

A Question of Creativity !



“Research is what I'm doing when I don't know what I'm doing !”

Wernher Von Braun

Kevin Byron

A Question of Creativity !

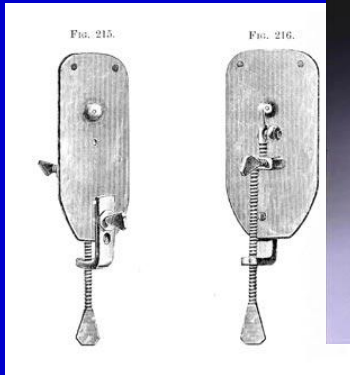
- Introduction
- How Science Progresses
- A Scientific Method ?
- The Creative Scientist

What is Creativity ?

Creativity:

Ideas that are *original* and *useful*. A novel and appropriate response to an open-ended challenge or problem.

“The transformation of conceptual spaces” (Boden)



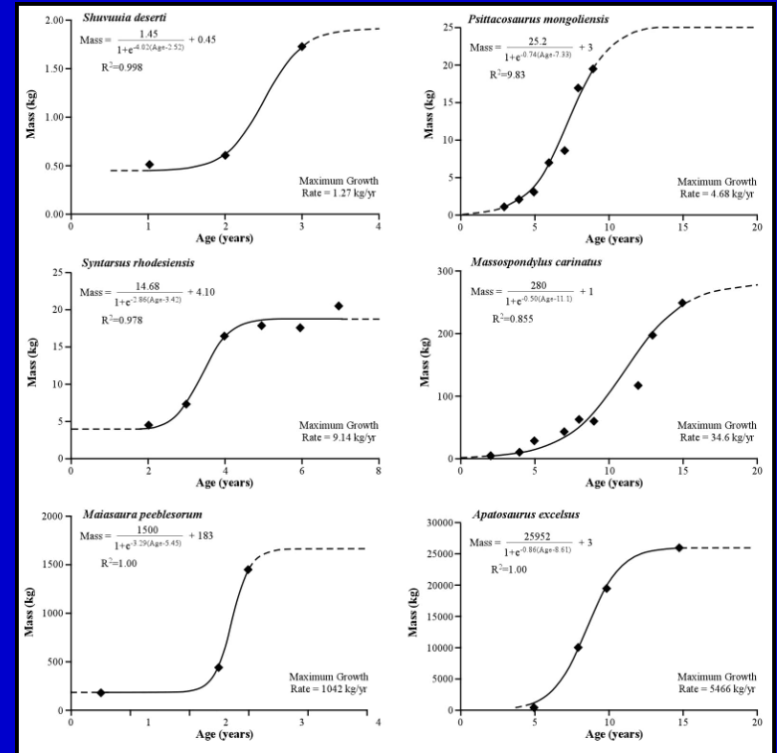
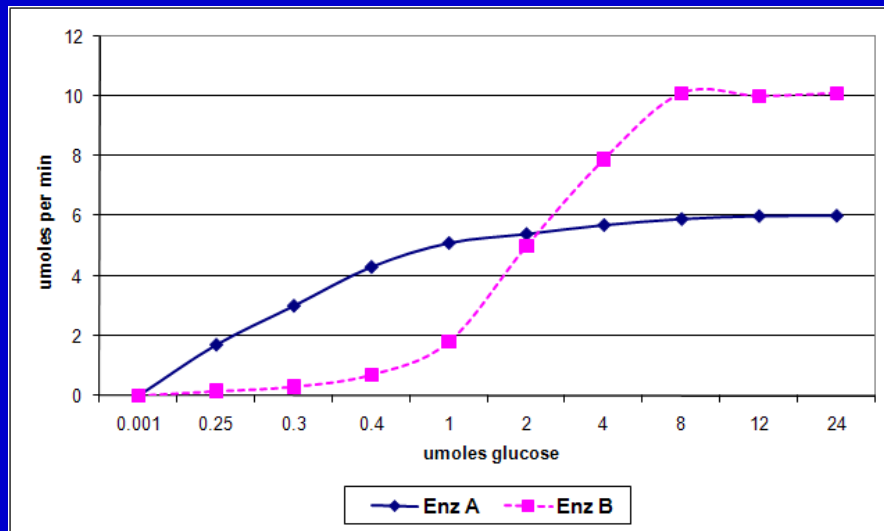
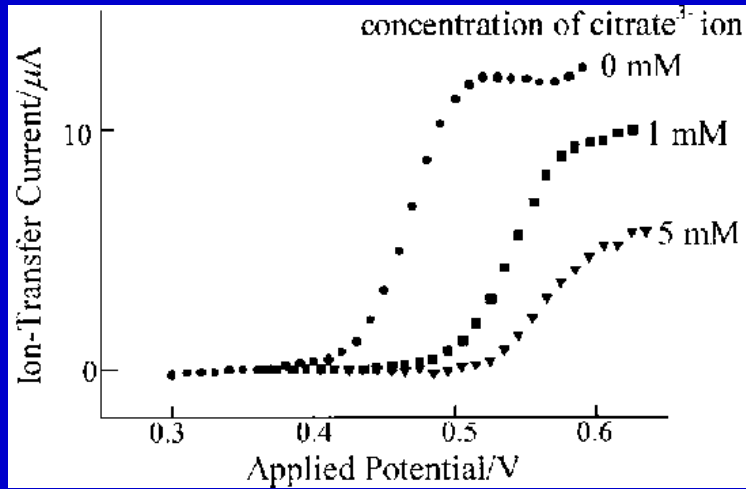
Three Components: * Domain relevant skills (formal education)
Creative processes
Intrinsic task motivation

