Contents of Volume IV

# Room for Doubt

# Preface to Volume IV

Sound is ephemeral, and experience of sound lasts longer than the reality of music. Awareness communicated by words lasts longer than the realities they describe or build upon. Words that resonate with human experience tend to bring awareness of permanence and inevitability.

These essays are about real and perceived, direct and indirect, happenings in complex worlds. With room for doubt in word representation we retain more of awareness. As precursor to action, for decision making we try to capture such complexities in words.

We use word and number strings to communicate content, context, and intentions. Words are convention bound to capture defined parts of our external and internal concerns. However, our word constructs are designed to communicate intentions and explore meaning of the communicated experience. In this sense words inputs are unlike any other sense inputs whose content has a more direct physical origin such as touch, taste, smell and light. Perception of the intention and meaning communicated by word strings is a significant part of deliberate human behaviors. Word communication involves interactions of at least two different minds. Therefore, doubt is a necessary part of the interpretation to grasp intentionality and meaning, as well as the associated behavior response.

Narratives are necessarily transient, partial and linear. Albeit, what a word string communicates comes to life with interactions. Quality of resulting perceptions depends on the

quality of interaction. If active interaction is about exploring the context and context of the information content, reasoning and thought help us evaluate the truth-value and liabilities of word representations and their behavior consequences. Because the variables for the interaction of mind with a word construct can not be fully defined, all language-based communication builds on partial truth values. We further explore the meaning and significance of the parts of a word construct with wide ranging formalisms (anecdotes to theories) to reduce doubt inherent in assertions with partial truth value.

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## IV-1 It is Jungle out There!

Playfulness in words, thought and actions makes the world accessible to mind. Such behaviors are motivated by desire to deal with real-world problems with perceptions as they emerge with active interaction.

The perception that *it is jungle out there* shadows us in all our dealings. It persists even generations after human ancestors moved out of Africa and crossed rivers, deserts, oceans and space. Uncertainties of nomadic life have given way to agriculture and settlements. To address concerns we continue to invent tools. To make up for our real-time deficiencies we increasingly rely on languages and institutions. Our languages are strewn with wide ranging words to on reflect uncertainties and doubts. As summarized in Table IV-1, the range and nuances of such words are not for the tone-deaf or the boxed-in mind. Consider how we routinely deal with limitations and liabilities by expressing shades of ignorance, wistful, wishful, and willful. Semantic nuances come to life when we have to acknowledge doubt, uncertainty, imprecision, and ambiguity.

**Table IV-1. Shades of Wishful, Wistful, and More!**

**A**bsurd, acausal, *ad hominum*, *ad verecundiam*, advertisement, affirmation, agony, alibi, alienation, allegory, alter-ego, always, ambiguity, ambivalence, amphiboly, analogy, angst, annihilation, annoyance, anomaly, aparition, aplomb, a priori, apple-pie, approximation, arbitrary, arguably, artistic-liberty, assumption,

asymmetry, attenuated, attitude, augury, augmented, authority, average, awareness, axiom

**B**alderdash, ballpark, banter, bastard, battle, Bayesian, bedazzled, believable, betwixt, bizarre, boundary condition, boxed-in (mind), bull (or bullshit), buncombe,

**C**art-before-the-horse, causality, cavil, certitude, chameleon, chance, chaos, chatter, chew fat, circular reasoning, clairvoyance, claptrap, clarity, cliché, clue, cognizant, coherence, coincidence, collision of ideas, complicit, conceit, concurrence, consciousness, consistent, constraints, contingent, contradictory, contrariety, contrive, conundrum, convention, convergence, converse, conviction, correlation, cosmetic, counterpoint, craft, crazy, creation, creative, credible, creditable, criteria, culpability, cupidity, curiosity, cutting edge, cynicism

**D**eception, debate, defeatist, defect, deferred, deja vu, denial, derisive, deterministic, devil, devious, diabolical, diatribe, dilemma, disability, discrepancy, disorientation, dissent, dissimulation, divine inspiration, dogged, dogma, dormant, dotted-line, double-take, doubt, dream, drivel, duality, dubious, dumb-down

**E**conomical with truth, emotional, emphasis, end-game, enigma, ephemeral, epithet, equivocation, error, essence, estimate, euphemism, evasion, evidence, evoked, exactitude, expediency, extreme

**F**ailures, fairy-tale, faith, fallacious argument, falsity, fantasy, farrago, fashion, feel-lucky, fib, fluctuations, foot-work, forked-tongue, fractal, frown,

**G**ame, genuine, ghost, gnawing, gods and God, grunt, guess, guesstimate, guided-tour

**H**alf-truths, happenstance, hidden, historical, hit-the-wall, Hmm! hogwash, hokum, Hollywood, Holy-smoke, horn-of-dilemma,

hornet's nest, humbug, hunch, hyperbole, hypothesis

***I*** *Ching*, ideal, ignorance, image, imaginative sympathy, imminent, impasse, imperfect, imperative, implication, impossible, imposture, imprecision, improvise, impugn, in-prefix (such as inability, inaccuracy, incoherent, incompatible, incomplete, incongruous, inconsequential, indecisions, indefensible, indifference, indiscretion, indiscriminate, inevitable) inspiration, instincts (reptilian and otherwise), intangible, intelligent life (and its variations), interesting, interpretation, intrigue, intrusion, intuition, inverted, ironic, irrefragable

**J**udgment call, judicious

**K**afkaesque, key, Kissingerian, kudos

**L**abyrinth, latent, latest, latitude, leap, legend, liberator, limbo, limits (of rightness), loose-cannon, lost (in translation), lull, (extent of) lies

**M**achiavellian, madness, magical, make-believe, marginalize, market-value, mask-of-theory, maverick, maybe (perhaps), maze, meaning, meme, message-control, metaphor, mind, miracle, miscommunication, misgiving, mistake, mock, model, mystery, mythical

**N**ebulous, nefarious, nemesis, never-say-never, news, non-certain, normal, notion, not-too-unreasonable, nugatory

**O**bdurate, obfuscate, objective, obsession, Occam's razor, oddity, official line, operational, optimism, ornamented, ostensible, out-of-sight and out-of-mind, outline, oxymoron

**P**alaver, panacea, pandemonium, paradox, parsimony, passion, perplexity, phantom, platitude, Platonic, plausible, poll, possible, potshot, Power-Point presentation, precision, predicament, pre-maturity, probable, problem, promise, propaganda, prove it, provisional, proverbial, prudence, pseudo-science, puzzle

**Q**uackery, quagmire, quandary, queasy, questionable, quick-sand

**R**ainbow, random, reality, reassurance, rectitude, reduction, refutation, reservation, restriction, revival, revolution, riddle, rigmarole, romantic, rumor

**S**acrosanct, Santa Claus, scheming, self-evident, senior moments, sensible, serendipity, shadow of tomorrow, shell (as in shell game), show me, simplistic, skepticism, sleuth, sly, smoke-and-mirror, solipsist, song-and-dance, sophistry, Spam, spin, spirit, standard, stargazing, statistical, stealth, story, stupor, subjective, subside, subversive, superstition, surreal, surreptitious, suspense, synchronicity

**T**abloid-truth, tangible, Tao, tea leaves, teleology, temerity, temptation, tentative, test, time tested, time for, transient, trap, trepidation, trial-balloon, tried-and-true, trite, trivia, tongue-in-cheek

**U**FO, *umm*, with un- prefix (such as uncertain, uncommon, undecidable, undecipherable, undetermined, undividable, unexpected, unexplained, unidentified, unknown, unpredictable, unreliable, unscientific) and universal (images, ideas, thoughts)

**V**alidity, variation, veridical, verisimilitude, vicissitudes, violation, virtual, vitiate

**W**ary, wise, wisdom, wishful, wistful, wit, WMD (words of mass deception, wielders of mass deception, weapons of mass deception, weapons of mass destruction. Interestingly all such usages emerged during the US attack on Iraq in 2003).

**X**YZ, let-there-be-X

**Y**ellow journalism, yoke

**Z**ebra-stripes (leopard-spots, means of camouflage and display), Zen

**Truth value of the doubt lies in knowing what we do not know.**

Words are not mere quick response substitutes for grunt. Arguing

can be a serious business. Use of words with closely-spaced meaning, helped by rules of grammar and punctuations, brings out nuances of grunt to facilitate discourse. It helps us explore the content of a concern, words if we can identify the states that can neither be satisfactorily affirmed, nor denied. After existence of the un-known part of the assertion is affirmed as the source of doubt, tools are needed to explore what *is* that unknown. Independent and orthogonal assertions further explore implications of *what we do know* and *how do we know.* Evolution of new social principles is often accompanied by tools that provide insights into the realms that we did not know existed before.

Word usage is about ascertaining truth-values of the content and context of our concerns. It is the only acceptable way to communicate interpretation of our sense experiences. Nouns, verbs and adjectives orient us towards the entity and event. Words have evolved to cover the range between the known and the unknown with degrees of doubt. Virtually all living organisms instinctively focus on the gradients or differences to identify changes in the inputs from the environment. We focus on changes in the mood and nuances. Words rise and fall as they evolve to deal with uncertainties of survival.

Sense experience persists as artifact of language. As vehicles of pronouncements and propaganda words have their hay-days. As tangible ideas evolve words fall in disrepute. Even those laced with the emotion-laden dialectic of affirmation or negation, soon come to recognize that the real world is not as discrete. Sharing experience requires words to identify genuine differences until every viable idea is expressed and every viable concern considered and addressed.

Idealized certainty (Aristotelian and doctrinal) is contrived as in: *One should never meet evil halfway*. The bipolar world (of a

binary 0 or 1 Boolean switch) is an isolated fragment of reality, if not an idealized figment of imagination. Binary polarity creates paradoxes of self-reference: Some forget that personal freedom to worship also includes freedom not to worship or not to believe. Ignoring the worlds that lie between such poles also assumes that all that *what is there to know is known.*

In order to net reality through words, and capture the range and relevance of a narrative, our thoughts juggle with overlapping states – not only the defined ones but also the others that may be out there. Reality-based alternatives ward off contradictions and inconsistencies. To realize and materialize potential of experience is a shared journey of mind.

A string of meaningful words builds bridges to another mind. It is a crucial step for knitting community behaviors. In its chaotic ways language mimics the real world complexity. But the purpose of meaningful word motifs and constructs is about interactions with such representation for usable perception. It takes us through unrecognized and unacknowledged states. It seeks correspondence to cognized reality through coherence, convergence, concomitance, and consilience.

**On Not-knowing**

It is doubtful if the perfect of good and evil exists. In real sense perfection is wishful construct to introduce feed-back into practice.

- The scientist has a lot of experience with ignorance and doubt and uncertainty. We take it for granted that it is perfectly consistent to be unsure - that is it is possible to live and not know (*Richard Feynman*).

- Experience is a hard teacher because she gives the test first (*Vernon Sanders*).

- I had the good fortune of being able to make my plans in near perfect ignorance of my destination (*Eric Hanson* in *Stranger in the Forest*)

- Creator can be dispensed with by eliminating the beginning (*Stephen Hawking)*.

- Human beings are all right for as long as they are ignorant of ignorance. This is our normal condition, but when we know we don't know, we can't stand it. (*Lewis Thomas*)

- If you ask me whether there is another world, well, if I thought there were, I would say so. But I don't say so. And I don't deny it. And I don't say there neither is, nor is not another world. And if you ask me about the beings produced by chance; or whether there is any fruit, any result, of good or bad actions; or whether a man who won the truth continues or not after death - to each or any of these questions do I give the same reply (*Sanjay Belatthiputta*, ca. 600 BCE).

- The secret of right and wrong has puzzled all the philosophers, baffled all the lawyers, muddled all the men of business, and ruined most of the artists (*George Bernard Shaw* in *Major Barbara*).

- Uncertainty is a challenge, a catalyst for change.

- I can't go on, I'll go on (Beckett)

- Perplexity is the beginning of knowledge (*Khalil Gibran*).

- You can not solve current problem from current thinking. Current problems are the result of current thinking (*Albert Einstein*).

## IV-2 Brute Force of Articulated Grunt

By meaning more, our lives yield more. Such a vision of qualitative change is no longer a zero-sum game.

*- An Ancient Arihant adage*

In the beginning there was darkness. First arose the grunt - possibly with mashing of jaws. Then there was another, and then still another... and it has not stopped yet. Many cultures have surmised that Word was the beginning. It means different things to different people. A Queen in the Alice's Wonderland plays: *Tusk. Tusk. Words mean what I mean*. In another world, Queen Juliana of Netherlands was exasperated: *I don't understand it. I don't even understand the people who understand it.*

Words are also tools of cultural ideals and beliefs. Such words tend to unleash thought, yet people often remain prisoners of babbles within the walls of boxed-in mind. Rituals of cultures tend to prey and thrive on such corruptions. Bolder myths are needed to serve the bigger powers on the ground. The brute force of *thou shalt not* rings the primordial grunt enshrined in *might is right*. Creation myths of *being created in the image of the creator* empower tribes of faithful to shape the world around them in their own images.

Complexity may not be coexistence of opposites, but it is part of dealing with doubt. Arjun enumerates the attributes of Krishna (Bhagvad Gita, ca. 300 BCE): *O Lord, I see within your body all the gods and every kind of living creature. I see Brahma the Creator, seated on a lotus. I see infinite mouths and arms, stomachs and eyes, and you are embodied in every form. I see you everywhere, without*

*beginning, middle or end... I see you, who are so difficult to behold, shining like a fiery sun blazing in every direction. You are the Supreme, changeless Reality, the one thing to be known*. To this Krishna adds: *I am time, the destroyer of all; I have come to consume the world.* Robert Oppenheimer witnessed the power of such grunt in the atomic blast test in the desert of New Mexico in 1945.

**Grunt and Vocalization**. Like symbolic art, gestures try to capture significant acts. Humans are also born with the ability to vocalize, i.e. to produce and distinguish bits of sounds. As we learn to use these, in an abstract way languages connect the bits of sounds with worlds of concern.

Alphabets formalize phonemes where the distinguishing sounds come from the vowels. Roman alphabets tend to reconstruct phonemes by an explicit combination of alphabets with the vowel. For example the character "i" stands for the sounds ranging from '*ei*' to '*ai*.' In the languages of India, a soft "a" is part of the consonants. As is apparent in the conception of zero and the ten-based numbering system, the panache of the ancient Indian mind for systematization is also apparent in the way vowels (*swar* or sounds only from the resonance cavities of the body) interact with consonants (*vyanjan*) brought into play as the sound of vowels is modified with the movement of tongue. For example the vowels (soft and hard) "i", "e", "o" or "u" originate from different regions of the respiratory system. The organs used for resonating the phonemes of *a*, *aa*, *i*, *ii, u, uu, e, ei*, *o*, *ou*, *am*, *ah* move from abdomen for *aa* to the nasal chamber for *am-ah*. By movement of the tongue one generates sounds of each of the consonants *k*, *ch*, *t*, *p* or *s* in association with the 12 vowels. The sound of "***aaoum***" – the primordial vocalization of all sounds – integrates the physiology and anatomy of the human sound

producing system with yogic practices!

Combinations of phonemes and lexemes are like formula for mental reality (*mantr(a)*) that enables, amplifies and configures conscious patterns of thought and behaviors. It is not too different than the limits to the use of a formula by a chemist to synthesize a desirable chemical agent. Contrast this to an apparent lack of order in the arrangement of alphabets in Arabic, English, and other European languages.

**Search for the Original-language**

Psamtik I (700 BCE) is remembered for his flawed experiment. He was an enlightened ruler of Egypt. He opened his country to large scale immigration. This brought Hellenic culture to Egypt and these mercenaries also helped him in his military campaigns against the neighbors. Psamtik was intrigued by the idea of the original human language. As described by Herodotus 200 years later, Psamtik instructed a shepherd to rear two infants in isolation and silence on the diet of goat's milk. The first word uttered by the pair was *bekos*. After it was found that bekos means bread in the language of Phyrgians of Asia Minor it was determined to be the protolanguage.

Quandary of the protolanguage remains with us. Whether or not the formulation of the issue by Psamtik was correct, it is quite likely that the speech with discrete words evolved about 100,000 years ago out of clicking sounds, rather than grunt gestured through modulation, mimicry and movements.

It is also recognized that the syntactic abilities to learn syntax in word strings is hard-wired at birth and developed soon after. Like technologies, complex languages and family of languages are built from group interactions over period of millennia. The transition from speech to complex language

distinguishes humans. Birds, insects, fish and mammals also have elaborate vocalizations for mating and group communications. In effect, developments in language (*tongues*), communication, and technologies are intricately associated with the evolution of cultures.

**Symbols for words and words for posterity**. Standard ways (convention) to capture sounds to represent entities, events and quantities are needed for human interactions in organized societies. The alphabetic roots of the Indo-European languages possibly go back 8000 years. I believe that writing with symbols for alphabets also emerged independent of the pictographic writing on the clay tablets of Mesopotamia, Syria, and Iraq.

