

*Credendum*

Everyone is creative!

(surprise)

*Credibility*

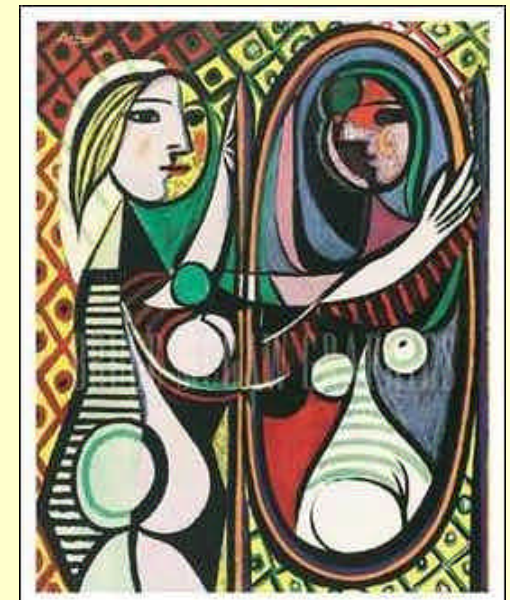
- Ideas
- Innovation
- Invention
- Creative problem solving\*

**All inventions are innovations;  
Not all innovations are inventions.**

A novel device to mix paint is an invention (and innovation).

Using an inkjet printer to “paint” in a new way is an invention (and innovation).

A new style of painting may be an innovation. But not necessarily an invention.



# Paradigms



*Joel Barker Definition:* a set of rules and regulations that establish boundaries and tells us what to do to be successful in those boundaries

## Paradigm Synonyms

Theory

Model

Belief system

Protocol

Conventions

Patterns

Methodologies

Values

Conventional wisdom

Etiquette

Traditions

Customs

Inhibitions

Superstitions

Rituals

Doctrine

Orthodoxy

Dogma

## *New paradigms*

When the profession can no longer evade anomalies that subvert the existing tradition of scientific practice — then begin the extraordinary investigations that lead the profession at last to a new set of commitments, a new basis for the practice of science.

**T.S. Kuhn**

*The Structure of Scientific Revolutions*

“*Creating Minds*” by Howard Gardner

## *Seven Exceptionally Creative Thinkers*

Sigmund Freud (1856-1939)

Albert Einstein (1879-1955)

Pablo Picasso (1881-1973)

Igor Stravinsky (1882-1971)

T.S. Elliot (1888-1965)

Martha Graham (1894-1991)

Mahatma Gandhi (1869-1948)