* Amabile, Phillips & Collins, 1994

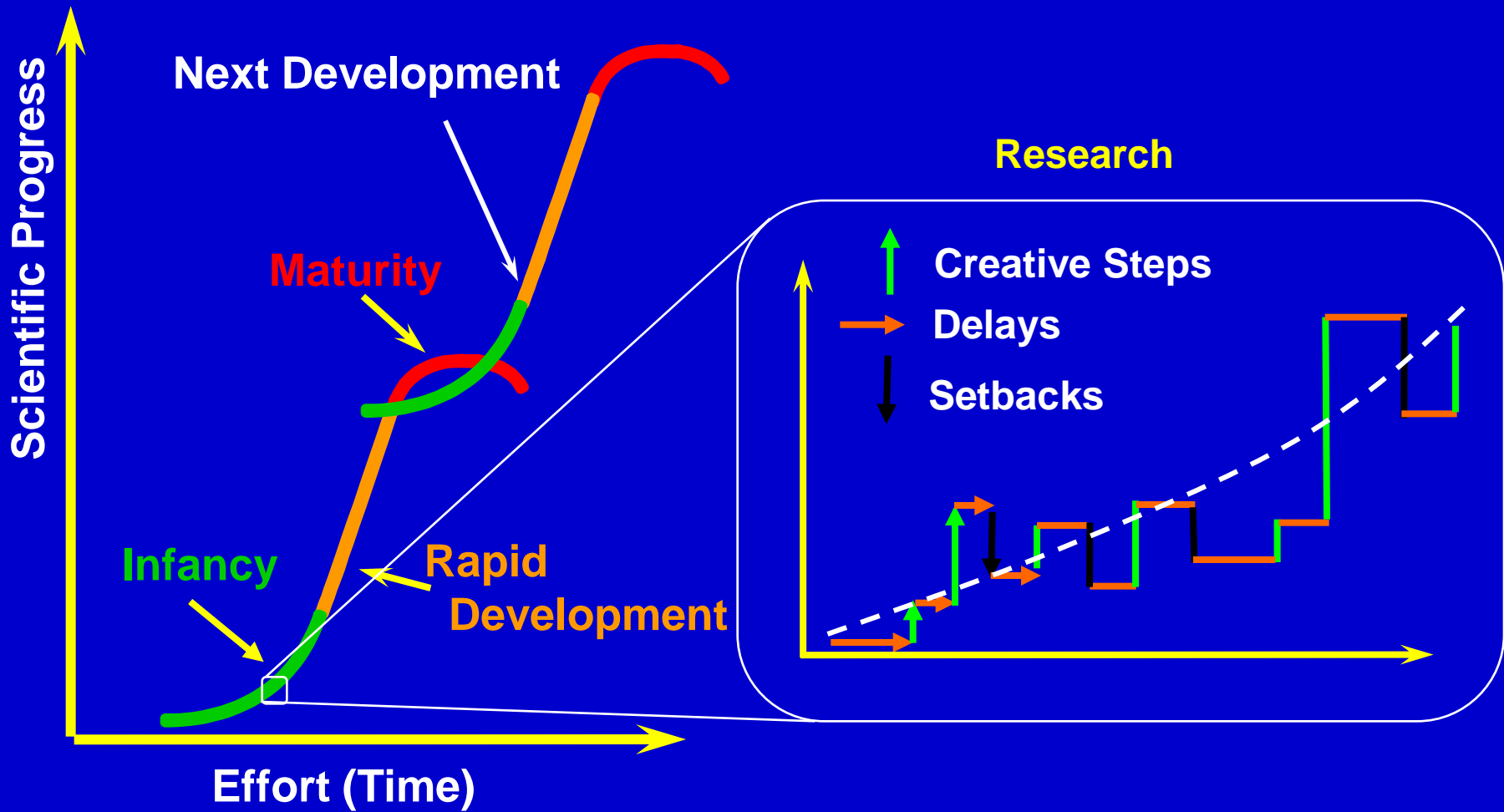
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The Sigmoid Curve



