# AESTHETICS OF PROBLEM PERCEPTION - PEDAGOGY OF A CREATIVE ACT

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Problems are common to all disciplines. In day to day life, every one of us faces problems and often solves them. Practical professions like Engineering or Management are continuously engaged in Problem-solving. Only when we turn to creative fields like Painting or Literature, do problems seem to take a different turn. When one is discovering or creating something new, the nature of 'problem perception and problem solving', in other words 'problem encounter' differs as it touches the boundaries of unknown. The 'aesthetic' nature of such creative endeavours in Art and Science has been well acknowledged by well known Artists and Scientists.

Industrial design is quite often described as a 'problem-solving process' and as a 'Creative activity'. So the problems, problem encounters and their aesthetic nature become an important concern of Industrial Design. In this article I shall first dwell on 'problem' with its widest meaning, focussing on the aesthetic or creative level of problem encounter. Later, pedagogy of such a level is discussed taking the example of 'Cube-bisection' problem posed to graduate engineers and architects as one of their basic design tasks.

What is a problem?

When does one experience a problem?

We may say 'a problem is a state of unrest or conflict in one self'. This state of unrest could be felt physically as a 'body need' or mentally due to the perception of external world. In either case the 'state of unrest' which demands a 'purposive action' (usually called solution) leads to the definition of a 'problem'.

We tend to deal with problems in two stages: problem perception and problem solving. The very gap or time interval between problem perception and problem solving is the genesis of the problem. The gap or time interval is caused by the obstacle, psychological or physical, between the problem perception and problem solving. Suppose I am thirsty, I go to a water cooler and drink water. The problem of thirst is over. There is no appreciable delay, i.e. time-gap, or hindrance between problem perception and problem solving. One may say there was 'no problem' in this case. On the other hand, if I am thirsty and the water is dirty then a 'problem' emerges as to how one can make water potable or get clean water from else where. At times solution to one problem may cause other problems. If water is to be boiled or distilled on a large scale to make it potable, it may cause fuel-shortage and may subsequently lead to the cutting of the forests, which in turn causes ecological problems. The recognition of water being dirty may be due to the reason it 'looks dirty' or we 'know that it has some disease-causing germs'. In either case we have certain pre-experience or knowledge i.e. we have seen clean water before or we have used water free of germs. Thus when we perceive the problem we have already considered a state where the problem has been solved. In effect 'problem perception' which leads to 'problem definition' has already absorbed the solution of the problem in varying degrees. The quality of problem-resolution i.e. 'satisfactory purposive action' in response to the unrest or conflict, depends on the level of problem perception. We can observe three levels of problem perception.*

1. Biological or physical level
2. Knowledge or specialisation level
3. Aesthetic or creative level

* There could be a fourth level which may involve extra sensory perceptions which I shall not touch upon here.

### 1. Problem perception at Biological or Physical level

This level of problem perception is based on our physical and biological needs, which we recognise internally. If I am hungry, I perceive the problem of getting food. If the room I am sitting in, gets hot and stuffy due to power failure, I look for the means to get fresh air and so on. This level of problem perception is common to us and other living beings like animals and birds.

Problems, at this level are physically felt and are not a product of our acquired knowledge.

Animals and insects whenever there is a threat or obstruction to their natural course of action, recognise 'the problem', which they try to solve according to their intelligence level. Scientists have been successful in setting problems to even earth-worms which the earth worms solved after over 100 trials. In an animal with higher intelligence, like chimpanzee all the steps from problem recognition to solution namely Preparation, Incubation, Illumination and Verification have been observed by scientists[1]. This level of problem perception which we seem to have inherited from our animal ancestors is basic to our physical existence.

