

# Thinking Skill Optimization: Critical and Creative Thinking and Decision Science



For Linked In

Presenter: Debbie Aliya, Aliya Analytical, Inc.  
Grand Rapids, MI      616-475-0059    [www.itothen.com](http://www.itothen.com)

# A Simple Methodology

- Compare and Contrast are the essence of Critical Thinking
- Compare: Find Similarities
- Contrast: Find Differences
- All things have both similarities and differences

# Rational Thinking

- “Compare and Contrast” is the foundation of RATIONAL THINKING.
- This is what humans do, and no other beings
- Rational thinking is based on the idea of a RATIO (Comparison!)
- Comparisons allow us to make links in our minds

# Rational Thinking CAN Lead to Integrated Thinking!

- Links in our minds are the essence of effective use of our grey matter.
- Siloed information is less accessible than integrated information.
- Integrated information creates a structure that may be added to more easily than siloed information.

# Integrated Information

- Thinking skills must be founded on information, knowledge, and experience.
- Thinking skills do not replace basic knowledge of reality.
- Be curious. Cultivate your curiosity.
- Integrated knowledge allows new information to be placed in context, within a frame of reference.

# TSO Allows Us to Override Programmed Inappropriate, Mental Shortcuts.

Image from *On the Origin of  
the Human Mind* by [Dr.  
Andrey Vyshedskiy](#)

Holistic visual recognition via  
amodal completion (right brain)



Visual recognition via visual  
analysis (left brain)



What do you see in the picture?



What did you see?



What do you see in the picture?



What did you see?

Do you see a word?



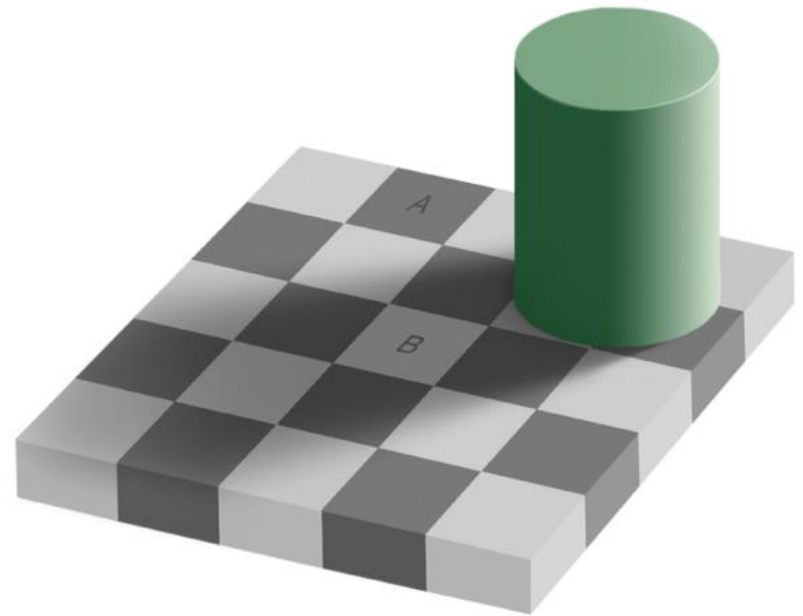
# There are certain things you have to learn from other researchers

- to be able to think most clearly.
- A and B are the same color!

Surroundings  
INFLUENCE  
HOW WE SEE  
INDIVIDUAL  
features.

(From Wiki)

Don't miss the moon for the finger!



# Simultaneous Contrast Illusion.

The background is a color gradient and progresses from dark grey to light grey. The horizontal bar appears to progress from light grey to dark grey, but is in fact just one color.  
(From Wiki)