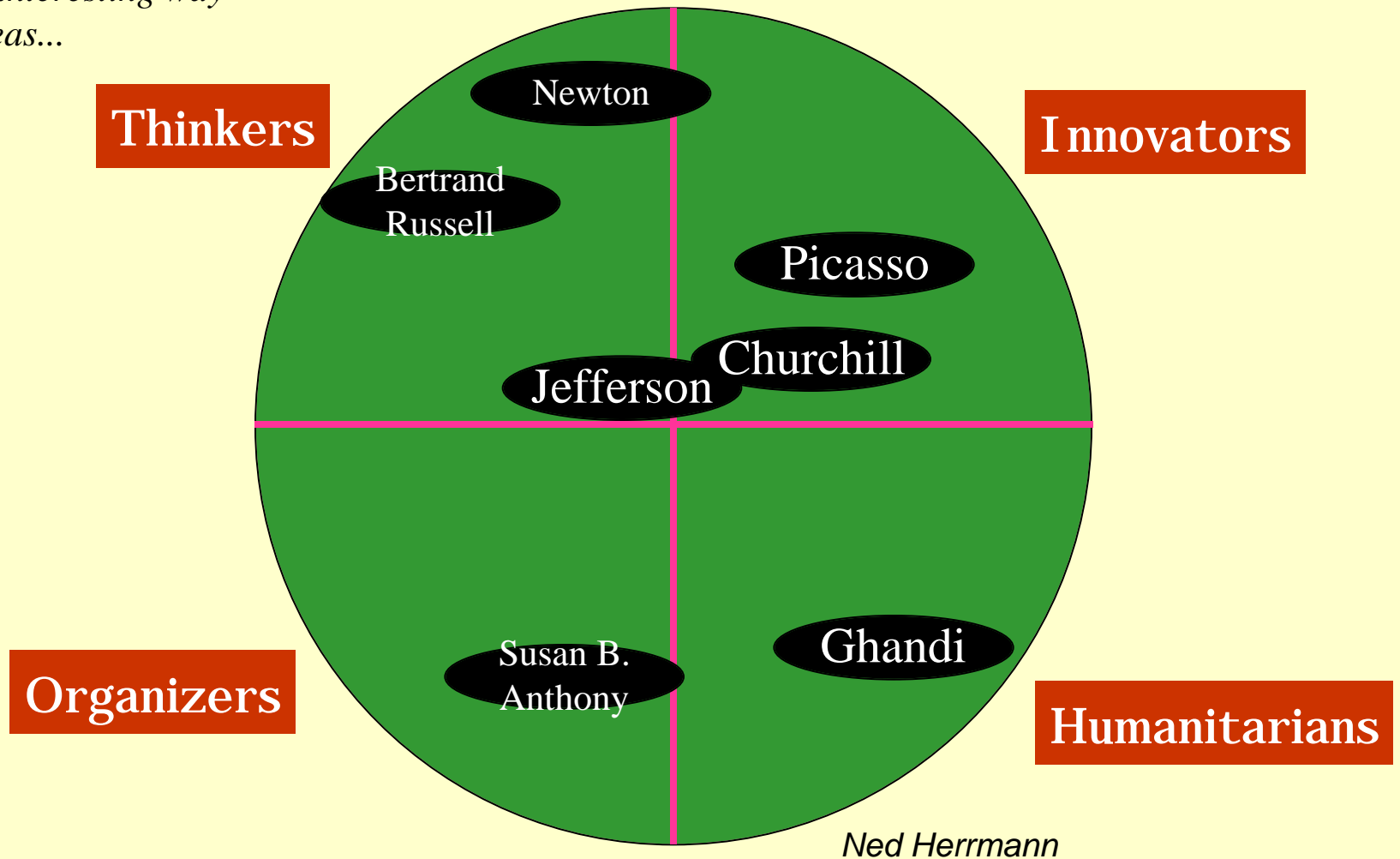
### Common characteristics:

- All have unusual personalities
- All show child-like or youthful behavior
- Each comes from a strict, but supportive household
- Prodigious talent
- Each spans two centuries

No need to emulate the “top of the line.” To admire is sufficient.  
Are there “geniuses” spanning the 20th - 21st centuries?

# Great brains in history

*Interesting to think about,  
but also an interesting way  
to group ideas...*





*An exercise*

## The Elevator

adapted from Chemtech, 22, 1, p. 24, 1992.

**The Situation:** Shortly after the upper floors of a high rise hotel had been renovated to increase the hotel's room capacity, the guests complained that the elevators were too slow. The building manager assembled his assistants. His instructions to solve the perceived problem: "Find a way to speed up the elevators." After calling the elevator company and an independent expert on elevators, it was determined that nothing could be done to speed up the elevators. Next, the manager's directions were "Find a location and design a shaft to install another elevator." An architectural firm was hired to carry out this request. No reasonable location could be found.

What solution might you come up with?

## The Elevator (a solution)

The real problem was to find a way to take the guests' minds off their wait. The guests stopped complaining when mirrors were installed on each floor in front of the elevators.

