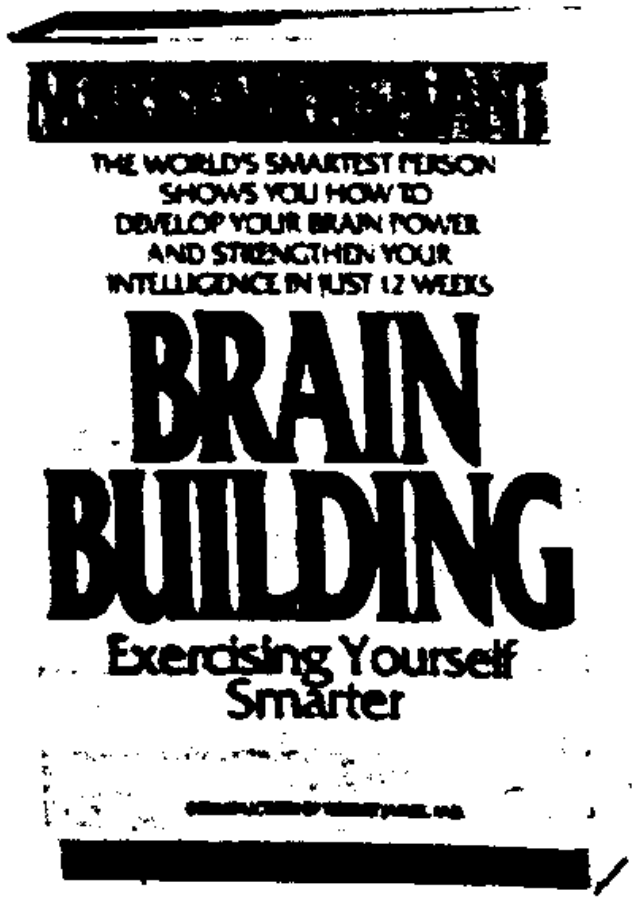
BY MARILYN VOS SAVANT

Why do objects of the same temperature feel cooler or warmer than one another? For example, standing with one foot on a bathroom rug and one foot on a tile floor, the rug feels warm and the tile floor feels cold, even though both are in the same 70° room.

—Anonymous

Heat flows naturally in the direction of decreasing temperature, and some objects conduct it better than others. Because the tile is a more efficient conductor, it will transfer heat away from the foot on the tile faster, making that foot feel cooler than the one on the rug.

How To Think Like A Genius With Marilyn vos Savant



High-IQ Definition

- One reason for the poor predictive validity at the upper end of the adult intelligence scale:
- The only items that discriminate at the upper end of the distribution represent specialized analytical test-taking ability rather knowledge and skills having general intellectual utility: e.g. …

A man plays the game of Russian roulette in the following way. He puts two bullets in a six-chamber cylinder and pulls the trigger twice. The cylinder is spun before the first shot, but it may or may not be spun after putting in the first bullet and after taking the first shot.
Which of the following situations produces the lowest probability of survival?
A. Spinning the cylinder after loading the first bullet, and spinning again after the first shot.
B. Spinning the cylinder after loading the first bullet only.
C. Spinning the cylinder after firing the first shot only.
D. Not spinning the cylinder either after loading the first bullet or after the first shot or after the first shot.
E. The probability is the same for all cases.

High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
- Prodigious performance

High-Achievement Definition

- Exceptional creativity
  - Big-C versus little-c creativity
  - Quantitative rather than qualitative difference both within and between these categories
  - e.g., …

Table 3.2 *All-time Eminence Rankings of Classical Composers*

1.	J. S. Bach	26.	Machaut	50.5	Fauré	77.	Praetorius
2.	Beethoven	27.	Schütz	52.	Dowland	77.	Borodin
3.	Mozart	28.	Liszt	53.	C. P. E. Bach	77.	Gounod
4.	J. Haydn	29.	Mussorsky	54.	Rimsky-Korsakov	79.	M. Haydn
5.	Brahms	30.	Corelli	55.	Perotinus	80.5	Sousa
6.	Handel	31.	D. Scarlatti	56.	Wolf	80.5	Sullivan
7.	Debussy	32.	Gabrielli	57.	Bartók	82.5	Bellini
8.	Schubert	33.	Couperin	58.	Grieg	82.5	Janáček
9.	Wagner	34.	Gluck	59.	Weber	85.	Donizetti
10.	Chopin	35.	Puccini	60.	Gibbons	85.	Webern
11.	Monteverdi	36.	Franck	61.	Sweelinck	85.	Willaert
12.	Palestrina	37.	Dvořák	62.	Schoenberg	87.	Offenbach
13.	Verdi	38.	Buxtehude	63.	J. Strauss, Jr.	88.5	Ravel
14.	Schumann	39.	Bruckner	64.	Saint-Saëns	88.5	Delius
15.	des Pres	40.	Sibelius	65.5	Telemann	91.	Elgar
16.	de Lassus	41.	Rameau	65.5	Lulli	91.	Hindemith
17.5	Purcell	42.	Frescobaldi	67.	Landino	91.	Satie
17.5	Berlioz	43.	Okeghem	68.	MacDowell	93.5	Cherubini
19.	R. Strauss	44.	Stravinsky	69.	J. C. Bach	93.5	Foster
20.	Mendelssohn	45.	A. Scarlatti	70.	Leoninus	95.	de Rore
21.	Tchaikovsky	46.	Dunstable	71.	A. Gabrieli	96.5	Boccherini
22.	Vivaldi	47.	Bizet	72.5	Carissmi	96.5	Franco of Cologne
23.	Mahler	48.	Gesualdo	72.5	Pergolesi	98.5	Clementi
24.	Byrd	49.	Rossini	74.	Marenzio	98.5	Tartini
25.	Dufay	50.5	de Victoria	75.	Smetana	(The next 4 are tied)	

Note. Adapted from Farnsworth (1969, 228). Copyright 1966 by Music Educators National Conference. Adapted by permission.

