• The limits of science and the science of limits

• Does critical thinking understand its own limits

• Does critical thinking understand its source

What else is required to enrich critical thinking and provide it with inspiration and colour

*Art & Science of critical thinking*
* WHO IS THE THINKER?
* WHERE DOES THINKING HAPPEN?
* WHY DO WE THINK?
* WHAT IS BEHIND, ABOVE AND UNDER THINKING?
* CAN WE OPERATE WITHOUT THINKING?

* Art & Science of critical thinking
Can the thinker be unbiased, impersonal, non-judgemental and still be wise & humane?

Can a computer do critical thinking?

Should the scientist be functioning like a computer or a human being?

What is the difference?

Art & Science of critical thinking
“The intuitive mind is a sacred gift and the rational mind is a faithful servant. We have created a society that honors the servant and has forgotten the gift.”

- Albert Einstein
Evidence based medicine is the integration of the best research evidence with clinical expertise and patient values.

EBM replaced ‘opinions’, anecdotal evidence and ‘experience’

EBM tends to give more credence to research evidence than the experience of doctors & patient
* Thinking. Measurement.  
Science. Evidence.  
Impersonal. Experiment.

Personal. Intuitive.

* Contrasting polarities
* Nature of complexity
* Uniqueness of each person's biochemical individuality
* Role of mind-body
* Emergent properties
* Placebo response
* Quality vs quantity
* Meaning and purpose left out

**LIMITS OF SCIENCE**
THE LIMITS OF SCIENCE ALSO POINT TO THE LIMITS OF CRITICAL THINKING & THE LIMITS OF EBM & THE LIMITS OF REDUCTIONISM

Living systems are dynamic, not easily predictable, and creative in many ways.

Function far from equilibrium at the edge of chaos.
* Science vs scientism

Scientism claims that science alone can render truth about the world and reality.
Denies the interiors.

* Critical thinking and thinking
Thinking can deny the thinker & other subjective components.

* Who, where and what is the thinker
* The critical thinker is a map maker using thinking as a mechanism to explore life and bring order into the complexity it confronts daily.

* But the map is not the territory!

* And complexity reigns supreme.

* WHAT DOES THE TERRITORY LOOK LIKE

* THE MAP IS NOT THE TERRITORY
The map is not the territory, the word is not the thing it describes. Whenever the map is confused with the territory, a 'semantic disturbance' is set up in the organism. The disturbance continues until the limitation of the map is recognized.

Alfred Korzybski
‘The idea of a purely rational life is a myth’

The way we make decisions is based on a range of qualities pertaining to human function that is not ‘rational’.

‘It is not possible to reason things out and make decisions purely on a rational basis.’

‘The myth of a purely rational life. George Ellis. Theology and Science. 2007;5:87-100

* Professor George Ellis
NOT RATIONAL’ DOES NOT MEAN IRRATIONAL

BUT THE USE OF OTHER QUALITIES BESIDES THOUGHT TO ENRICH THE THINKING PROCESS

RATIONAL THINKING!!
“I never made one of my discoveries through the process of rational thinking.”
— Albert Einstein

*Intuitive vs Rational*
‘The myth of the given is really of exteriors untouched by interiors of mere objects untouched by subjective and inter-subjective structures.’

‘It is the myth of the objects without subjects, of surface without depth, of quantity without quality, of veneers without value.’

CRITICAL THINKING & NON THINKING ARE POLARITIES THAT NEED EACH OTHER.
*Left and right brain*
* Weather forecasting is map making but the actual weather from moment to moment is the territory.
* Medical protocols are map making but the actual reality of each patient is the territory.
* Teaching methods are map making but the uniqueness of each pupil is the territory.

* MAPS VS TERRITORY
* The arrow of time - nothing is reversible and therefore every moment is unique.
* All things are interwoven & do not operate alone.
* Nothing is simple - the particle ‘zoo’. Any direction you go there is complexity.
* All living systems are ultimately unanalyzable because the ‘parts’ are constantly being folded into each other. There are no parts.
* There is always a greater whole.
* Complex Systems are systems which exhibit “Non-Linear” behaviour.
* They possess common features which we identify with systems which are “complex”.
* We see “emergent behaviour” from complex systems which would not be immediately apparent from analysing their component parts.
‘Nature is bathed in a constant flux of gravity, electricity, and magnetism in addition to small fluctuations in temperature and other forces. Even the movement of distant stars will produce minute changes in the gravitational field experience on earth.’

