



UNLOCKING
CONSCIOUSNESS



BRIAN MIND FORUM

Appendix 002

Quotations and Definitions of Intelligence

Intelligence is central to our understanding of cognitive neuroscience, yet, here at the beginning of the 21st Century, we have no agreed definition of Intelligence.

Hampering our ability to design general AI is the embarrassing fact that we don't understand what we mean by "intelligence". This lack of knowledge makes any predictions of when we will achieve strong AI fraught with uncertainty.

Christof Koch. President and Chief Scientific Officer. Allen Institute of Brain Science.
Advisor Scientific American Mind Board of Advisors.
Student and collaborator with Francis Crick

DEFINITIONS

Intelligence Latin Root *intellegere*, to comprehend, perceive or understand.

The action or fact of mentally apprehending something quickly: understanding, knowledge, comprehension of something. OED.

Latin **inter** "between" and **legere** "choose, pick out, read"

Intelligent: intelligible, capable of understanding: **Intelligibly**, comprehensively.

Also: Faculty of understanding. Superior understanding. Quickness of mental understanding. Intellect.

The Greeks linked the concept of intelligence to theories of the immortality of the soul. Bacon, Hobbes, Locke and Hume all strongly objected, and preferred the word 'understanding'. The arrival of computing and the potential of artificial, or machine intelligence, has stimulated a new dimension to the debate.

The Board of Scientific Affairs of the **American Psychological Association** published the report "Intelligence: Knowns and Unknowns" in 1995:-

“Individuals differ from one another in their ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought. Although these individual differences can be substantial, they are never entirely consistent: a given person's intellectual performance will vary on different occasions, in different domains, as judged by different criteria. Concepts of "intelligence" are attempts to clarify and organize this complex set of phenomena. Although considerable clarity has been achieved in some areas, no such conceptualization has yet answered all the important questions, and none commands universal assent. Indeed, when two dozen prominent theorists were recently asked to define intelligence, they gave two dozen, somewhat different, definitions.”

"Intelligence measures an agent's ability to achieve goals in a wide range of environments,"

A synthesis of 70+ definitions from psychology, philosophy, and AI researchers

In 1994 the **Wall Street Journal** invited fifty-two researchers From "Mainstream Science on Intelligence" to provide an 'op-ed statement': -

“A very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings— "catching on," "making sense" of things, or "figuring out" what to do”

Wikipedia suggests: -

Intelligence has been defined in many different ways including one's capacity for logic, understanding, self-awareness, learning, emotional knowledge, memory, planning, creativity, adaptive behavior, problem solving and self-control. It can be more generally described as the ability to perceive information, and retain it as knowledge to be applied towards adaptive behaviors within an environment or context.

Intelligence is most widely studied in humans, but has also been observed in non-human and animals and in plants. Artificial intelligence is intelligence in machines. It is commonly implemented in computer systems using program software.

Within the discipline of psychology, various approaches to human intelligence have been adopted. The psychometric approach is especially familiar to the general public, as well as being the most researched and by far the most widely used in practical settings.

“Human intelligence is the intellectual capacity of humans, which is characterized by perception, consciousness, self-awareness, and volition. Intelligence enables humans to remember descriptions of things and use those descriptions in future behaviours. It is a cognitive process. It gives humans the cognitive abilities to learn, form concepts, understand, and reason, including the capacities to recognize patterns, comprehend ideas, plan, and problem solve, and use language to communicate. Intelligence enables humans to experience and think.”

Swedish Nobel Foundation

In his new book 'Life 3.0' Max Tegmark reports that, at a symposium organized by the Swedish Nobel Foundation, a panel of leading AI researchers were asked to define intelligence. "They argued at length without reaching consensus".

Professor Tegmark suggests "a very broad definition of intelligence is the ability to accomplish complex goals".

This definition highlights the problem, as this definition addresses the objectives and purposes of intelligence, as opposed to what the 'mechanism' of intelligence is, how and why it evolved, and how it operates.

Other individual definitions include:-

"The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment."

David Wechsler

"...the resultant of the process of acquiring, storing in memory, retrieving, combining, comparing, and using in new contexts information and conceptual skills."

Lloyd Humphreys

"Innate general cognitive ability"

Cyril Burt

"To my mind, a human intellectual competence must entail a set of skills of problem solving — enabling the individual to resolve genuine problems or difficulties that he or she encounters and, when appropriate, to create an effective product and must also entail the potential for finding or creating problems and thereby laying the groundwork for the acquisition of new knowledge."

Howard Gardner.

"Intelligence is knowing what to do when we do not know what to do."