Scientific Progress



Stages in Creative Thought



- Preparation

- Incubation

- Insight

- Evaluation

- Elaboration

The "Eureka !" Enigma !

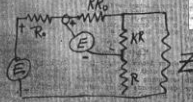
THE NEW YORK TIMES TURDAY, AUGUST 6, 1927.

$\Delta E = (k+1)KR_0 + 4KR$
 $\Delta E = K[4(R_0+R) + 4R_0]$

$\frac{\Delta E}{E} = \frac{K}{K+1}$
 $\frac{\delta E}{E} = \frac{K}{1+K} = 1 + \frac{1}{K}$
 $\frac{\delta E}{\delta R} = [1 + \frac{1}{K}]$
 $\mu = 1 + \frac{1}{K}$
 $\frac{1}{K} = \mu - 1$
 $K = \frac{1}{\mu - 1}$
 $k = \frac{1}{1.5}$

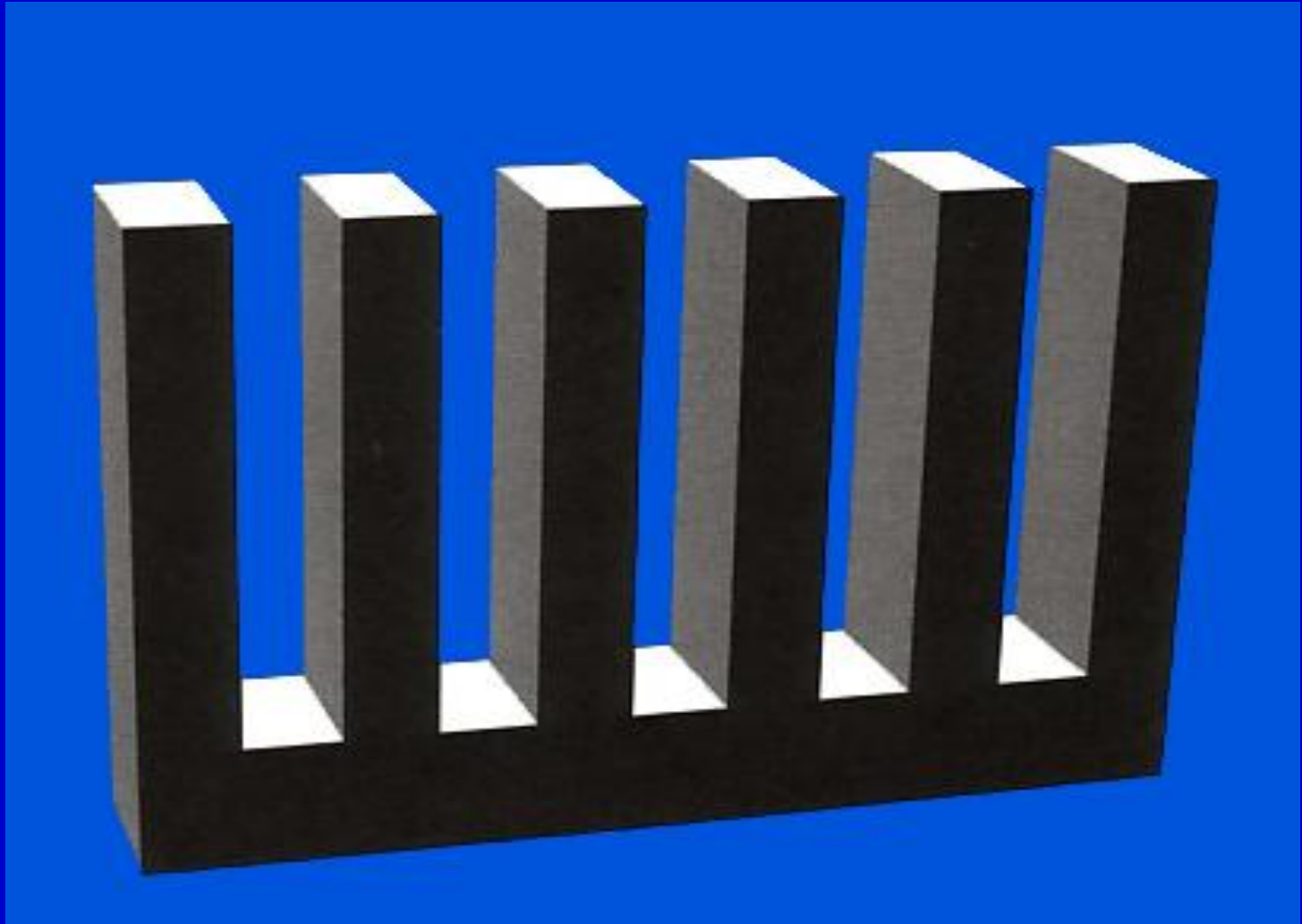
Disclosed in principle to E. C. Blessing Aug 6, 1927
H.S. Black Aug 18, 1927
Witnessed and Inducted E. C. Blessing Aug 18, 1927