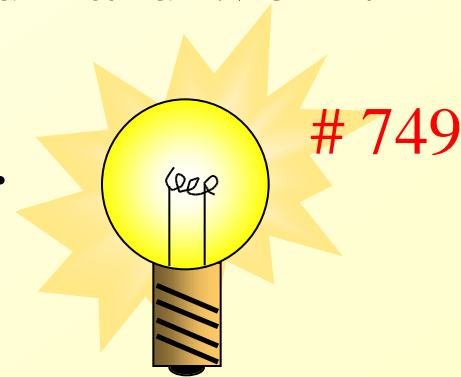


Thomas Edison is often quoted as having said:

*“Genius is 99% perspiration and 1% inspiration.”*

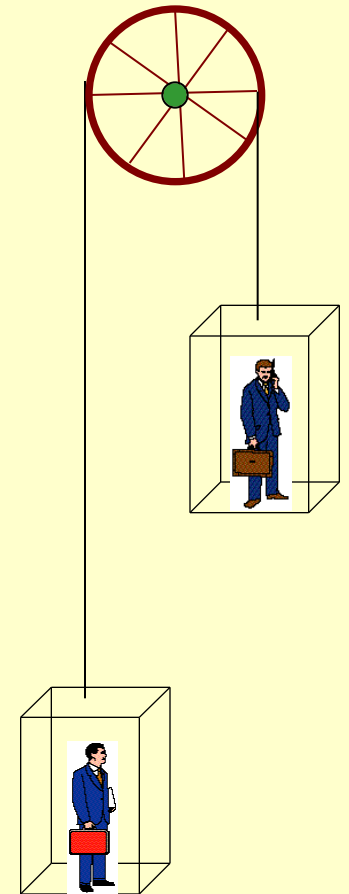
Almost always, creative people are known for their energy, drive and hard work.

And, they are persistent...



# Welcoming New Ideas

- Looking for merit in crude ideas
- Fresh perspectives
- Appreciating humor
- Dealing with criticism
- Write it down
- Understand your final goals
- Explore many possibilities
  - the mind map / create a matrix
- Combine ideas
- Think quick -- push the edge
- Think in pictures -- make a sketch
- Nature is a rich source of creative ideas



# brainstorming

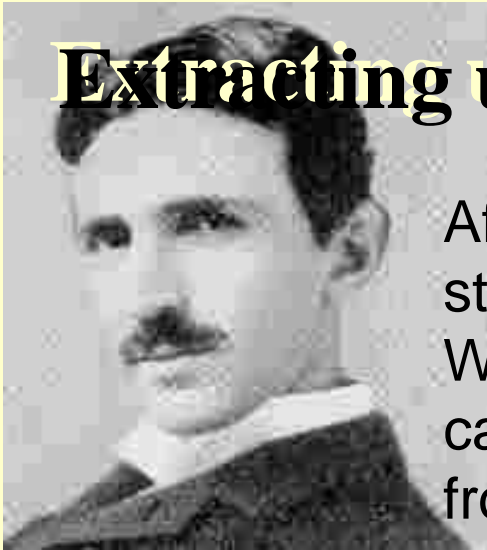
Importance of diversity (*i.e.*, the last lecture in this course)

Visualize what someone else might think

Open up!

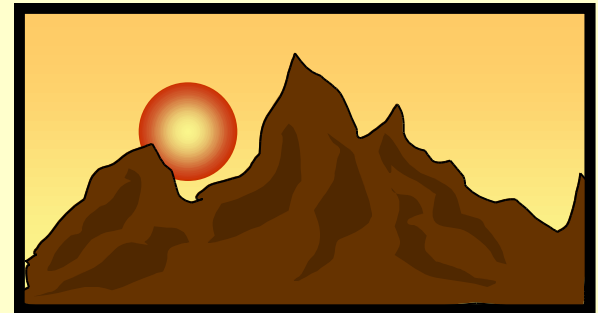
The downside is the excessive criticism of flawed ideas.

## Extracting useful concepts from “thin air.”



After the development of the DC motor, Nikola Tesla struggled to develop an alternating current motor. While walking with a friend one sunset, the solution came to him as he remembered a line from a poem by Goethe:

*The glow retreats, done is the day of toil;  
It yonder hastes, new fields of life exploring;  
Ah, that no wing can lift me from the soil,  
Upon its track to follow, follow soaring.*



The imagery in this poem is a person following the setting sun. Tesla drew the analogy between the motor armature being pulled along by a magnetic field traveling just ahead of it.

