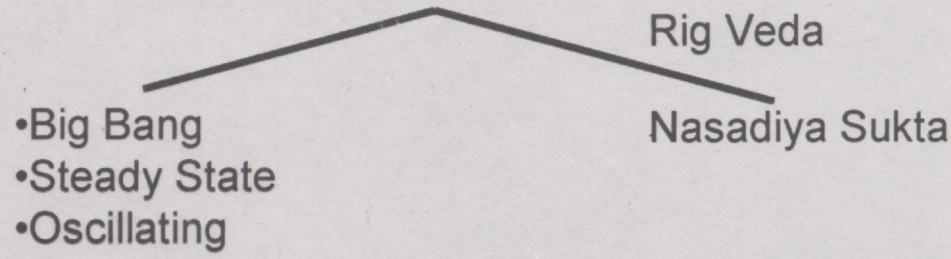
Nature (Cycle?)
(Creation – Sustenance-Destruction)



❖All parameters associated with Nature have changed with the passage of time

PHYSICAL AND CHEMICAL EVOLUTION

The Big Bang Creation of the Universe (13.6 billion years) – Solar System – Earth* (5 million years) – Man (100,000 yrs)

- Theory supported by observation and experimentation

*Expanding Universe (Hubble)
3° Microwave Radiation: Penzias and Wilson
~~Wilson~~ Hydrogen to Helium ratio

❖Temperature, Density, Radius of the Universe as a function of time.

❖High Energy Processes – Cosmic ray and accelerator experiments on fundamental particles and forces

Questions that Cannot be Answered

•Why should nature operate according to natural laws? What is the Mechanism of operation. Who controls? Why constants of nature don't change with time?

•How much of nature have we understood? Are there domains beyond the present science?

•Is "emergence" another word for "we do not know how"? But it happens. (Anirvachaneeya)

•Is vitalism the concept that was prevalent in early science coming back in some other form? Oneness?

•An integral part of nature is life body-brain-spirituality (kokoro) can we make a machine that is similar?

•Nature's nature - Scientific laws? (assumption)

•Human Nature – at the individual level and at the society level – is that what determines culture – what part of human nature is inherited and what part acquired?

•Supernature?

•The nature – culture – science Tangle.

•One Sunami – nature's fury – upsets the balance. Natural disasters vs Man made disasters

•Reducation of distance and time – virtue or evil?

The Interconnection between Nature, Culture and Science (Contd..)

- Are there other natures similar or different from our nature in other parts of the universe? – SETI, How would their cultures be?

- Culture – emerges from *society* – moral, ethical, artistic and economic values and needs.

- How have different cultures influenced development of science? Historically, Why did not science develop in older civilizations – China, India, Greece? What was special about Europe? Culture?

Culture

Man alone is the unique animal that builds culture by compulsions of his own

- ❖It is a biological imperative
- ❖Culture is that millieu of ideas, myths, values which the human animal exudes
- ❖Cultures comprise – knowledge, skill, technology, belief, art, morals, law, customs and habits
- ❖Culture initiates a process of reformation whose benefits can be concretely analyzed
- ❖Language plays an important role in dissemination and effectiveness of cross-cultural understanding – English for example.
- ❖Influence of mechanization, urbanization and globalization on culture
- ❖The influence of culture on the beginnings of philosophy and science in the ancient periods
- ❖Roots of tradition and culture
- ❖Culture and its strictures
- ❖Man needs not only bread but also art, ritual, philosophy, science, myth, religion, dance, drama, poetry

Effects on Man

- ❖Racial prejudices continue to remain as powerful force even to-day

CULTURE !