Jean Piaget 1896-1980

"Judgment, otherwise called "good sense," "practical sense," "initiative," the faculty of adapting one's self to circumstances ... auto-critique."

Alfred Binet

"Some recent philosophers have given their moral approval to the deplorable verdict that an individual's intelligence is a fixed quantity, one which cannot be augmented. We must protest and act against this brutal pessimism. It has no foundation whatsoever. Everyone should be given lessons of will, of attention, of discipline; before exercises in grammar they need to be exercised in mental orthopaedics; in a word they must learn how to learn."

Alfred Binet.

"Intelligence is:- Seeing facts in terms of other things. Ability to make big links between different contexts."

Greenfield: Times 2 No 09.

"Intelligence is the habit of persistently trying to understand things and make them function better. Intelligence is working to figure things out, varying strategies until a workable solution is found. One's intelligence is the sum of one's habits of mind."

Lauren Resnick.

"We know much more than we know we know."

Michael Polanyi.

"Intelligence = brain power. Comes in many different forms from high level theorising, through logic to imaginative originality."

Mary Beard, Cambridge.

"Analytical skills to master wide range of information and identify quickly relevant issues: communication skills to present facts lucidly: forming fruitful relationships: knowing what to say to whom"

Peter Lampl.

"Alertness, perceptiveness, wit, curiosity, creative responses to opportunities and problems: learn quickly from errors: self motivated, ambitious, derive pleasure from putting talents to use."

A C Grayling.

"Entia non sunt multiplicanda praeter necessitatem."

(Things should not be multiplied any more than necessary)

(if something cannot be explained simply a complicated explanation will not help)

William of Ockham

"Background that ties together sets of skills: solve problems, think logically, reason, adapt to change, think outside box. Dealing well with environment. A brain that facilitates survival."

"No commonly agreed definition of intelligence."

Maria Leitner, Mensa.

"Seeing what lies beyond scholarship. Intelligence and Scholarship do not go together."

Patrick Moore.

"Separate from cleverness. Involves humanity. Ideas, insights, and visions, but must have understanding what makes the world tick and how ideas impact the greater good"

Professor Wendy Hall.

"Not just quick witted and articulate, nor knowing a great deal, nor just being wise. Being able to see the flaws in arguments – especially one's own."

John Humphreys.

"As many different definitions as there are for beauty. We know so little about the brain that all pigeon holing should be avoided at all costs."

Anthony Beevor.

"Easy to recognise, more difficult to define. Ability to think laterally. Intelligence + wit = sex appeal."

Anne Robinson.

"Intelligence is a social triumph, which reveals our debt to earlier generations, other cultures, teachers, professors, parents, and all the media. Collective intelligence involves a major change in the way we think about the relationship between the individual and society, consequently the way we organise our schools."

Phil Brown, Hugh Lauder.

"When one set of concepts in one set of circumstances and in one media can be applied to solve another problem in different circumstances and other media."

Richard Feynman

"Intelligence is the discipline of imposing order out of chaos."

Edwin Schrödinger 'What is Life?'

"Intelligence is adaptively variable behaviour during the lifetime of the individual."

David Stenhouse NZ [p41 NS 27 July 2002]

"Intelligence is making decisions based on recognising patterns in information. The higher the level of intelligence, the more complex the decision making"

Simon Krystman

"Creativity (one form of intelligence) is the ability to synthesise knowledge to produce a novel idea; and that intuition (a further form of intelligence) is implicit knowledge acquired through experience that is not consciously expressible."

Demis Hassabis. Co-Founder, Deep Mind

"The ability to deal with cognitive complexity".

Linda Gottfredson

"Goal-directed adaptive behaviour".

Sternberg & Salter

"The theory of Structural Cognitive Modifiability describes intelligence as "the unique propensity of human beings to change or modify the structure of their cognitive functioning to adapt to the changing demands of a life situation."

Reuven Feuerstein

"...all branches of intellectual activity have in common one fundamental function, whereas the remaining or specific elements of the activity seem in every case to be wholly different from that in all the others."

Charles Spearman.

Peter Godfrey Smith studies neural abilities in animals and fishes that only have common ancestors with us way back in distant history such as the Cephalopods, including the octopus family. He argues in 'Other minds' that there are undeniable signs of intelligent behaviour.

"There is no single scale on which intelligence can be sensibly measured. Different animals (and different humans) are good at different things, as makes sense given the different lives they live. Brains are like tool kits for behaviour. Some elements are common to many trades, some elements exclusive to others. There is infinite diversity".

Peter Godfrey Smith