Strongly enunciated vowels and consonants of the Indo-European languages emerged about 6500 years ago. Around this time people in the Ganga valley developed symbols for each of the 18 to 20 alphabets of the Prakrit languages. This Brahmi script survived as rock inscriptions, and evolved into the Nagari script used by 14 of the major languages of India.

Patanjali (ca 500 BCE), also a mathematician, began to systemize and organize the Prakrit (*naturally created*) languages. In the process he explored the relationship between thought and cognition as the Yog(a). Panini (b. 350 BC in Kandhahar) formalized (Sanskrit, *created by purification*) phonemes to facilitate communication which emerged as a full fledged grammar around 200 CE. Similar changes came into Greek after 200 BCE from the Centers in Cairo, and then into Latin around 1100 CE and in to English around 1400 CE. Not coincidentally in this period European centers of learning arose for assimilation of Moorish libraries transmitted by the Jesuits. Such institutions made it their business to "purify" the use of languages and "realign"

information into contemporary beliefs. It continues to be the academic tradition.

**On issues of language communication**

* When you think of alphabets, that are asked to bear all the human investigations and all the aspirations and appetites that we have and that have ever existed in human history - it is terribly abstract (*Alan Gurganus*).

* All languages are full of images and metaphors whose origin is being lost together with the art form from which they are created (*Robert Oppenheimer*).

* A foolish consistency is the hobgoblin of small minds (*Emerson*).

* ...it is life in the poem and not in the history of the poet (*Elliot*).

* We have an innate preference for the represented subject over the real one: the defect of the real one was so apt to be a lack of representation. I like things that appeared, than one was sure (*Henry James*).

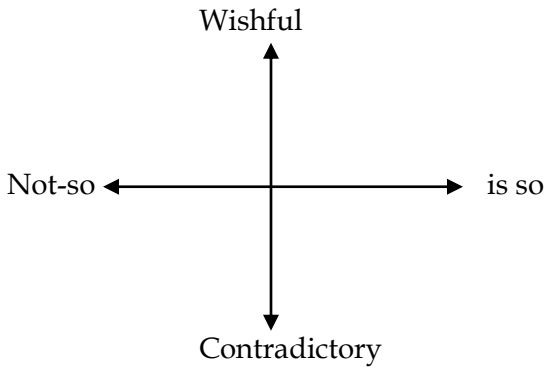
* Mathematics is a language that sometimes makes things clearer to me than do other languages, and that sometimes helps me discover things that I have been unable to discover with the use of other languages (*J. Willard Gibbs*).

**There is more to language than just the grammar**. Words are meant to communicate a represented part of the universe. Word-strings leave a neutral but curious observer with an array of metaphors for thought. If history is any guide use of organized speech has facilitated and improved human understanding. Enlarging vocabulary goes hand in hand with enhanced perception. We cheer, jeer, and leer at multi-characterizations of the known, as well as of what we do not understand or do not know. Word spectrum appeals to the aesthetics and appearance of certainty. Verbs are particularly useful in introducing the

induction to guide the rhythms of examined life. As we draw a nimble distinction through parts with shades of perceived certainty, the world is no longer black or white. Perceived range of words is a liberating experience for mind, while words allude to the captured nagging and pestering issues. In this surreal of extremes, dreams are interspersed with encounters with reality. Wishful thrives as day-dreaming as well as the source for innovative and imaginative solutions to create value.

**Devil's Advocate**. Cynics and mindless skeptics have given bad name to devil. Devil is often confused with evil. Voodoo, Ying-Yang, good-and-evil are about casting certitudes of this world in the platitudes of the others. Far too many chaotic and disordered states fall outside such a desirable order. Dealing with states of disorder requires acknowledging ignorance.

Being devil's advocate is about a wider search for certainty. They invent words to dissect states of the world that remains outside evidence based affirmation. It is not just a matter of rhetoric. It is the way to experience and explore through orthogonal assertions to seek independent evidence. As we learn to focus on the partial truth values of the particulars of similarity, degrees of certainty also emerge from the meaningful differences.




Perceptions bridge the gap between what we comprehend

and find accessible and what we choose, desire, and know. As the identified content and context of our concern intersect with the unreal, its scrutiny helps us identify what we may know, what we do not know, what we pretend to know, and what else may or may not exist. Being devil's advocate is about scrutiny of what lies beyond the black and white worlds.

## IV-3 Between the Bits of Utterances

What's in a name? That which we call a rose by any other word would smell as sweet.

Possibly yes. Also some varieties of rose have no smell. In naming we connote more than just an object, act, or event. Names connote a class - not just what is common to the class but also the range of common behaviors and the distinguish characteristics. Names may come to mean something, but names rarely communicate the experience. Sweetness of rose for example is an experience of reality that is independent of the name.

Bees give meaning to flowers. A bee, and for that matter any bee or any flower are not meant for each other. Survival strategy lies in the behaviors that facilitate interactions that assure nourishment for the bee to thrive, and in return by carrying pollen from flower to flower bees assure survival of plants and all those who depend on plants. Tennyson in *Flower in the Crannied Wall* wonders:

*Little flower - but if I could understand*
*What you are, root and all, and all in all,*
*I should know what God and man is.*

**To break out of the prison of words.** Neither grammatical correctness nor the poetic liberties confer reality, validity, or meaning to the word constructs. Whether or not coined explicitly for such a purpose, enduring words come to represent a concept with affinity to common experience. On the other hand, dead-end words like god come to mean different thing to different people. This is because it is about nothing accessible to mind and senses.

Such words become mere cliché as their concept space and boundaries are lost in the rubble of their evolutionary history. On the other hand, evolving boundaries of words like medicine also enrich interactions with our concerns to create value.

**Nurturing language and communication.** Words may be coined to carve out a discrete world, but by naming we are bound to the actions of the word that evolve through its usage. Although by naming we commit to a part of the observed and experienced reality, words are not about just keeping the promise. As names begin to evoke essence of experience they also invoke the subjective and objective realities. In doing so, a name comes to represent identities that connote not just certain qualities but the entirety of the form and function.

Such relations become part of word usage. Once let go, as part of the shared worlds the word boundaries take on their own course: Meanings take shape as connotations are chiseled. Such sharing is part of building common perceptions. It facilitates a consensus about the experience of reality communicated by word representations. Even if a word may be coined as analytical device with focus on the particulars, the word boundaries change as the concept space expands in search of generalization that we share. Ultimately ideas cohere around a word to become a motif or module of shared experience and insights.

Languages facilitate mind to mind communication. Humans have in-born propensity for the syntax and inference, apparently *hard-wired* during the early development. For the interpretation of word constructs all languages make use of syntax to evaluate intentionality, i.e. what is behind and between the uttered words and vocalizations. With identified syntax languages seek syllogisms to elaborate the content and context of assertions. Ratios and fractions complement such systematic

manipulations of the boundaries of *all and some* with numbers. Inference procedures are not derived from the rhetoric or idiom of language, but are intrinsic in the way the "realist" in us has evolved to deal with the content of sense data in the context of asserted concern. Emerging context of experience further facilitates the representation and abstraction.

**Written words to guide reality.** Shared reasoning is remarkable antidote to vagaries of mind. Phenomena of language and the meaning it communicates are intertwined with the social surroundings: Language has become a vehicle of accountability, if not the rationality, to guide actions and behaviors. Written words further facilitate reasoning without risking repercussions and liabilities of face to face encounters. Social nature of this art form is an integral part of continuous reshaping the social contract with which we live.

To break out of the prison of our minds there is no substitute for contemplation. Written words facilitate contemplation without intimidation, and liberate from the tyranny of grunt to nurture independent views and opinions. More than any other human achievement, writing, printing, computing, and now the electronic media and Internet Web continue to facilitate ever wider searches for the choices that our minds can offer and make.

## IV-4 In a Word

Hierarchical relations are built from discrete parts communicated as words, thoughts, beliefs, theories, motifs and modules. Concepts emerge as parts are combined and made to work together in play with reality.

Words do not discriminate truth from lie, fact from fiction, or real from imagined. Words do not validate or confer existence. Individual entities are assigned a named class on the basis of their common content or lack of it. Events relate to the changes in relation to time and context of entities. Attributes such as *dry wetness*, *hot ice*, *soft hardness*, or *all-knowing* may be conceivable to the mind but scarcely provide awareness.

**Language is a way we peer into each other.**
Words of people who have used words effectively!

- I gotta use words when I talk to you (*T. S. Eliot*)
- A very interesting thing to know is how you are feeling inside you to the words that are coming out to be outside of you (*Gertrude Stein*)
- One must be very aware of one's own very limited point of view, the "first-person-singular" aspect of everything we say (*P. W. Bridgman*)
- With continued application of words concepts are attached to structures of activities external to mind. Words are tragedies of concepts that they harbor by being metaphor. If men do not pour new wine in old bottles, they do something almost as bad: They

invest old words with new meanings (*Herbert A. Simon*)

- The meaning of the word is its use (*Wittgenstein*)
- The difference between the right and almost right word is the difference between lightening and the lightening bug (*Twain*)
- It is an old and consistent tradition with us to be concerned with the words we use and their purification (*Oppenheimer*).
- In order to comprehend the whole the mind is not a vessel to be filled, but a fire to be kindled by words (*Plutarch*)
- .. and his words burned like a lamp (*Ecclesiaticus*).
- Words are like leaves; and where they most abound, much fruit of sense beneath is rarely found (*Pope*)
- Words drip with meaning *(Berenson*)

**Word as concept modules**. Language is about grasping parts to access more. We construct the future from bits and pieces that come our way from the past with an affinity for our minds. Irrespective of their origins, such meaningful concepts are often rooted in the physical and psychological realities. By rearranging all such bits and pieces we create semblance of order and certainty about complex worlds.

At a very basic level we name things to communicate and manipulate parts of sense experience. Developments of tools, alphabets, words, numbers, and relations have facilitated understanding of shared realities. With strategy of divide-and-conquer, and of refinement through trial-and-error, words break the cognized experience into parts to dissect usable concepts. Some words do so better than the others. As bits and pieces for communication, words work on the principle of *garbage in and garbage out*. It is an acknowledgement humans do not experience undifferentiated worlds. They remain outside our awareness even as we scramble with such humbug by loading it with our

own perceptions.

Linguistic evolution is the study of processes and strategies to explore the concept space with word boundaries that come to be intuitively obvious for meaningful communication. Analysis of an assertion tends to focus on the parts where logical relations are likely to be rooted in reality. Deeper truth values emerge from the scrutiny of the implications and converse of the assertion. Hallmark of contemplative understanding is to grasp the hierarchy *through parts* and not just enumerate parts. The process is likely to be more useful if it works in both directions: From whole to the parts, and from parts to the whole.

**Politics of Parts**

In August 1624 by the French Parliamentary order Etienne de Clave was arrested and convicted for proposing a non-Aristotelian theory of elements. It was not about science or the nature of the universe. By invoking that the whole could be broken into discrete parts, those who were in power felt that the idea could be applied to analyze and scrutinize all forms of higher order. So the conviction was about preserving the status-quo of the ideas that empower the authorities. It was not a struggle for truth but about the dogmatism to limit the latitudes of human thought.

**Viability of a part.** A part is a unit of the class: A grain (a unit) of wheat is the representative of a heap of wheat. Such a concept of the smallest viable discrete part does not suffer from the Greek paradox of infinite divisibility. A heap can be divided into equal parts until we are left with two grains. It is a critical limit below which if further divided the heap (a set of two) is lost: A single grain can not be called a heap. Subdivision of a grain further

destroys the identity of the unit.

An understanding of how parts make up the whole is critical for ascertaining the validity of the analysis and the reconstruction of the hierarchy of the parts. A loss of the attribute of the unit or the set is necessarily a loss of their identity. It is also a limitation of analytical approach where *a cow is not a mere sum of its body parts*. For reconstructing the whole from the parts it is necessary not only to put back all the parts, but also in a suitable relationship. Otherwise *a cow can be made to dance like a peacock*. Consider the analytical significance of the assertion that all living beings are constructed with cells as the unit of organization.

Conception of the whole from parts is necessarily directed for a purpose. Recognition of specific patterns is a necessary part of mathematics as much as of music and arts. Achieving a consistent pattern is a key to understanding the function of the part as well as the reconstructed whole. Such analytical ability to manipulate and share a description of the associations unleashes power to reason, infer, and validate. What emerges or remains outside calls for extra functionality and interoperability.

## IV-5 To a Concept

In philosophy as well as in physics even the most familiar and fundamental percepts are based on assumptions about perception and reality. Not many of these can be proven.

Potential of a conceptual association through parts, including words and models, lies in facilitating cognition to validate perceptions. It is not as much about new facts but about new ways of thinking about facts. Such understanding takes us from the prior and current body of knowledge (facts, experiments, observation, data) on a path (direction, trend). In this search purpose of reasoning is not to get entangled with the past but find an unencumbered way towards the future. Knowing, understanding, analysis and associations make the world of our concern accessible to make assertions.

Languages are play with notions of things and actions. The pay off comes as concept boundaries and their meaning is redefined with experience. Although such context and constraint are recognized through usage, through words one learns in stages to distinguish, validate and expand their identities. Here a role of communication is to identify behavior choices. That is also a major limitation: Awareness reduced to words can become the total awareness, and thus limit utility of the experience as mere buzz word.

Reason for ordering words is to nurse experience with thought as the product of reason. Field for such word interactions is scoped through definitions that help us identify the variables

and parameters. A matrix of observable particulars and meaningful generalizations provides a system for implementing thought to make the experienced world more accessible. Patterns that emerge relate to something more fundamental - possibly analogous to the fundamental particles. Such reality-based conceptual building blocks, sought to understand the material worlds, have been remarkably successful. Hierarchy of interactions and relations through the building blocks is meant to bind the smallest to the largest of the conceivable worlds. For the success of a hierarchical enterprise, it is useful not only to salvage relevance, but also understand instabilities and liabilities as part of what follows from exploration through parts.

Worlds beyond the sense experiences are invoked as the metaphysical worlds (not unlike virtual or augmented). Words and motifs are invented to communicate such worlds that hardly communicate awareness. Their affinity to real world experience is often to the feelings such as a fear of the unknown. Such association remains self-referential. Not all cultures deal with such imagined worlds in the same way. Two extremes are noteworthy. In English metaphysical worlds are objectified as noun. In the natural languages, metaphysical worlds are expressed through verbs as part of the subjective yet vital and causal aspect of the universe.

For utilitarian purposes we name things and identify actions to elaborate relations. A better grasp follows with an appreciation of the reality-based constraints as explored through curiosity driven questions that often start with what, when, where, how much, why. Curiosity guides word assertions to identify, organize, and categorize the cognized world to take stock of where we are and where we ought to be. It is not possible without an awareness of the experience.

**Is language needed for cognition**? Like Evolution and astronomy, linguistics is an observational science whose subjects are too distant in time or space, or too human to treat like guinea pigs for controlled manipulations. Most of our knowledge about human language ability has come from the freak instances of *The Wild Child* or *The Wolf Children* where infants were left isolated so that they did not learn the use of language during their formative years. One of the most widely studied cases is of Genie. After total solitary confinement for 11 of her 13 years, in November 1970 she came to the attention of a Los Angeles county welfare office.

Within a year she learnt to vocalize and use sentences with few words with occasional use of verb. After that, even after several years of interactions with a variety of people, her comprehension of syntax did not develop any further. Slowly, Genie developed abilities for nonverbal communication. She could organize, categorize, draw silhouettes, and identify perspectives. She could recall shapes and order of pieces in a structure. She scored high on spatial tests for identifying the missing pieces. She had ability to manipulate concrete spatial shapes and forms that require focus on color, number, and size of objects. By all criteria she was not mentally retarded. She was always correct on the cognitive matters. On the gestalt tests Genie scored higher than any one in the literature. Her comprehension was better expressed through visual than verbal means. Even after years Genie did not learn grammar. She did not grasp the meaning of *Thank you*, nor did she learn to say *Hello* in response to *Hello*. Fifteen years later she became a master seamstress. Yet, she never rehabilitated to the normal living. *Is there a lesson here for teaching and learning? Did she become an object of exploitation for the sake of knowledge?* **Based on the available knowledge she could not be treated for her own sake.**

**An abstraction:** Language communication is our collective struggle to articulate and relive patterns and rhythms of our experience. Through language we also make our feelings, perceptions, and imaginations known. We make our internal and external identities known by communicating in terms of ideas and generalizations. Through conceptual transformations not only we grasp and communicate the past and understand the present, but live into extrapolated future worlds.

We conceptualize future at instinctive, intuitive and intellectual levels. In such abstract images concepts are the products of inputs. Use of viable motifs is a necessity to understand and consolidate experience. It is possibly as a necessary outcome of the short term memory. The sensory information arrives in packets and chunks with affinity for the motifs. For cognitive processing we become aware of such packets that are only the pieces of the continuous unceasing external world. Information from identifiable pieces is compared with those from the past. Uncertainty persists until a basis is established in terms of a suitable knowledge base where inconsistencies are already addressed and contradictions are weeded out. Remaining doubt can be addressed with further search.

