

## **The Process of Creativity and of Solving Problems:**

This article is a very short synopsis of the creativity process described in [An Essay on The Psychology of Invention in the Mathematical Field](#), by Jacques Hadamard.

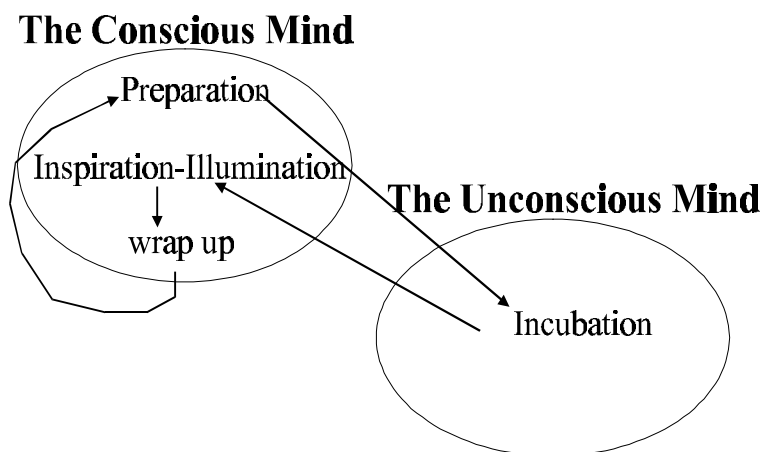
## The Process of Creativity and of Solving Problems:

By Hulan E. Jack Jr.

From Jacques Hadamard, An Essay on The Psychology of Invention in the Mathematical Field, Dover Press 1954 (reprint from Princeton University Press 1945)

In these studies, the process of creativity or solving problems consists of five steps:

1. **Event:** an idea occurs or a problem is presented.
2. **Preparation:** intensive conscious work goes on in an effort to make sense of the situation and to solve the problem. Usually ending in frustration due to lack of success. This effort may be for minutes, hours or even days.
3. **Incubation:** the unconscious mind takes over and does extensive processing in the background. You have no conscious knowledge or awareness of these happenings This step may last for hours, days, weeks or even months.
4. **Inspirations - Illumination:** now that the unconscious has sorted it out, more or less, it presents its findings to the conscious mind. This is the “aha”, “I think I got it”, or “now I see it” thing.
5. **The wrap up:** now you consciously verify the results and package it by writing it up (in his book this is often called “precising it”), explaining and/or presenting it to others.



This is an idealized version. The truth is that it is often iterative. A number of **illumination** may be only partial solutions. The **wrap ups** following these **illuminations** are **preparation** for the next loop or cycle.

A Quote from pages 44-45

Let us now consider....., the unexpected inspirations of which repeatedly illuminated Poincare's mind. We have acquired the notion that they are the consequence of a more or less intense and lengthy unconscious work. But is that unconscious work itself an effect without cause? We should be utterly mistaken in thing so; we have only to cpme back to Poincare's report to be led to the contrary conclusion. His first inspiration on getting into the car at Coutances follows a preliminary period of deliberate labor; and after that, we see him studying arithmetical questions "apparently without much success" and finally, "disgusted with his failure"; upon which new fruitful steps reveal themselves to him. Then he makes a systematic attack on the chief remaining question, "*carrying all the outworks, one after the other. There was one, however, that still held out, whose fall would involve that of the whole place. But all my efforts only served at first the better to show me the difficulty, which indeed was something.*" And he again notices that all this work was perfectly conscious. [ the preparation HEJ]

Only then, and after having been compelled even to set it aside for a while the solution of the difficulty suddenly appeared. [ the incubation HEJ ]

In all these successive steps, as we see, "sudden inspirations (and the examples already cited sufficiently prove this), never happen except after some days of voluntary [conscious HEJ] effort which has appeared absolutely fruitless and whence nothing good seems to have come, where the way taken seems totally astray. These efforts then have not been as sterile as one thinks. **They have set going the unconscious machine and without them it would not have moved and would have produced nothing.**"

Helmholts had similarly observed that what we have called incubation and illumination must be preceded by this stage of *preparation*.

End Quote

Awareness of the process by students is of the utmost importance. Most students consider there fruitless initial efforts as signs of their dumbness, of their inability to understand, "to get it." That is far from the truth. Instead, it is key to the process of understanding, of successfully coming up with a solution..