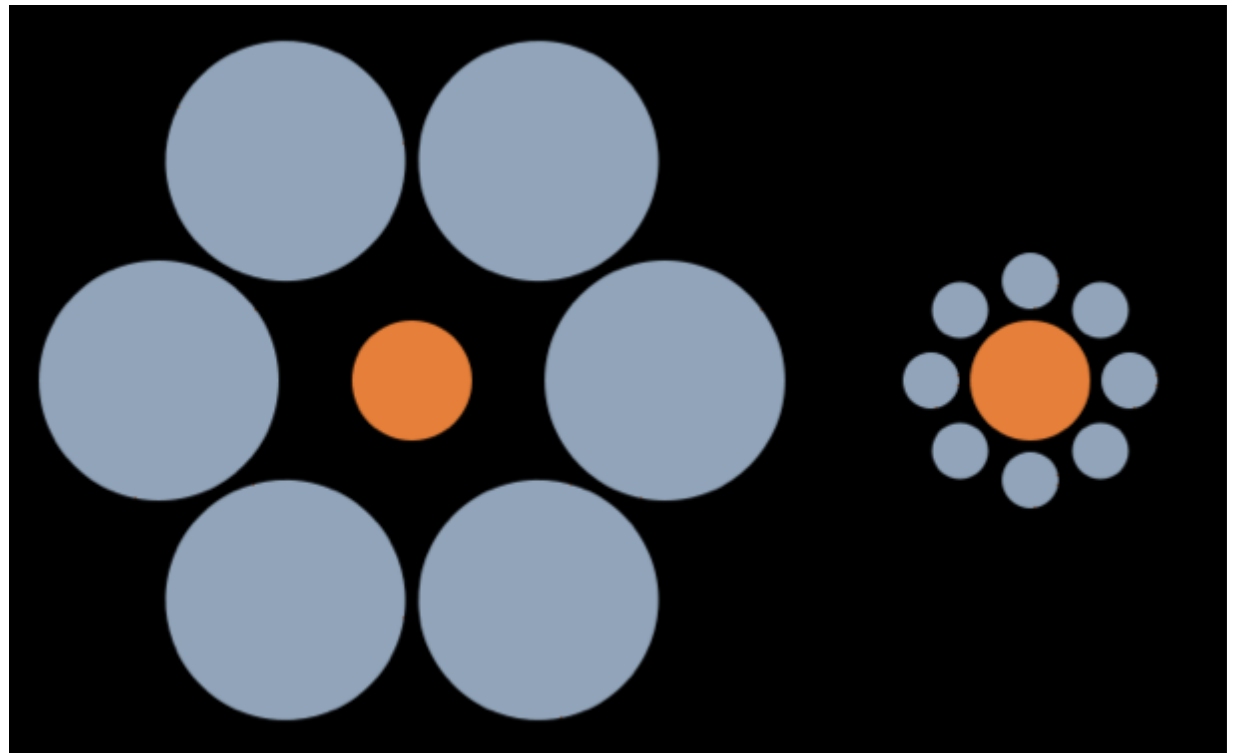
60  
60  
60

190  
190  
190

120, 120, 120

# Which orange dot is bigger?

- <http://en.wikipedia.org/wiki/File:Mond-vergleich.svg>



# What can we learn from what we just did?

- People are different and see different things.
- You can miss something important.
- Knowing / Defining your frame of reference is the key to being able to know if you are right or wrong, or if there IS a right or wrong.
- Defining your frame of reference is arguably the most difficult part of critical thinking.
- **WHAT QUESTIONS DO YOU ASK?**
- We have to become aware by study of the limitations of our brains and senses.