Apparently, we use the same mechanism for processing wide-ranging information at virtually all levels. Perception of the whole facilitates filling gaps of the unknown parts. It is the basis for bounded rationality that both the known and the unknown are part of the complex universe that exists and influences our actions and behaviors. Elimination of the non-existent parts from the unknown wards against illusions and delusions, and provides a way out of mazes, labyrinths, dead-ends, and paradoxes.

## IV-6 Taming Memes and Sound Bites

Duality evokes cognition and comprehension of uncertainty. Polarity of dialectic and rhetoric divides elevates issues towards unsustainable absolutes that do not survive even in the Platonic universe.

Use of organized words is a power to be controlled. As precursor to shifts in perception and paradigm, words evolve into concepts to be nursed to bring out meanings seeded in facts. Consequences of such flares influence individual and social behaviors by shifting focus between form, content, and context. Metaphors and rhetorical phrases grab attention.

Untended or unattended tends be claimed by others. The same conception is also intrinsic in many of the common practices designed to make the audience wallow in the non-nutritious and unhealthy packaged-relevance that gives appearance of order, and therefore of knowledge and wisdom for the moment. Scrutiny is exercised to the extent that ultimately *media is the message*. Although standardization of language is prerequisite for communication, by making words a commodity for authority and propaganda, such controls create a culture of uniformity of thought. In this co-evolution all victories are pyrrhic.

Perception of clarity, and not necessarily the clarity of perception, is the name of game. In substituting product with the process, slogan and rhetoric flare evoke images through causality of implied generalizations. Sound bites are experimentation by trial and error. At best they are stale old messages that substitute thought and understanding by vigilance. In this war dance one

cannot deal cursorily with dense, forbidding or unyielding barrage of sound bites. Who pays for it? When does it loose its relevance? When do people become resistant or immune to it? What is the cost of sound bites in terms of perpetuating ignorance and myth? Against such barrages how can one maintain sanity for freedom of choice and decision-making?

Innate potential of expressed intentions does not take hold as mind constantly deals with chatter from wide ranging inputs from sound bites, humor, anecdotes, bantering, propaganda, memes, buzzwords, political pronouncements, and marketing. For an appreciation of the flow consider the rise and fall in the public domain of pithy words to buzzwords to euphemisms: human-right, commies, food, smart-alecs, sharp-wits, pertinence, encouragement, credit, rewards, god, science, sales-pitch, believe-us, weapons, crank, crackpots, quack, cool, and intelligent-life.

It is not clear how one grows out of the fascination for the contradictory, conflicting, augmented, and virtual. Dominated by ego, sex, mimicry and peers, trivia can play a role of cohesion. Such devices of pop-culture exploit the flicker of the proverbial five-second-attention-span. It is a moot issue whether the media and politicians pray on it, or cater to such behaviors.

Disconnect of words from thoughts and behaviors exaggerate the inability to listen or to focus beyond sound bites. As the emphasis shifts from process to product, allusions of singular thoughts evolve into faith with built-in contradictions. In dealing with such communication assaults it is good thing if one does not have to take sides. Even then words take prisoners, and change our identities. Do such words take us where we want to be? Or do they take us where we do not want to be? Or would they take us somewhere we would not even know - like a meme-land?

**Do animals wallow in memes?** We do not know, unless of course memes have something to do with the herd instinct. In the absence of elaborate means of communication memes in animals may not be as evolved as in humans. In analogy to the genes, a large and diverse but controllable behavior potential can be unleashed through interactions with a limited set of options. We pass on memes through social interactions where they have momentum that comes in the way of our desires and efforts to accomplish something original or tangible.

Without an understanding of the underlying experience we are prisoners of words without ability to comeback from the world *behind the looking glass*. Animals may not have elaborate ways to pass on their collective experience, yet the young do learn and test boundaries of experience through playful interactions. It is clear that restrained, planned, and deliberate actions of the self-motivated humans often reduce social chatter enough for them to see the inconsistencies in the herd behaviors. Such insights are precursors to decision-making and choosing the alternatives.

**Uses of History for Life**

In an essay of this title Frederich Nietzsche created an interesting scenario for contemplation. *Animals may not know what it means by yesterday or today, yet they do learn from experience. With some poetic liberty a human may well ask: Why do you not speak to me of your feelings? Is a silent gaze unfettered to the moment because the animal does not wish to respond or forgets what it was going to say, or is it because it knows that humans do not understand!*

**Survival value of memes**. Dawkins coined the term *meme* for a unit of cultural information. The idea of memes is attractive and seductive. The list of memes is long and impressive: They

dominate tunes, ideas, fashions, sound-bites, catch-phrases, ways of making pottery and arches, as well as ways of philosophizing and doing science. Some memes have staying power even without any evidence: Ideas of heaven and hell have served to propagate diverse experiences and psychological needs in appropriate personal and cultural contexts. At a more practical level, the technologies of fire, wheel and agriculture probably evolved the same way - adapting to local conditions and choices through deliberate trials. Something analogous can be said for the emergence of the ideas of the Egyptian surveyors into the theory of relativity over a period of 4000 years.

Idea of *meme of memes* is useful in describing and understanding the stages, trends, and concepts through which the cultural changes take hold. As a measure of human progress memes become the trial and error means for transferring and transforming ideas into innovation. To be shared, a vaguely defined meme takes root in collective conscience only when critical mass of related ideas is shared on a base for existence. **Memes emerge as schemes for variations on themes.** Memes offer the convenience of describing an isolated part of the shared experience as a category. Unfortunately, like buzz words, memes are seductive generalizations without a tangible basis. Such messages loose vigor, passion, and relevance necessary to transcend the past experience to the present. At some stage the memes we acquire begin to color our experience: As an afterthought one learns to rationalize in terms of memes. A loss of spontaneity from the experience signals a need to break away: Without insights into the underlying experience one can not understand meaning or limitations of words.

One creates new boundary conditions by forgetting about memes as an end of experience. Our inherited and nurtured

memes, if there are any, mutate and evolve through reflex behaviors.

**Striking phrases whose Truth or Falsity is irrelevant**.

- Media is message
- Lake Erie is dead
- Buying is being
- Tree-huggers
- You are what you eat
- The whole is greater than its parts (*Euclid*).
- In Athens, we think that silent men are useless (*Pericles*).
- Some people speak when they have to speak, while others speak when they have something to say.
- The way one talks about the work determines the nature of the work.
- Structure is implicit in Art, but not detachable sort of unbounded space.
- Pregnant in matter, in expression brief; let every sentence stand with bold relief.
- What signs fail to express their applications show.
- " The horror of that moment" the King went on, “I shall never, never, never forget!" " You will though," The Queen said, "if you don't make a memorandum of it" (*Lewis Carroll*)
- What we see, is not what we see, but what we are (*Soares*)
- Ultimately we will probably know everything. What we may discern is the man.
- While words of learned length and thundering sound
  Amazed the gazing rustics ranged around.
  And still they gazed, and still the wonder grew
  That a small head could carry all he knew.

A meme is not cognized, does not create sense awareness, break mental habits, or shift perception. Such a shift is necessary to get away from the weight of restrictions built into conventions and precedents. Only cognized experiences become vehicles for conscious choice for transformation.

Contemplation is not about utter and total absorption in the present that comes to athletes, writers, artists and others lost in the moment. Nor is it about mystical *moment that looses the baggage of existence and history*. In the scheme of things larger structures or systems are supported, if not generated, by self-reference as one cognized motif refers to another that is perceived to play a role.

## IV-7 Words Hijack Thoughts

To a significant extent the logic to contemplate action is part of words such as may, be, can, would, should, must, and ought. While the indicator words facilitate communication by providing access to intentions, implications and consequences, which may also hijack thought.

Designs and desires of cognitive biases shape all actions including word-smithy. Knowledge of the past is a human construct necessarily burdened by human failings that find their way in mental views through which all constructs have to be expressed, composed, and conceived. It is also the realm of the determinants of the cognitive, linguistic and evolutionary structures.

**Indicator words and phrases**

***For premise:*** Follows from, is clear from, whereas, for, given that because of, in so far as, as we know, as we can see, as is shown by, supposing that, assuming that, granted that, in the light of the fact, the reason that, as is implied by, based on, owing to, by virtue of the fact, due to, for the reason that, as we know from, follows from, as is implied by …

***For conclusions:*** Therefore, thus, so, hence, as a result, consequently, as a consequence, so we see that, implies that, means that, shows that, proves that, suggests that, demonstrates that, is evidence that, it may be inferred that, it follows that, leads to the conclusion that, one must conclude that …

At the root of the debate is the basis for tentativeness, and its relationship to the prevalent reality. Only through evaluation of such partial (tentative) constructs do we learn to see entities and events in real time. If nothing else, purview of our mental images (conceptions) emerges with place and time. From this perch even the principles of logic, mathematics, and science suffer from biases. Most of our formulations of even the pithy issues change every few generations. With this also change perceptions of reality, its value as the knowledge and information, and its utilitarian potential.

**Walk through a Zen-garden.** Faithful narrative of an event or happening is often an enjoyable experience. In the context of behaviors, precision of intentions in language communication is often diverted, if not lost, with the differences with which people perceive the flexibility and complexity as the power of words. Yet, even for those not extensively trained, a narrative of language can glide from normative to readily grasped imperative and declarative. Lasting beauty of narratives lies in the staying power that language provides for ideas and thoughts that transcend the time, geographical and cultural boundaries. Although terms may require elaboration through description and explanation, there may not be an explanation for the event or entity. At the very least, much of the necessary information for the perception of such events is lost in the mist of time as we try to capture the order. Some of the elements of narratives are considered below.

Masses of words create an immediate impact. The realm of *anything goes* is cluttered with unknown outcomes and undesirable dead-ends. This can be overwhelming enough that we loose sight of the trees in the forest. The order of singular purpose can substitute the anarchy of organic farming or a late fall garden. Metaphor of garden teaches us about organization,

manipulation and communication of thought. With an appeal to the content, the context of space and time adds to the interest by including considerations of size, height, light, shade, focal point, and season.

It may be an oxymoron, but the purpose of nursing thought with facts is to identify the particulars and relations that are inviolable. Otherwise, in an unknown territory we come across virtually limitless contradictory, incongruent, confusing, confounding, mind-boggling, puzzling and uncertain elements. Boundaries begin to emerge with identified relations between the spaces broken by paths, walls and fences. Since there is no map, an educated guess is all that is needed without having to reinvent wheel at every turn of the path. Exploration of the concept space begins with the consideration of doubtful by entertaining a hypothesis to consider the alternatives, ambiguous and incomplete to explore realms of plausible, probable, feasible and consistent. Achieving constancy of a path *from here to there* is an evolutionary exercise as the frame of mind emerges through plan, write, cool, and revise.

Consistency is a critical element of communication to evolve into conceptualization. With such sensitivities as ideas are expressed the focus remains on an implicit or explicit area in relation to the overall plot. Consider the audience including you yourself who will be living with the construct by examining possible combinations and relations. Arrangements of ideas around a concept may or may not allow much wiggle room for other themes, but it must be possible to include variations on the theme. Even a mundane theme can be of interest if it brings out novel and unexpected.

***Through random trials.*** Works ascribed to Shakespeare could not have come from random hits at a keyboard of even an intelligent

word-processor equipped with a spelling and grammar checker for the proper English usage of the period. By the same token, by himself Shakespeare the bard could not have conceived all the pithy ideas.

***Matter of Style.*** The appeal remains in the focus on the content concomitant to the insights. Style is about deliberate mixing of facts and relations with rhetoric flare if necessary to touch but not overwhelm. Choice of a style with understated focus or with emphasis on a single point comes from the consideration of all relevant factors. The overall presentation can to top-up with the message up-font, or top-down with the message emerging in the end after meditation. Its extent has intrinsic appeal for different reasons just as charms of different gardens peak in different seasons.

***Can this be said more simply?*** It is foolish to make a long prologue and be short in the story itself. One way to deal with complexity is to group ideas. Although not an end in itself, order and simplification are the first steps towards the mastering of the subject. Even for well-defined problems, multiple steps exist between the given information (input) and the solution (output). Additional relevant information and relations often emerge as one move away from the particulars of information at hand towards the solution.

***Association and order in regularity.*** Humans thrive on associations. Insights into cycles and chaotic behaviors have been the breeding ground of the knowledge industry. The life as we know has come to rely on sun to rise and set every day - more or less on time. Sumerian and Egyptian priests noticed a relationship between the position of the sun in the sky and the regularity of the rainy season that flooded the rivers and marked the sowing-season. Long before the facts of astronomy were

known, the pattern was captured in lunar and solar calendars. The insight introduced a predictable order for the economic stability at the dawn of the human civilization. Among other things it was also used to divide the time in to days, weeks, months and years for social and personal interactions even before the invention of clock and calendar.

***Causality (Cause-and-effect).*** Ordering allows for succinct but comprehensible. The information is compressed by alluding to commonalities through laws and models. We can not live without such intertwined notions of causality and generalization. They are ingrained in our thinking, decisions, and actions. Language communication relies on the principle of *let the buyer be beware*.

There are no standards for the placebo or even accountability against snake-oils. Sometimes, the chain of events leads to a particular outcome. Then there are more distant consequences. Consider the constructs: *Captain Cook about to discover New Zealand* or *Voyage of Columbus to America*. These assertions may not sound strange but they are paradoxical because the order, if it ever implied cause and effect, is reversed: What was to follow or discovered defined the prior moment. Consider the implied causality of *You can't judge a book by its cover* against its counterpart *Clothes make the man*. Similarly, *10 billion hamburgers sold* or *everybody has it* does not necessarily make the next one any better for you to buy.

***Some assumptions go deep.*** For thousands years many argued that universe cannot have limits. Here is how Lucretius (50 BCE) reasoned: *If space is bounded, imagine what will happen if one tries to throw a stone past the boundary. Either the stone will cross the boundary or something just beyond the boundary will stop it.* Contrast this to the concept developed in the Ganga-valley: *Space is the boundless nothing, wherein lies the tangible universe with limits.*

Logical and mathematical consequences of these formulations are quite different. Needless to say that many still believe in a five mile high bowl of universe created 5000 years ago.

***Synchronicity.*** Inductive inferences are like *all ravens are black*. They set a stage for independent verification or rationalization of a generalization. In contrast to the Newtonian determinism, Jung's concept of synchronicity purports that *all events in the universe are connected in an acausal way as evidenced by occasional coincidences*. One can not look for a Grand Plan in isolated facts like: *While I talk and a football game is on TV, a sea gull catches a fish in Nile delta, a tree falls in the Siberian wilderness, a woman takes a dip in Ganga*. There would always be accidental events that leave signatures and seem to follow but not fall in a pattern of events with a causal correlate. Are such events worthy of planning a course of decision to act?

Understanding of the causality through the hierarchy of the physical world has emerged from strategies in which function at one level is related to events at another level. It is the crux of the so called structure-function correlation. Events with invariance and consequence assume causality. Philosophers also look for teleology to find meaning in narratives of the occasional.

***Asymmetrical universals***. We rarely know entire reality. Often what we know cannot be expressed in a finite space or time. Others may not want to hear even if we desire to do so. Such issues bear on the content and significance evaluation by symmetries. Aesthetics of symmetry comes into play both in reasoning and the physical reality. Sphere, a perfectly symmetrical object, is a Platonic perfection. Adam was created in the image of the perfection itself. Asymmetry is created when Eve was carved from a rib of Adam. In fact, idealized have to be continually deconstructed. Even the ideas about the perfection of

Eve, commonly interpreted as beauty, are ever-changing.

***Limits to endless self-replication.*** We know more about the language of computers than out own, presumably because we taught them to do things based on the way we designed computers. Motto being *it can be done if it can be defined*. For such purposes inputs are controlled, systematized and standardized usually in the form of numbers coded as binary electrical blips. Virtually all social, economic and scientific enterprises have become such number machines and data bases: Not that the data as such is meaningful, but the changes are relative indicators of perturbations.

## IV-8 On the Tail of Two Tales

Since ignorance evokes grunt and theory creates mess, most of us think in heuristic, unsystematic and inductive ways. Through words we learn to explore subtleties and begin to describe and explain the processes through which we wish to make sense out of the world around us. Object of heuristic search is to provide efficient prescriptions for rational action in the absence of complete knowledge.

Just as there is a garden for every season, there is a tale for every reason. Consider two ancient parables, each with its share of symbolisms that we draw on throughout this book. In one Adam is expelled from a garden of eternal delight for questioning the status quo. In the other, an elephant being examined by visually handicapped. Its focus is on dealing with incomplete information. The moralist drive of the first stands in contrast to the heuristic tone of the second. At a deeper level, one does not allow for doubt even in the form of curiosity, and the other appeals for a systematic search for evidence to reduce doubt.