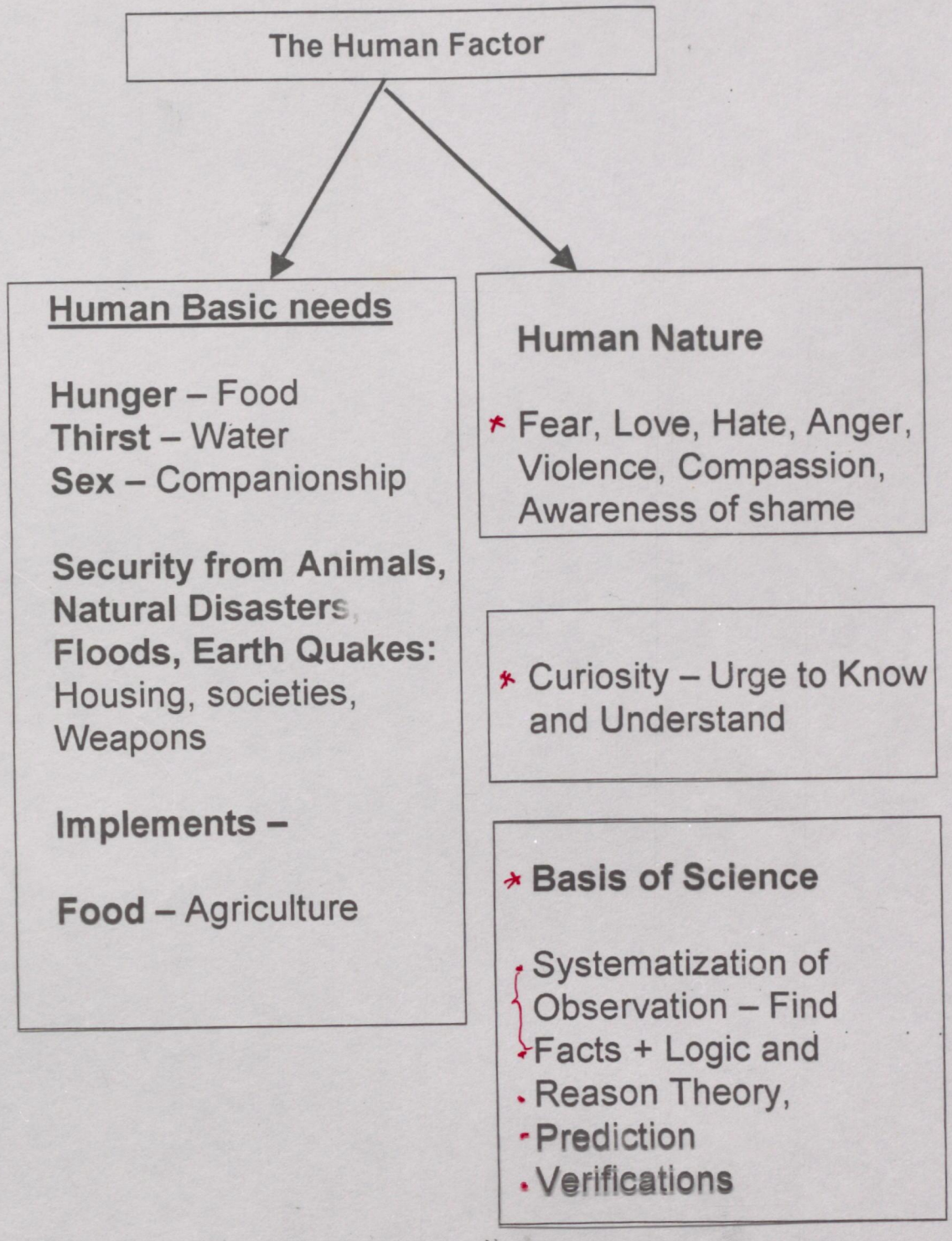
CONSCIOUSNESS AND SCIENCE

Notion of culture is derived from the Latin verb 'Colere', i.e. Cultivating the land to grow plants for consumption by humans and their domesticated animals slaves, servants and companions.

