

Chapter 2: How Human Mind Thinks

Ranganathan and Neelameghan assumed that most of the people think in the similar manner, only a few or minority group think in different way. But this may not be true. There are evidences in psychology that same object or phenomenon may be perceived differently by different persons . Even the same person may perceive differently at different point of time. It is known as *Bistable Perception*.

2.1 Bistable Perception:

Bistable perception is a perceptual phenomenon characterized by changes in subjective perception while sensory input remains constant. Usually, perception alternates spontaneously between two mutually exclusive interpretations of the same sensory input. Rarely, more than two interpretations are possible, in which case the term multistable perception is used (Coon & Mitterer, 2011). Famous experiments of bistable perception are with i) Necker cube, ii) Rubin's Face / Vase picture and iii) Duck-Rabbit picture.

2.1.1 Necker Cube:

It was discovered by a Swiss crystallographer, Louis Albert Necker, in 1832.

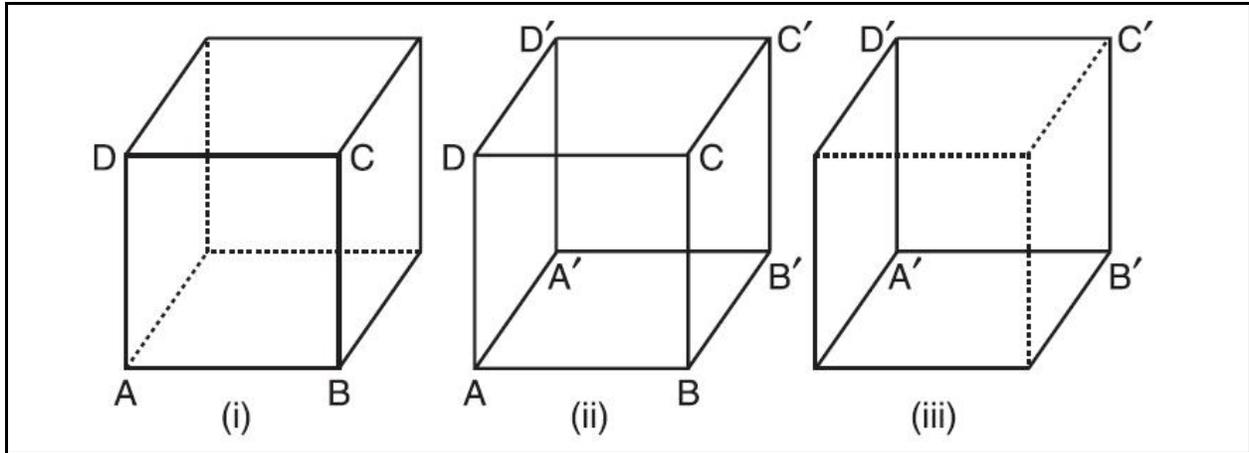


Figure 2.1: Necker cube (Barrow, 2005, p.14)

The Necker cube, with all lines solid, is shown in the centre as (ii). On either side, (i) and (iii) offer alternative visual interpretations of it. On viewing the Necker cube one may see the interpretation (iii), followed soon afterwards by the interpretation (i), followed by rapid shifting between the two as he tries to decide whether A or A' is nearer to him. As Necker first emphasized, the most impressive distinction between (i) and (iii) appears to be the orientation of the cube (Barrow, 2005).

The Necker cube is used in epistemology and provides a counter-attack against naive realism. Naive realism (also known as *direct* or *common-sense* realism) states that the way people perceive the world is the way the world actually is. The Necker cube seems to disprove this claim because people see one or the other of two cubes, but really, there is no cube there at all: only a two-dimensional drawing of twelve lines. People see something which is not really there, thus disproving naive realism (Wikipedia)

2.1.2 Rubin's Face/Vase illusion:

In this experiment, people see either a figure of vase on central position on a black background or two black faces against a white background.

