



UNIVERSITY OF
CAMBRIDGE

The Psychometrics Centre

MPhil SDP 2018 Psychometrics 1

Classical Psychometrics, 12th February 2018

John Rust

<http://www.psychometrics.cam.ac.uk>

Plan

- Ancient and Modern
- What is intelligence?
- Measuring intelligence
- The rise and fall of Eugenics
- Consequences
- The Flynn Effect

What's in a word?

- Intelligence
- I.Q.
- Ability
- Critical Thinking
- Aptitude
- Achievement
- Competency
- Cognitive Complexity
- Academic Potential
- Executive Function

Plato's Republic (Book 5)

- Socrates asks Glaucon:
 - “When you spoke of a nature gifted or not gifted in any respect, did you mean to say that one man will acquire a thing hastily, another with difficulty; that a little learning will lead the one to discover a great deal whereas the other, after much study and application, no sooner learns than he forgets; or again, did you mean that the one has a body which is a good servant of his mind, while the body of another is a hindrance to him? Would not these be the sort of differences which distinguish the man gifted by nature from the one who is ungifted?” (7, 359)

Xunzi (Hsun Tzu c. 310 – 220 B.C.E.)



Edward Jenner “The Artist” Vol 19 1807

- “For though all men are, as we trust and believe, capable of the divine faculty of reason, ..., yet it is not to all that the heavenly beam is disclosed in its splendour.”
- “In the first and lowest order I place -
- The Idiot: the mere vegetative being, totally destitute of intellect.”

Edward Jenner: “The Dolt”

•“In the second rank I shall mention that description of Being just lifted into intellectuality, but too weak and imperfect to acquire judgement; who can perform some of the minor offices of life – can shut a door – blow a fire – express sensations of pain, etc., and, although faintly endowed with perceptions of comparative good, is yet too feeble to discriminate with accuracy. A being of this degree may, with sufficient propriety, be denominated the silly poor creature, the dolt.”

Edward Jenner: “Mediocrity”

•The third class is best described by the general term of Mediocrity, and includes the large mass of mankind. These crowd our streets, these line our queues, these cover our seas. It is with this class that the world is peopled. These are they who move constantly in the beaten path; these support the general order which they do not direct; these uphold the tumult which they do not stir; these echo the censure or the praise of that which they are neither capable of criticising or admiring.”

Edward Jenner: “Moral perfection”

•“... the happy union of all the faculties of the mind, which conduce to promote present and future good; all of the energies of genius, valour, judgement. In this class are found men who, surveying truth in all her loveliness, defend her from assault, and unveil her charms to the world; who rule mankind by their wisdom, and contemplate glory, as the Eagle fixes his view on the Sun, undazzled by the rays that surround it.”

Intelligence as “Giftedness”

- Gifted by the Gods? (Plato)
- Or the Heavenly Beam? (Jenner)
- Or Gaia (Lovelock), Mother Nature (various)?
- Or Survival of the Fittest (Darwin)
- Or DNA (Franklin, Watson and Crick)

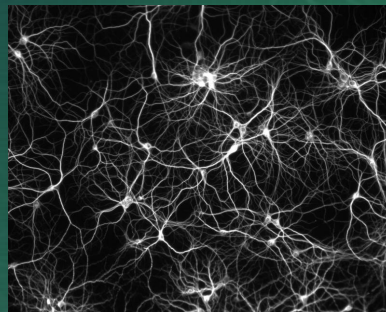
Intelligence as spiritual evolution

- The Tree of Life (Archetype)
- Stones, plants, germs, worms, fish, reptiles, birds, mammals, anthropoid apes, man, heroes, gods, pervasive spiritual force, the unknown unknowable.
- “Savages”, “the lower races”, “the civilized nations” (sic) (Darwin)
- Spearman’s “g”
- “A sort of psychophysiological energy”
- Eysenck “speed of nerve transmission”