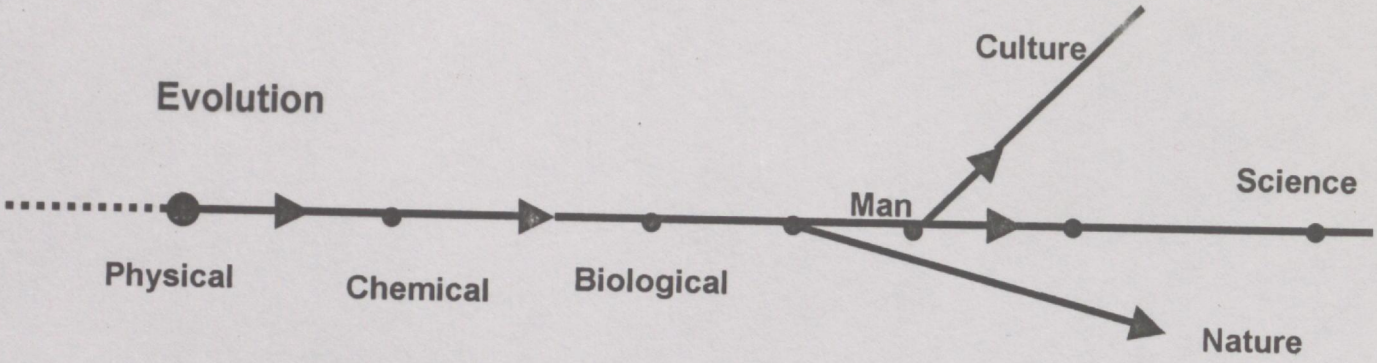
This means that at it is not a human activity against nature but the aim is to make natural productivity usable

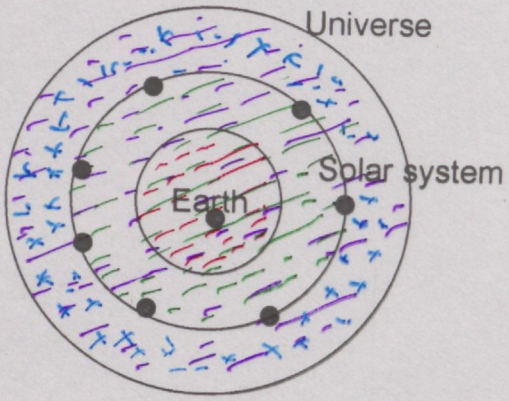
Who are all Interested in Consciousness?

- Disciplining of the Mind: Meditation, Yoga, Zen, ...
- Philosophers: Western, Eastern
- Computer and AI Scientists
- SETI (Search for Extra-Terrestrial Intelligence)
- Physical Scientists: Physicists, Chemists, Mathematicians
- Instrumentalists: CT-Tomography, MRI, fMRI, PET, LASER, EEG, Microelectrodes
- Non-entity does not exist as such
- Life Scientists: Neurobiologists, Neurosurgeons, Evolutionary Biologists, Psychologists, Psycho-linguists, Animal consciousness investigators, para-normal
- Druggists Anaesthetists
- No consciousness Meter Yet



- The savage Ancestors discovered tools, the seeds and domesticated animals – cows, dogs, pets, created language, and also superstitions.





Levels of Nature

I. Perceived by Senses alone
II. With the aid of instruments
III. Theory and imagination

Human nature
Fear, Love, Hate, compassion, anger, shame, ambition, curiosity, Music, poetry, Literature

Culture
Individual level
Societal level
National Level

Pure Science : Curiosity in understanding, Living and Non-living

Space, time, matter, causality as the basis

Origin: Universe, life, consciousness

MAXWELL TO PLANCK, EINSTEIN, DIRAC
(> 1850 to Present Day)

Transcendence in Physics begins in my opinion with Maxwell's prediction of Electromagnetic waves and their discovery by Hertz.

Unification of Electricity and Magnetism.-
(the troublesome ETHER.)

- Electromagnetism - EM waves
- Radioactivity - $\alpha, \beta, \gamma, \ldots$
- Atomic Physics - Spectral lines
- Special and General Theories of Relativity ($E = mc^2$), Four Dimensional Space-time Continuum
- Quantum Hypothesis ($E = h\nu$)
- Photo-electricity
- Quantum Electro Dynamics
- Discovery of Elementary Particles
- Mesons, Hyperons ... Quarks, Gluons,
- Anti. particles
- QCD

These phenomena could not be explained within the framework of old Concepts and laws and principles.