Electric Company
 8% GUARANTEE
 LEHMAN BROTHERS
 BONNE BROS & CO.
 MEDICAL INCORPORATED




Creative Thinking Exercise

What could this be ?



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The Art of Doing Science

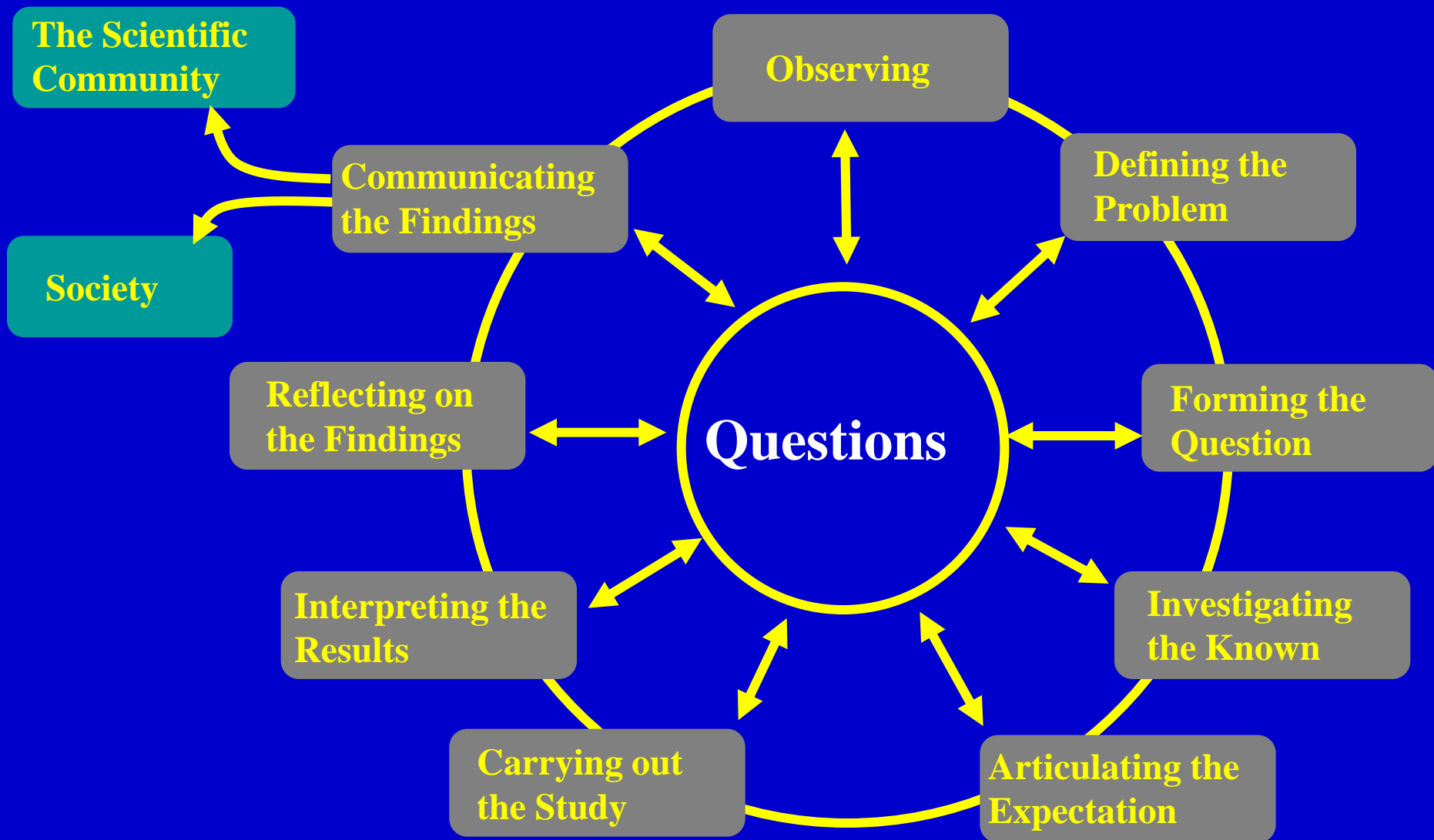
The Scientific Method ?