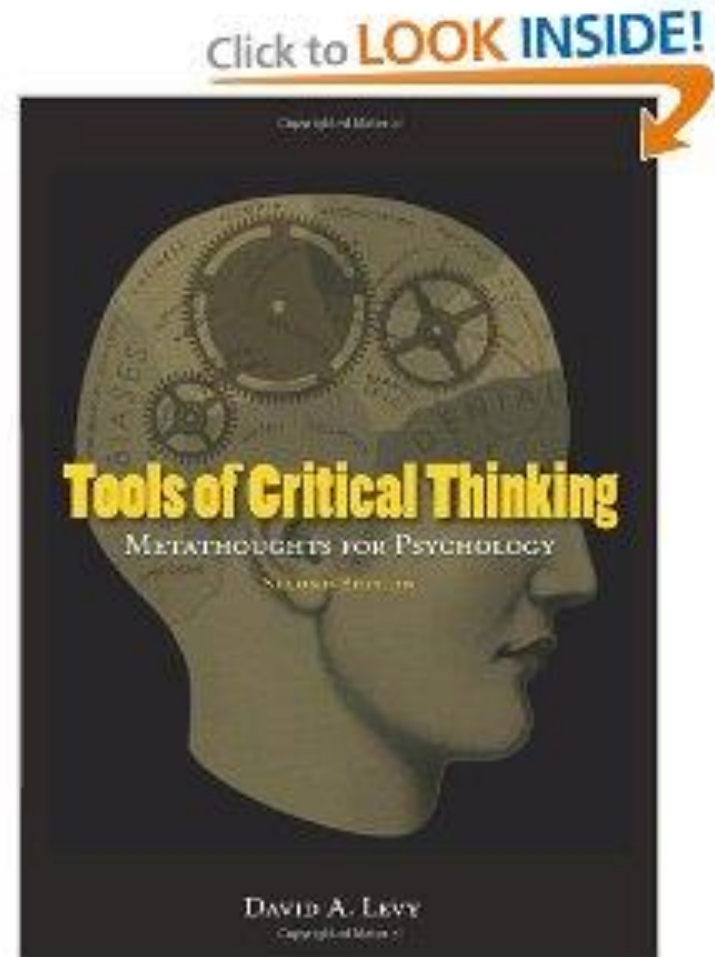


# Back to Thinking Skills

- Moving on to some other important helpful ways to think about things.

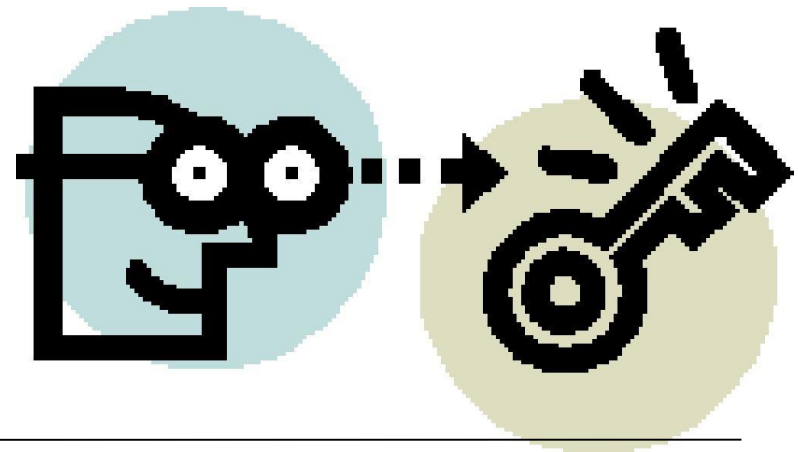
# Based on a wonderful book!

- Short chapters
- Excellent, fun exercises
- Seems simple, but very powerful
- Geared to psychology students, but
- We all need to understand how our minds work!



# Key Points from the Book

- There is a set of “mental” tools that are widely applicable in life and work
- That we can use to understand in greater depth and breadth; in a more useful or appropriate frame of reference.
- And to solve problems



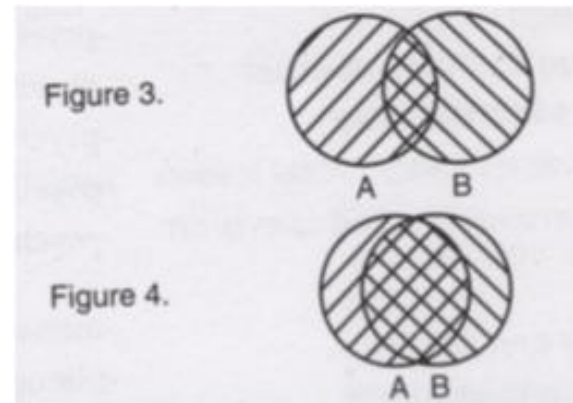
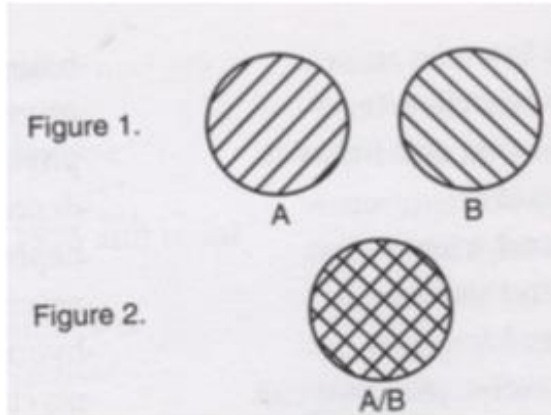
# With Practice

## Meta-Thoughts

- Become a part of your mind
  - Let you see multiple possible alternatives
  - Help you connect the dots
  - Help you understand things in totally new ways
  - Help you learn useful things so your decision making improves over time.
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# The Similarity - Uniqueness Paradox

- All Phenomena are both Similar and Different
  - From David Levy's *Tools for Critical Thinking*