The Interconnection between Nature, Culture and Science

❖ **The profile of nature has changed with time –**

Evolution– Big Bang – Expansion of Space – Creation of Particles – Stars, Galaxies, Planets, Earth – evolution of the earth – Evolution of life – Plants, Animals, Man

❖ **Nature inspired concepts of Science:**

*Space, time, continuity, discontinuity – discreteness – causality

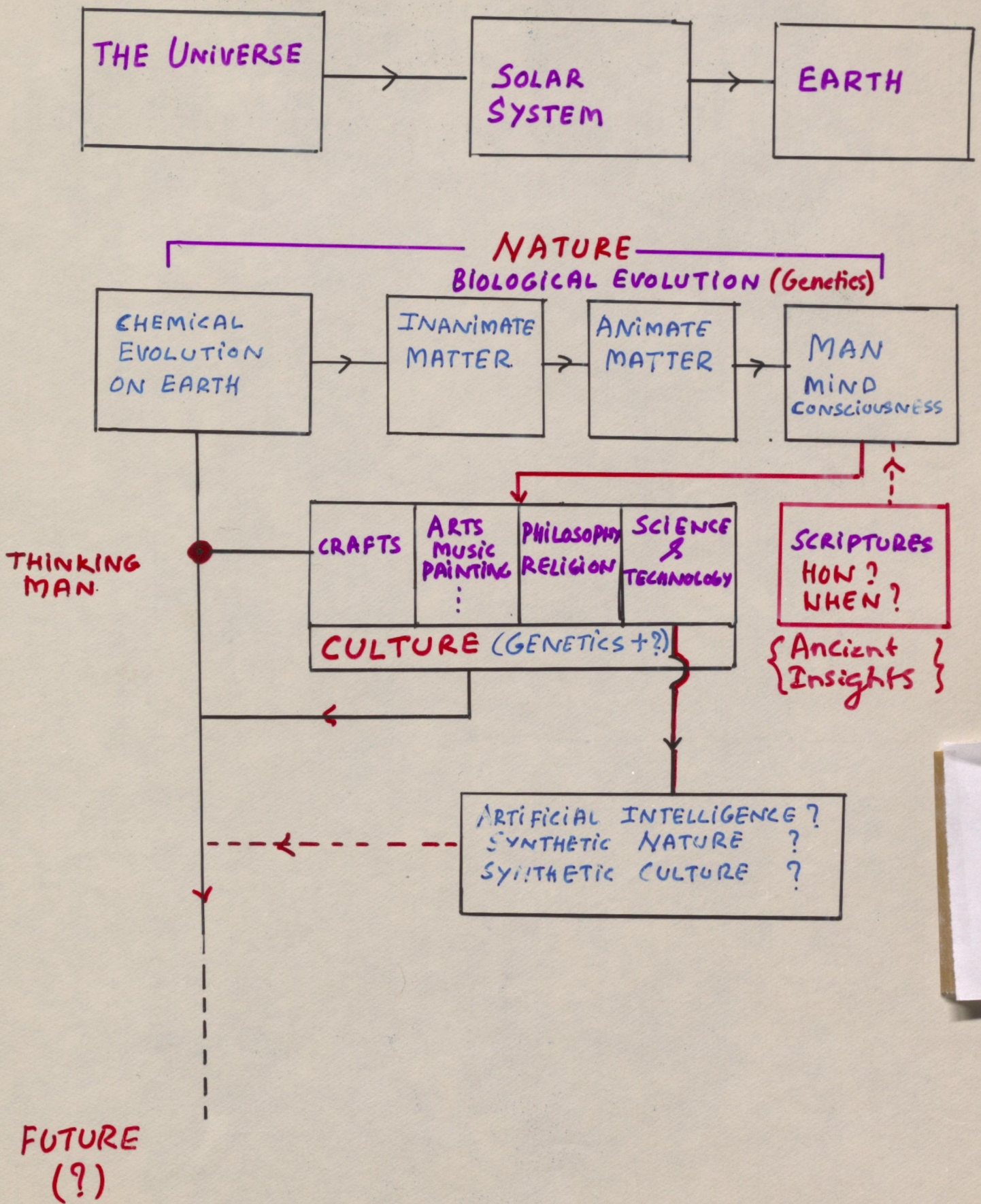
*Heat, Light, Sound, Electricity, Magnetism, Gravity, Wave