**Garden of Eden.** Judeo-Christian-Islamic traditions surmise that as a part of (Theon) rationality, omnipotent God also directed Adam and Eve to stay away from the fruit of knowledge. After Adam picked the apple and Eve took that fateful bite into it, for their curiosities humans were doomed to live outside the perfection of the Garden of Eden. Symbolically, both the US criminal code and Old Testament make a connection between forbidden fruit and knowledge: *It is legal to grow poppy plants, unless it is done with the knowledge that its fruit will be used for*

*manufacturing a controlled substance (morphine)*.

Theon rationality is an attempt of a monotheistic philosophy to curb the tendency of believer to be curious and get distracted. It assumes that answers come as grace from a prior knowledge. The assumption is that for every purpose the knowledge, if not the answer, preexists as in *I am all that is and that was and that shall be,* but with a warning that *no mortal hath lifted my veil*. Is it exasperation with the diversity of nature? In a similar tone in *Closing of the American Mind* Alan Bloom laments: *All that is human, all that is of concern to us, lie outside of natural science*. Is it meant to sooth concerns of the faithful about perceived uncertainties?

In the stone-age speak world is acknowledged as grunt or no-grunt. Prescribed ways break the bonds from the diversity and plurality of existence in a complex world. The garden-path takes away the *burden of choice*. The Adam-Eve parable is from a culture where the word *jungle* is still used to denote the open spaces outside the settlements. Since open spaces could not be ignored, trees are wrapped in a taboo of a choice between the grace and the curiosity. As if to adopt the judgmental attributes, even the desert life forms have evolved to be thorny and venomous. Evolved in harsh environments, behaviors of desert tribes follow from the symbolism of a judgmental god juxtaposed against devils and barbarians. Rhetoric becomes heavier with allegories of power, death, suffering, and sacrifice.

The self-referential justification for faith goes something like:

***Whatever the Bible says is true.***

***The Bible says that God exists.***

***Therefore, it is true that God exists.***

One might as well conclude *science and logic should have no*

*effect whatsoever on such a well-formed religion*. In such desires hover meanings to life through faith in miracles, myths and wars. Such hopes may be perceived necessary, yet they lack direction. The promised truth is a commodity that is never delivered - yet we pay for it. There seems to be a perpetual contradiction as one breaks the laws that one wishes to uphold. Parable of the God that *giveth and taketh* has served well to perpetuate the view that God takes side with the faithful.

Recall Doubting Thomas (Didymus for twin in Greek), a contemporary of Jesus. He questioned ambivalent evidence on a variety of issues. He is also known as Apostle of Orient (India) possibly because that is where he learnt the value of doubt. For this mission *Jesus had him sold as a slave to a merchant.* Didymus did not believe in Resurrection for which he is charged to have *heralded the wound of disbelief.* To strengthen the faith and *to cast the doubt aside*, around 5th century CE the keepers of the Church did not include his Gospels in the Bible (New Testament). They surmised: *God cannot be seen by mortal man*, and as for the faithful *Blessed are those who have not seen and have believed*.

Note the resonance of *duvidha* (the Sanskrit word for ambivalence, doubt) with Didymus. In *Conundrum of the Workshop*, Rudyard Kipling tried to capture such influences on human curiosity: *Our father Adam sat under the tree and scratched with a stick in the mould. And the first crude sketch that the world had seen was joy to his mighty heart. Till the devil whispered behind the leave: It's pretty, but is it Art?* Tinkering guided by curiosity is a necessary precondition to change the status quo. In stages, every scratching, musing and discovery, is ignored, challenged, tolerated, and then celebrated with.

***Making head and tail* of an elephant.** **A** parable from the Indian subcontinent takes the other fork on the path to reason. Imagine

yourself as one of half a dozen blind people standing around an elephant. Or imagine that with others you are examining a best in a pitch dark room. Key condition is that the beast can not be seen in its entirety. Also not only the visually-challenged do not see the beast, they have not even heard of such a beast or its name. The challenge is how to conceptualize and represent such an entity.

Except for the impaired sight, all other senses and faculties of each of the six observers are intact. One would develop a uniquely personal perspective in an eventless universe where both the observer and the observed do not move. For simplicity let use assume that the beast is an elephant. The person near the head will not agree with the descriptions given by those near the tail, tusk, trunk, legs, or the underbelly. Of course, a conundrum breaks out if the disbelief in each others *personal knowledge* is mutual. Even in an environment of mutual trust, each interpreter has to *make head and tail* by superposing veritable perceptions in relation to the reality of the whole. Questions of all manners are permitted within the common experience of the deterministic reality. Consider ways to resolve the conundrum:

**External insight**: Someone knowledgeable arrives to explain the problem and offer solution. Reliance on such guidance calls for eternal faith. Can you trust if you do not have a way to confirm the solution and evaluate its relevance? Preexistence of knowledge for perpetual guidance suffers from many other inconsistencies and contradictions.

**Personal knowledge**: As the observers with limited abilities cope with the conundrum make observations, a wise one among them realizes that everybody can not be standing at the same place. The wise one generates *a table of experiences from different perspectives to construct a description of the beast*.

**Shared knowledge**. If the observers could communicate with each other, they could develop a consensus about what they are dealing with and what is its relevance. A running description could be used to understand and predict future behaviors. Reliability of the predictions could increase with a record of accumulated successes and failures. By sharing in the process participants are empowered to ask questions. Resulting feedback makes the world accessible where experience is cognized as usable motif for the future.

Doubt emerges as we interact with our concerns. The first parable provides a template, and the second is algorithmic way to increase certainty with emerging evidence. Cognitive explorations facilitate in stages appreciation of the extant reality and of the liabilities.

Motifs in parables have lasting influences on human thought and behaviors. The garden-path for Adam was chiseled into the Aristotelian-Aquinas deduction where *not-yes is necessarily no*. The Elephant and blind men parable's appeal to reduce doubt in stages was formalized in the smoke-fire syllogisms (see Nay section on this site). It calls for evidence-based affirmation where independence evidence is required to assert *it is so* or to assert *it is not so*. Real world evidence can only affirm something on the basis of concomitance and invariance.

## IV-9 Anecdotes: Experience or Wishful

Anecdotes appeal with the power of observation, memory, and recall. In the interplay of experience and ideas, one man's joke may be another's philosophy. Reason is sacrificed yet the perception of the event remains. As the implicit are manipulated, spontaneous interactions focus attention to open new levels of awareness in association with integration of discerned patterns through analogies for explanation by iteration. As part of the consequence evaluation issues are packaged and loaded to raise questions that lead to deeper insights.

Shared knowledge of complex systems comes into practice through anecdotes. Often the fall out from anecdotes is the truth functionality that emerges with interaction of rational and spontaneous. As in Harem of *One Thousand and One Nights*, the role opposite gender plays in the genesis of ideas is often delegated to mistresses, muses, and other providers of the incidental and un-credited ideas. At the root of this tangle are elements of inspiration and rational mixed in with uncertainties of intellectual freedom and impulsiveness of jealousy and rivalries. As in a Greek melodrama all parties end up doubting their sanity: Arguments become futile and indistinguishable from whine that strips away power to reason. Through ambiguity of *this too and that too* mysticism calls for alternate reality. Similar paradoxes emerge in myths and epics through irrational use of principles, power, martyrs and heroes.

The task is to put away psychoses to identify an ad hoc or sane course of action. To paraphrase Descartes: *One is sane as long as one seeks a rational course.* What is that rational course? Desire to do so may spur creation and conviction, but how can one guard

against premature bliss. How does one arrive at it? How can one be certain? What strips away the melodramatic elements of this search? Does persistent desire to know bring one ultimately to terms with the reality? What happens on the way where desire to know is mingled with other desires?

**Detours in the Journey of Mind**

**Dream**: According to a Chinese tale (ca. 400 BC) Chang-Tzu dreamt he was a butterfly. It was so real that after being awake he wondered if he was a butterfly dreaming of being a human.

**Hallucination**: The term is often applied to the chemically or stress induced altered state of mind. The problem of such distortions is far more wide spread.

***Mirage***: Overlapping states of illusion, delusion, and hallucination.

***Evil geniuses***: The term was invented by Descartes to meditate on an age-old question. His variation was how to demolish falsehoods *to establish anything at all in the sciences that was stable and likely to last.* To make a point about our mental images and the external reality, around 350 BC Plato imagined people living in a cave. These people have been chained by the evil master in such a way that they see themselves and other people only through their shadows on a wall of the cave. All their experience of existence is through such shadows. A modern reader can imagine such a virtual reality concocted by the evil genius in an environment wired with cameras and television screens but without a possibility of feedback.

**Mass-hysteria and Collective-amnesia**: Such behaviors are all too common through the human history right up to the 21st century: They continue to feign wars of exploitations and genocide.

**Chaos**: Inflate a toy balloon and let go. The path of the balloon is chaotic, not random. One cannot accurately predict the path of the balloon even if relations of all the forces acting on the balloon can be described. This is because magnitudes of the variables at any given point remain too uncertain to predict the outcome for the 'next' moment. Similar processes are at work in shuffling of a deck of cards, evolution of the traffic patterns, and the weather patterns where at least initially there are stupendous and mind-boggling numbers of possibilities.

**How-do-you know?** With varying degrees of skeptical slants, this question has been and continues to be raised in virtually all cultures. Following the approach of Euclid for two-dimensional geometry, 1700 years later Descartes approached the third dimension not merely as a representation of reality, but as a belief: "I think, therefore I exist."

**Brain in Vat**: In 1930s Penfield noted that touching a part of the temporal lobe activated the nightmarish dreams that have been haunting his patient for several years. Such observations have created numerous thought experiments invoking brain-in-vat invoking mind dissociated from the external reality.

**Labyrinths and mazes***:* Fascination and excitement of dealing with unknown without a reference point probably comes from our cave-dwelling days. Labyrinth of caves have evolved into large buildings and garden mazes. The idea of arriving at a goal through a judicious choice of paths is intrinsic in the philosophical idea of *maya* and *lila*, and also in scientific simulation and modeling. In man-made mazes and labyrinths one deals with little knowledge of the path, although the goal may already be set. Borges has crafted the contemplation: *Beneath English trees I meditated on that lost maze. I imagined it inviolate and perfect at the secret crest of a mountain. I imagined it erased by rice fields or beneath*

*the water. I imagined it infinite, no longer composed of octagonal kiosks and returning paths, but of rivers and provinces and kingdoms... I thought of labyrinth of labyrinths, of one sinuous spreading labyrinth that would encompass the past and the future and in some way involve the stars.*

**Paradox**: An assertion that asserts its own validity (or invalidity) is invalid as in the Liars paradox of *I am a liar*. It is self-referential.

**Catch-22***:* It is an expectancy paradox memorialized by Joseph Heller in a novel Catch-22: There was only one catch and that was catch-22, which specified that a concern for one's own safety in the face of dangers that were real and immediate was the process of a rational mind. *Orr was crazy and could be grounded. All he had to do was ask; and as soon as he did, he would no longer be crazy and would have to fly more missions. Orr would be crazy to fly more missions and sane if he did not, but if he was sane he had to fly them. If he flew them he was crazy and didn't have to; but if he did not want to he was sane and had to.*

Greek plays, Medieval opera, Gothic tangles as well as reality based fictions explore the condition of man after emerging from the Garden of Eden. Individual excursions, howsoever illogical or illusory they may appear, ultimately chart the track for collective rationality provided we are willing to learn from such experiences. The anecdote implicitly focuses attention on the condition of ignorance, i.e. that we do not know that we are ignorant. In spite our collective progress, as individuals we may wonder if we wish to get out of that curse. Also once humans fell from grace, Prometheus stole fire from gods. Ever since we have been learning to live with ways to harness and control the products of fire - the energy and drive for actions. Both the goals and processes become indistinguishable as we realize that lacking ends and means we have to take care of ourselves and the garden.

**One man's junk is another's treasure**

Language is a playful activity driven by primitive and primordial instincts. Of the various devices to explore the word boundaries none is probably more universal than laughter. It transcends the cultures of the common and the uncommon senses. As deterrent for buzz, laughter is tonic against fear, antidote against doubt, and placebo for commonsense where simplicity is not to be confused with lack of functionality. Effective jokes are playful explorations that:

* Catch you off-guard yet appeal to the shared experience.
* Is contagious as we learn from others or do not want to be left behind (laughter breaks out uncontrollably).
* Bring out relations (insights) by unintentional juxtaposition of dissimilar ideas.
* Bring about free-flow of ideas by unintentional as well as voluntary control.
* Are acceptable as it ends well for the narrator (although it may cost others).
* Are usually about people (individual or groups) and therefore part of the social interactions.
* Are not always about an overt value but the covert message ingrained in the culture.
* Give appearance of fooling around - to make a point!
* Relate to universal experiences of cleverness to deal with weakness, self-defense, pride, and fear.
* Use phonetics in the narration style to overcome limitations of language and extend the range of verbal communication to include non-verbal means such as gestures, intonations, cultural metaphors, and icons.

## IV-10 Word Play

It is a common sense that eye can see only what the mind knows. The uncommon sense goes beyond what one knows to access the concept space of the representation.

The imagined may not be possible, yet possibilities often remain unimagined. Imagining situations elicited by words is a way to explore objective world. Talent lies not only in thinking up possibilities. Task of playful imagination is in ascertaining whether a particular is really possible so as to make the function accessible. Thought experiments explore context through playful manipulation of variables and relations with an appeal to the process and the goal. The imagined may not fit perfectly, but a representation becomes suspect if it is too good to be true.

**Framing questions.** Words have shifting boundaries defined by use. It is not trivial to decide the core feature of a word in use although etymologists and philologists have rules to do so. Old meanings tend to persist along with the new. Consider the term energy. It has wide-ranging meanings in the historical and cultural contexts. In such usages ordered processes require energy. Interpretation of the term energy applied to quantify the invisible content of a system, that is an essential variable for the change, goes to the heart of the playfulness of metaphorical or rhetorical use of the term *energy of a conception or representation*. A modern conception of information is also as a form of energy intrinsic in the order (related to entropy). Attempts to capture the order are clearly intrinsic in perception, communication, tools, hypothesis, decision-making, thought, rationality, and knowledge.

Through word-play we realign thought. Child play is about bonding. Parlor games and other shared family activities for entertainment seem to increase during harder economic times. Such activities encourage players to come out of cocoon to laugh and bind by exploring the relations.

The Sanskrit word *Kreeda-ratnam*, the jewel of plays, has been used in Kam Sutr to denote the playfulness of relationship and sexual acts. Play is not about winning or loosing even though there is an outcome. This ancient text clearly distinguishes it from games people play to impress, score or to win, as is intrinsic in sex-appeal. Also consider the consequences of introducing the idea of sin in the sex play, or of the distortions introduced by the advice *to lie there* by the stiff-upper lip Victorians, or *to fake orgasm* by the feminists, or the rationalization in some teenage cultures to engage in mindless sex because *there is nothing else to do*.

Concept of play is as wide as a human culture. It is voluntary activity executed within limits of time and place. Rules freely accepted, yet binding to those within. Its aim is in itself. It is accompanied by a feeling of tension, joy and conscious awareness that is not necessarily *different from ordinary life*. It excludes little, yet it is utterly frivolous to those without. Other elements of play that have been identified are free, separate, uncertain, unproductive, governed by rules, and make-belief. Seeming inconsistencies and no reference to the cultural context or ad hoc values for playfulness has bothered some. However, such factors can be accommodated in the loosely defined rules and thereby destroy the existential view of the play worlds. Play is over at the moment the players take off their masks.

Mathematical game theory spans a very narrow range of actions of hypothesized rational (rule-based) players. Play covers a much broader range where the players are not necessarily

rational enough to obey all the rules all the time. For quantitative, mathematical, and intellectual purposes one may wish to consider the restrictions and limiting qualifications that make a game out of a play and vice versa.

## IV-11 Parables as Thought Algorithms

We all embroider. Storytellers explore and aspire to validate the range of our perceptions. In all cultures tales have evolved and are adopted as a means of portrayal of the patterns and events of human life. As prose and poetry of daily living they have homely paradigms. They cut deep into psychological problems, fears, consolations and aspirations to provide captivating webs of social meanings for resolutions. They illustrate complex concepts by bringing out variations on a theme (motifs, family ties, personality types, cultural niches, attendant traditions, world-views and contexts). Parables play with the questions of reality imbued with methods and philosophies.

Parables have a role in exploration and disseminations. Effective parables algorithmically explore alternatives and choices through evaluation of outcomes and consequences. Traditions and customs often relate to substantive matters (concepts, models, theories) accomplished by diversity of methods and practices. Variables may not be easily identified and expressed for the thought experiment, yet certainty emerges as successful practices modify the search algorithm. When repeated in different contexts anecdotes become parables that explore boundaries of the new experience. Although such devices explore ideas and aesthetics relegated by each narrator and listener, in this struggle between content and rhetoric attention to cultural sensitivities is critical if the wider appeal is not to be lost.

**Cognition for consequence evaluation**. All dealings that shape the man while carrying out the ordinary business of life fall in the realm of cognition that is about the content of sensory inputs.