### 2. Problem Perception at Knowledge level

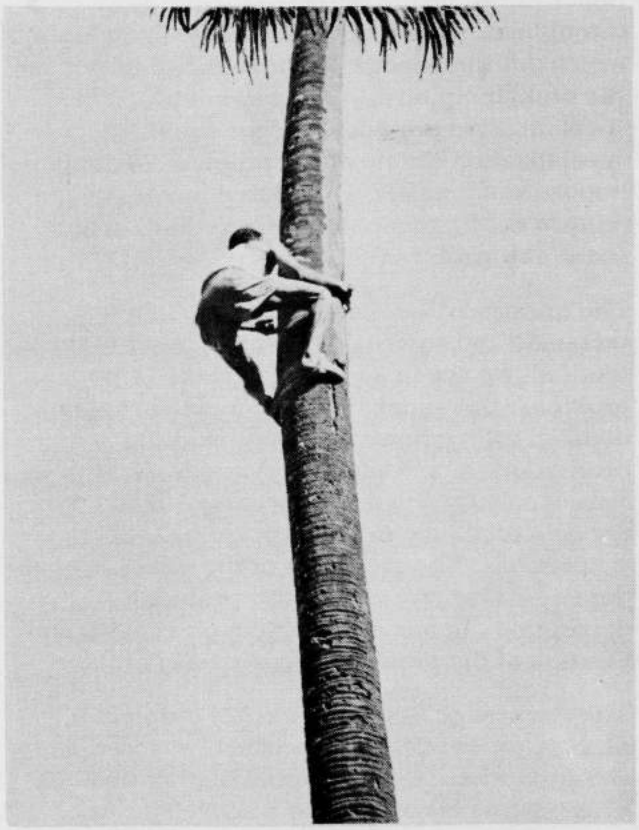
The knowledge level of problem perception takes place because of the person's knowledge: education, training, cultural or ethnic back-ground, etc., in short 'one's conditioning'. At this level of problem perception one looks through his/her conditioning, knowledge or specialisation. Let us see how this level of problem perception takes place in case of 'palm-tree climbing' in India.

People climb palm trees to tap palm-juice, which oozes, when cuts are made on the top portion of the tree. The juice is collected, once in a day or two days and fresh cuts are made to ensure the flow of the juice. Palm-juice called 'Neera' is drunk fresh or 'Gur' - a kind of sugar is made out of the juice. Sometimes alcoholic liquors are distilled illicitly out of this juice. Palm-trees are 20 to 30 feet tall. Climbing them is rather unremunerative, risky and demands skills. There are atleast 2 to 3 million palm trees still untapped in India.

Traditionally a small community of tappers climb the trees. They perceive no problem in their task. But if we were to pose this problem situation to different professionals, they all would perceive the problem in different ways.

An economist in 'Planning Commission' would look at it as a problem of unemployment and low wages. An ergonomist may see it as a problem of safety for the climbers. A machine designer may perceive the problem as that of designing a tall fork-lift which can move in the uneven terrains. A botanist may think of the problem as how to grow a dwarf variety of palm-tree to eliminate tree-climbing. A chemist may see it as a problem of oxidation and coagulation at the cut which necessitates the reopening of the cut every day. Otherwise juice can be collected below, by connecting a tube from top to bottom. Some specialists may reject the problem altogether. A musician may consider this as a technical problem which is not of his concern.

In effect, every specialist, who recognises the problem, perceives it in terms of a solution which could have been used in this case, but could not solve the problem fully. Thus the economist would recognise the problem because the wage increase of 'farm - workers' has increased the employment of the unskilled; but in this case unskilled cannot be employed. The ergonomist may see the problem because a standard safety belt which is a known solution to him is inadequate here. Similarly the botanist knows that dwarf variety of coconut tree has been successfully cultivated, but such a variety does not exist in palm-tree, so he/she recognises the problem. Similarly the chemist may be seeing the problem in terms of a similar solution which has been successful elsewhere.



Thus all successful solutions in any field become the specialist's knowledge. And the specialist looks at the new situation through this knowledge i.e. some known solutions. If it is directly applicable he may just recommend the solution and his interest in the new problem situation may be lost. In fact, as the psychologist Kurt Lewis[2] has shown, we do not become emotionally involved in either a task too easy or in one that is too difficult, but only in tasks we can manage our best.

Each one of us tends to be a specialist in some sense and this specialisation or narrow knowledge limits our problem perception to this

uncreative level. Even, a scientist of specialised knowledge, and a nobel laureate, Konrad Lorenz cautions, "The specialist comes to know more and more about less and less, until finally he knows everything about mere nothing. There is a serious danger that the specialist, forced to compete with his colleagues in acquiring more and more pieces of specialised knowledge, will become more and more ignorant about other branches of knowledge, until finally he is utterly incapable of forming any judgement on the role and importance of his own sphere with in the context of human knowledge and culture as a whole".[3]

### 3. Creative or Aesthetic level of problem perception

The third and an important level of problem perception is the creative or aesthetic level. At this level we do not perceive the problem through our knowledge but through imagination which our knowledge provides ie. we do not see the problem in terms of a solution which our specialisation provides. We get out of our specialisation to invent the problem. We super impose some hitherto unrelated image or pattern on the present problem situation and see a 'new problem'.

