

# What do scores mean?

- Lewis Terman, of Stanford University, began with a different assumption than Binet; Terman felt that intelligence was unchanging and innate (genetic).
- He created the “Stanford-Binet Test”

$$IQ = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

What to do if you score low on an IQ test?



Binet

Study, and develop self-discipline and attention span.



Terman

Remove your genes from the population (eugenics).

Eugenics Seeks to Improve the Natural, Physical,  
Mental and Temperamental Qualities of  
the Human Family



CARNEGIE INSTITUTION OF WASHINGTON  
DEPARTMENT OF GENETICS

The Eugenics Record Office, Cold Spring Harbor, Long Island, N. Y.

Founded by Mrs. E. H. Harriman

Established October 1, 1910

CHARLES B. DAVENPORT, Director

HARRY F. LAUGHLIN, Assistant Director

This office is devoted to the study of the biological forces which determine the natural capacities and limitations of mankind. It looks forward to having ultimately a good working pedigree-index of the natural traits of a large portion of the families of America.

Science can not experiment with human beings. It deedes merely to learn and publish the actual results of man's experiments on himself. Every marriage is an experiment in heredity. Every person should be interested in the actual

# EUGENICS

EUGENICS IS THE  
SELF DIRECTION

OF HUMAN EVOLUTION



LIKE A TREE

EUGENICS DRAWS ITS MATERIALS FROM MANY SOURCES AND ORGANIZES  
THEM INTO AN HARMONIOUS ENTITY.

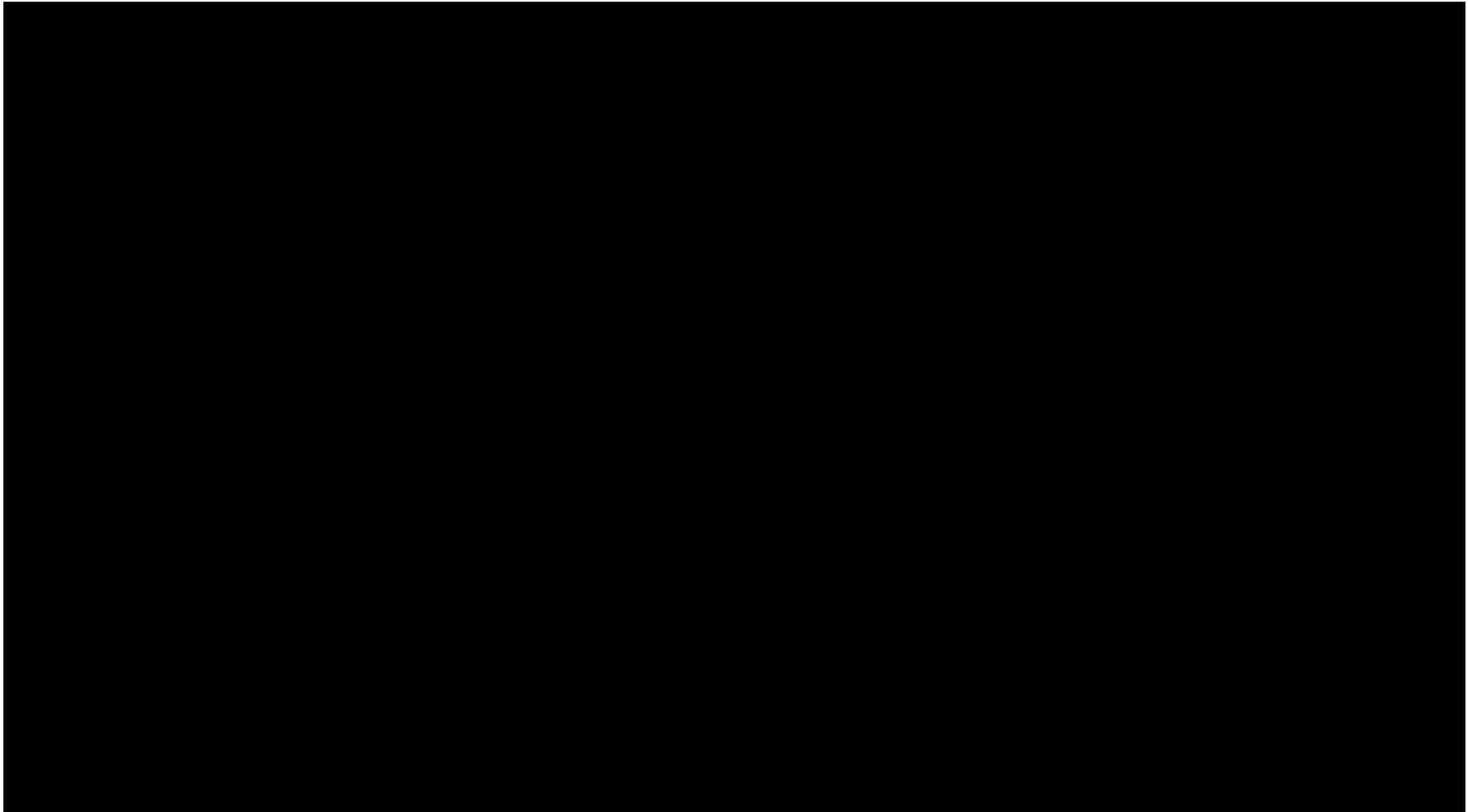
Nazi Propaganda: "Qualitative decline in the population...It will come to this if individuals with lesser value have four children and those of higher value have two."