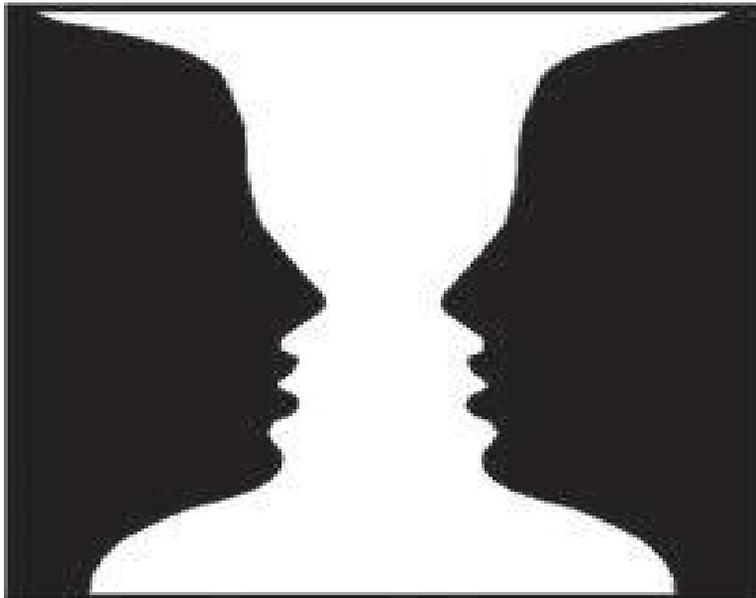


Figure 2.2: Rubin's face/vase illusion (Sterzer & Rees, 2009)

2.1.3 Duck-Rabbit problem:

In this experiment one can see the figure either as a duck or as rabbit. This experiment has a long history.