1. Proposal of a hypothesis on an observed phenomenon
2. Design of Experiment to test the hypothesis
3. Acquisition & Analysis of data from the experiment
4. Test of the results against the hypothesis
5. Progress in understanding the phenomenon



Creativity

The Enquiry Wheel



Harwood, W.S., Reiff, R., & Phillipson, T.

Voices from the frontline: Scientists' conceptions of scientific inquiry. *J.Chem Edu* (2004)

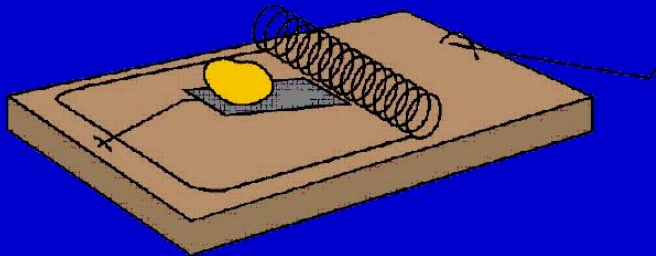
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Defining Your Research Question

5W + 1 H: (Who ? What ? Where ? When ? Why ? How ?)

Abstracting the Question



How do I build a better mousetrap ?

Why ?

In order to get rid of the mice

Abstracted question: How do I get rid of the mice ?

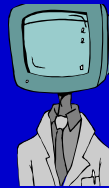
Nurturing Creativity

'Tools'

Brainstorming



Conceptual
Combination



Changing *perspective*

Analogy / Metaphor



'Behaviour'

Intuition



Attention Span



Visualisation



Lifestyle



Idea Finding Techniques: SCAMPER

- Ask “What if ?”

Substitute

Combine

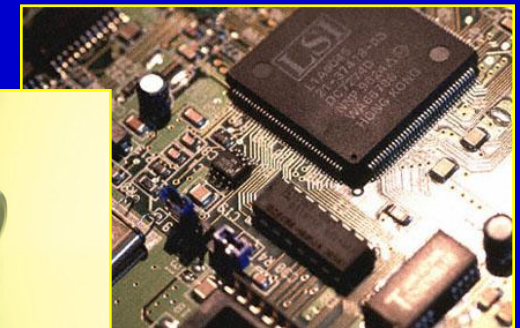
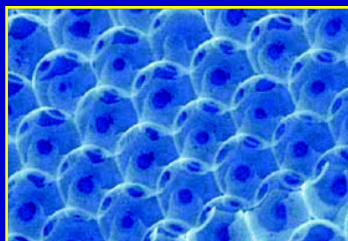
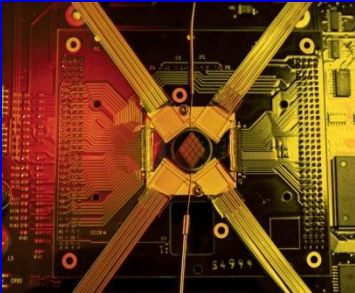
Adapt