## Qualitativer Bevölkerungsabstieg. bei zu schwacher Fortpflanzung der Höherwertigen



So würde es kommen,  
wenn Minderwertige 4 Kinder und Höherwertige 2 Kinder hätten.

George Bernard Shaw -  
a Nobel Prize and Oscar-winning Irish author and  
philosopher.



# Virginia's test case - Carrie Buck

"A probable potential parent of socially inadequate offspring."



- At her trial, she was said to have "a record of immorality, prostitution, untruthfulness and syphilis."
- In private writings, the director of the home where she lived described her family as: "These people belong to the shiftless, ignorant and worthless class of anti-social whites of the South"

<http://www.hsl.virginia.edu/historical/eugenics/3-buckvbell.cfm>

<http://www.eugenicsarchive.org/eugenics/>



# Some well-known individuals who supported eugenics:



Alexander Graham Bell  
John D. Rockefeller  
Theodore Roosevelt  
Woodrow Wilson  
Winston Churchill  
Margaret Sanger

# Termer (from Stanford) and his IQ Test

- A 8 year old has a mental age of 10, what is her IQ?
- A 12 year old has the mental age of 9, what is his IQ?
- Used Binet's research to construct the modern day IQ test called the Stanford-Binet Test.

$$IQ = \frac{\text{mental age}}{\text{chronological age}} \times 100$$

# Coming to America

- The idea of IQ testing became popular in America for three reasons:
  - A huge increase in immigration
  - New laws requiring universal education
  - Military assessing new recruits for WWI
  - Despite its utility, IQ testing had a big downside. Tests ended up reinforcing prevailing prejudices about race and gender.
  - Ignored was the fact that environmental disadvantages limit the full development of people's intellectual abilities.

# Changes in how *intelligence* is defined: Binet v. Terman

- Binet: intelligence malleable
- Terman: intelligence is inherited and stable



# Modern Tests of Mental Abilities

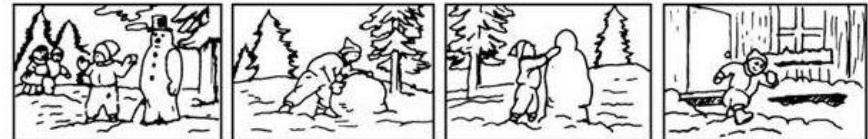
- Wechsler Adult Intelligence Scale (WAIS) consists of 11 subtests and cues us in to strengths by using.....

## Factor Analysis

- Later - Wechsler Intelligence Scale for Children (WISC), an intelligence test for preschoolers.

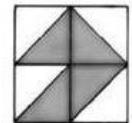
### Picture Arrangement

The pictures below tell a story. Put them in the right order to tell the story.



### Block Design

Using the four blocks, make one just like this.



### Object Assembly

If these pieces are put together correctly, they will make something. Go ahead and put them together as quickly as you can.