❖**Science inspired concepts for explaining phenomena in nature :**

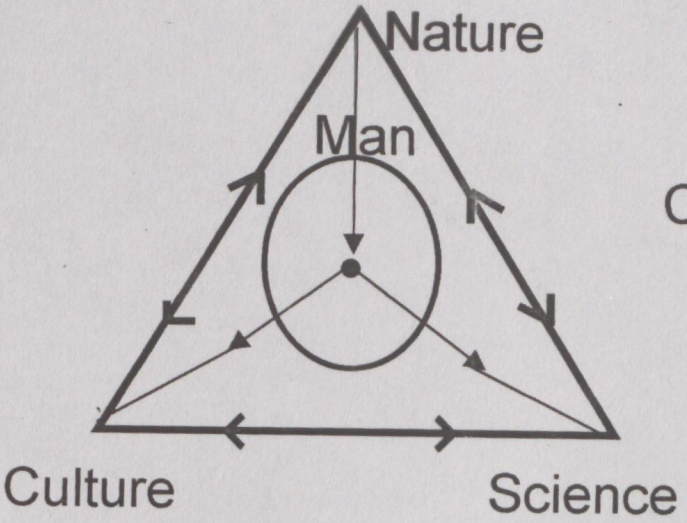
*Electro-Magnetic Waves
*Identity of Matter and Radiation
*Space-time Continuum – Quantum Vacuum
*Expanding Universe – Big Bang Creation

❖**Nature we are familiar with in our everyday life - is a very, very minor part of the universe at large**

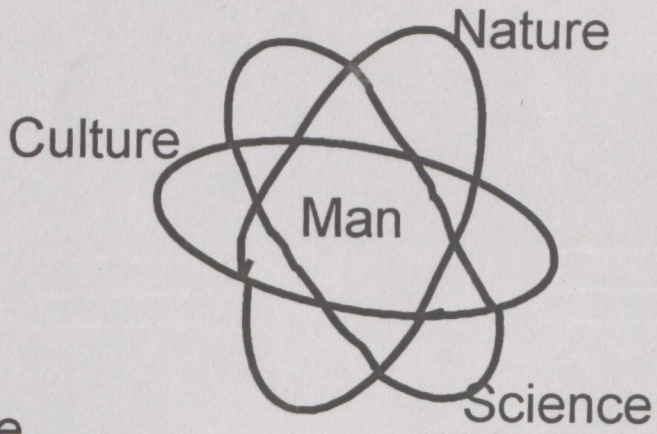
EVOLUTION - PHYSICA AND CHEMICAL



Triangle



Tangle



Bhagavad Gita Ch: 16

1. अभयं सत्वसंशुद्धिर्ज्ञानयोगव्यवस्थितिः ।
दानं दमश्च यज्ञश्च स्वाध्यायस्तप आर्जवम् ॥

2. अहिंसा सत्यमक्रोधस्त्यागः शान्तिरपैशुनम् ।
दया भूतेष्वलोलुप्त्वं मार्दवं ह्रीरचापलम् ॥

3. तेजः क्षमा धृतिः शौचमद्रोहो नातिमानिता ।
भवन्ति सम्पदं दैवीमभिजातस्य भारत ॥

4. दम्भो दर्पोऽभिमानश्च क्रोधः पारुष्यमेव च ।
अज्ञानं चाभिजातस्य पार्थ सम्पदमासुरीम् ॥

5. दैवी सम्पद्विमोक्षाय निबन्धायासुरी मता ।
मा शुचः सम्पदं दैवीमभिजातोऽसि पाण्डव ॥