Like actions, choices also have outcome and consequences. Choices are based on the alternatives that have to *be sought* (steady-state) and not just *be given* (equilibrium in perfect world). Each of the alternatives, including no-choice and placebo, has outcome and consequences. Perception enters both in seeking the choices as well as in evaluating the rational consequences of the alternatives.

How often do we hear but not listen? Look and not see? People respond in their own ways to the same entity or event. The same holds for anecdote, painting, or a textbook passage. Differences prevail even among those from the same background and comparable natural abilities to respond. Active interaction with inputs is critical for communication and sharing the experience. It thrives on honest difference of opinion. Not all such differences have skeptical origins. It is integral part of our being through mind, nature, genes, nurture, and culture?

Playful interaction through anecdotes, tales and parables is the way to compare and contrast individual perceptions that are multidimensional. Methods based on the use of language are linear. Tales try to circumvent the problem of linearity by evoking and eliciting the *feel* for the situation and experience. For the face to face communication one relies on gazing where the narrator is coming from. It is there in the content, intonations, body language, and the background of the speaker. Such awareness is enhanced as we try to peer into the mind of the narrator. The loss can be crippling if the author is separated by time, space or culture. To make up for the loss in translations, re-narrations require renditions with substantial interpretation of the intention and context. Here the judgment-mechanics of the author, teller, interpreter, and reader becomes critical for evaluating the level of perception of reality communicated through words.

Difference between the perceived and objective environment is the drive for all interactions. In the perceived world of a decision-maker the total available information does not approximate the total information in the external environment. Acknowledged sins of commissions (distorted perceptions and inference) and omissions (ignorance, gaps) provide the drive for the search for viable alternatives - but only within limits of the perceived choices. The information available to an individual is filtered, distorted and approximated if it is not available at all, or the listener does not have ability to evaluate the choices to their logical inference, or if the number of choices is too large.

Key elements for interaction with parables are attention and exploration of alternatives as rules, roles and choices of individual behaviors. Here one enters the realm of premises based on perception, beliefs, knowledge and personality. This is not just a set of prescribed or proscribed behaviors. It is a matrix of criteria for generating and evaluating possible courses of action, and also for assessing the state of environment and implications for actions.

When we have it all together we have an algorithm for a role of a decision-maker. With a full realization that the rational decisions do not guarantee success, algorithms can only lead to many of the possible alternatives for the decisions to be made under a variety of conditions. In an abstract sense key elements of the process include:

- Decision premises for the problem and the processes (no matter what the outcome).
- Search activity based on meeting the aspirations.
- Operative goals based on observable criteria of success through defined means of attainment. Non-operative goals lack concrete measure of success or programs for attainment.

- Emerging roles
- Tracing the implications
- Parable algorithms are based on little reliance on earlier models of success. Here there is a tug between opportunities versus tendency towards the equilibrium for optimum. This is how iterations through relevant anecdote and parables become effective learning tools.

One learns that all conclusions (guesses) are fallible simply because the evidence is never complete. Good guesswork requires efficient use of all the available information by enabling variations of rashness and caution to be distinguished from variations in the amount of the available evidence that is used. Threshold criteria (values, culture, apathy) are key factors for resolving signal from noise through versatile and creative guessing as well as correct and efficient guessing.

A lack of such sensitivities and sensibilities is obvious in the less interactive narratives. Beyond the limitation of the devices, the metaphors do little to a casual reader without the benefit of being sensitized. Interpretation, through active interaction of the narrator with the listener, defines the limits and context of the metaphor for flow of thought and ideas to weave personal elements into the bigger tapestry. Otherwise, one remains in ones own corner of the universe from where the rest remains inaccessible.

## IV-12 Hearing to Listen and Looking to See

Wisdom of *do not get caught up in your own image* echoes in *King of jesters is also Jester of kings*. Voltaire noted the irony of a trickster as: *God is playing comedian to people who are too afraid to laugh*.

Origins and significance of the word interactions lie deep in the human condition. It facilitates grasp of reality in stages where blinders of cognitive biases prevent realization of the obvious. Context for the organization of relevant information is also provided by social and personal interaction. Virtually all languages have redundant inputs. Often the search goes on for a while before one knows what one is looking for. Yet elaborate expressions for the not-seeing, not-listening, not-responding, and not-caring behaviors attest to the blinders that we have to shed before interactions become meaningful to change quality of perception. Operational ideal is: More honest we are with our understanding, as individuals more effective we can be.

Goal of all searches is perceive particulars in relation to the rest of the universe. Through the opposites of evil and good, we cherish and yearn to establish degrees of deeper connectivity with the experience. Lasting understanding comes from the more inclusive solutions, and not from winning or loosing, or from making a point based on facts or ideal. In such searches heroes of fairy-tales often find themselves at forks where the third branch of the undecided outcomes is juxtaposed against the branch of favorable outcome and the other that threatens the survival.

Opportunities lie in-between.

**Exploration of intended, formalist, and evoked.**

As play tools words have self-imposed and external sense of boundary as in: *Faith is believing in something you know damn well ain't so. Lack of faith not to believe in things you know damn well are so!*

***Theory determines what you see.*** Perceptions are shaped by web of motives inherent in principles, beliefs, ideals, idols, dogma and taboos. Man styles himself in such images. Yet sooner or later such universals crumble: *If reality is grand, the grandiose is unreal.*

***Search for the hidden through generalizations***:

* Levels of meaning as through jokes
* Elaborations, definition and elucidation of the problem
* Taking liberty: Anything goes for exploring feasibility
* Modeling for developing optimal criteria
* Value for maximizing the pay-off above a minimum (min-max)
* Dealings with a novel experience
* Successive approximation applied to older concepts to find trouble and then discern the pattern (*rat in a maze*)
* Interactions with reality are influenced by wide-ranging purposes. It is a critical consideration if the experience is to be accessible to all for real-time use without reliance on experts and agents-of-insights including variations of family, educational, church, political and scientific enterprises where the decision-making power is wrested upon *those who know*.
* Curiosity helps in exploring the physical limits and beyond as in: *If the universe has limits, what is beyond the boundary*?
* Often used in large general sense but words may still have special meaning. Precision helps in defining the hidden areas that may be neglected otherwise. Restricting the domain of validity produces a gain in universality.

- Inquiry into nature of matter is domain of science, and into things that matter to heart is the domain of arts. Arts strive for the universals of the personal knowledge of the phenomenal world. The sciences strive to develop shared knowledge that brings together the phenomenological diversity. Both are painstaking, absorbing and continuing creative processes of discovery, each with their own media, crafts, techniques, aesthetics, peer scrutiny, and utilitarian appeal. Both strive for dispassionate perception of world. Both influence and are influenced by the environment. In both cases market forces influence not only the medium and the craft but also the content to serve the interest groups. Both range from hack to high and sublime. In both cases, plurality of experience invites comparisons to discern universality, although arts may dwell on the worlds that converge for the moment. Probably because the individual identity is so strongly valued in arts, orgies of individualism and personal quests for novelty invite variations on a theme by changing strokes or word order in poem or lyrics. Variations on a theme are also part of the archival stage of the sciences that also serves the purpose of independent verification.

***Skeptics**:* Viable alternatives from agnostics and skeptics are at the core of rational practice that thrives on challenges of new inputs. Both arts and sciences benefit from skeptics. They make us aware of traps set up by our representations. To the extent we are slave of the language that we use, we pay limited attention to precision. Our rational conviction is often clouded with motives. Precision to language accorded by knowledge of semantics aspires for meaningful formulation of statements with respect to their verifiability. Perseverance and persistence also leads to meaningful deductive and inductive abstractions with a full acknowledgement that images and ideals are neither absolute nor

ultimate. Doubters and hard-balls keep the search on track through the worlds and values created through practice of reason.

***Dionysian impulse.*** One fanaticism brings forth another to counterbalance the intellectual duality. In this environment of two-cultures, Dionysian impulse of passionate abandonment challenges hope that given time science can solve all problems (scientism). Such romanticism is inherent in the guises of the world populated with heroic individuals, in rejoicing as the motive for the arts, in the denial of reality outside the mental construct, and in the post-modern deconstruction.

***Explanations***. Scientific descriptions are about regularities. Such explanations help us understand things by way of a common answer to a series of questions often posed in the form of assertions built around a hypothesis in the context of established knowledge. Explanation of individual events is also given on the basis of prior knowledge and in the context of other events. Such descriptions, explanations or assertions invoking a cause do not necessarily evolve to the level of physical laws and theories. This is because causality implied by the descriptive terms is not always meaningful.

- Phenomenological regularity implies an intrinsic, whether or not we have identified it. In a scientific explanation such intrinsic is operationally used to deduce the pattern of events: Kepler's laws of planetary motion led to the more fundamental Newton's laws of motion and gravity, and so on. Such explanations and relations inevitably hold within the constraints of the observed world. Recognizing patterns of behavior and changes are part of explanation because they help us identify things that remain to be explained. Therefore, it is also necessary to distinguish whether an event is an accident or an outcome of a pattern of behaviors.

***Choices by analogies.*** Identifying the change and difference

consists of many levels of processing. Word choices relate to incidental versus the essential quality of events and relations. Clues, if not keys, to word choice are provided by perception of stimulus to category of idea, process, and information. As cognition and choices evolve from simple to syntactic to semantic levels, with degrees of sprouting and pruning of perceptions to draw on the available inputs awareness is transformed to interest and knowledge.

***Combinatorial jungle***. All conclusions (guesses) are fallible simply because the evidence is never complete. Good guesswork requires efficient use of all the available information by enabling variations of rashness and caution to be distinguished from variations in the amount of the available evidence that is used. Such threshold criteria (values, culture, apathy) are key factors for resolving signal from noise for versatile, creative and efficient guessing. As a first step one must devise or identify codes for reducing redundancy.

Acceptable methods deal with relations in the real world. We habitually deal with (logical) functions that are more than simple conjunctions of two or more events. As the number of possibilities rises rapidly, finding a path through such a complex combinatorial jungle is not just a matter of detecting this association or that association. It is a formidable task that requires knowledge of the associative structure of a large body of information. A machine searches for the programmed goal.

Spotting serendipity and taking charge is both an art and a craft. It is a common experience that things happen in unexpected ways at unexpected places and unexpected times. What is unique is that sometimes they fall in place. What we make out of such insights creates value. It is not the premise for deja vu but an equation for the future.

Ideas do not come out of the blue yonder. The search space of ideas is multi-dimensional, and imagination is knack for alternatives including variations on a theme. Ideas self-propagate by spawning new ideas that cohere in a framework as precursor for change and vehicles for logical integration of content and form.

## IV-13 Standardization of Meaning

Poetry maintains intimate connection of subject-object (or observer-observed) as in dream and metaphors. Real world concerns are transferred through legends and stories. In assigning meaning to psychosomatic experiences through such tools, the essence of being human is fixed as a reference point in relation to gods and evils. Even science will not make a poem better. Craft counts.

Representation is *the smoke from a fire that burnt*. Psychosomatic concerns are intrinsic in vocalization of the awareness and experience. Vocalization laden with meanings is highly variable: Mothers sense nuances in the cry of a baby - something that a casual observer would miss. Toddlers are also sensitive to the concerns in the voice of their mothers. If *god made babies cute to induce their mothers to care for them*, our adoring responses of children attest to the success of the strategy of nature.

Evolution of about 2000 modern languages in less than 10,000 years can be traced to far fewer protolanguages on the migration patterns. Apparently, human verbal communication began less than 60,000 years ago as chatter of clicking and sucking noises. Today only 30 groups of people from Central and South Africa communicate with click sequences interrupted with other nonverbal utterances and gestures. Toddlers also make clicks and gestures as they learn to speak, and then they learn the adult-speak. It suggests that the transition from clicks to more modern organized languages is probably hard wired.

Approaches from the traditional belief systems to search for meaning in concerns expressed through words are not much different than those recognized and used by modern psychiatrists: *Not to deny the reality of the individual experience so as to find its expression*. How do we standardize such articulations? How do we communicate and cognize meaning? How do we recognize and acknowledge shades of meaning that we understand?

**Techno- and cyber-speak**: In less than a century printed word and international commerce have changed patterns of language usage. More powerful forces towards restrictive uses of word strings are at work in computer languages and cyber communication with loss of nuances. It is already beginning to resemble the global techno-speak ranging from text-messaging to international communication of science. Although it is porous, it certainly does not communicate the nuances for creative thought process as well as discourse and public understanding. Problem-solving is not *waiting for Godot* (who never shows up) or *to go on even if you can't go on* with the hope that things will work out. Nor is it looking into math tables or *googling*. Things do ultimately fall in place and we come to accept them wherever they fall.

In search of meaning, the grammar of sentence focuses on the action (verb) as it relates to acts and actors (*char-actors*). Properties of a system represented by words evolve with a range of overlapping and independent propositions related by appropriate operators. The consistency and viability of the solution in the information domain of the problem depends on the logic operators that define the bounds of reality.

The solution is not the convergence by brute force of a mantra or formula. By the same token logic does not necessarily solve problems or lead to insights. It makes things clear to communicate by examining the truth functionality of the

alternatives related by operators within established conventions. The dialectic of the bipolar is a necessary first step in search of meaning by defining the problem and testing the acceptability of the extremes. In this search solution rarely emerges through a single well-thought proposition.

To get around the problem of myopic views, we draw from other views. Literary devices continue to play a major role in bringing out meaning of experiences. They also give meaning to individual experience. Our concerns and imagination engage us to construct a mental plan of the experiences. Often a reality is to be abstracted from the shadows of the implicit rather than the representation itself. In the end the individual has to be convinced of the reality even if it involved making excursions into other worlds from where we look back on what our own world is like. Clearly, it is far more preferable to explore and deal with the undesirable on such imaginary plane: An experience of the undesirable is not desirable.

There is more to the meaning. In the recluse way of dealing with the issues of existence a problem perches the humans between heaven and hell, that is right here and now on the Earth. Prose and poems introduce the dream-like symbolic codes - metaphors and memes. Such constants and variables liberate the thoughts from the confines of experience and observations. Such imageries can be liberating as in dreams, notions of prophetic visions, communications from external realms, and other events of chance occurrences or coincidences. The issue is not that do they happen, but what can you make out of such experiences. Can you count of these? May be the wisdom of *luck favors prepared mind* lies in visions that can be used to innovate and create value.

## IV-14 Tales Explore Meaning

Story tellers embroider to explore the logical space of perceptions. It succeeds to the extent that it hides the discontinuities and eclipses contradictory experiences that would undermine the intended meaning of its story. Whatever is its overt purpose, it can not avoid a covert exercise of power: Narrative inevitably sanctions some voices while silencing others.

In all cultures tales have evolved and adopted as a means of portrayal of human aspirations in relation to the patterns and events of life. Since something is always lost in the translation of thought to words and standardization of meaning, tales encourage playful explorations. Without becoming too self-referential, as a means of self-discovery and self-expression of a culture every tale is a cross-section of the whole. As an artifact of representation it facilitates grasp of the whole with some imagination. With variations on a theme of common motifs, family ties, personality types, cultural niches, attendant traditions, world-views and contexts tales illustrate more complex concepts. Tales explores philosophies through webs of psychological and social meanings in play with the questions of illusion and reality. In such as play, wisdom received as a neat conclusion is not just unwise, it is usually wrong.

Playing and imagining build on a well-articulated sense of reality. The process of exploring the alternatives follows from choices. It tends to minimize, if not eliminate, arbitrary decision making. It is a journey where the imaginary and real worlds are explored - often without an ad hoc priori. In this world one can

outdo Wonder Woman who might be having *a bad hair day*, or excel Superman down worrying about the miserable state of world. The consequences of such actions can be explored by identifying different and probable variables.

It is not surprising that at least for the last five millennia travelers have carried tales to far and distant lands, and continue to do so through the electronic medium. Many of the ancient tales and fables that moved along the ancient trade routes are homogenized and adopted in different cultural contexts. The phenomenon is apparent in movies and TV shows, where it is not clear if they have the staying power except for the marketing.

**Deeper connections.** Concerns of enduring tales find deeper resonance across geographical, cultural and historical boundaries. Therefore, redundancy in terms is necessary for exploration of the meanings of complex terms like behavior, success, roles, rational, love, life, objective and moral. It is only a matter of time that in the end of this personal journey, or a guided tour by the narrator, one decides to relate and quantify the variables to develop propositions for the relations intrinsic in the observed behavior.

We weave levels of meaning beyond their superficial plots - the first level of meaning. Deeper levels of meaning are not the domains of only intellectuals or transcendental reasoning. Accessing relevant meaning does not necessarily require wading through long, obscure, and complex discourses. Without resorting to proverbs on moral virtues, tales can be entertaining at the superficial level while encouraging playful and open-minded exploration of many levels of awareness when the ideas and concepts are left for the reader to discover. As a teaching-tool and mental exercise, tales can perhaps help to counteract some of the over-structured limited thinking which all too often characterizes the mind nurtured on canned laugh and mushy plots.