Relaxation and taking your mind completely off a problem is a path to creative ideas.

Free thought word lists: my “core-dump” thinking about creativity

Adventure

Challenge

Infusion

Explore

Create

Passion

Imagine

Individuality

Pie-in-the-sky

Effervescent

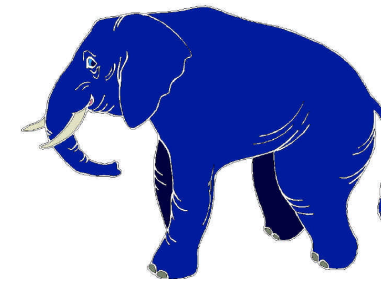
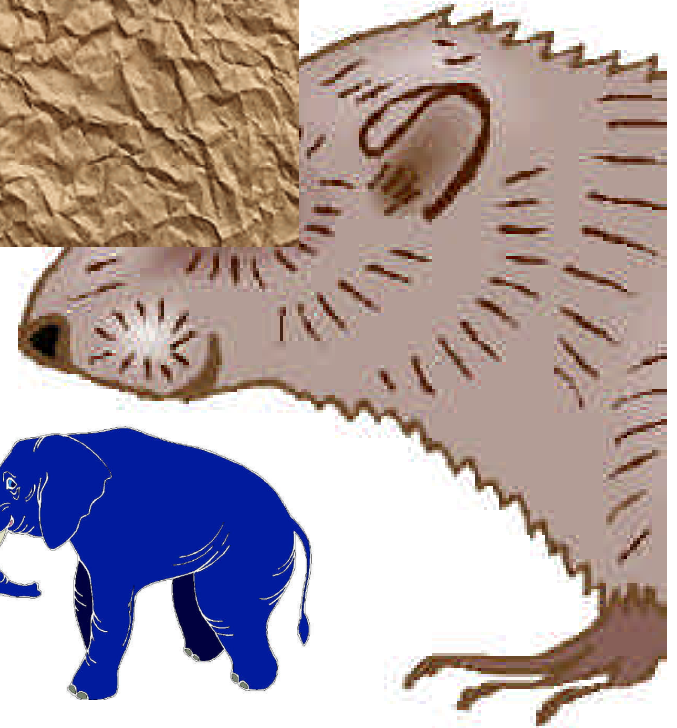
Synthesize