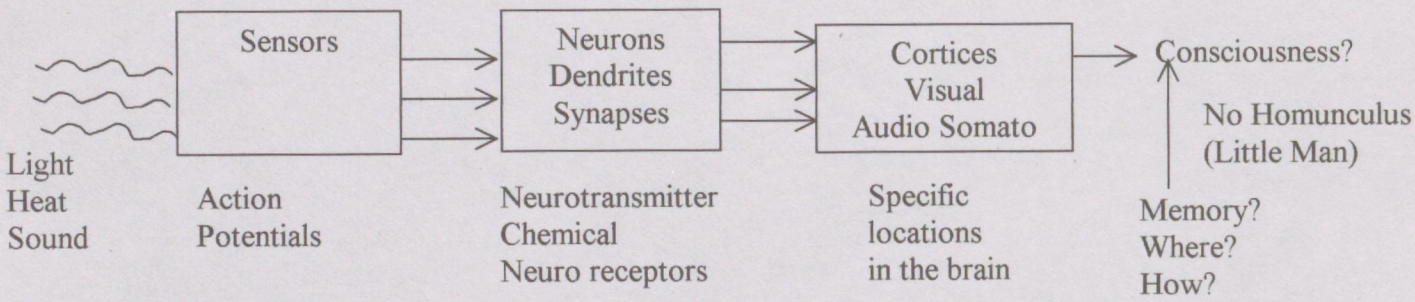
6. द्वौ भूतसर्गौ लोकेऽस्मिन्दैव आसुर एव च ।
दैवो विस्तरशः प्रोक्त आसुरं पार्थ मे शृणु ॥

दैवी संपत्ति & आसुरी संपत्ति

WHAT IS CONSCIOUSNESS?

- I see, I hear, I smell, I taste, I feel hot, cold, I think, I decide, I control my acts, I enjoy, I get angry, I calculate, I remember, ...
- Whatever is ultimately responsible for all these and any many more, I call consciousness. (Working definition)
  - What does the neurosurgeon Sperry say about this?.....*T*
  - What does the Nobel Laurate Crick say about this?.....*T*

Let us consider the case of COGNITION.



HUMANS

- 10^{11}-10^{13} Neurons
- Each Neuron passing through 10^{3}-10^{4} synapses
- 60-70 neurotransmitter chemicals identified
- Any single event involves the combined firings of hundreds of thousands of Neutrons. Example of Discuss Throw

1. Fearlessness, purity of heart, steadfastness in knowledge and yoga, almsgiving, control of the senses, yagna, study of the scriptures, austerity and straight – forwardness.

2. Non-injury, truth, absence of anger, renunciation, serenity, absence of calumny, compassion to beings, uncovetuousness, gentleness, modesty, absence of fickleness.

3. Vigour, forgiveness, fortitude, purity, absence of hatred, absence of pride, these belong to one born of divine state, O Bharata

4. Ostentation, arrogance and self-conceit, anger and also harshness and ignorance belong to one who is born, O Partha, for a demonaic state

5. The devine nature is deemed for liberation, the demoniacal for bondage. Grieve not, O Partha, you are born for a divine state

6. There are two types of beings in the world, the divine and the demoniacal; the divine has been described at length; Hear from me, O Partha of the demoniacal.

7. प्रवृत्तिं च निवृत्तिं च जना न विदुरासुराः ।
न शौचं नापि चाचारो न सत्यं तेषु विद्यते ॥

8. असत्यमप्रतिष्ठं ते जगदाहुरनीश्वरम् ।
अपरस्परसम्भूतं किमन्यत्कामहैतुकम् ॥

9. एतां दृष्टिमवष्टभ्य नष्टात्मानोऽल्पबुद्धयः ।
प्रभवन्त्युग्रकर्माणः क्षयाय जगतोऽहिताः ॥

10. काममाश्रित्य दुष्पूरं दम्भमानमदान्विताः
मोहाद्गृहीत्वासद्ग्राहान्प्रवर्तन्तेऽशुचिव्रताः

11. चिन्तामपरिमेयां च प्रलयान्तामुपाश्रिताः
कामोपभोगपरमा एतावदिति निश्चिताः

12. आशापाशशतैर्बद्धाः कामक्रोधपरायणाः ।
ईहन्ते कामभोगार्थमन्यायेनार्थसञ्चयान् ॥

13. इदमद्य मया लब्धमिमं प्राप्स्ये मनोरथम् ।
इदमस्तीदमपि मे भविष्यति पुनर्धनम् ॥

14. असौ मया हतः शत्रुर्हनिष्ये चापरानपि ।
ईश्वरोऽहमहं भोगी सिद्धोऽहं बलवान्सुखी ॥

...