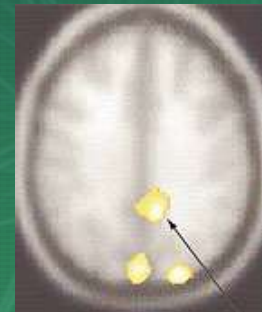
Spiritual icons for IQ



“Psychophysiological energy” (Spearman)



“Speed of nerve transmission” (Eysenck)



“bits light up”

Intelligence as a natural hierarchy

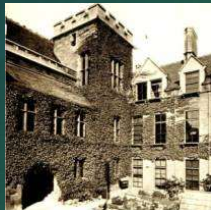
- Stones, plants, germs, worms, fish, reptiles, birds, mammals, anthropoid apes, man, heroes, gods, “higher spiritual force”.
- “Savages”, “the lower races”, “the civilized nations” (sic) (Darwin)
- Spearman: “g” as a sort of psychophysiological energy
- Eysenck “speed of nerve transmission”

The Victorians

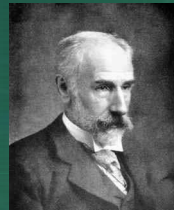
Wundt



Cattell



Edgeworth

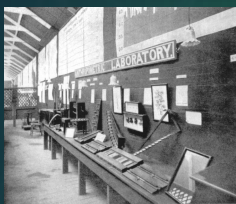


Theory of True Scores

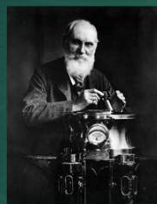
If we tabulate the marks given by the different examiners they will tend to be disposed after the fashion of a gendarme's hat.

I think it is intelligible to speak of the mean judgment of competent critics as the true judgment; and deviations from that mean as errors.

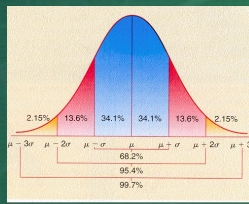
This central figure which is, or may be supposed to be, assigned by the greatest number of equally competent judges, is to be regarded as the true value, just as the true weight of a body is determined by taking the mean of several discrepant measurements.



Galton



Kelvin



Gauss

Eugenics and Dysgenics: The degeneration hypothesis

- A population is termed 'dysgenic' if it exhibits either enhanced reproduction levels among organisms with seemingly undesirable characteristics, or if it exhibits diminished reproduction among organisms with seemingly desirable characteristics.
- The eugenics movement argued that we humans, by caring for the sick and 'unfit', are undergoing dysgenic degeneration, and that scientists should become involved in damage limitation.

Charles Darwin (1871) "The Descent of Man"

- "The moral sense perhaps affords the best and highest distinction between man and the lower animals" (p 126)
- "There is not the least inherent improbability, as it seems to me, in virtuous tendencies being more or less strongly inherited Except through the principle of the transmission of moral tendencies we cannot understand the differences believed to exist in this respect between the various races of mankind.' (p. 124)

Charles Darwin (1871) “The Descent of Man”

- The chief causes of the low morality of savages, as judged by our standards are, firstly, the confinement of sympathy to the same tribe. Secondly, powers of reasoning insufficient to recognize the bearing of many virtues, especially the self-regarding virtues, on the general welfare of the tribe.
- Savages, for instance, fail to trace the multiple evils consequent on a want of temperance, chastity etc. And thirdly, weak power of self command, for this power has not been strengthened through long-continued, perhaps inherited, habit, instruction and religion.” (p119 of 2nd edition, 1888)

W R Greg Fraser’s Magazine (1868)

- “The careless, squalid, unaspiring Irishman, fed on potatoes, living in a pig-sty, doting on a superstition, multiplies like rabbits or ephemera
- The frugal, foreseeing, self-respecting, ambitious Scot, stern in his morality, spiritual in his faith, sagacious and disciplined in his intelligence, passes his best years in struggle and in celibacy, marries late, and leaves few behind him.”
- Paraphrases of this quote appear as footnotes in both Darwin (“Descent of Man”, and Galton (“Heredity Genius”)

W R Greg Fraser's Magazine (1868)