*essence*

Journey

illumination

horizon

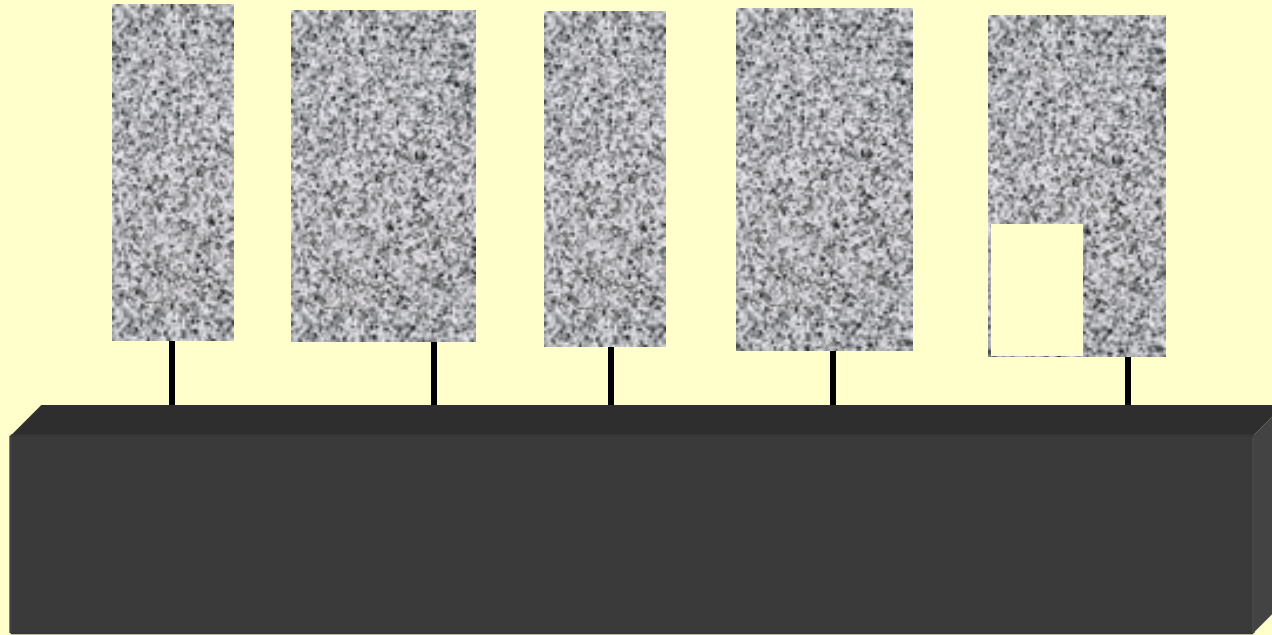


- Modify -- change color, shape, size
- Magnify, minify
- Expand the range
- Substitute
- Rearrange
- Reverse or upside down
- Combine

A	B	C	D
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A+	A	A-	B+	B	B-	C+	C	C-	D+	D
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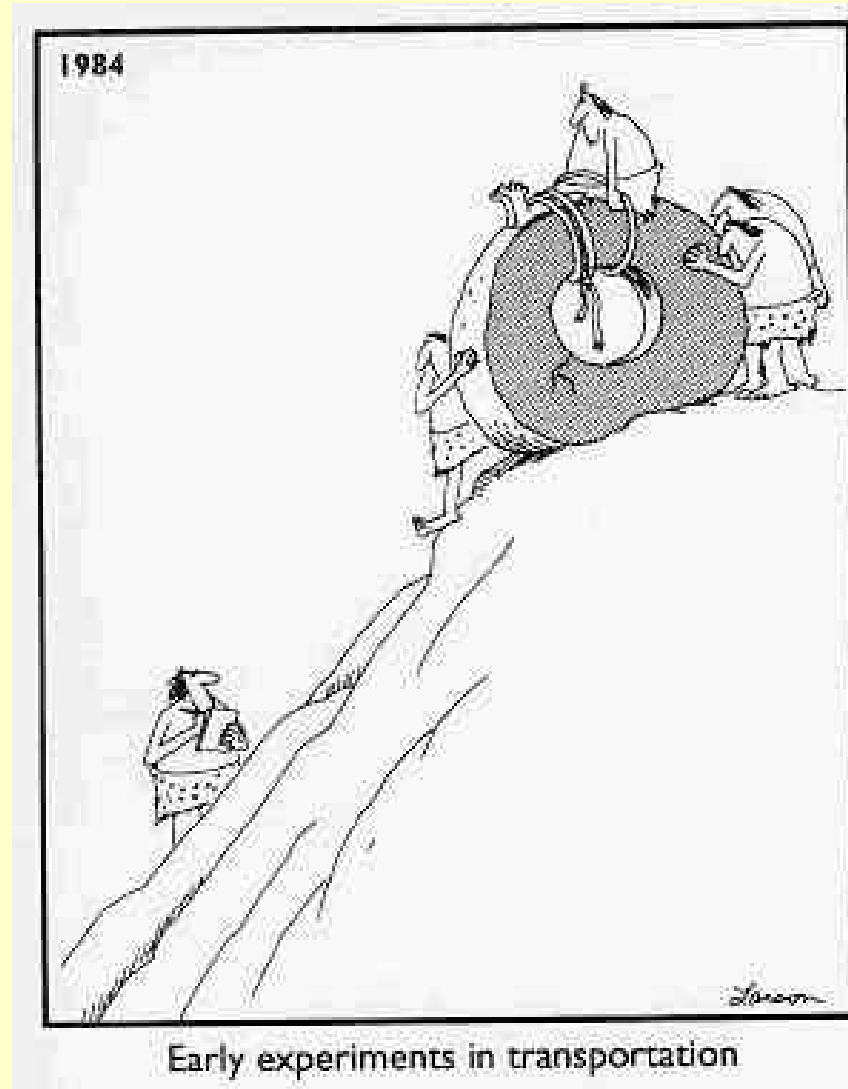