7. The demoniac know not what to do and what to refrain from; neither purity, nor right conduct not truth is found in them.

8. They say "The universe is unread, without a moral basis, without a God, born of mutual union, brought about by lust; what else?

9. Holding this view, these ruined souls of small intellect, of fierce deeds, rise as the enemies of the world for its destruction.

10. Beset with immense cares ending only with death, regarding gratification of lust as the highest and feeling sure that is all.

11. Bound by a hundred ties of hope, given over to lust and anger, they strive to secure by unjust means hoards of wealth for sensual enjoyment.

12. This to-day has been gained by me; this desire I shall fulfill; this is mine and this wealth shall also be mine in future.

13. That enemy has been slain by me and others also I shall slay. I am a lord, I enjoy, I am successful, powerful and happy.

14. I am rich and well born; who else is equal to me? I will sacrifice, I will give alms, I will rejoice. Thus deluded by ignorance.

Physics at the end of the 20th. Century.

Fundamental Physics

- Basic Concepts of Space, time, matter, energy ...
- Ultimate Constituents of matter, Radiation (Molecules - Atoms - Protons and Neutrons - Mesons, leptons, antiparticles. ...)
- Basic Forces of Nature Gravitation, EM, Weak, Nuclear ...
- Conservation laws, Symmetry
- Role of mathematics
- relation to astrophysics
- relation to Life Sciences
- philosophy of Science

Applied physics
Technologies based on physics

- Electricity, Magnetism., optics.
- Electronics, Communication
- Atomic Energy
- Space
- Materials
- Sources of Energy
- Defence Applications
- Instrumentation
- Lasers
- AI, SETI
- Meteorology
- Geophysics

Quantum Computers ?

Future → (Era of NEW PHYSICS ? ? ?)

The COMPLX

phase transitions
Co-operative phenomena
Self-organization
deterministic chaos.

Physics
Chemistry
Mathematics
Astronomy

⇓ INTERDEPENDENT DISCIPLINES.

- ⊙ Pre-Science Period. < 1600 A.D
- ⊙ Era of Classical physics 1600 - 1885
- ⊙ Era of Modern Physics. > 1885.

Nature, Culture and Science – Triangle or Tangle?

B V Sreekantan

Nature and Culture, 5-6 May, NIAS, Bangalore

What controls nature?

"With the advent of science came the beginning of a profound change of the intellectual approach to the interpretation of nature. Supernatural causes, manufactured in the imagination to satisfy the desire for explanations, were superceded by natural causes discovered in the laboratory. The universe came to be understood as a vastly complicated mechanism built of electricity, energy and operating with marvelous precision in accordance with the system of laws.

"We now see ourselves in a world governed by natural laws instead of capricious deities and devils. This does not necessarily mean that God has been ruled out of the picture, but it does mean that the architect and engineer of the universe is a far different type of being from the gods assumed by ancients and that man lives and dies in a world of logical system and orderly performance."

K T Compton

An appropriate Scientific Definition of Nature is :

- The Universe and Everything in it that is accessible in it to the inquisitive methods in Science.
- But, Nature as we perceive it in our everyday life is a small part of this entity - the Universe

Culture : (Encyclopedia of Philosophy)

- Culture comprises those aspects of human activity which are socially rather than genetically transmitted.

Science began in the discovery of Causes

Reason:

in day to day transactions –
Sound thinking, intelligence, sanity and sense
Not - emotion, imprudence, obstuteness – not dogmatic

Rationalism (Descartes, Plato, Aristotle)

- (ratio =reason) - is quite different!
-process of logical thought – by Deduction
- logical deduction may lead to conclusions
-"Cogito ergo sum" away from truth of the premise

Intuition (Kant): All questions even big questions of philosophy could be made to yield to the reasoning of the mind – access all great truths by mind alone

Empiricism

According to *Locke* – mind is a blank page. It is experience that writes on it.