- “Given a land originally peopled by a thousand Saxons and a thousand Celts – and in a dozen generations five-sixth of the population would be Celts, but five-sixth of the property, of the power, of the intellect, would belong to the one-sixth of the Saxons that remained.
- In the eternal “struggle for existence” it would be the inferior and less favoured race that had prevailed – and prevailed by virtue not of its good qualities but of its faults.” (P. 353)

Terman (1919) Manual of the Stanford Binet

- Of children with high IQ on his test
- “really serious faults are not common among them, they are nearly always socially adaptable, are sought after as playmates and companions, they are leaders far oftener than other children, and notwithstanding their many really superior qualities they are seldom vain or spoiled.”

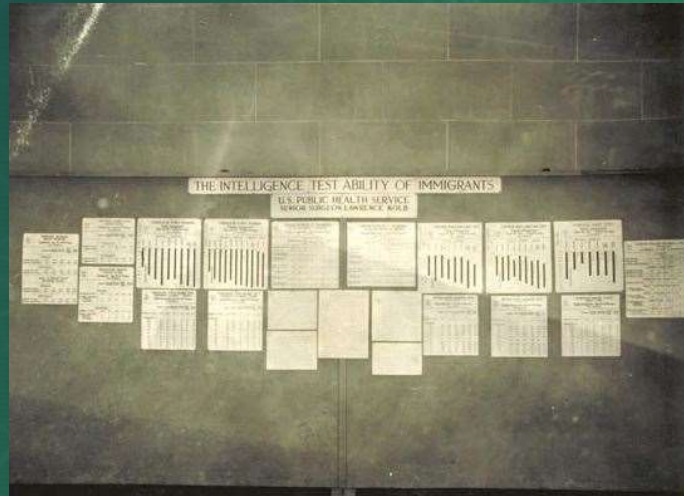
Terman (1919) Manual of the Stanford Binet

•“It is safe to predict that in the near future intelligence tests will bring tens of thousands of . . . high-grade defectives under the surveillance and protection of society. This will ultimately result in the curtailing of the reproduction of feeble-mindedness and in the elimination of enormous amounts of crime, pauperism and industrial inefficiency. It is hardly necessary to emphasize that the high-grade cases, of the type now so frequently overlooked, are precisely the ones whose guardianship it is most important for the state to assume.”

US Army Alpha

- 1917. The Yerkes Committee set up by US army. First group test of intelligence (Army Alpha). The brief:
- Adaptable to group use.
- Correlated with other measures of IQ.
- Measured a wide range of ability
- Could be scored objectively with stencils.

IQ testing, Ellis Island

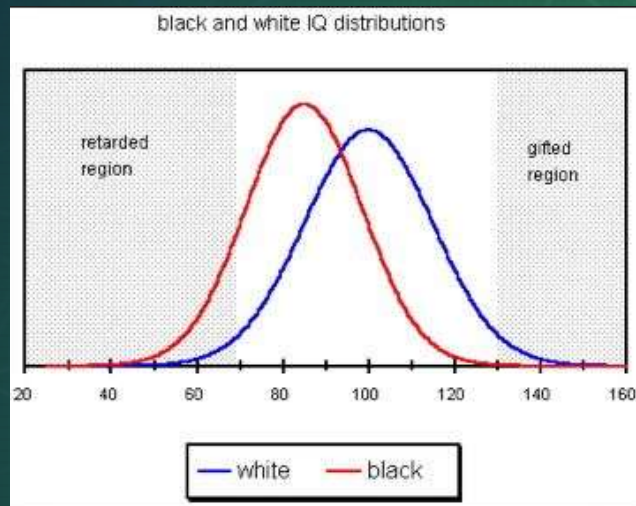


“Racial Hygiene” “Scientific Racism”

- Virginia (1924) “Sterilization Act” for the “feeble-minded”
- Germany (1933) “Law for the Prevention of Genetically Diseased Offspring” (sterilization for feeble-mindedness, mental illness, blindness, deafness, physical deformity)
- Germany (1937) ‘Commission Number 3’ compulsory sterilization of children of mixed-race origins.
- Germany (1939) Euthanasia introduced in psychiatric hospitals for those with disabilities (broadly defined, this included homosexuality and “social deviancy”)
- Soviet Union (1949), Incarceration on psychiatric diagnosis of “philosophical intoxication”, “sluggish schizophrenia” (poor social adaptation), etc.