All measurements are limited by nature’s creativity.
Conventional science is an attempt
* to bring order into the apparent Chaos
* to bring certainty into uncertainty
* to make prediction possible
* to develop protocols that fit everyone
* to reduce the whole to its underlying ‘parts’
i.e. reductionism
What drives conventional reductionist science and attempts to reduce everything to its parts is the conventional scientists using what they perceive very often as critical thinking.
Critical thinking can become similar to scientism when it does not recognise the source of thoughts, who is doing the thinking and excludes the subjective, the intuitive flow and the experience.
Despite complexity and without critical thinking, living systems apart from humans are able to function in an extremely creative and even intelligent way. So what is it that feeds into critical thinking?

What would one’s experience be without thought and emotions?

Going beyond thought & emotions.
*Going beyond thought & emotions
Wonder, or radical amazement, is a way of going beyond what is given in thing and thought, refusing to take anything for granted, to regard anything as final. It is our honest response to the grandeur and mystery of reality our confrontation with that which transcends the given.

(Abraham Joshua Heschel)
* blank
* empty
* dead
* boring
* dull
* expressionless
* like a vacuum

*The non-thinking mind*
* silent
* awareness still present
* inner peace
* feeling
* knowing→ intuition
* meditation and the practice of mindfulness are ways to access this space.

THE TERRITORY

* Non thinking mind
THE THINKING MIND CREATES MAPS
THE NON THINKING MIND WORKS IN THE TERRITORY
Is the map or the territory ‘The Reality’
Head or heart

Map or territory
* Researchers at the HeartMath Institute and many others around the world now believe, based on scientific studies, that a great deal of human intelligence is heart intelligence

* The conflict between head and heart
* Is ‘love’ a quality of head or heart
* Should love be left out of critical thinking
* Should the heart be left out of critical thinking

*Work of the HeartMath Institute*
Research has shown that the heart communicates to the brain in four major ways: neurologically (through the transmission of nerve impulses), biochemically (via hormones and neurotransmitters), biophysically (through pressure waves) and energetically (through electromagnetic field interactions).

When the heart is coherent, the body, including the brain, begins to experience all sorts of benefits, among them greater mental clarity and ability, including better decision-making.
* WHICH IS MORE REAL: THE SUBJECTIVE WORLD OR THE OBJECTIVE WORLD?
DOES THE OBJECTIVE WORLD HAVE ANY MEANING WITHOUT THE SUBJECTIVE WORLD?
IS THE OBJECTIVE WORLD AWARE OF ITSELF?
DOES LOVE INFLUENCE THE OBJECTIVE WORLD?
SHOULD LOVE & OTHER SUBJECTIVE COMPONENTS BE PART OF CRITICAL THINKING?

* SUBJ ECTIVE & OBJECTIVE REALITY
* We seem to have developed critical thinking without recognizing the source which is ‘non thinking’ and this is why teaching meditation, contemplation and accessing intuition is so important in dealing with children who naturally have these qualities

* Teaching tends to move children from heart centredness to head centredness

* Head & heart as functional centres
* Otto Scharmer’s ‘Theory U’

The ‘blind spot’

This is the place from which we operate when we do something.

Thinking is doing but the blind spot is who we are.

It is the spot from which knowing/intuition and feeling arises.

The blind spot is just beyond thought & emotions
Thinking is doing but the blind spot is who we are. It is also the spot out of which knowing arises. When thought and emotions stop for a moment, then we discover that this blind spot is quiet, peaceful and awareness or mindfulness is present here too. It is the place out of which creativity arises, inspiration and the artistic imperative to create.
* It is from this space that critical thinking gets its wisdom, compassion, dare I say loving intent, and from where one can see the big picture.

* Otto Scharmer identifies these two fields as open mind and open heart.

* Open mind when no thought fills all the spaces

* Open Heart when one is free also of conditioning, emotional reactions.
*Heart & head need to work together*
Clever mind vs Wise mind
* Critical thinking

MAP MAKING
* The Thinker
* THE BLIND SPOT, THE TERRITORY
  open heart (feeling) * open mind (knowing)
*THINKING & NON THINKING*
Intuition will tell the thinking mind where to look next.