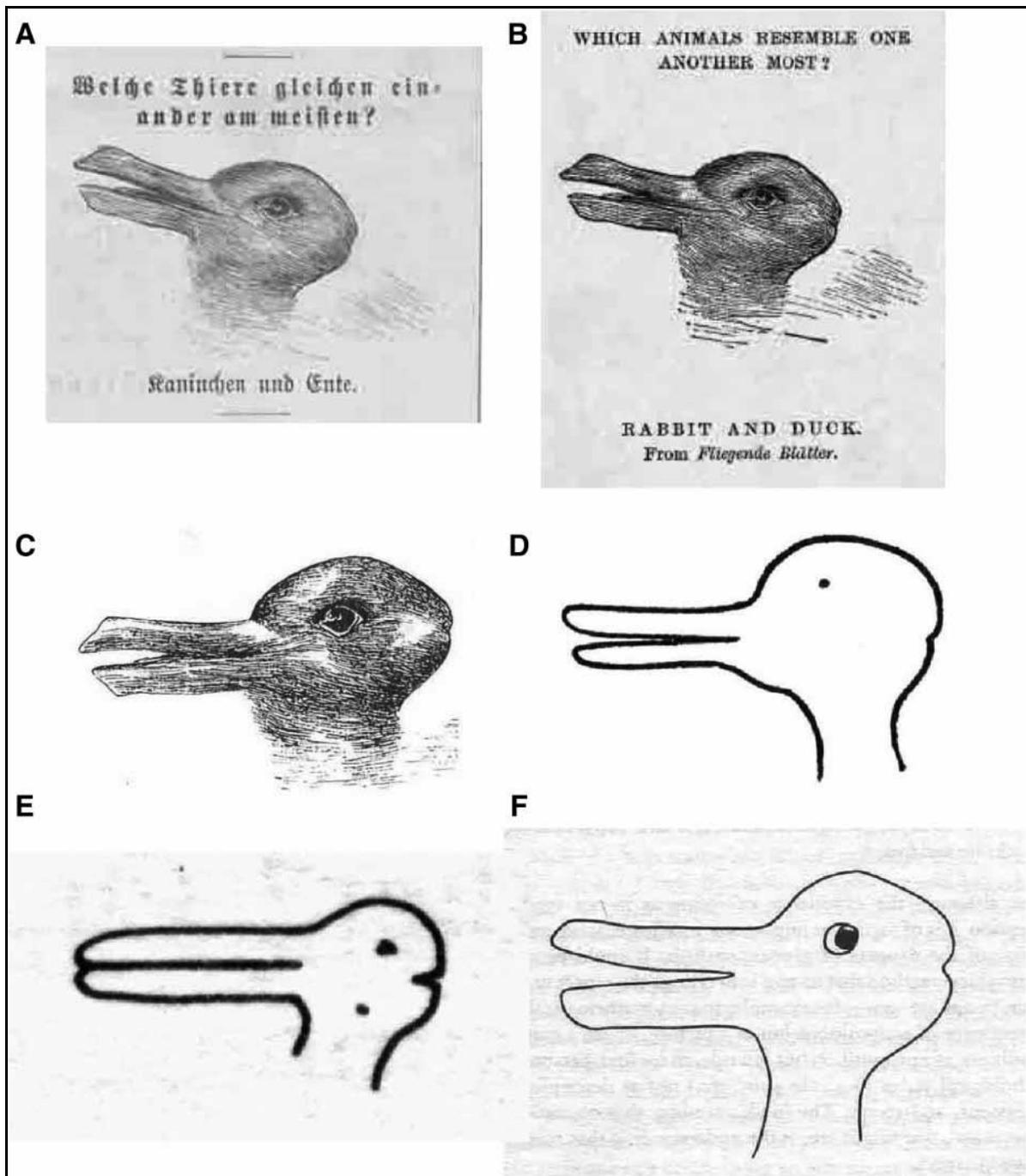


Figure 2.3: **Duck-Rabbit problem**

Drawings of the duck_rabbit figure. (a) The original drawing in the 1892 Die Fliegenden Blätter. (b) The version in Harper's Magazine of 1892. (c) The version used by Jastrow in 1900. (d) Wittgenstein's version in the Philosophical Investigations of 1953. (e) Geach's drawing of the duck_rabbit figure from his notes for Wittgenstein's 1946_47 lectures, for which the entire image is only 10 mm in width, and it is assumed that the tiny lower dot is an error occurring

during printing. (f) The version shown in Monk's biography of Wittgenstein and said to be that used in the 1947 lectures (McManus, Rawles, Moore, & Freegard, 2010).

Interest in bistable perception has recently been boosted by the advent of modern brain imaging techniques such as functional magnetic resonance imaging (fMRI). Such techniques can be used to measure brain activity in humans noninvasively, and therefore offer the opportunity to study the neural correlates of conscious visual perception.

2.2 Steven Pinker and How the mind works:

Steven Pinker studied experimental psychology at McGill University and Harvard University.

After serving on the faculties of Harvard and Stanford universities he moved to the Massachusetts Institute of Technology.. Pinker has studied many aspects of language and of visual cognition, with a focus on language acquisition in children. He is a fellow of several scientific societies, and has been awarded research prizes from the the National Academy of Sciences and the American Psychological Association

Pinker published his famous book 'How the mind works' in 1997. He was influenced by evolutionary psychologists John Tooby and Leda Cosmides. He argued for a computational theory of mind.

First, we don't understand how the mind works—not nearly as well as we understand how the body works, and certainly not well enough to design Utopia or to cure unhappiness. Then why the audacious title? The linguist Noam Chomsky once suggested that our ignorance can be divided into *problems* and *mysteries*. When we face a problem, we may not know its solution, but we have insight, increasing knowledge, and an inkling of what we are looking for. When we face a mystery, however, we can only stare in wonder and bewilderment, not knowing what an explanation would even look like (Pinker, 1997, p. ix).

The complex structure of the mind is the subject of pinker's book. Its key idea can be captured in a sentence: The mind is a system of organs of computation, designed by natural selection to

solve the kinds of problems our ancestors faced in their foraging way of life, in particular, understanding and outmaneuvering objects, animals, plants, and other people. The summary can be unpacked into several claims. The mind is what the brain does; specifically, the brain processes information, and thinking is a kind of computation. The mind is organized into modules or mental organs, each with a specialized design that makes it an expert in one arena of interaction with the world. The modules' basic logic is specified by our genetic program. Their operation was shaped by natural selection to solve the problems of the hunting and gathering life led by our ancestors in most of our evolutionary history. The various problems for our ancestors were subtasks of one big problem for their genes, maximizing the number of copies that made it into the next generation (Pinker, 1997, p.21).