### Digit-Symbol Substitution

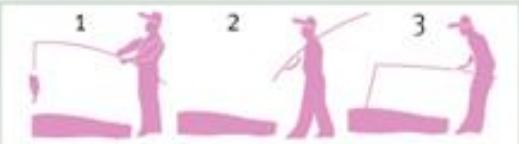
Code

△	○	□	×	◊
1	2	3	4	5

Test

1	5	4	2	1	3	5	4	1	5

### Wechsler Adult Intelligence Scale (WAIS)

Test	Description	Example
<b>Verbal scale</b>		
Information	Taps general range of information	On what continent is France?
Comprehension	Tests understanding of social conventions and ability to evaluate past experience	Why are children required to go to school?
Arithmetic	Tests arithmetic reasoning through verbal problems	How many hours will it take to drive 150 miles at 50 miles per hour?
Similarities	Asks in what way certain objects or concepts are similar; measures abstract thinking	How are a calculator and a typewriter alike?
Digit span	Tests attention and rote memory by orally presenting series of digits to be repeated forward or backward	Repeat the following numbers backward: 2 4 3 5 1 8 6
Vocabulary	Tests ability to define increasingly difficult words	What does audacity mean?
<b>Performance scale</b>		
Digit symbol	Tests speed of learning through timed coding tasks in which numbers must be associated with marks of various shapes	Shown: 1 2 3 4 <input type="radio"/> <input type="checkbox"/> <input type="triangle"/> <input type="circle"/> Fill in: 1 4 3 2 _____
Picture completion	Tests visual alertness and visual memory through presentation of an incompletely drawn figure; the missing part must be discovered and named	Tell me what is missing: 
Block design	Tests ability to perceive and analyze patterns by presenting designs that must be copied with blocks	Assemble blocks to match this design: 
Picture arrangement	Tests understanding of social situations through a series of comic-strip-type pictures that must be arranged in the right sequence to tell a story	Put the pictures in the right order: 
Object assembly	Tests ability to deal with part/whole relationships by presenting puzzle pieces that must be assembled to form a complete object	Assemble the pieces into a complete object: 

# Assessing Intelligence: Sample Subscores from the WAIS

## VERBAL

**General Information**  
**Similarities**  
**Arithmetic Reasoning**  
**Vocabulary**  
**Comprehension**  
**Digit Span**

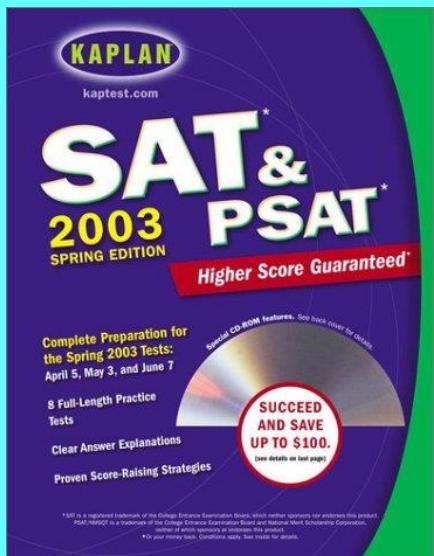
## PERFORMANCE

**Picture Completion**  
**Picture Arrangement**  
**Block Design**  
**Object Assembly**  
**Digit-Symbol Substitution**

# Aptitude v. Achievement Tests

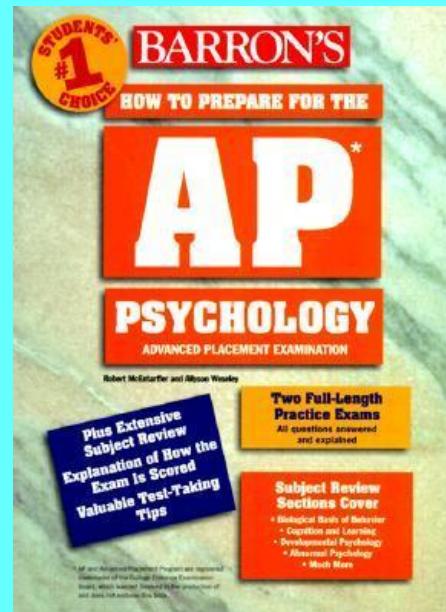
## Aptitude

- A test designed to predict a person's future performance.
- The ability for that person to learn.