# Similarity – Uniqueness Exercise 1

knee    eye    mind    rock

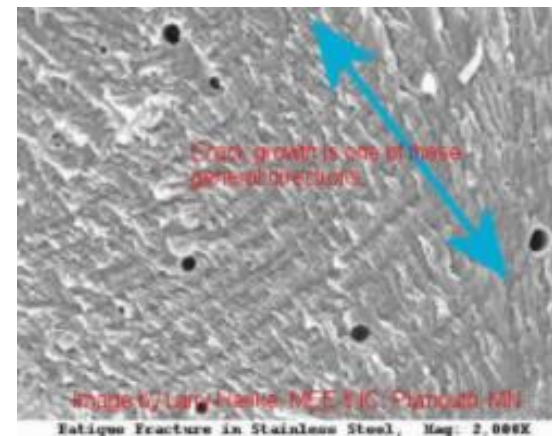
- Compare and Contrast all possible pairs.
- Find a unifier for each group of three.
- Find a unifier for all four.
- How are the items unique?
- Are these all things?
- How many different sentences can you make with all four words?

# Similarity – Uniqueness Exercise 2

- Pretending things are more similar than they are is a way of looking at racism, for example
- “All \_\_\_\_\_ are \_\_\_\_\_”
- Pretending that things are totally unique when they in fact have things in common, is a way that we lose the ability to learn about one thing based on pre-existing knowledge

# Similarity – Uniqueness Exercise 2

- Fatigue Striations and Altocumulus Undulatus Clouds





# FOUNDATIONAL CONTRAST 1

- Object or Construct (from Levy)
  - Apples versus Existentialism
- Brings up key point about one of the major reasons we care about TSO
  - Sorting out SH\*T from SHINOLA
- Objects can have statements of fact made about them that can be judged true or false
- Constructs are most legitimately judged by philosophical standards of UTILITY.

# This is essential for intercultural understanding.

- Apples and tables are objects.
- Political systems and religions are constructs.
- A bank building is an object.
- A bank (business institution) is a construct or at least has elements of a construct.
- Antarctica is an object (the land) and a construct (government boundaries, etc.)
- The map of Antarctica is a construct, even if it is printed on an object (piece of paper).
- **The map is not the territory.** (Korzybski)

# Foundational Contrast 2

- Binary (Dichotomous) versus Continuous
- Let's rate these....
  - Light switch on or off
  - Dead or alive
  - Empty or full
  - Body or soul
  - Body or mind
  - Heart or brain

# Hero of Understanding: Niels Bohr

- The opposite of a small truth is a lie.
  - This computer is on the table.
  - This computer is on the floor.
- The opposite of a great truth is another great truth.
  - Democracy is the best system of government.
  - Democracy is the worst system of government.  
(Plato)
- How can this be the case?

# Evaluating Kinds of Truth

- How can this be the case?
  - “Democracy” is a complex construct with different features that might be under consideration at any given time.
  - Opposites are culturally defined
    - Black v White or B&W v Grey
    - Beautiful v Ugly or Beautiful v Plain
    - Good v Evil “things, acts,” etc.
    - Physical v mental
  - Your answers???

# Evaluating Kinds of Truth

- We interact with reality through our senses.
- Our senses tend to trick us.
- That's why Plato thought truth from senses was suspect. He believed in ideal forms.
- We can have NO facts to decide about the truth or falsehood without our senses.

# New Topic: Creativity

# Connect - Create

- Connections are the foundation of creations.
- When you can connect dots that others can't, you are “being creative.”
- Connecting dots (seeing connections) that others don't is a cultivatable skill!
- You need to do it to get better at it!  
Anywhere, any time you have a few minutes, and MAKE MINUTES!
- It's a good habit!



# Connections Exercise

- Think of a “thing.” Maybe pick something here in the room.
- Think of another “thing.” Maybe something that is only found out-of-doors.
- Find 5 “Features” they have in common.
- If you do this with things that are quite different from each other, it will build your skill and level of knowledge integration faster.

# Some of mine that ended up interesting...

- Honey
- Wire
- Curtain in my living room
- Clay dragon my son made in ceramics class
- Venetian blinds at ASM Dome classrooms in 2004
- Lettuce

# Some Case Studies



Bring Forth The  
FIRE of CREATIVITY!

**BY**

Understanding.....

Doing Failure Analysis  
Doing Science

Through critical thinking....