6. [REDACTED] - (W) - Resident Buncombe County
 Proceedings instituted by George H. Lawrence, SPW
 Medical history by H. C. Whems, M. D.
 Sterilization recommended by Dr. Whems
 Social history:
 Married woman, [REDACTED] years of age, who is the mother of 3 children ranging in ages from [REDACTED] to [REDACTED] years. On a psychological examination given by Dorothy Hamilton she was found to have an I. Q. of 56. The family has been financially dependent for many years and there is a history of inter-marriage with Indian and Negro.
 Diagnosis: Feeble-mindedness
 Operation will be performed by surgeon on staff of Biltmore Hospital at time of delivery.
 Consents: Consent is signed by [REDACTED], patient, and by [REDACTED], husband.

Herrenstein and Murray "The Bell Curve" (USA, 1994)



The Flynn Effect

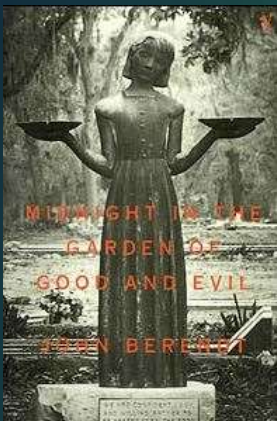
Wechsler Intelligence Scale for Children		Average at 1949	Rate of change p.a.
WISC	1949	100.00	
WISC-R	1974	107.63	0.311
WISC-III	1991	113.00	0.322
WISC-IV	2003	117.63	0.363



The first psychometric revolution (1890-1990)



To sum up 20th century psychometrics



Samuel Taylor Coleridge
(Table Talk, 1831)

*If men could learn from
history, what lessons it
might teach us!*

*But passion and party
blind our eyes, and the
light which experience
gives us ... is a
lantern on the stern
which shines only on the
waves behind.*



Psychometric revolutions

Innovation

- Examinations
- Mental Tests
- Online testing
- Adaptive Testing



Intended consequences

- Meritocracy
- Diagnosis
- Instant results
- Efficiency

Taking our eyes off the ball

Innovation

- Examinations
- Mental Tests
- Online testing
- Adaptive Testing

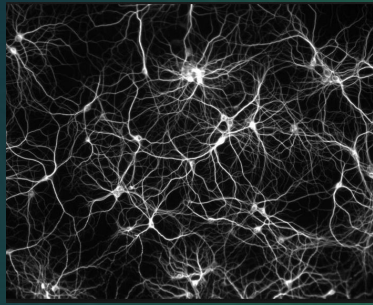


Unintended consequences

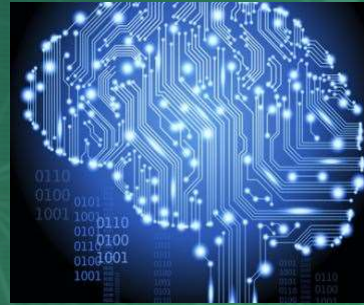
- Discrimination
- Eugenics
- Cyber insecurity
- Artificial Intelligence

Ways forward

Neuropsychology



Behavioural Analytics



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Psychometrics Seminars

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Upcoming events

IRT and CAT using Concerto (3 days)
Mar 08, 2017
Cambridge, UK

Mplus course in Structural Equation Modelling (3 days)
Mar 14, 2017
Cambridge, UK

Certificates of Occupational Test Use, Level A and B (3-day course)
Mar 27, 2017
Cambridge, UK

SEM in R: (with MLM) (up to 6 days)
Apr 24, 2017
Cambridge, UK

Upcoming events >