High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
  - Exceptional personal influence
  - Big-C creativity as outstanding leadership

High-Achievement Definition

- Exceptional creativity
- Outstanding leadership
- Prodigious performance
  - Sports
  - Chess
  - Music
  - IQ?

What is creativity?

- Three-criterion definition
  - Novelty/Originality
  - Usefulness/Adaptiveness
  - Nonobviousness/Surprise
- Three p's of creativity
  - Process: e.g., logic versus intuition
  - Product: e.g., scientific versus artistic
  - Person: e.g., ability versus personality

What is talent?

- Thesis: Nature
- Antithesis: Nurture
- Synthesis: Nature-Nurture Integrated
- Complications

What is talent?

- Thesis: Nature
  - Galton (1869): *Hereditary Genius*
  - de Candolle (1873): *Histoire des sciences et des savants depuis deux siècles*
  - Galton (1874): *English Men of Science: Their Nature and Nurture*

What is talent?

- Antithesis: Nurture
  - Watsonian/Skinnerian Behaviorism
  - Cognitive Psychology:
    - Domain-specific expertise (knowledge/skills)
    - Deliberate practice
    - The 10-year rule
    - Empirical problems
      - Individual differences in 10-year rule
      - Performance predictors with substantial heritabilities

What is talent?

- Synthesis: Nature-Nurture Integrated
  - Talent is defined as any set of two or more individual-variables that
    - feature substantial heritability coefficients, and
    - either accelerate expertise acquisition or
    - enhance performance given a particular level of expertise acquisition
  - Given this definition, variance attributed to talent can be estimated using published validity and heritability coefficients

Table 4
Criterion–MAT Correlations and Lower- and Upper-Bound Criterion Heritability Estimates

Criterion (c)	r_{cM}	r_{cM}^2	h_{cL}^2	h_{cU}^2
First-year graduate grade point average	.41[a]	.168	.118	.134
Graduate grade point average	.39[a]	.152	.106	.122
Faculty ratings	.37[a]	.137	.096	.110
Comprehensive examination scores	.58	.336	.235	.269
Degree attainment	.21[b]	.044	.031	.035
Time to finish degree	.35[b]	.123	.086	.098
Research productivity	.19[b]	.036	.025	.029

The lower-bound estimate assumes that $h_L^2 = .70$ and the upper-bound estimate that $h_U^2 = .80$

Table 2
California Psychological Inventory Criterion Heritability Estimation for Two Criteria

Estimator	SvNS	CvLCS
Equation 1		
k	4	8
Sum $(\Sigma\ r_{cj}^2 h_j^2) = h_{c1}^2$	.1233	.2955
Equation 2		
k	3	4
Sum $(\Sigma\ \beta_{cj}^{\prime 2} h_j^{\prime 2}) = h_{c2}^2$	.0260	.0454
Equation 3		
k	3	4
Sum $(\Sigma\ r_{cj}\beta_{cj}^{\prime} h_j^{\prime 2}) = h_{c3}^2$	.0467	.0915
h_{c3}^2/R_c^2	.3659	.4770

What is talent?

- Complications
  - Simple or Complex?
    - Latter multidimensional
  - Additive or Multiplicative?
    - Latter emergenic
  - Static or Developmental?
    - Latter epigenetic

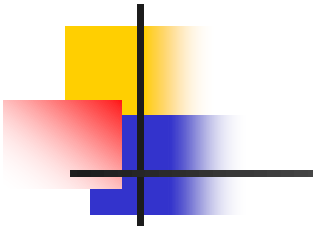
$$P_i = \sum_{j=1}^{k} C_{ij}^{w_j},$$

$$P_i = \prod_{j=1}^{k} C_{ij}^{w_j},$$

If *k* is small, then talent is *simple*; if *k* is large, then it is *complex.*

Assuming that *k* > 1, then two additional possibilities:

If Σ is the operator, then talent is *additive*; if Π, then it is *multiplicative*.



$$P_i(t) = \sum_{j=1}^{k} C_{ij}(t)^{w_j},$$

$$P_i(t) = \prod_{j=1}^{k} C_{ij}(t)^{w_j},$$

If developmental trajectories are epigenetic rather than static:

Former additive epigenesis;

Latter multiplicative (emergenic) epigenesis

Fourfold Typology Based on the Two Dimensions of Simple Versus Complex and Additive Versus Multiplicative Giftedness

	Additive		Multiplicative	
Repercussions	Simple	Complex	Simple	Complex
Trait profiles	uniform	diverse	uniform	diverse
Cross-sectional distribution	normal	normal	skewed	extremely skewed
Proportion ungifted	small	extremely small	large	extremely large
Familial inheritance	highest	high	low	lowest
Developmental trajectories	few	numerous	few	numerous
Developmental onset	early	earliest	later	latest
Identifiability	highest	high	low	lowest
Instruction/training strategies	few	numerous	few	numerous