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# Case Study 1: Doing Failure Analysis

- Common Thought Errors in FA Work
  - “It broke because it did not meet the spec.”
    - Error: Part does not know what the spec is.
    - Fact: Spec is a construct, not a thing
    - Reality Check:
      - All parts that don’t meet the spec don’t break



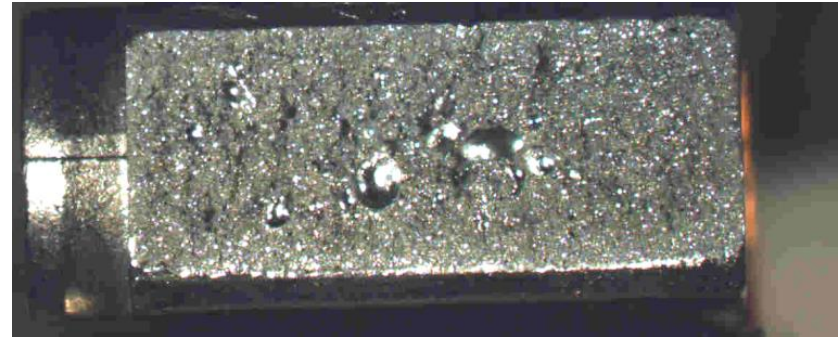
# Case Study 2: Doing Failure Analysis

- Common Thought Errors in FA Work

- “It broke because it had porosity.

- Porosity is bad.

- We need to buy castings with no porosity.”

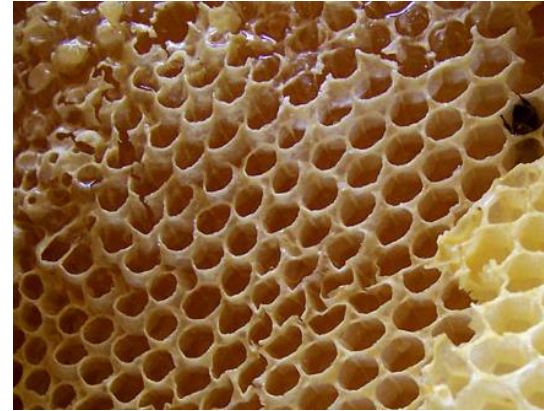


- Compare, Contrast, Create!

- Fact: Most castings have porosity and most work well.
    - Fact: Castings with no porosity may not exist or may be \$\$\$\$
-

# Case Study 2: Doing Failure Analysis

- Compare, Contrast, Create!



From Wikipedia

- Consider the Opposite: Hollow parts are in common use. People pay extra for honeycomb material
  - Can we find an economical way to limit problematic porosity?
  - What are we really trying to accomplish?
-

# Case Study 3: Doing Failure Analysis

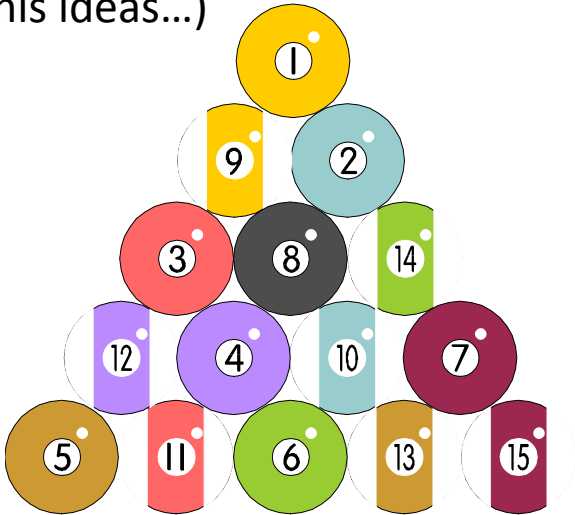
- How about?
  - “It broke because the stress exceeded the strength.”
- This is always true.
- How do we make it useful?
  - Precise physical factors
  - Multiple levels of human factors
- Need to fill in details
- This is an example of **NOT Either / Or**  
**BUT Both/ And**