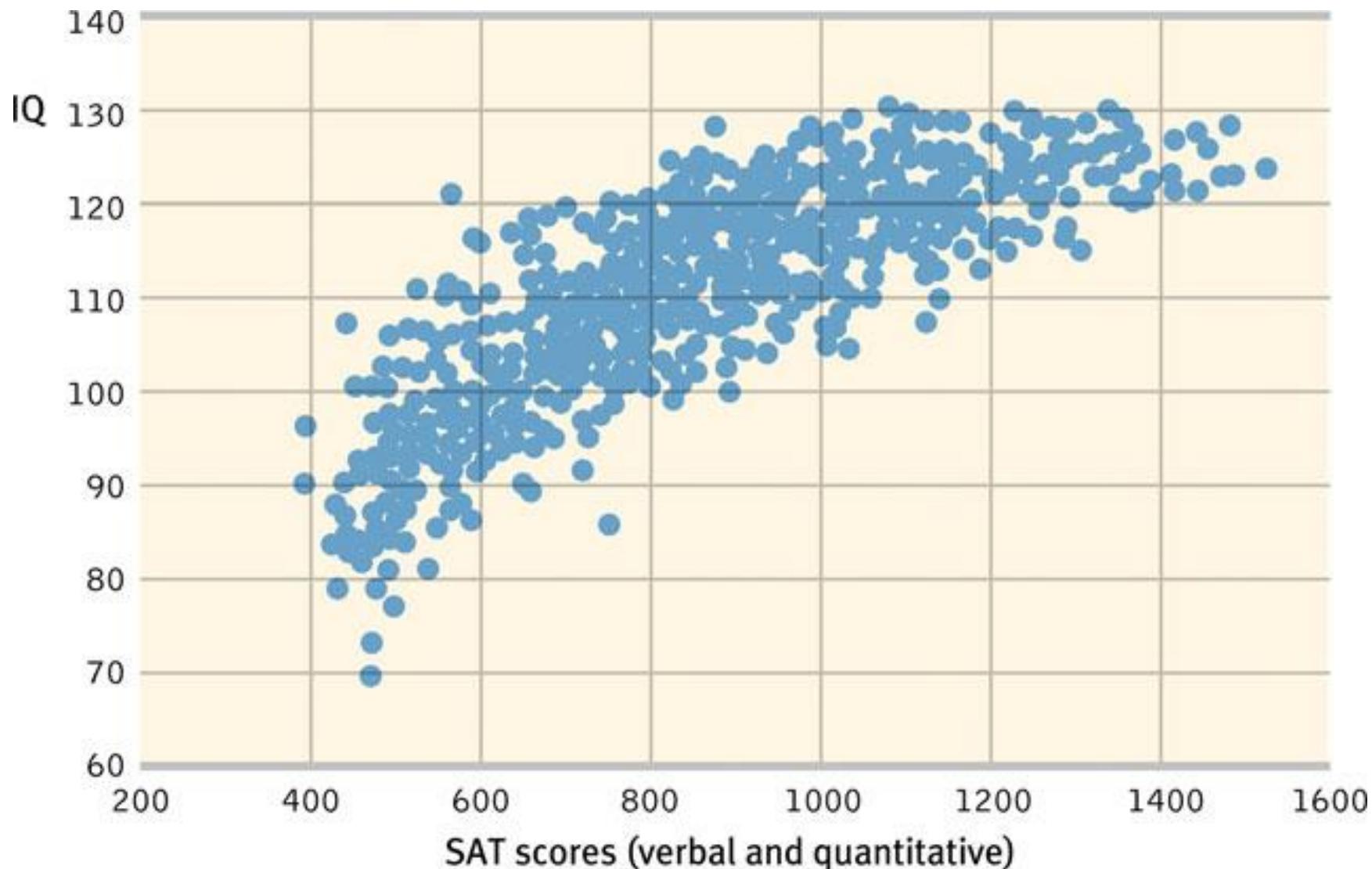
## Achievement

- A test designed to assess what a person has learned.



Q: What is the correlation between SAT scores and IQ scores?

## Aptitude and Achievement Tests



What are the 3 most important considerations when testing?



# How do we construct Intelligence tests?

Tests must be:

- Valid
- Reliable
- Standardized

# Validity & Reliability

Validity: The extent to which a test measures what it is supposed to measure.

- *Content Validity*: does the test actually sample a behavior it is measuring?
- *Predictive Validity*: does the test accurately predict future behavior?



Reliability: The extent which a test yields consistent results over time.

# Reliability

The extent which a test yields consistent results over time.

## Test-Retest Reliability

- Administering the same test to the same set of examinees on two separate occasions.