The question like 'Pose a problem in a rectangle and solve it' is a typical poser of this kind.[4] As we see in a rectangle, there is 'no problem'. But super imposition of the rhythmic divisions of sunflower seeds or exalting proportions of a 'Raga' in Indian Classical Music, may lead to a 'new problem' of how to divide a rectangle in such appealing proportions. The greatness of the solution would depend on the strength of the 'problem perception'. In fact the problem perception and solution of the problem become inseparable.

The creative or aesthetic level of problem perception, in effect is concerned with the situation where the 'problems' are not obvious. This process is common to Science and Art. Scientific research has to deal with the unknown, where the 'problems' have to be discovered and Art's major concern is creating the new. Aesthetic process in Art is unquestioned. The aesthetic nature of Science, especially in the creative phase is emphasised by many leading scientists time and again. The famous physicist Bruno Russi[5] states, 'An intuitive feeling for the order and the simplicity underlying natural phenomena is as essential to the creative scientist as it is to the creative artist, for to discover a scientific truth is merely to reveal some new aspect of the armory of nature'. We observe this aesthetic bias to be in greater strength when we look at the comment made by another famous scientist, Heisenberg to Einstein .

'You may object that by speaking of simplicity and beauty I am introducing aesthetic criteria of truth, and I frankly admit that I am strongly attracted by the simplicity and beauty of the mathematical schemes which nature presents us. You must have felt this too: the almost frightening simplicity and wholeness of the relationship, which nature suddenly spreads out before us....'[6]

Scientists seem to have used the aesthetic notions like simplicity, order and cleanliness with 'vehemence' in judging new theories or works of science. Cognitive psychologist, Prof. Gruber who studied Darwin's thinking process in great detail points out how these limited notions of aesthetics have dominated scientists' thinking. 'For a long time nothing so offended the aesthetic sensibilities of many scientists as the suggestion that the world was not perfectly orderly. When Herschel disdainfully described Darwin's theory as the 'law of higgledy piddledy', this was not only an intellectual objection to the introduction of chance into a scientific theory but an aesthetic reaction as well. This is clear from Herschel's other remarks'[7].

Gruber's further remarks elaborate the third level of problem perception. 'When we consider the scientists' thinking, we cannot escape the aesthetics of complexity. As we come to understand the intricacy of the course of thought, some of us admire it and find it all the more beautiful. As we see its unfinished character and the struggles of the scientist with a task which is inevitably and tragically beyond his grasp, other aesthetic values come to the fore. There is little prospect that our picture of creative thinking will grow simpler in the near future. We have just begun to uncover its seductive labyrinths'.

We see similar views expressed on the creative process of Art, by artists as well. In fact the disorder and destruction of existing imagery in the creative process is evident when we look at the statements of Paul Valery or Picasso .

'For the fact is that disorder is the condition of mind's fertility: it contains the mind's promise. Since fertility depends on the unexpected rather than the expected, depends rather on what we do not know. How could it be otherwise?' questions Paul Valery.[8]

'When one begins a picture one often discovers, finds things. One ought to beware of these, destroy one's picture, recreate it many times.

On each destruction of a beautiful find, the artist does not suppress it, to tell the truth, rather he transforms it, condenses it, makes it more substantial' – said Picasso in his conversations with Christian Zarvos.[9]

Thus the creative or aesthetic level of problem perception implies a deep emotional involvement of the Artist or Scientist. And in his/her bewilderment of this encounter with the unknown, invariably the aesthetic values come into the fore.

The metaphoric super imposition of images has great part to play in this process of problem perception, Brownowski, in one of his talks tells us how Keppler came to the notion that masses attracted each other. He was influenced by a neo-platonist called Nicholas of Cusa who thought that all the matter in the World attracted each other. Nicholas of Cusa in turn has taken the idea from a 5th Century imposter who said 'God's love is universal, it infuses the whole Nature and it therefore infuses every piece of matter. And therefore not only does God's love draw every piece of matter to him, but every piece of matter must be drawn to every other piece'.[10]

Based on Darwin's use of five images (a tree, tangled bank, wedging, war and artificial selection), Gruber points out that every creative individual makes use of such images of wide scope. "An image is 'wide' when it functions as a schema capable of assimilating to itself a wide range of perceptions, actions, ideas. This width depends in part on the intensity of the emotion which has been invested in it, that is, its value to the person".[11]

**Problem Solving:**

We have seen the 3 levels of problem perception.