— Jonas Salk —

*Intuition feeds thinking*
Faith, consciousness and awareness all exist beyond the thinking mind – Ram Dass
For the brain and nervous system to function optimally the following nutrients & support structures are required:

- Omega 3 to 6 ratio important
- MCT & coconut oil - ketone fuel for brain
- Phosphatidylserine
- Low glucose, high fat diet
- Healthy microbiome
* Germ free mice experience less brain-derived neurotrophic factor, an irregular stress response, decreased intentional motility, immune function & cell excitability.


Evidence suggests that our mood is regulated at least in part by gut probiotics.


* Gut microbiome
* Reversed her husband’s Alzheimer’s disease, starting within hours of taking coconut oil.

* [www.coconutketones.com](http://www.coconutketones.com)
* Alzheimer’s Disease. What if there was a cure.
* Coconut oil & Low-carb Solution for Alzheimer’s, Parkinson’s and other diseases.
* Start with 1-3 tablespoons per day.

* Dr Mary Newport
Lead, even in low concentrations, is connected to epidemic of children with ADHD, developmental and learning problems, and even autism.

- Canfield RL et al Intellectual impairment in children with blood lead concentrations below 10mcg/dl. NEJM 2003;348(16):1517-26

- Aluminum & mercury other brain toxins.

**Metal toxicity affects brain function**
* 60% of brain tissue is composed of fats, and most pesticides are fat-soluble & accumulate in brain.

* Even small quantities can activate microglia, causing chronic brain inflammation.
The analysis reveals that the majority of well-designed studies undertaken over the last 20 years find a significant association between low-level exposure to organophosphates and impaired cognitive function.
*Our Toxic Environment*
TO OPTIMISE CRITICAL THINKING:
1. Logical linear thinking does not operate on its own
2. Requires the intuitive rising of information from non-thinking mind.
3. Requires a healthy functioning brain.

Children operate from #2 but don’t always have healthy #3 and don’t know how to use #1
Creative Thinking
- Openness to novelty
- Idea generation
- Curiosity
- Invention
- Imagination
- Divergent thinking
- Playfulness
- Reasoning by metaphor and analogy

Problem-Solving
- Elaboration
- Synthesis, Integration and combination
- Complexity
- Abstraction and simplification
- Awareness of Environment

Critical Thinking
- Evaluation and assessment
- Categorisation and classification
- Reasoning through logic
- Identification
- Interpretation
- Analysis

*Creative vs critical thinking*
'I expect you all to be independent, innovative, critical thinkers who will do exactly as I say.'
## Difference between lateral and vertical thinking

<table>
<thead>
<tr>
<th>VERTICAL THINKING</th>
<th>LATERAL THINKING</th>
</tr>
</thead>
<tbody>
<tr>
<td>selective</td>
<td>generative</td>
</tr>
<tr>
<td>moves only if there is a direction in which to move</td>
<td>moves in order to generate a direction</td>
</tr>
<tr>
<td>analytical</td>
<td>provocative</td>
</tr>
<tr>
<td>sequential</td>
<td>makes jumps</td>
</tr>
<tr>
<td>one has to be correct at every step</td>
<td>one does not have to be</td>
</tr>
<tr>
<td>one uses the negative in order to block off certain pathways</td>
<td>there is no negative</td>
</tr>
<tr>
<td>one concentrates and excludes what is irrelevant</td>
<td>one welcomes chance intrusions</td>
</tr>
<tr>
<td>(categories) classifications and labels are fixed</td>
<td>they are not fixed</td>
</tr>
<tr>
<td>follows the most likely paths</td>
<td>explores the least likely</td>
</tr>
<tr>
<td>a finite process</td>
<td>probabilistic one</td>
</tr>
</tbody>
</table>
* Children are comfortable with the blind spot and operate from here.

Critical thinking must be taught but not at the expense of denying the intuitive, spontaneous, creative side of mind.

NB of meditation, mindfulness and non-competitive sport and movement.

* Educating children
Dear Mind,
Please stop thinking so much at night,
I need to sleep.

*Bring back the heart
Look deep into nature, and then you will understand everything better.

Albert Einstein
People aren't rational. We're not thinking machines, we're - we're feeling machines that happen to think.

— Peter Watts —

*Feeling & thinking*
"It is the supreme art of the teacher to awaken joy in creative expression and knowledge." - Albert Einstein
EVERY CHILD IS AN ARTIST.

THE PROBLEM IS STAYING AN ARTIST WHEN YOU GROW UP.