**Cassandra's curse: Despair of knowing future.** It is said that the Sun god Apollo fell in love with beautiful Cassandra, the youngest daughter of the last king of Troy. She was given gift of seeing future for agreeing to love him. When she could not love him, Apollo asked her for a single kiss. As their lips touched, Apollo breached into her mouth that *no one would ever believe Cassandra's prophecies*. Her warnings of Greeks attacking Trojans and about soldiers hidden inside the Trojan Horse were not heeded by Trojans. When asked by Greeks near the end of the War, she foretold of a palace murder and her own death before the end of the day. It also came to pass.

All the same, it continues to be so with most insights about the future course of events. As for an ending, this anecdote juxtaposes optimistic tendencies against the backdrop of pessimism that pervade aspects of human condition: *Many claimed to have found the ultimate truth, yet the present remains murky and the future in doubt*. Trust (accountability and responsibility) is the issue in dealing with prophesies and forecasts.

Tales are for the sheer joy of representational activity that helps in inventing characters, managing dialogue, and controlling narratives so as to assure maximum effect with an acceptable level of consistency. One develops a sense of connecting and combining episodes to build subsequent forms of play without overt sense of winning, loosing, and justice. Active interaction dissociates drudgery and boredom from creative interpretation of literature and other life situations. In such playful activities the only prerequisite is that all players understand the substitutions, roles, and themes that are involved. The subsequent discussion is an attempt to mobilize resources and then negotiate the arrangements (matrix) satisfactorily.

In many traditions tales based on anecdotes and parables cajole the listener into thinking without offering solutions. The force of the story-telling genera comes to its zenith in the episodic Epics that celebrate plurality of view-points while leaving the task of drawing a conclusion to the listener. Like a good play, this device leaves the message at the discretion of the audience. Yet the approach directs thinking by gentle coaxing and pointing a way. This universe of sensibilities and sensitivities intertwines the personalities of the characters of the story with that of the listeners. An appreciation of such cross-currents requires nimbleness of mind because the process is characterized by a flow of thought, rather than driven by a message. A river cannot be captured: If dammed it looses its identity. For such reasons attempts, intellectual or otherwise, to capture the essence of the flow of conscience from most traditional cultures remains diffuse.

Some of the experiences that follow from interactions with tales are outlined below.

***Exploring the cognitive space***. Search for meaning in tales develop or parallel emotional and intellectual growth. We can not pretend to be playing and imagining unless we have a well-articulated sense of reality. Tales are about launching what might initially appear to be a simple anecdote. In the more sophisticated realm of the tale we need a gentle hint to channel thoughts to grasp the deeper meaning. The reward of the revelation is an understanding of the tale at a much more profound level. That revelation is the key to unlocking the potential of the human mind through tales.

***Climax is not necessarily the conclusion.*** We do not yet understand what children understand in the stories of others. Like canned-laughs, short and trite proverbial or moral endings are often contrived for brainwashing and indoctrination. A tale is

meant to be continuously and indefinitely evaluated as training for responsible adulthood. What might have once been a quaint story can become an aid for maturation, a metaphor for lofty ideals, a problem solving technique. Discussion provides an immediate feed-back at an unconscious level to the many latent themes beyond clever plots, word play, bizarre characters, exotic action, struggle between good and evil. As long as we do not know how we learn, there are very few better ways of accessing the meaning of experience.

***On being lost in a combinatorial jungle***. A sense of connecting and combining episodes teaches creative interpretation of literature and other life situations. The task is not just a matter of detecting this association and distinguishing it from that association. Soon one learns the concept that the possible number of logical outcomes rises rapidly even if one starts with few simple events. To deal with such situations first one must devise way for reducing redundancy. It requires knowledge of the associative structure of a body of information. For resolving signal from noise it is necessary to factor in thresholds of values, culture, apathy, along with versatile and creative guessing as well as correct and efficient guessing.

***Beyond the cold logic***. There are many aspects on which one does not have intuitive grasp due to developmental or individual differences: such as the joy of literary exploration; pleasure of playing with imaginative characters (imaginary worlds, wishful solutions, imaginary friends); a level of psychological reality associated with personality traits; imagination and associated willingness to loose oneself to play and relinquish control of impulses; taking risk in relationship with others. Through tales we learn that characters can change, conflicts can be resolved without removing (*terminating*) an entity, what makes a character

tick, ways to deal with power, appreciation of the underlying motives that may not be the same as the stated intentions, distinction between pretence and fantasy. Other elements of rational decision-making include appreciation of conflict, role of players, payoffs and rules. Such choices make one think about what to do rather than let chance decide as one learns the distinction between rational and irrational solutions.

***Modes of thought***. Then there is value in imagining whole new worlds. What might initially appear to be a simple anecdote can be launched into the more sophisticated realm of the tale. A skilful narrator may provide a gentle hint to channel thoughts into that realm in order to grasp the deeper meaning. Revelation is an understanding at a much more profound level. The subsequent ethical behavior depends on our choice of values, criteria, notions about rationality, and the sort of relationship between the playmates. These are not strategic choices that may bestow advantages in a particular situation. These are choices that we make because of the way we view ourselves and the world including the other players. If the outcome does not lead to resolution - it allows us to consider other than the strategic modes of thought.

***Life-long learning***. Tales have great staying power in the memory of the individual. They continue to provide guidance at several levels and evolve with each success or failure. Longer the time since the original telling, more motivations creep into recounted tales. Everyday sheds a new light on the tale, and opens a different door to perception through discussion. Ultimately, we learn to appreciate limitations of many of our cherished notions such as, every problem has an answer, or there exists the *best* choice among the courses of action. Growing collection of shattered illusions brings forth the power of rational analysis to

aid instruments of cognition to reveal the nature of the situation we find ourselves in. Even though the experience may have nothing to tell us about how we ought to behave in a particular situation, the subsequent ethical behavior depends on choices of values, criteria for evaluation, notions about rationality, and the dynamics between the players.

Durability and staying power of tales comes from universal motifs, structures and taxonomy. Like a good theory, worldliness derives from the supernatural and mythical. Yet as a means of self-discovery and self-expression tales provide a matrix of identifying the personal concerns which come together with the motifs in the climactic moments. At the cross-section of every tale, where the whole can not be grasped directly, with some imagination the motif becomes representative. Significance of the unintended events lies in the way the opportunity is used. Magic of fairy tales relies on sudden change of state as a way to explore the local or particular. Such spontaneous symmetry-breaking is random yet the consequences are chaotic, that is they exert the influence of that small bias or preference over a large number of successive events. Such insight into methods of doing things calls for scrutiny of the existing practices as well as the possible worlds.

***Cultural imprints.*** In all cultures tales have evolved as medium of expression with flexible boundaries (jokes, myths, ballads, legends, epics). Their web of psychological and social meanings has great staying power in a culture where they evolve as transmitted through generations. Tales have durability even as they pass from one culture to other. Although the key elements remain at the root, diffusion of tales and fables through a culture or mixing of cultures is reflected in the changes. As a means of self-discovery and self-expression of a culture tales provide ways of identifying the factors that may be regarded threats to personal

values, religious standards, or esoteric preferences. Biased interpretation of tales is also a hallmark of missionary and colonial agenda. Such filters of alien values are apparent in versions of ancient tales recounted by Anderson and the Grimm Brothers.

Ancient tales are playful in that they place no moral judgment. Emphasis in a tale is often on the process of getting to the end rather than the end itself. In the end there are no ready-made answers - only more questions. There are no winners and losers - only survivors. It is the job of the storyteller to protect the innocent and down-trodden – at least as a form of poetic justice. Individual judgment of the listener may incite discussion to entertain levels of meanings. The messages are implicitly woven with the choice of culturally relevant characters, words and situations. Their significance in terms of possible assumptions can be gleaned only with careful perusal and playfulness that places no moral judgment. Rather than the end, the emphasis in a tale is on the process of getting to the bottom of ones own cognition and comprehension.

No ideal solution is to be construed. The meaning is not distilled but comes from a participatory creative experience. At the end of such a journey each reader comes out different and at a different point depending on the personal experiences of life.

## IV-15 Cast of Characters

In exploring human relations through narratives life begins to mimic art for the evaluation of denotation (prose) and connotation (poetry). One may ask what are the limits of such endeavors?

In creating a hero a novel glorifies one over many. Rooted in feudal origins, the genera of novel celebrate Western individualism by creating a character that rises above the cast of characters. With the assumption that *beauty always takes place in particular,* epics portray larger than life individuals as *the god of individuation and just boundaries*.

A degree of homogenization of thought and values is needed before novels find deeper resonance in any culture. Much too often they become self-referential in the guise of consistency. Attempt to transcend cultures that may be at odds with each other may make for a good story, however one has to pass a judgment in order to conclude a novel. A novel at its best, and for that matter a song or movie, instills a sense of participatory yet guided journey with a gut level experience to elicit a reaction. Such writings thrive on ambiguities.

World views of many cultures are not amenable to this medium. The task of creating a viable literary tradition in the genera of novels, that address individual aspirations as well as the condition of the cast of characters, does have serious hurdles to overcome. Rarely does a novel resolve deeper contradictions. In creating a world around a character - a particular point of view - the device of novel is for a self-contained world. The force of persuasion comes from an apparent consistency and cohesiveness

of the argument. Be as it may, it is contrived continuity.

A personal-search-for-identity in novels is often meant to identify inner doubts and contradictions, and offer solutions in a particular context. It is all the more necessary as Empires become way of life. Developing a character does not provide an identity unless deeper contradictions are resolved. Such characters create an affinity for the readership that comes back for more of the same. The devise of novel becomes tremendously successful in creating heroes for a culture that identifies with characters against permanence and inevitability. Such socio-political themes have emerged as tools of Evangelism, Nationalism, Colonialisms, and other contemporary ideologies.

Besides their propaganda value, narratives of fiction are devices of passive escape with little affinity with the mind. Solutions are offered by raising consciousness as in role of the individual versus the aspirations of many, alienation versus loyalty, and empathy with oracles of anti-social malice as individuals. Accountability of the fictitious character is left open to the make-believe worlds where little is certain. In the personal journey of the reader attitudes are formed in the system that is not open for debate. Unlike tales and epics, novels loose relevance with changing time and place because the very source of the inputs for the creative processes from the public commons is not acknowledged, accessed, and reinvested.

With turn of wheels of fortune lions turn into poodles. But myths can be kept alive much longer - imagine the cast of characters created to perpetuate incarnations of imperialism. A mix of evangelized ideas in resonance with the prevailing political and social aesthetics is struck through the popular culture, media, and other marketing institutions. Such institutions build on the two culture syndrome to mint obsessions for breakthroughs. Ideas

are often passed on as anecdote, and those that catch on perpetuate by imitation as memes. Negative perceptions develop as curiosity runs a mock: Analogy to the life-cycle of a common cold virus may be apt here in terms of the stages for transfer, infection, mutation, variation and distortion.

Just as a topic sentence can be fatal, a punch line for a conclusion also short-circuits the experience and undermines emotional and sensual. Like a game it undermines reader's imagination to engage in the unfolding of the plot. The creative process for novels is fundamentally different than that of mimicry and play: Children take it all - before they learn selection through their peers. With a distortion it also works in the favor of the genera of romantic pulp, mystery, and gothic that derive from the public commons. They do not even try to communicate or encourage reader to interact, let alone comprehend and interpret the broader context of the metaphors for flow of ideas. Individuation of characters and their creator relies exclusively on the passivity of the reader guided by the words of authority of the author or the critics. In contrast, epics evolve with time where playful inputs as the images and metaphors from the public commons are interpreted over and over again.

**Writer Behind Shakespeare.** Literary works attributed to Shakespeare (1564-1616) have impressive ways with words with wide ranging content and context. Contrary to popular belief, in all likelihood creator of this work was not the bard for the Royalty who produced and acted in 2 or 3 shows per week. He had little educational background (possibly Grammar school), time and resources to have had access to the variety of international and cross-cultural experiences represented in the writings. It is not clear if he ever traveled outside England.

There are no known manuscripts of any of this works. In the contemporary publications there is no mention of such a writer, or his death. Moreover, there was no such contemporary literary tradition of individual writers in England from which the work could have sprouted. Only decades after his death, literary works attributed to Shakespeare were first published as an edited collection.

It has been suggested that the real writer could be Christopher Marlowe (b.1564-?). He was recruited as a student at Cambridge, and around 1590 sent clandestinely by Elizabeth I to spy on the activities of the Catholic Church in Italy. Another possibility is that the work was compiled. Recall that in 1611 the King James Bible was published as the *Word of God* edited by some 40 scholars at Oxford and Cambridge. It was based on a version published 50 years earlier based on the more ancient Greek and Hebrew books. Recall that this was the period when the European Universities were involved in the metabolism, and reformulation for their own purposes, of the material captured from other parts of the world. Could it be that following this tradition the works ascribed to Shakespeare came out of a *committee*?

# IV-16 Play With Unknown and Unexpected

My goal is simple: It is complete understanding of the universe.

*Stephen Hawking*

Play behavior is common to all animals with cognitive abilities. On the way to viable perception, most play acts rely on inputs and feedback that is critical for learning the restraints and constraints on the variables for acceptable behaviors. As in tales and parables, play acts explore the similarities and differences by including animals and imaginary characters with unusual abilities to communicate. Operationally, play is active interaction of the observer with happenings and events for identifying variables and relations. Play devices appear to be useful for collecting information from diverse and unexpected sources under unusual conditions to deal with the unknown.

Although we seem to recognize it, it is quite difficult to define what word play and playfulness with the content is. Even as part of serious creative work play activities are perceived by players as *having fun*. Humans tend to be playful in virtually all their dealings and decisions. It is there in the jokes. It is there in the less-serious attempts to break the monotony of more directed goals – such as the interruptions in the school work, socializing in discos or cocktail parties, and festivities and food rituals including the after-dinner speeches. Such activities prepare people of all ages by sharpening skills for virtually all aspects of existence, survival and emotional well-being. Playfulness encourages

learning from trial-and-error without a stigma of arbitrarily defined and judgmental criteria of success or failure.

Playfulness within and across the species line is common to all animals. The evolutionary rationale for play behavior in animals has been suggested as *training for the unexpected*. It applies to a whole range of activities that tend to rehearse social and physical functions involving muscular and motor to cognitive abilities. It is therefore not surprising that young animals tend to be more playful in order to develop flexible kinematic and emotional responses to unexpected events in which they experience shock or a sudden loss of control. In play one learns to exercise a level of control through deliberately relaxing the control and self-handicapping by putting oneself into disadvantage.

A general objective of play often appears to be to explore plausible solutions and learn how to regain control from failures for the next step. Not quite the same as in dreams, play behaviors include arrays of apparently purposeless and often irrelevant personal and social activities. A common feature of all play activities is switching between in-control and out-of-control actions that place demand on emotional states to encourage exploration of unpredictable (and therefore unknown) sensory stimuli. Improvisations for play include combining conventional moves with atypical ones in significant situations. For humans such self-induced mishaps include varying degrees of movements, gestures and language skills.

Exercises in survival skills in unexpected situations also include controlling emotional overreactions that lead to aimless panic and escalated conflicts. The immediate benefit from play may not be significant. Play is dropped under harsh conditions that require expenditure of time and energy for other purposes.

**Game versus Play:** ***Adaptive Features of Play*****:**

Self-handicapping

Seeking and creating the unexpected situations and opportunities

Exploration of alternatives and unknown by trial and error under relatively safe environment

Mechanisms that suppress play also give the signs of negative emotions that suppress *having fun* (hunger, pain, anger, malaise, frustration, fear)

Recovery from stress again requires play or having fun for emotional replenishment

Rich cognitive content

Play activity increases after a change in the environment, weather, or habitat

***Functional and social consequences*****:** Ability to handle unexpected physical and emotional events, versatility to deal with misfortune and handicap (almost a universal feature).

Sequential variability of serious and fun components prepares for unexpected interruptions. Juveniles learn to deal with strangers, cheating, dominance and predation.

***Characteristic of Games:*** The restricted environment of games is most commonly expressed as in *the only game in town*. On the other hand, playful exploration permits information gathering without such contingencies.

***Outcome***: definite versus not necessary

***Limits***: defined boundaries versus to be explored

***Rules***: explicit versus vaguely understood but fair

***Purpose***: immediate versus the past skills and experience

***Less vigilance*** during play encourages cooperative (non-harmful) manner of social interactions with an understanding of signals to be reciprocated.

**Eureka moments**! It is a common experience that useful thoughts gel in unexpected moments.

- Archimedes realized buoyancy relationship between volume and weight while he was taking bath.
- Elias Howe got the idea of sewing machine in a dream. After years of impoverished drudgery spent on fruitless attempts to perfect a sewing mechanism, in the Mid 1840s Howe dreamt that he was being led out for execution. As he stood there trembling, Howe looked around - each of his guards toted a long spear; the broad leaf blade of every spear punctured by a hole. As he woke up he realized the hole in the sewing needle should be at the tip, not in the middle. The real nightmare for Howe was a protracted lawsuit against Merit Singer that eventually settled in Howe's favor.