Similarly we can observe three levels of problem solving as well namely;

1. Physical level of problem solving
2. Knowledge level of problem solving
3. Creative or aesthetic level of problem solving

**1. Physical level of problem solving**

At this level we solve problems through physical action. For example if I feel thirsty I walk to the nearest tap or cooler and drink water. We inherit this level of problem solving trait from animals. Though we make use of knowledge in the form of past experience, the basic behavioural pattern in solving the problem is akin to and inherited from our animal ancestors. The abstract level of knowledge which provides the overall view of a situation, is missing at this level of problem solving. The typical situation where we can see this level in operation is in case of a traffic jam. Every vehicle rider tries to go through at the same time. We try to use the physical strength and quickness as a means to solve the problem, which is akin to animal behaviour. In effect, we restrict our view to our own conflict in solving the problem. We fail to see the overall picture, even when our particular way of solving the problem is actually enhancing the conflict situation.

**2. Knowledge level of problem solving**

We solve a problem at this level, by making use of our specialised learning or acquired knowledge. The knowledge here is not merely experience based as before, but developed on our ability to use abstract concepts. Suppose we are in a traffic jam, instead of trying to push through and aggravate the problem further, we may use our knowledge of different route which may not be known to others, and get out of the traffic jam.

Knowledge level enables us to solve the problem through the particular specialisation which we have acquired. Thus a problem of heat in Summer, may be solved by an architect by designing a shelter which has a natural venturi effect, by a mechanical engineer by designing a special cooler or fan, by a textile engineer by developing a special ventilating cloth to wear, by a food-technologist by developing a cold drink which may help us to counter the heat and so on .... Thus we see that the knowledge level enables us to solve the problem in a fashion which others without that knowledge are unable to do. As pointed earlier in this article, knowledge level due to the narrow specialisation can also set up a mental block due to which we may fail to see simple solutions out side this knowledge.

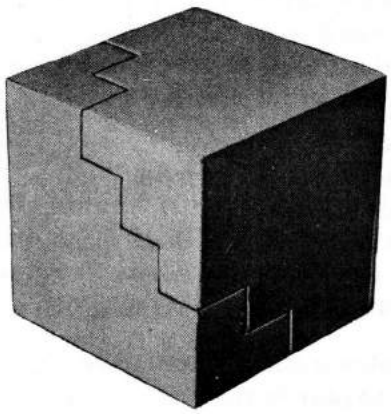
**3. Creative or Aesthetic Level:**

At creative or aesthetic level, problem perception and problem solving get intermingled and are sometimes inseparable. Nevertheless an identifiable creative, aesthetic level of problem solving is evident. At this level, four factors, personal identity with the problem, the psychological distance one is able to exercise, ability to superimpose, unconnected images and aesthetic sensitivity seem to be important in solving the problem.

**Synectics**

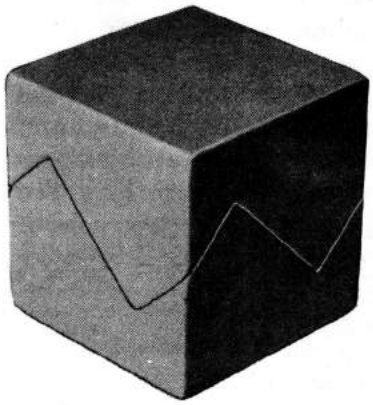
W.J.J. Gordon,[12] after extensive studies along with his collegues, on how people invent, has proposed a method which he calls 'Synectics'. Synectics proposes four analogies for creative problem solving.

**1. Personal analogy:** In using this analogy, the person solving the problem identifies with the problem as if he or she is an element in the problem. If one is thinking of the problem of thirst, the problem solver may think himself/herself as the 'dirty water' and articulate the feelings of the dirty water which wants to get rid of or throw away dirt.



**2. Direct Analogy:** A direct analogy from an unconnected area, like structure of a tree for designing a shelter, is used to solve the problem in this case.

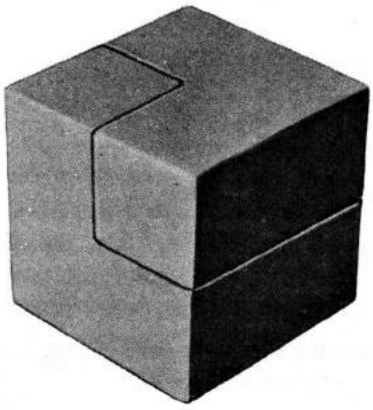
**3. Symbolic Analogy:** A 'symbol' instead of an object is used as an analogy in solving the problem. The symbol could be mythical, cultural etc..., while solving the problem of a collapsible jack, Indian rope trick was used as an analogy, which enabled the group to come to a new concept of collapsible jack.