Pinker compares , “The mind, like the Apollo spacecraft, is designed to solve many engineering problems, and thus is packed with high-tech systems each contrived to overcome its own obstacles” (p.4).

Pinker claims that thinking is computation. The mind is a set of modules, but the modules are not encapsulated boxes or circumscribed swatches on the surface of the brain. The organization of mental modules comes from genetic program, but that does not mean that there is a gene for every trait or that learning is less important. The mind is an adaptation designed by natural selection. Pinker also believes that computational theory of mind can solve the puzzles of the mind-body problem.

computational theory of mind (CTM) was proposed by the mathematician Alan Turing, the computer scientists Alan Newell, Herbert Simon, and Marvin Minsky, and the philosophers Hilary Putnam and Jerry Fodor.

2.3 Fodor's Criticism to Pinker:

Jerry Fodor, one of the founding fathers of the Computational Theory of Mind (CTM) heavily criticized Pinker on the issue and published a book entitled '*The Mind Doesn't Work That Way : The Scope and Limits of Computational Psychology*'

Fodor argues that the computational theory is part of the truth about cognition. But it is not a very large part of the truth; He thinks problems about thinking are unlikely to be much illuminated by any kind of computational theory. Computational nativism is clearly the best theory of the cognitive mind that anyone has thought of so far (vastly better than, for example, the associationistic empiricism that is the main alternative); and there may indeed be aspects of cognition about which computational nativism has got the story more or less right. But it's nonetheless quite plausible that computational nativism is, in large part, not true. So if computational nativism is radically untenable, Chomskian nativism is radically incomplete (Fodor, 2000).

2.4 Pinker's Reply to Fodor

In 2005, Pinker published an article entitled "So How Does the Mind Work?" in *Mind and Language* to reply Fodor.

Pinker (2005) replies,

"First, my claim that the mind is a computational system is different from the claim Fodor attacks (that the mind has the architecture of a Turing Machine); therefore the practical limitations of Turing Machines are irrelevant. Second, Fodor identifies abduction with the cumulative accomplishments of the scientific community over millennia. This is very different from the accomplishments of human common sense, so the supposed gap between human cognition and computational models may be illusory. Third, my claim about biological specialization, as seen in organ systems, is distinct from Fodor's own notion of encapsulated modules, so the limitations of the latter are irrelevant. Fourth, Fodor's arguments dismissing of the relevance of evolution to

psychology are unsound” (p.1).

He also states,

“Some final thoughts. It should go without saying that we don’t fully understand how the mind works. In particular, we don’t have a complete theory of how the mind accomplishes feats of common sense and scientific inference. Scientific psychology is not over. On the other hand, Fodor has failed to show that there is some known, in-principle chasm between the facts of human cognition and the abilities of biologically plausible computational systems. Chicken Little is wrong, and more, not less, research needs to be done” (p.22).

2.5 Fodor’s Reply to Pinker:

Consequently Fodor (2005) replies, “ So, how does the mind work? I don’t know. You don’t know. Pinker doesn’t know. And, I rather suspect, such is the current state of the art, that if God were to tell us, we wouldn’t understand him”(p.31).

2.6 Penrose on Computational Theory of Mind:

The other attack on the computational theory of mind comes from the mathematical physicist Roger Penrose, in a best-seller called *The Emperor's New Mind* . Penrose draws not on common sense but on abstruse issues in logic and physics. He argues that Godel's famous theorem implies that mathematicians— and, by extension, all humans—are not computer programs. Roughly, Godel proved that any formal system (such as a computer program or a set of axioms and rules of inference in mathematics) that is even moderately powerful (powerful enough to state the truths of arithmetic) and consistent (it does not generate contradictory statements) can generate statements that are true but that the system cannot prove to be true.

Penrose believes that the mathematician's ability comes from an aspect of consciousness that cannot be explained as computation. In fact, it cannot be explained by the operation of neurons;

they are too big: It cannot be explained by Darwin's theory of evolution. It cannot even be explained by physics as people currently understand it. Quantum-mechanical effects, to be explained in an as yet nonexistent theory of quantum gravity, operate in the microtubules that make up the miniature skeleton of neurons. Those effects are so strange that they might be commensurate with the strangeness of consciousness (Penrose,1989).