**A famous granite sculpture -- what's the message?**

*Instead of focusing on the object, focus on spaces between*

Humor and cartoons can give you a fresh perspective



The Far Side  
Gary Larson

# Refining Your Ideas

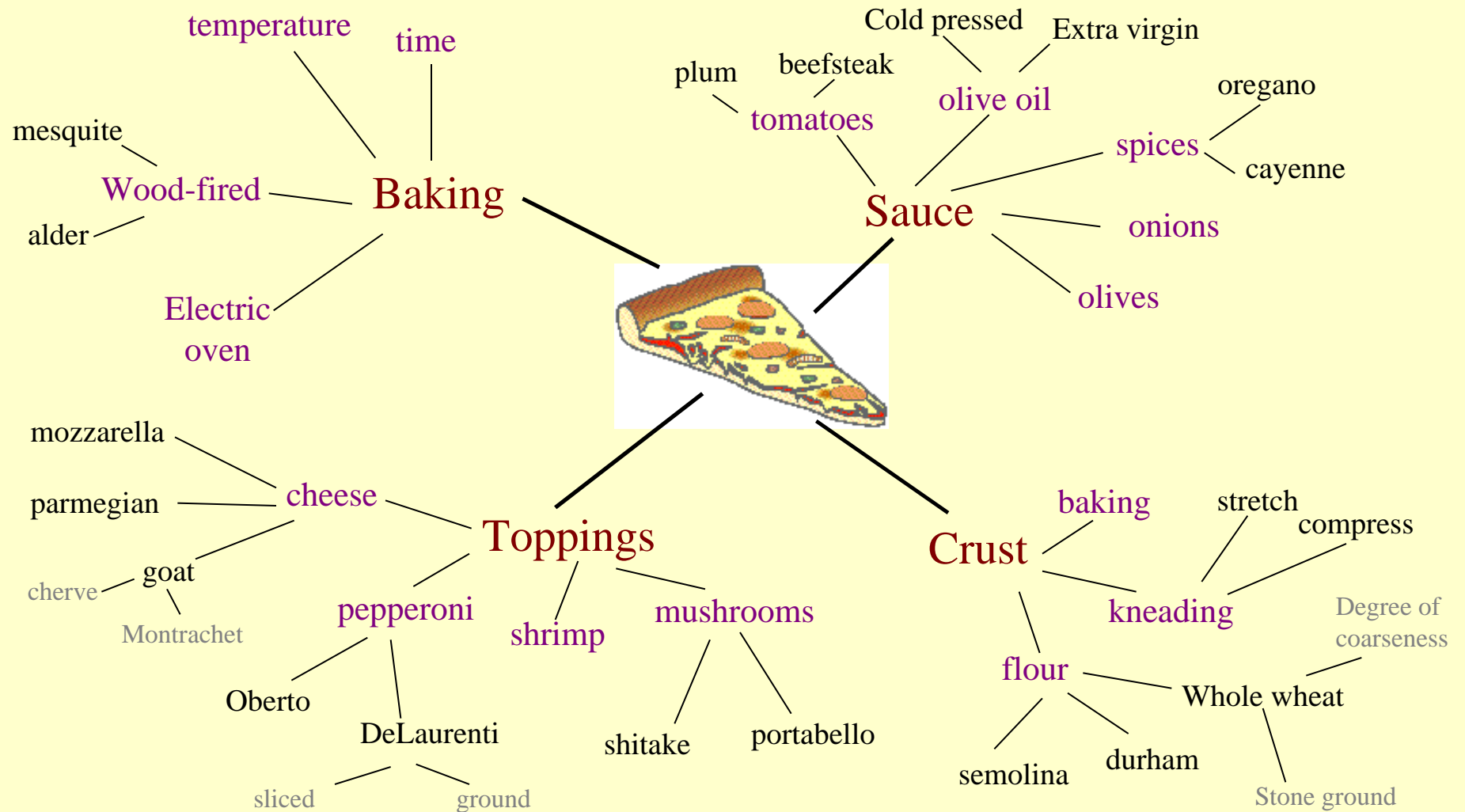
- Retaining and eliminating components
- Combining ideas
- Seeking flaws
- A bridge from the old to the new is needed