## IV-17 Ways of Doubt

If being human is about the ability to use tools, use of tools also constructs influences the quality of perceptions.

Lack of doubt is faith. Chances of success improve with search for viable alternatives to improve upon *knowing what we do not know*. Also *I think, therefore I am confused* endures play behaviors to make room for doubt. The dynamics underlies virtually all reasoning. Doubt is intrinsic in all manners of methods, searches, assumptions, and endeavors for exploring and examining our concerns. In such play acts a jump from *how* to *why* is as unsafe as is the jump from *is* to *ought*. Thus we arrive at limiting value of truth and limits of reasoned truth. It is also paradigmatic that rational behaviors are intertwined with perceived truth. Successful behaviors have a greater bearing on the truth value of perceived reality. In evaluating certainty, one acknowledges doubt and liabilities as part of rational interactions to get around the wishful disconnects.

Virtually all methods and manners of concept manipulation make world accessible. Humans can embrace uncertainty and attain a harmonious state through conscious effort. For example, mind and body rooted in spirit is motivated by ad hoc idealizations of grace, judgment and omniscience. Such contradictions, as well as inconsistencies and paradoxes, have undesirable personal, social and intellectual consequences.

A reasoned search begins with the premise that the world is knowable to humans through human efforts. It moves forward by weeding out distractions and paradoxes. As we learn to judge

and evaluate vulnerability that comes from the inconsistent actions and we also learn to stay clear of mindless consistency.

Harmony of thoughts and words with reasoned behaviors is rooted in reality. Being alive is about expression of potential that lies in the accessible. It has enduring value for survival and well-being. Knowing and understanding articulated in behaviors motivates search for meaning.

Dynamics of perceived certainty shape actions where it is better to be confused with thought, rather than not think. For their validation through practice thoughts rely on diversity and plurality of inputs to sample a wider cross-section of reality. Trajectory of thought consistent with behaviors allows search through workable alternatives.

**Consistency through Representation**

- As a basis for the theory of knowledge, the logic of reality binds all explorations of represented reality.
- An entity is represented by a name. Mutually agreed representations are at best circumstantial evidence for existence.
- Verified properties of an entity are analyzed in terms of defined criteria. It is conceptually identified as a class and category in relation to classes of other entities to distinguish it from the rest of the world.
- In the appeal to the parts emphasis is not on finding order among the parts but on finding the order (quality) that distinguishes the part.
- Depending on the purpose, a representation can be more majestic than the reality. The purpose of representation is to peel off the unwanted layers to define a manageable sliver of reality, as in equations, theories, art, photo, fiction, advertisements, public relation pronouncements, conceptions of aliens and gods.

- Goal of representation of reality is not truth: *Let there be X* does not necessarily mean that there is X, unless of course verified independently. It is an essential quality of representation that *there is no such thing as inaccuracy: All photographs are accurate, none of them is truth.*
- Two descriptions do not necessarily mean two sides of an argument. Two sides of an argument do not forgive ignorance and absolve demagogy.

## IV-18 Reference, Reason, Resonance

" Are you the smoke from a fire that never burned?"

- *Derek Walcott*

It is useful to understand the baggage behind the use of the term "mind" in the Western tradition. In a movie Roman Polanski articulated the fallacy of the conception of mind as: After a man cuts of his head, should he say *me and my body* or *me and my head*. Of course, one can not make head or tail out of it. For a good while the European concept of mind was mired with an affinity with an external entity that controls humans, which was seen as the spirit, *free will,* grace, or the *guiding hand* of one stripe or the other. Not only mind was considered to be separate from sense organs, its function was also outside the realm of body and brain.

Operationally mind is a matrix of thought that facilitates representation. All cultures have placed a great emphasis on systematic search. A hallmark of effective thought is that it builds on the reality-based consistency. Virtually all cultures have taught their young discernible forms of patterns as in basket-making, pottery, weaving, or the Euclid's theorems. Patterning is also at work in the use of languages and other means of communication. Rule based consistency facilitates exploration of physical worlds as well as those of beliefs and concerns.

Empiricist and naturalist approaches do not emphasize such a matrix. Generalizations, principles and theories evolve as one creates order in the observations by categorizing. By ordering the web of interconnected beliefs is subjected to scrutiny. We make sense by induction, a process built into the evolution of

vocabulary and languages. It is not too different than the realization of a child that takes the conception of water from spoonful of *mum-mum* to rain of water to lake of water.

**Perceptions for Deconstruction**

All comprehensive searches are necessarily chaotic. A systematic search with feedback may be efficient, but it can not access what lies outside the representational matrix. It is a problem of constraining and defining *all that there is*. What is needed to take one out of the prison of personal knowledge? Can we ever know anything other than experience of our own awareness? Multiple searches are guided by the belief that such experience registers something more than only the awareness. For such purposes we also use tools whose world-readings are less likely to be subjective. Here are other turns:

* History is not something that happens to other people.
* Dare to be naive (*Buckminster Fuller*).
* Anything that exists is possible (*Kenneth Boulding*).
* At first people refuse to believe that a strange new thing can be done, and then they begin to hope it can be done. When it is done, all the world wonders why it was not done before (*Frances Hodgson Burnett*).
* If you ask unconscious to give you information in your dreams it will oblige you. It is really amazing how the unconscious longs for ways to get in touch with us (*S. Grafton*).
* We have now sunk to a depth at which the restatement of the obvious is the first duty of intelligent men (*G. Orwell*).

## IV-19 Folly of Denying "I"

It is not unusual to deny ignorance: We do so by asserting *I am*, by placing a mask of theory over the face of nature, or by ad hoc assumptions that may be technically liberating but they constrain searches.

Ignorance is often about the ignorance of the starting point. For a meaningful search humans start with the assertion of *I am*, that is *I exist* in relation to everything else. It is much less subjective and much more accountable than the revealed truths supped to be inaccessible to human intelligence. Appeal of the assertion "I am" against the revealed truth lies in the almost universal desire to rid oneself of opinions hitherto harbored in ones mind.

**The Wise**: Wisdom of the ages is a search for more immediate motives. If the wisdom stands as article of faith, or even as apparently innocuous axiomatic, blinders of ad hoc notions become so ingrained in mindset that nobody bothers to substantiate them at all. With bare and banal expediency of *it saves time*, the whole enterprise of revealed truth becomes self-referential and asymmetrical.

As people and institutions find ways of coping, attitudes interfere with thought that facilitates viable alternatives that have to be found before the past is discarded. A construct looses relevance if it tries to be true relative to a culture, a situation, a language, ideology, or some other social condition. If thought is concocted as a plan of survival, habits of boxed-in mind sacrifice deeper search. Paradox is that such forces operate in the contexts where a deeper search is all the more necessary. In such

environments evidence, fact, and inference all fall under the category of local interpretation that are more or less right by virtue of the interests they satisfy. When attitudes do not substitute for reasoning such concerns and ramblings are locutions of expediency, temerity, rhetoric, acrimony, and vindictiveness.

**The Mystic**: Possibly as part of the search for the relations that exist between the individual and the world outside, anyone absorbed in a book knows the mystical allure of being transposed to different worlds. Like other mind-altering experiences, the perception that all knowledge is in The Text, or Wisdom of one persuasion or the other, is a disincentive. It produces a person who can not question, analyze, reason and create. In trying to solve a number of problems, the institutions of Supreme and Omniscience creates many more questions like *Who created the creator* and *Why should He put man to sin only to forgive him*. It is aptly captured in a *rubai* of Omar Khayyam:

*Oh, Thou who man of baser earth didst make.*
*And with Eden didst devise the snake,*
*For all the sin, wherewith the face of man,*
*Is blackened, man's forgiveness, give and take*.

On being taken over by that feeling of *almost anything will do*, the coherent begins to become incoherent. It is the core of rational practice that thrives on the input of viable alternatives from agnostics and skeptics. With a realistic starting point in the combinatorial jungle of the unknowns, suitable premises for effective arguments can be developed to the level of a testable assertion. For operation of the inquiring mind, the starting points for asking and answering important questions differ from culture to culture, and may also differ from person to person. However, a reasoned consensus rarely requires the force of authority.

**From the starting point of "I":** Searches link the starting assumptions to ultimate consequences. Process of building arguments requires reexamining the basic assumptions that underlie the beliefs. This can be deductive, or inductive, or actually any method that works! Concerns have to be addressed to increase precision and build inductive tautologies in the form of viable theories, models and algorithms. However, all open-minded inquiries ultimately erase the circumstances from which such questions arise.

Mathematical methods deal with quantities of objects. Sets for such purposes focus only on the shared qualities. Following the lead of the surveyors in the Nile Delta, Euclid contrived the space to the flatness of two-dimensional surface. Three orthogonal coordinates of Descartes reclaimed not only the three dimensional space but translocation with time as a change (or movement) in this space. Capturing the essence of the physical dimensions and change with time is a major step forward for representation. It places on a quantitative footing the traditional ideas about representation of reality of entities and events in the space time continuum. The Cartesian view of physical space facilitated evolution of mechanics and speeded the search for fundamental formulations in virtually all disciplines of inquiry.

**Evolution of "I" to "I am":** All human searches use "I am" as the starting point to eliminate the role of chance and illusion. Shrouded in a cloak of complexity, worlds of our concern in *I will do, I do, I did* have many more qualities that senses can perceive as intentionality. Just as there are valid criticisms of senses there are also valid criticisms of reason. The belief expresses in all such assertions of "I", including *I think, therefore I am* or *I think therefore I am confused*, does provide a starting point that places the physical reality in reference to "I am" the non-judgmental observer.

**The "I" of Descartes**

Could Descartes have openly argued that even if omniscience (God) exists it can not be relied upon for making meaningful decisions for I? He did not and could not. In the context of faith assertion of *I exist* is for the deduction of all that follows from the God. It is similar to *I am imperfect* as a conception for an independent perfection. From this dichotomy Descartes went on to argue that the creator of I, the God, must be perfect. Descartes also developed other arguments in the favor of God. In all such over-hasty generalizations, Descartes seems to have ignored the fact that the perfection he envisaged may not exist or is not the entire reality. It is not clear if Descartes was trying to escape the wrath of Church. He had good reason to fear: Recall that only a few decades earlier Galileo was silenced by Church.

In the task of reconstructing the world in relation to *I the observer*, the method is an instrument of action and behaviors with a built-in reality-check and feedback. Spotting serendipity and taking charge is both an art and a craft for humans. Dealing with the reality in the space-time continuum creates another paradox. Impossibility of the origins of something from nothing applies to all forms of resources and order, including the matter, energy and information. Thus the infinite of the space and time continuum are the mere "nothing" against which reality of matter, energy and information is represented in finite parts.

## IV-20 Deconstruction of ad hoc

Doubt is intrinsic in assertions based on a point of view, or a generalization, or a stable or momentary aspect, or the meaning of the word and its derivatives, or personal knowledge.

- Samantbhadr ca. 200 CE.

Do you really believe that the sciences would ever have originated and grown if the way was not prepared by magicians, witches, alchemists, and astrologers? Their promises and pretensions first had to create a thirst, a hunger, and a taste for the hidden and forbidden powers.

- Nietzsche

Diversity of inputs and outcomes enhance quality of conception of complex worlds. Pursuits of knowledge to support decisions and problem solving are highly goal directed processes where a solution comes at the expense of everything else. Use of the logic of parts to deal with complex systems, where parts can not be identified and quantified, is a not meaningful, except the assumption that the known facts of reality can not be violated. Therefore, it is critical to examine the paradigm on which such models are based. Certain elements stand out.

**Theory Mess.** In the classificatory order of the Scholastics image of being rational is often cultivated by appearing to base arguments on what is commonly perceived as ordered, if not tried-and-true. Crouching arguments in some sort of validity of moment to justify beliefs is nowhere more insidious than in politics and religion. Excesses of *scientific creationism* or *intelligent life* are matched in a comment by the Chinese President Jiang in

1990s to justify imprisonment of dissidents as: *Theory of relativity, ... , I believe can also be applied to the political field. Both democracy and human rights are relative concept and not absolute and general.*

Few hundred years earlier in one of the notorious cases Sepulveda argued that the inhabitants of the New World are not human. In the environment of the farcical inquisition trials, King of Spain, predisposed to collecting gold, was swayed to order destruction of flourishing cultures. Humanistic arguments were ignored. Even today, the best of legal and political systems are adversarial - meant to polarize the dialectic - often in the context of the prevailing wind.

In humanities there is temptation to match the success of science. The two cultures have been apart from the beginning and an overlap is a dangerous mix. It is for the benefit of both if they remain separate but communicate effectively. Instead of mimicking science other disciplines can do what they do best. If not swayed by ad hoc, humanists identify issues of human condition. Philosophy is good at posing problems to explore this and other worlds. Enduring philosophical questions do become scientific problems as a part of the belief that universe as whole and its parts are understandable. The problem of disaffection emerges when as mere pretension we apply the understanding provided by methods of science to beliefs, meaning, or social engineering.

Beliefs are blueprints for inquiry and decision-making. Acceptance of something as true is one thing, and the truth of that belief is another. Documenting the former is a traditional historical endeavor. Establishing the latter is a routine epistemological task. Just as a philosophical quarrel is not a psychological speculation, epistemological language is not epistemological principles. As we affirm the constructs, it is

necessary to evaluate their origins and establish a deeper basis. Otherwise, we risk a contradiction and fallacy in the premises.

Reliability of constructs and representation in practice is often a useful measure of the connection to the underlying reality. Constructs of the world through laws are judged relative to the underlying reality, and the ability to predict outcomes is verified through practice. Through such abstract and expedient the laws of physics and chemistry have a truth-value. Justification lies not in the context of its origins but in the content and the evidence that is always available for reexamination. A dialectic cultural critique of science is not the same as the use of politically and ideologically charged metaphors in scientific discourse. The later reveals science as a construct of empirical practice as it tries to stay in touch with shared reality. Neither is to be confused with *scientificity*.

**Metaphor of Science**. Science is no substitute for rationality: It has been used far too often for deliberate irrational ends. Scientifically elaborate methods were used in the concentration camp, battlefield, and other operations for social engineering and salvation. Such factories may not be in public eye, but attracting public participation invites scrutiny of insidious manipulations in guises of official secrecy. There are far too many instances of ideas once thought to be democratic or universal are later exposed as alibis for social inequities for institutional-use.

**Nuclear Waste**

In Goiana (Brazil) a glowing substance was discovered in a piece of junk. The dealer showed it to his friends. The children were fascinated by it and dozen of them smeared it on their body. The authorities were alerted only when dozens of people died. They found that the material was cesium-137 isotope from a

machine for the radiation treatment of cancer patients.

If you think that this is an aberration from a third World country, consider the following: Plutonium is primarily used for the production of nuclear weapons. It is also the most toxic material known: inhaling a single molecule can mutate the genes and potentially kill a living being. To this add: *The 1992 meeting (organized by U. S. Department of Defense with armed guards posted outside the door) involved a report to the top brass on the current state of the art with regard to managing nuclear waste, some of which will continue to be dangerous for up to 240,000 years. "It was a very unusual meeting," she says, "because these engineers basically admitted that they didn't have a clue what to do about it. In fact, they were personally overwhelmed by the enormity of the problem. A couple of them actually broke down and sobbed."*

Things have not changed much since. We are in the early part of the learning curve about the consequences of Nuclear power plant technology that was created to address exponential demand for energy. All the nuclear waste has been created only in the last 50 years. The problem of nuclear waste for health and environment was not even suspected until 1960s. We do not know what to do with the extremely hazardous high level nuclear waste that comes from spent fuel and the operations of the fuel and arms production facilities, and everything else that comes in contact. These materials are likely to remain dangerously radioactive for tens of thousands to millions of years. The proposed solutions range from outlandish (hurling it into the outer space) to ridiculous (burying it deep in some mine shaft). Operationally, the issue is what should be done to confine the waste for at least 10,000 years - that is the time during which plutonium decays to the currently acceptable level. This is also the length of time that has passed since the last ice-age, and

virtually all human technologies have evolved during this time.

Expertise means not just having relevant experience and knowledge but having demonstrable competence and clear evidence to justify doing things, and not just in one way rather than another. In effect, we know the dangers of radioactive stockpile - not just as the weapons. We know that we do not know how to dispose of such dangers. Yet most nations continue to produce it, stockpile it, explode it, send it up in rockets, and some times even misplace it. Considering such limitations one may wonder how the problem is being handled now by the various nations equipped with nuclear arms and power plants.