Questionnaire (Completed 9/20)

- 4 I feel I do not have much proud of.
- 3 On the whole, I am satisfied with myself
- 2 I certainly feel useless at times
- 1 At times I think I am no good at all
- 4 I have a number of good qualities
- 3 I am able to do things as well as others

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# Standardization

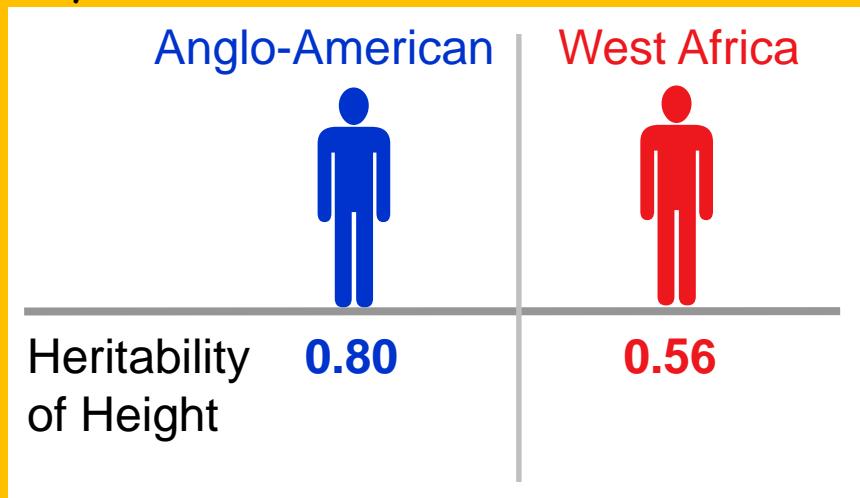
- Defining uniform testing procedures and scores by comparing scores to a pre-tested group.
- Tests like WAIS are periodically re-standardized. (The average intelligence score in 1920 would only score a 76 by today's standard.)
- This also helps to eradicate biases due to gender, race, culture, socio-economic status, special-needs, etc.

# Heritability

- Heritability refers to the extent to which the differences among people are attributable to genes.
- Mathematical formula, with results varying from 0-100.
- In an identical environment, and difference would result in a heritability of 100. (Correlations of .7 or above are considered strong evidence of genetic influence.)
- As environments become more similar, heredity as a source of differences necessarily becomes more important.
- Question: If all schools were of the same quality, all families equally loving, and all neighborhoods equally healthy, would heritability increase or decrease? Why?

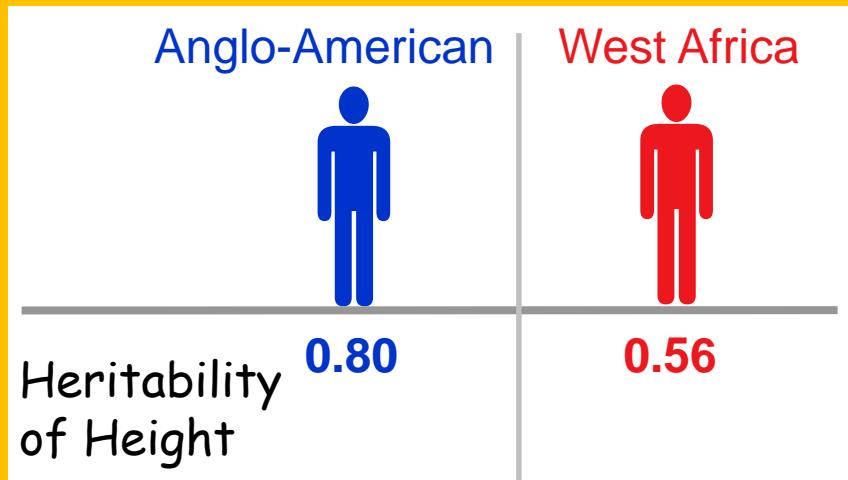
## Heritability of Body Height & Environment

- Heritability of height is how much variance (differences,) exist groups of individuals, due to genetic factors.
- In Anglo-American studies, heritability has been found to be about 0.80.
- Much lower estimates have been found in West Africa (0.56) - why?



## Heritability of Body Height & Environment

Because the much more prevalent and severe environmental factors in developing countries, largely malnutrition and recurrent/chronic infections throughout childhood, interfere with the ability of individuals to reach their full genetic "height potential."



Mark Twain explains it best using the barrel example...

# Genetic Differences

- Genetic differences and environmental impact