## *The Matrix Route to Possibilities*

Exploring ideas for an improved vascular graft

	<b>endothel</b>	<b>SMC</b>	<b>macs</b>	<b>FN</b>	<b>platelets</b>	<b>fibrin</b>
Pore size						
Pore shape						
Polymer						
Thickness						
Compliance						

# Pizza making (*mind map*)



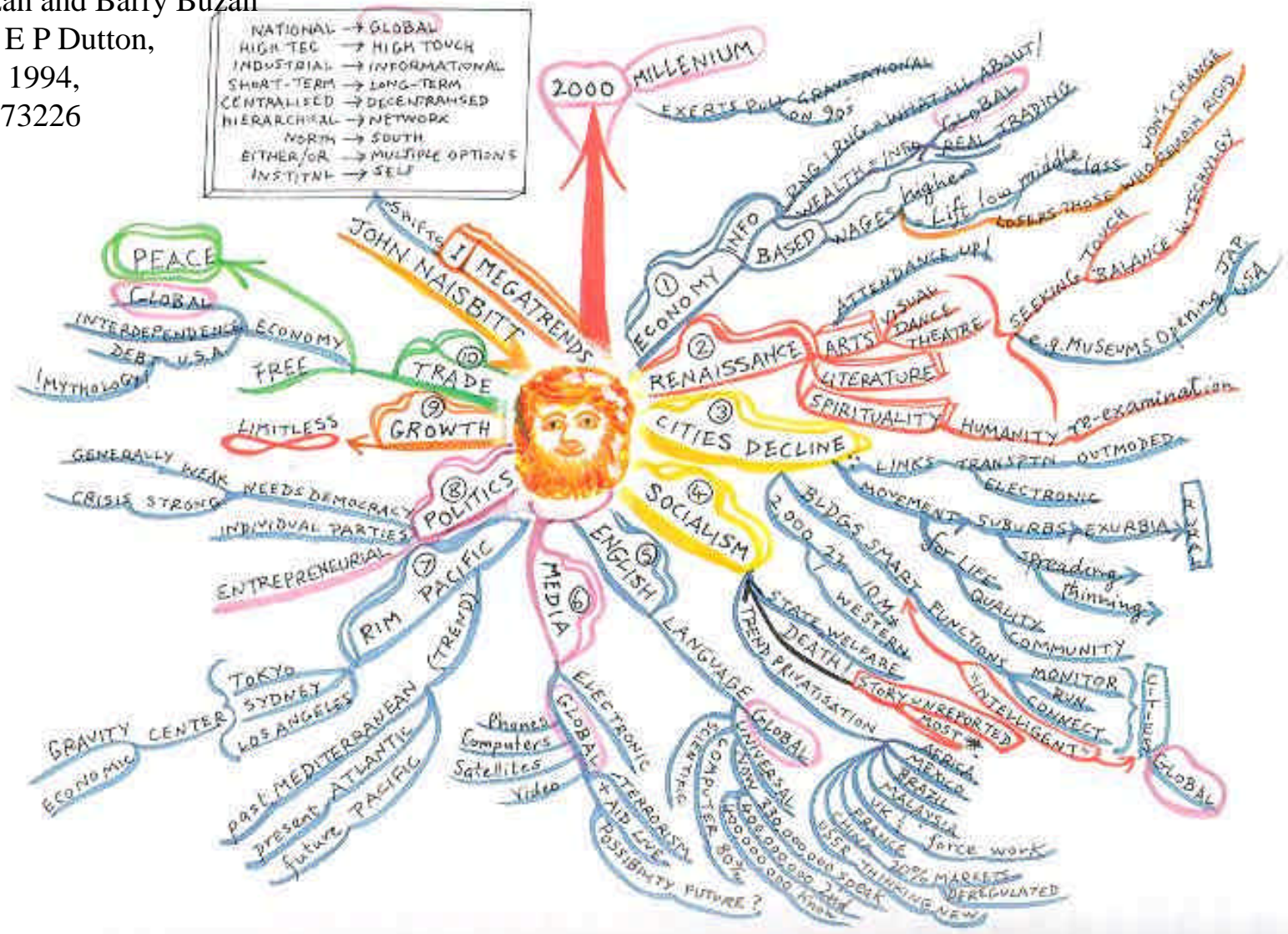
# The Mind Map Book: How to Use Radiant Thinking to Maximize Your Brain's Untapped Potential