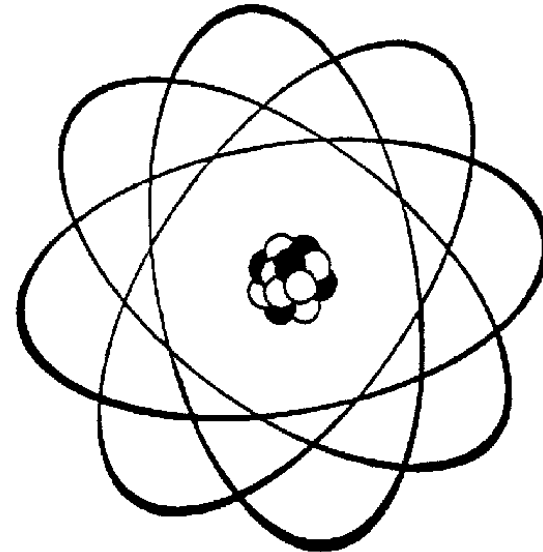
# Case Study 4: Doing Basic Science

## Chapter I: Description Limits Action

The NATURE of the atom  
according to Democratis  
(this is actually simplified from  
his ideas...)



The NATURE of the atom according  
To 20<sup>th</sup> Century Atomic Physics





# Case Study 4: Doing Basic Science

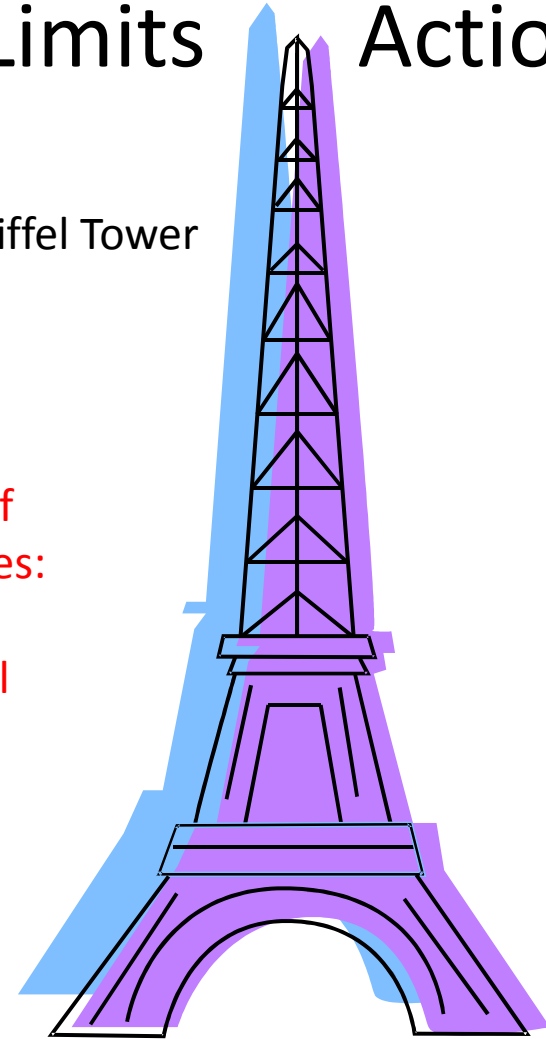
## Chapter I: Description Limits

## Action

Easter Island



Eiffel Tower



Multiple Levels of  
Physical Structures:  
Atomic  
Architectural

# Case Study 4: Doing Basic Science

The TYPES of MATTER  
according to  
The Ancient Greeks



# Compare, Contrast, Connect, Create

Group → ↓ Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	1 H																	2 He
2	3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
3	11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
4	19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
5	37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
6	55 Cs	56 Ba		72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
7	87 Fr	88 Ra		104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
Lanthanides				57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
Actinides				89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

The TYPES of MATTER  
according to us

# Chapter I: Description Limits Action



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# Chapter I: Description Limits Action