Modify

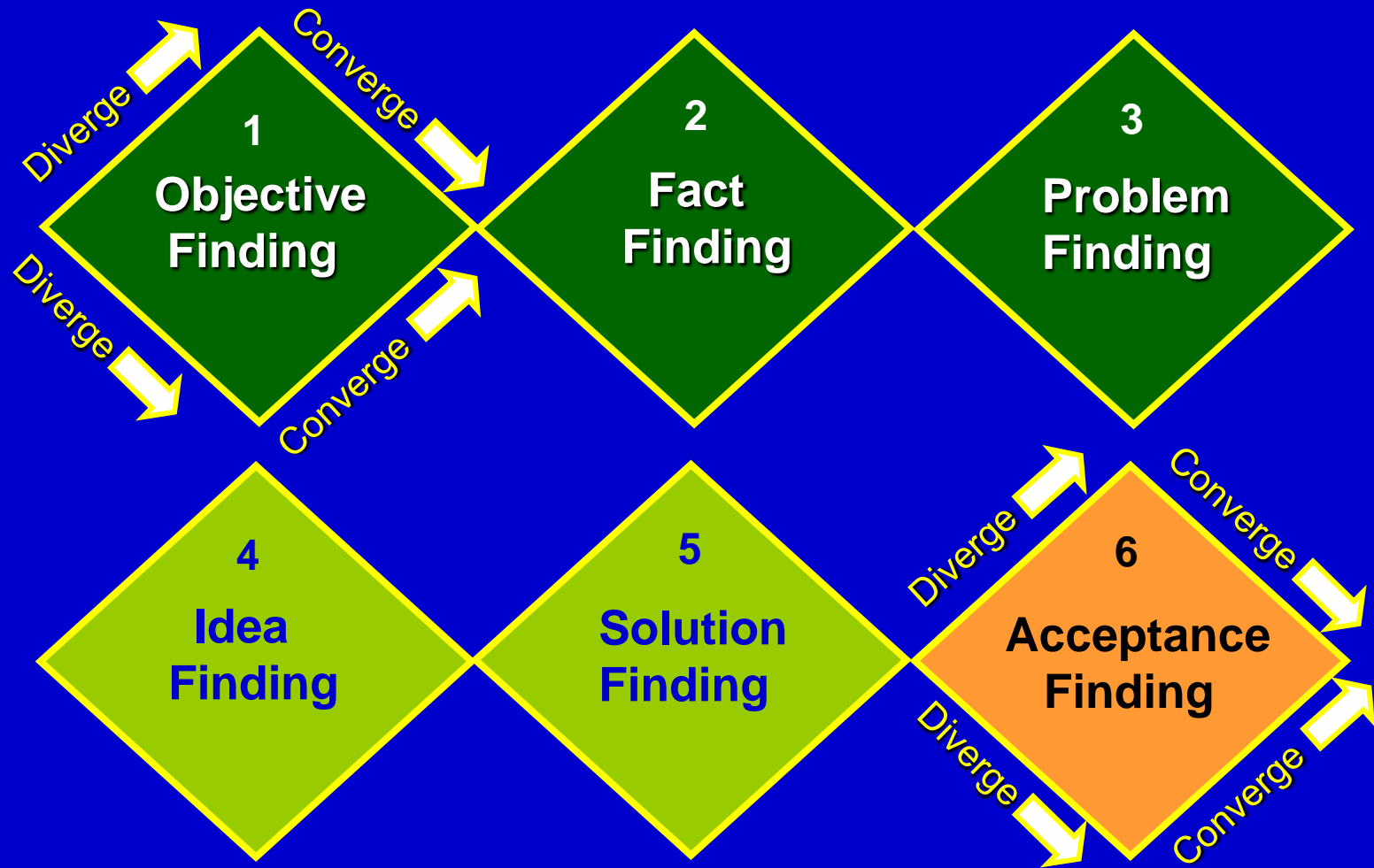
Put to other uses

Eliminate

Reverse



Osborn–Parnes Creative Problem Solving (CPS)



Steps	Stages
1 - 3	Identifying and Clarifying the Challenge
4 - 5	Finding Ideas and Evaluating them
6	Putting the Solutions into Action

ENTRE: Creative Problem Solving

Statements that describe the future vision of challenges/problems.
Tools: Diagnosing, Abstracting

Idea-finding Tools
Association
SCAMPER
Analogy
Combining

How is acceptance gained ?
What needs to be done ?
What resources are required ?



One clear statement that gets to the heart of a selected challenge

1. Identify Criteria to evaluate Ideas
2. Evaluate best Ideas by testing against criteria

Who does What ?
How ? & When ?