Empiricism in Greek is experience and trial (also in Archimedes, Ptolemy, Hippocrates):

If you want to understand Nature look at Nature and not at Aristotle!

- Sense Data – what one sees, hears, tastes, smells
→ road to truth

Beginning of Science (Contd..)

Empiricists

Galileo: Enlarged the visible universe with the Telescope
Francis Bacon: Novum Organum (New Method)

"Our knowledge of the external world comes from our sense impressions – systematic and orderly observation of nature stressed the value of ***Inductive logic.*** The mistake that Bacon made was that Empiricism would lead to **Certain** knowledge. He failed to recognize the **Probable** character of truth,

Boyle (1660); Newton(1690, Principia); Locke(1690) – (Reason + Empiricism) → Modern science
(attributed the mechanistic world to Divinity)

Newton – Higher mathematics, celestial Mechanics, physical optics

1674 : Leeuwenhoek – Microscope – Bacteria in rain drops

Hume: None of man's belief can be given the stamp of certainty – ruined empiricism inductive inference

Statistical analysis – extent of uncertainty

Interference during experimentation?

1883 : Cell as the unit of life – spontaneous generation of life?

1864 : Pasteur – "Life is germ and germ is life"

To-day: "Life *Once* did arise by spontaneous generation". But a highly improbable event under present conditions. Logic tells us that science can only prove that an event is highly **improbable**, it can never prove it as **impossible**

How Nature is Modified by Culture?

- Hunting of animals modified by new techniques
- Agriculture production Methods
- Industrial Production - Pollution of water, air,
- Creation of Pure and Applied Science - new perspectives on nature.

Nature : The physical environment that human culture inhabits. Whole of physical universe – not exclude man human nature (svabhava) - individual.

S and T : Benefits and Deleterious Efforts

- Better utilization of natural resources – survey, process
- Better Communication – radio, TV, Tele
- Quick transportation – ~~non familia~~r
- Agriculture – genetics
- Disease control – information dissimination

- Bomb – mass destruction of people, land, crops
- Biological weapons
- Cloning
- Lands infested with explosives, RDX
- AK47, Star wars
- Deforestation
- Cutting of hills

* **Fire** - For warmath, Scaring wild Animals, and later for Cooking.

10,000 - 2500 BC : Neolithic Revolution

- Homo Sapiens - the Superior ones appear.
- Man moves from gathering food to producing food - Rudiments of agriculture, Domestication of animals and plants - fruits, flowers
- Wheel — potteries for cooking food. Animal drawn wheeled vehicles - increased mobility.

6000 BC : Copper, Bronze, Iron - for implements Gold, Silver for ornaments.

• 3000 BC - 1600 AD :

Potter's Wheel, Wheeled carriages, Ships, Lever, Pulley, Wind Mill, Porcelain, Mechanical Clock, Compass, Gun powder, Spectacles, Printing Machine, Metal Types for printing, Main Spring Watch, Microscope.

- Pyramid 2900 BC
- Vedas 3000 - 1400 BC.
- Bible

1800 - 1900 AD :

Steam Locomotive, Steam Ship, Arc Lamp Gyrascope, Spectroscope, Bi-cycle, Cement, Electromagnet, Rail Road, Electric Generator, Electric Telegraph, Revolver, Safety Match, Elevator, Kerosine, Internal Combustion Engine, Type Writer, Dynamite, Telephone, Phonograph, Incandescent Lamp, Fountain Pen, Aluminium, A-c. Motor, Motion Picture Projector, Safety Razor, Submarine.

S and T take over

Brain-Storm-cum-Discussion Meeting on Nature and Culture

28–29 May 2004

ABSTRACTS

National Institute of Advanced Studies
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Bangalore 560 012, India

Sponsored by: Project of History of Indian Science, Philosophy and Culture (PHISPC),
Centre for Studies in Civilizations (CSC), Kolkata and New Delhi