By Tony Buzan and Barry Buzan

Published by E P Dutton,

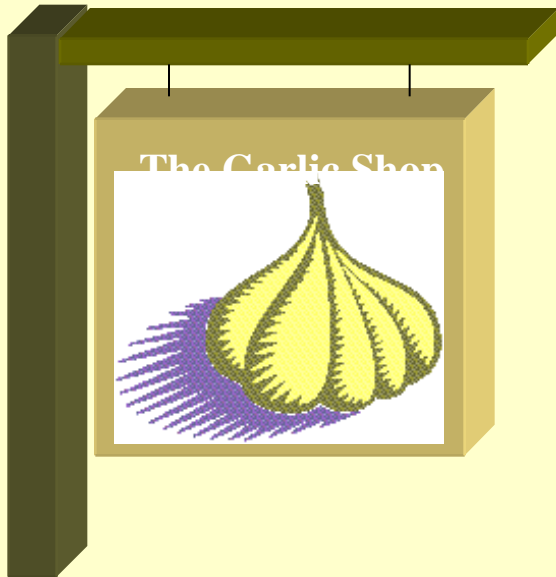
September 1, 1994,

ISBN: 0452273226



Mind Map by Tony Buzan of a two-day lecture/400 page book by John Naisbitt (see pages 256-7).

# A Class Mind Map Exercise



You've got this idea for a new business, The Garlic Shop. Everything in the shop will taste of garlic or be associated with garlic.

In 5 minutes, develop a mind map to help you start the Garlic Shop.

# The Barriers to Creativity



*Whenever you hear these phrases, bristle!*

- Don't make a mistake.
- I assume that...
- We just don't do it that way around here!
- That doesn't make sense.
- That's not practical.
- That's childish and frivolous
- There's just one answer.
- I'm just not a creative person.



# A Few Interesting Reference Sources

"Strategies for Creative Problem Solving", H. Scott Fogler, Prentice-Hall, NY, 1994

"Creativity : How to Catch Lightning in a Bottle" George Gamez, Elizabeth Ferrant (Editor)

"Creative Problem Solvers Toolbox," Richard Fobes, Solutions Through Innovation,  
Corvallis, OR, 1993

"The Mind Map Book" Tony Buzan, BBC Books, London, 1993

"Creating Minds" Howard Gardner, Basic Books, NY 1993

"The 100: A Ranking of the Most Influential Persons in History" Michael Hart, Citadel Press,  
Secaucus, NJ, 1987

"The Creativity Infusion" R.D. Gamache, R.L. Kuhn, Harper & Row, NY 1989 (business)