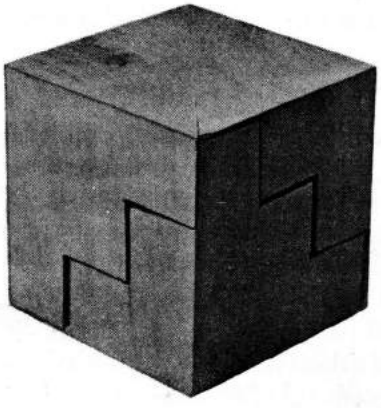
**4. Fantasy Analogy:** Freud's theory of wish fulfillment is the basis of Fantasy analogy. One wishes abnormal situations or fantasies to solve the problem. Clues to solutions are developed from these fantasies. In solving the problem of a closure, one can fantasise to order a group of insects to stitch across the opening.

**Pedagogy**

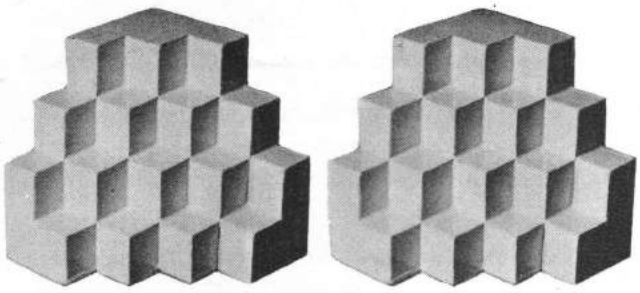
The question of how to deal with the pedagogy of the creative or aesthetic level, is of prime importance to design educators. Traditionally this takes place in design schools at a tacit level. I shall discuss one of the tasks[13] set for graduate engineers and architects at I.D.C.to develop their creative, aesthetic level of thinking. The problem was defined as, "Divide a cube into two identical parts, with a visual surprise as you open it." The word 'Visual surprise' was used to keep the problem 'vague', to some extent. What is 'a visual surprise' was discussed and each student was encouraged to recollect from his/her memory a 'visual image' or a 'metaphor' that has left a strong memory as a 'surprise.' Each student arrived at a different solution for this problem; few are seen in the photographs.

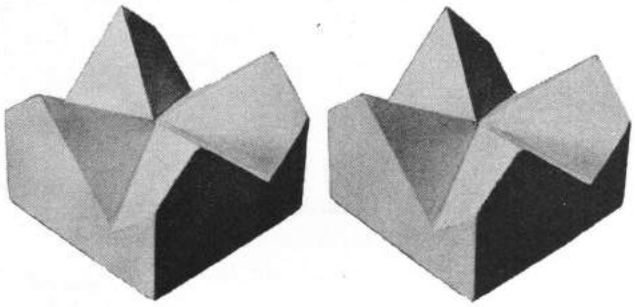


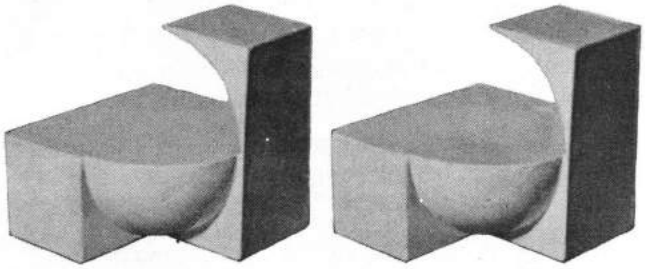
A brief survey with the students a year later on the above problem indicated that many of them had used images like

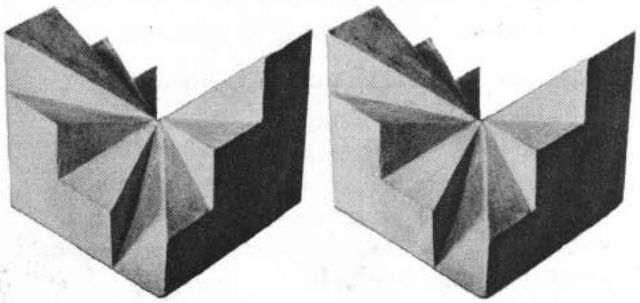


- positive and negative pyramids
- little toy-cubes of different colours which she used to play
- positive and negative black and white masses: temple like configuration.
- steps going up and down









Interestingly, inspite of their strong verbal culture, the students could not articulate their feelings, though they had arrived at interesting three dimensional solutions. All students expressed satisfaction and they were proud of their solutions.

Teacher's discussions with the students, during the task, centred on how to connect their sense of surprise with the aesthetic notions like symmetry, rhythm, continuity and simplicity. The variety of the solutions, considering their back grounds does indicate that the task has helped in bringing out the inherent, individual creative, aesthetic potentials of the students. However the internal processes seem to be subtle and difficult for articulation.

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