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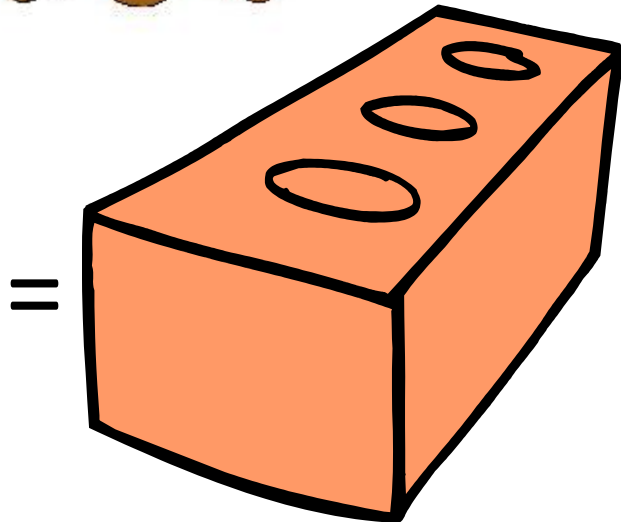
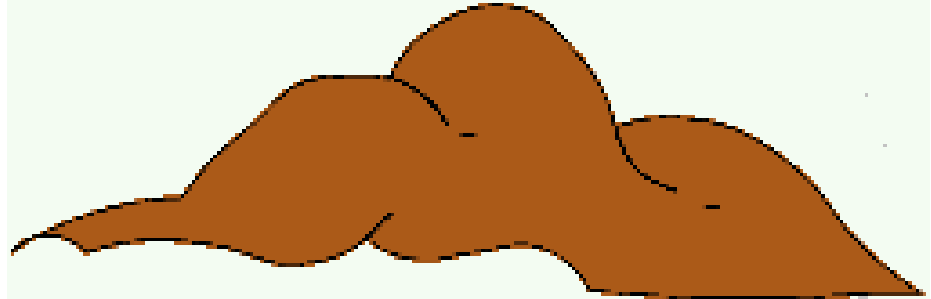
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# Case Study 4: Description Limits Action



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But could they  
make?



[https://upload.wikimedia.org/wikipedia/commons/thumb/3/30/52\\_8134\\_Hoentrop\\_2012-09-16.jpg/512px-52\\_8134\\_Hoentrop\\_2012-09-16.jpg](https://upload.wikimedia.org/wikipedia/commons/thumb/3/30/52_8134_Hoentrop_2012-09-16.jpg/512px-52_8134_Hoentrop_2012-09-16.jpg)

# Case Study 4: Doing Basic Science



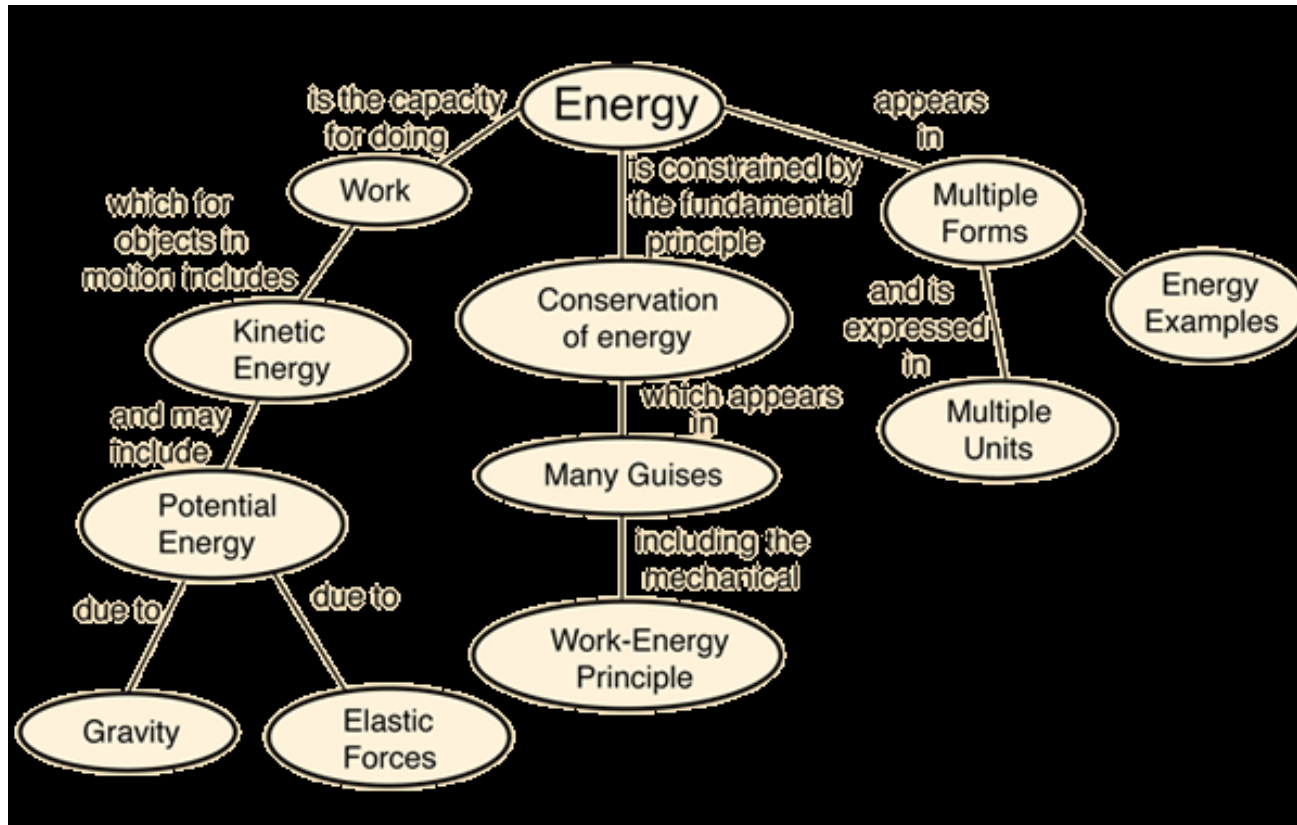
BUT Using Compare,  
Contrast, Connect,  
Create we can ask:

Is fire really matter?  
Or is it energy?

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# 20<sup>th</sup> Century Separation of Energy from Matter

<http://hyperphysics.phy-astr.gsu.edu/hbase/enecon.html>





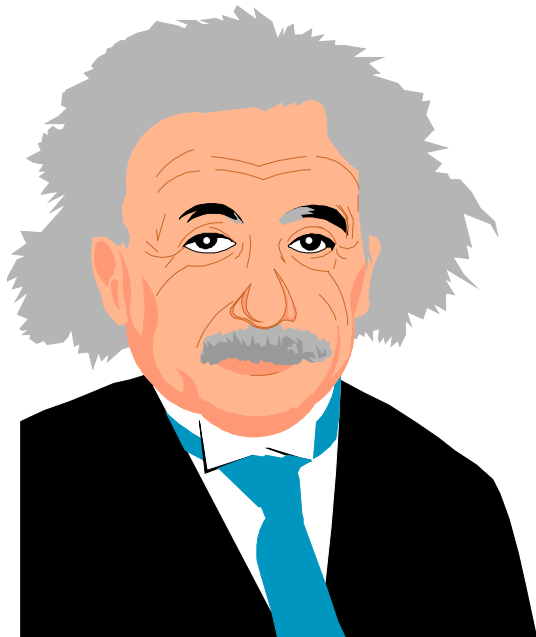
# Separating Energy from Matter



1973

“Matter is matter and energy is energy. Potential energy doesn’t have anything to do with matter changing into energy.”

COMPARE, CONTRAST, CREATE!  
Maybe the Ancients were RIGHT!



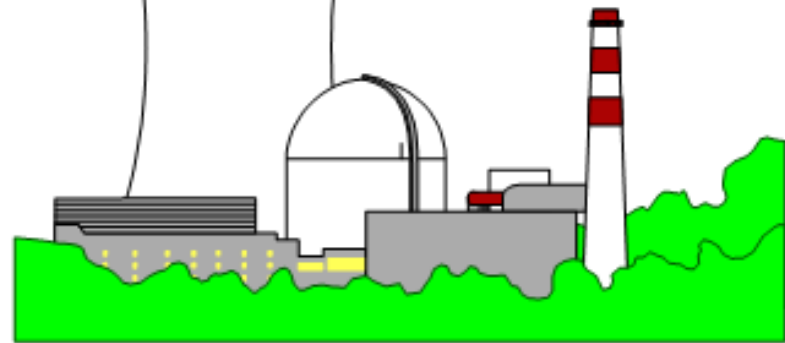
$$E=mc^2$$

# Chapter I: New Description gives New Range of Possible Action



China 500 AD per  
Buzzle.com

20<sup>th</sup> Century AD



# Final Topic: Decision Science

- Choose with Confidence!
- Understand that your confidence may be low.
- We make decisions all day, every day.
- Losing your temper or saying something thoughtless is a decision.
- Not making a decision is a decision.
- Having Compare-Contrast-Connect-Create-Choose with Confidence is like Count to 10 – on steroids!
- Making the habit of stopping to think and knowing that a few moments structured thought will ALWAYS provide new insights or choices will transform your life, probably for the better.

# Final Topic: Decision Science

- Practice empowers!
- You are the only one who knows your detailed thought process.
- “It’s always easier to solve other people’s problems.”
- If your life is already perfect in every way, you don’t need this stuff.

# Final Topic: Decision Science

- What legacy do you want to leave?
- “We all have free will, and we have one foot nailed to the ground.” (Gurdjieff)
- Thank you for your attention!