Consider t*he technologically feasible solution* of burying the waste in the mountain range of Nevada. Advantages include: it is near the testing and production facilities for the US nuclear arsenal; the site is in possession of US government and far from most population centers; the arid climate is likely to minimize risk of seepage from the ground water; and the site is far from oceans in the event of the changes associated with the rise in the ocean levels in the event of global warming. One could even make a technological case for making the site earthquake proof - only if we know about the geological and physical behavior over such an extended period of time. One of the more serious problems comes from the fact that concentrated waste is likely to remain at a temperature of 200$^{o}$C (450$^{o}$F). Very little information is available about the properties of materials that will last for 10,000 years under such extreme conditions. US Department of Energy has concluded that climatic conditions resulting from another period of glaciations (ice-age) will be cold and dry.

An ancient wisdom observed: *From a hundred and twenty leagues a bird sees carrion far below, the very same bird is unable to recognize a trap.*

Some of science is concerned with improving human well-being. Often the consequences of scientific salvation are not as carefully thought through. Consider the measures based on the realization that happy and healthy individual is a better citizen. Now for the first time (since March 2001) in the human history a greater percentage of the human population consumes more calories than those consume less than the needed calories. Success of agricultural revolution has eliminated hunger for most, yet it has created conditions for malnutrition of another kind. Reasons for curbing obesity are emerging as we realize the personal and social costs of cancer, arthritis, diabetes and cardiovascular problems associated with such malnutrition.

Crouching science for the social purposes has prompted the warning: *Any mingling of knowledge with values is unlawful, forbidden*. Justification of science is in good science that establishes validity of the knowledge first. Applications and utility will and do emerge from such insights - some expected and but many more are unexpected. For good reason there is healthy dissent and opposition in the rank of practicing scientists for overt attempts to fashion instruments of social engineering. It follows from the realization that extracting consequential from the instrumental is never neat and clear in areas of human concerns.

No enterprise can transcend its origins or what is intrinsic in premises. With this in mind, effective divide-and-conquer strategies are multi-dimensional. The goal is not the zero-error rate, but an essential goal is not to be overcome by the unknown. Such goals include sustainable choices for health, happiness, and meaning. The *choice of meaning* is personal for all individuals. As for the *meaning of choices* in the real world: Stupidest means least selective in terms of choices or actions.

If nothing else, the role of knowledge and information is to reduce level of anxiety with which we all live with veritable Pandora's box of possible worlds. Unfortunately, there are no natural laws about what we should allow or disallow *a priori*. As for the patience, Max Planck observed: *A new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.*

It is the way it has been. Even if we believe in the survival of the fittest, we have to police against cheating, stealing, murder, prostitution, and worse. Problems are often ill defined and solutions are impregnated with prejudice and past practices. Some arguments are easy to falsify. Some persist through belief and faith even when contradictions can be spotted. Ideologies, theories and practices of the yester years are more difficult to rid. Such dead-end appeal to the timelessness of the meaningless: We are afraid to admit that *there is nothing there* like the Emperor's new clothes.

Through fads and fashions of convictions we cannot 'compute' or 'meditate' our way out of commonsense. Social and thought engineering through metaphors of science is misguided. Newton's laws and Darwin's principles prompted theories of social change that were used to justify war and exploitation. Logical deduction, and to some extent even the empirical and implicit inductions, tend to focus on what is already built in the assumptions behind the metaphors. While the analytical and logical methods spot the contradictions they suffer from the problem of incompleteness and undecidability built into the starting assumptions. Not surprisingly deeper concerns about methods of science have come from scientists themselves because they understand the origins of the problems long before they are

apparent to anybody else.

Metaphors are always imperfect: They free thought by interjecting assumptions. Even if metaphors have liberating influences on thought, it does not necessarily mean that they are enduring. Of course, the reality and meaning has to be built into the assumptions and axioms. Metaphors of social action do not handle reality in the same way as the metaphors of equations handle the reality. Equations are useful for modeling outcomes of defined worlds. Precision of mathematics is useful to check internal consistency. Using wrong mathematics leads to fictitious causes.

## IV-21 Survival by Trial

All functions in an organism are expressed through thousands of protein molecules copied from the blueprint coded in its DNA which is also genetically transferred to the progeny. Changes in the blueprint are slow and random.

What cooks in the melting pot of the genes of an individual is evolutionary experience of the survivors. Survival is about what persists and is passed on to the progeny. It says little about what transpired on the way to the present. It is not that the fit survive in the long haul, but the survivors are fit for some reason. Genes give propensities for behaviors that are further influenced by nurture and beliefs.

**Sneaky and devious**

Here we are not talking about massive denial and deception practiced through changing standards for dress sizes. Consider the zeal with which the strongest dung-beetle guards its property and keeps its harem under the dung-pile. While the strong male guards on the surface, weaker males gain access to the harem through tunnels. Does the reality of survival lie in sneaky and devious behaviors? Think twice before concluding that attributes of sneaky and devious behaviors are seen only in the animal kingdom: An English princess of 20th century had relationships with her horse trainer and others.

**Humans as tool-seekers**. Evolutionary fitness of human species comes from the range of sublime to reptilian behaviors. Need for tools and institutions follow from the realization that humans are limited in important ways, and tools make up for the deficiencies. Our ability to imagine alternatives and to speculate comes from the tools that facilitate group interactions. Without tools, individuals are able to come up with far fewer relevant choices. Quick-fixes and desires are battle of ideas with chaos of choices in the public commons.

Not all ideas and choices are created equal. Individuals accept social constraints on actions because plurality of thought and behaviors often take us towards an optimum in choices. Although few seem to go beyond the tools and gizmos, through trial and error as a group we are forced to modify and move gradually from the desired to the desirable validated by practices and behaviors. A higher evolutionary purpose of the choices could be a part of the desire to see ourselves through the others. In such enterprises, rarely do we have the necessary knowledge to make informed decisions in real time, or be able to make use of the relevant knowledge at hand. Chaos does not necessarily allow for the best although that is the way people make choices.

Choices have become relevant for another reason. The genetic changes and mutations occur at random and the selection process is very slow. Foundations of modern society and its rapid evolution are based on agriculture and language. Both set the ground for a rapid transfer of knowledge to build on the known and established order. Both encourage deliberate exploration of consequences. In the give and take of social existence *we harvest what we sow*. We equate potential to seed. In many cultures mind is equated to the field, and actions to nourishment. Therein lies another ancient wisdom about conservation: *Net harvest is what*

*you produce and what you put in*. In such realms of thought we realize that the end products do not materialize out of nothing. Therefore, success of ordered enterprises lies in seeing and creating value in a controlled fashion.

Built on the experience of pottery, plough, wheel and fire of the last ten millennia, the devices introduced during the last two centuries have rapidly changed virtually every aspect of the environmental, social and consumer landscape to varying degrees for most people: public hygiene, clean water, antibiotics, electricity and motors, plastics and other synthetic materials, transistors, internet, as well as wide-ranging pollutions with global consequences. We have not violated laws of physical reality of matter and energy (thermodynamics), nor have we *created something out of nothing*. We know it is not sustainable, yet do not know where the current momentum will take us. Immanent or transcendental Utopia is not around the corner, nor is the End.

**The past that changed the future!**

***Controlled fire*:** About 100,000 years ago in East Africa.

***Domestication of animals*:** About 10,000 years ago between southern Caspian to India.

***Agriculture*:** About 10,000 years ago in the plains of Euphretes, Tigris, Nile, Sindhu (Indus), Ganga (Ganges) and central China.

***Pottery, wheel, cart and variations*:** About 8000 years ago between Iran and plains of Sindhu.

***Urban organization*:** About 7000 years ago in East Syria and Iraq

***Written language*:** About 5000 years ago in East Syria and Iraq to Ganga valley.

***Numbers and grammar***: About 5000 years ago in the Sindhu and Ganga valley.

**Innovations and choices:** Newer ideas and innovations propel us to do better if not perceived as unsafe, unjust or uncaring in different time and social frames. Interactions, alliances, and institutions necessitated by new inputs defy permanence. In there lie deeper concerns and wider implications. Whether continuous or abrupt, the intellectual, conceptual, and technological expectations are emotive. Against the backdrop of the longer term trend such changes often make the systems unpredictable (fractal, chaotic, fuzzy). Erratic, chaotic and periodic (cycles) behaviors follow from new inputs. Whether by growth or adaptation, we learn to deal with such uncertainties.

Material success unleashed by physical and medical sciences has made desires virtually synonymous with choices in the marketplace. It never goes according to the script as Vladimir noted in *Waiting for Godot*: *Things have changed here since yesterday*. Forces that caused the great upheavals (such as Industrial revolution) over the historical times are now being exported over a very short duration to the unsuspecting and the unprepared.

If *more is different* is the panacea of change, *buying is being* is the paradox of choices offered in the market place. Exploitation of resources is based on the strategies developed in the niche environments. For those who are adversely affected the change is inherently unfair, one-sided, and beyond the traditional checks and balances. If we instinctively react in the culture of better hunting, can we change the rate at which we change and adapt?

## IV-22 Flowers in the Garden of Eden?

The flowers are easy to paint; The leaves difficult.
- A Haiku

Denying the flower nips the promise of fruit and leaves. Humans have an almost universal admiration of blossoms and blooms. Relationship between man and nature can be compared to relationship of flowers and fruit with leaves. Deserts of Middle East bloom for months. Ancient Egyptians used flowers and fruit for a variety of rituals. Yet the Biblical tribes purged such pagan practices.

Flowers and fruits have evolved rather recently on the evolutionary time scale - about 200 million years ago. In the innovation of trading nutrition for transport of genetic material, flowers have evolved to communicate with their own kind through other species. It has created more interdependence and room for more variability by appealing to sensory gratification and much more. Such emotive elements are the bases of the symbiotic relationships of flowers, bees, and birds. All benefit from the relationship evolved to carry out pollination - a critical step in the perpetuation of the all.

It is no surprise that plants use multiple signals to communicate. At right time of year a patch in bloom buzzes with social activities as insects amicably fly, flit, flirt, dart, and visit in search of nourishment as they are going about their business of collecting food and preparing for fruits and healthier plants. Insects are lured by odor. Sexual mimicry is accentuated with colors spread over a wide range of the spectrum that extends well

into the ultraviolet and infrared regions not visible to human. The form, shapes and patterns of flowers, and size of blooms, facilitate transfer of the genetic material to insects. Architecture of bloom avoids self-pollination. Whether or not there is any sexual gratification for the insects, their interaction with flowers often gives them food in return for taking pollen to distant blooms. One botanist has compared insects to *flying penises*.

Appreciation of flowers encourages reflection of potential consequences. Evolutionary rationale for a predisposition of foragers for liking, recognizing and distinguishing blooms lies in the fact that flowers represent promise of fruit in the future. The knowledge provides an immediate competitive advantage for getting food in the future. Beauty is advertisement of good health that comes with genes for resistance to parasite and a lack of stress. Time to reflect on beauty also indicates leisure time away from the struggles of immediate existence. Predilection for the appreciation of bloom also leads to the realization of their more distant significance that a flower matures into a fruit only when conditions are ripe.

As flowers brighten the space while soothing the glum mood, they invite observation, gaze, and contemplation of the meaning of the relationship with the environments past and present. Possibly as analogs to play acts they titillate human senses to astonish and evoke desires and dreams. Just as jasmine evokes the sense of thousand-and-one nights, chrysanthemums and cherry blossom have become symbols of aesthetics. While evoking passion, love for flowers always entail a sense of fleeting moment, mortality, with a sense of purpose. As turned into a game by hobbyists and businesses, forests are plundered and decimated for rare orchids and other forms of genetic materials perfected by nature for certain attributes.

Cultures have plunged into mania for that perfect tulip. Tulip has been elevated as *a thing of beauty* by human intervention. Its origins lie in oases of Middle East where its modern journey began about 500 years ago with a search for desirable attributes. The name is corruption for the word turban in Turkish. Virtue of tulip is in its perceived beauty - without scent or a medicinal or food value. Its only recorded use is that bulbs were used as food during famine. For the seventeenth century Europeans, made newly-rich from the Colonial trade, the criteria for beauty included brighter colors, more perfect symmetry, and the length of the stem.

Tulips are not as amenable to propagation by seeds aided by insects. Therefore the criteria and technologies have become the bases for artificial selection of bulbs by humans. Practices developed during the search for desirable tulip over the last four centuries are precursor to genetic selection and engineering. As a precursor to globalization, this includes hollow promises, as well as the theft and cunning to establish claims. In both cases one learns from and selects from a library of natural mutations for adaptations to niches created by human desire for whatever reason. Rarity also inculcates a sense of unachievable beauty - that may well be beyond the insect sense of ideality.

This upheaval of capitalism created a *bubble*. In *tulipomania* of 16$^{th}$ and 17$^{th}$ centuries many Europeans and at least one Turkish Sultan lost everything they had - all for the show. Some have called it the atonement of the Calvinist Dutch in terms of Ponzi schemes of greater fool theory. In accord with *easy come easy go*, it is understandable that the Dutch traders, returning with the loot from the colonies, were gripped by the dream of putting some color in their monotonous and inhospitable landscape which they had controlled through human efforts - that is by making canals

and dikes, and by erecting windmills. Possibly the sense of place and light, so celebrated by Dutch painters, also emerged from such an interaction of the culture with spalshes of colors and the perspective literally enhanced with lenses and mirrors. After all, as an art form tulips do represent near perfection of contrast, pattern and variation.

With all its intrigues and cunnings to put some color in drab lives, the search went on for that perfect tulip – a black tulip. If it was achieved, it has never been seen again after its only appearance in the eighteenth century. The search has led to an appreciation of the genetic traits and the selection and development of the technology of controlled propagation of desired traits. As we understand now, the color of tulip comes from a base color - shades of yellow, overlaid with a darker anthocyanin pigment. A virus partially and irregularly suppresses the pigment. Thus depending on the degree of infection in broken-tulips the darker color appears in patches. Element of environmental variability in the whole search is introduced by the fact that the virus is spread from tulip to tulip by the peach-potato aphid.

**Migration of Stunted-Wheat**

The story of transfer of certain genes in developing a stunted variety of wheat is an interesting example of transfer of genetic material (germ-plasm). The parent strain of Norin 10 was the winter hardy variety called Turkey Red brought to US by the Mennonites who visited Ukraine in 1874 at the invitation of the Russian Czar. This strain was taken from Lancaster, Pennsylvania to Japan in 1892. The Japanese farmers perfected a dwarf strain Norin 10 by crossing Turkey Red with a local variety Daruma - *no leg* - because it does not tumble down. On its return as a part of

the World War II loot, short-straw Norin 10 covered 60% of the wheat acreage in US in 1984. Norman Borlaug recognized the desirability of short-straw wheat: Short-straw plant uses less nutrients for the formation of straw and are less likely to roll over under physical stress. Several stunted varieties of wheat were perfected through the 100,000 tons of seed stock shipped during the 1960s by Borlaug to India, Pakistan and Turkey. These genes are now part of the nearly 75% of the wheat crop throughout the world.

*This and several other articles later are inspired in parts by Botany of Desires by Pollan.*

## IV-23 Unintended Consequences

Humans arrived less than a million years ago compared to the evolution of the earliest single cell life-forms about 3500 million years ago. Fossil records show that complex species tend to disappear after one to ten million years. Even if humans evolve much slower than most other organisms, one may wonder if the epigenetic technological changes could change the pace of evolution and human behavior pattern.

Human interference with breeding in selection and co-evolution is but one reflection on our ability to make far flung choices. Just as bees coevolved with flowers, human liking for flowers may be a predisposition for potential foraging of the fruit that are likely to follow. With such tendencies the first technological revolution of post ice-age, about 8000 years ago, brought agriculture and domestication of animals. In this coevolution humans have selected certain grains, flowers, fruits and nuts are the expense of others. Dogs and other pets continue to coevolve to provide for the human need for emotions and desires. In search for drugs selected strains of laboratory mouse and rat have come to represent the laboratory norm. Options offered by nature, coupled with vicissitudes of economy and political whims, have unintended consequences. Certainly civilization has not become rationality.

**Plagues**. Living with animals means being exposed to their diseases. Humans adapt to disease-causing bacteria by developing resistance. Such human carriers of diseases have

brought misfortune and annihilation to the unsuspecting and innocents. Epidemics of black plague, that has periodically destroyed large populations, appeared with the emergence of the organized human societies. Egyptians noted that the presence of snakes in the human surroundings offered protection. Romans carried snakes to the colonized parts of Europe. Their gratitude to snake is still celebrated in the Emblem of American Medical Association: two intertwined snakes in eternal bliss! No useful connection was made between snakes and the cause of Plague. A Papal bulletin attributed plague to the *wrath of God*. The Medical Faculty of University of Paris attributed the contagion of Black Death to *poisonous air spread by a conjunction of the planets*. Popular rumors in the Christian world attributed the problem to Jews, and acted accordingly.

It took another 500 years to develop a clear understanding of how the contagion is spread in humans through bites of rat-fleas. Such an understanding based on the life-cycle of the flea provided a basis not only for the ancient observations but also deeper insights into ways to prevent plague in a reliable way. Episodes of plague are intricately related to the ups and down in the rat populations that coexist with humans in homes and fields. Extensive convulsions and dislocations in the 14th Century Europe were wrought upon by wars of Crusaders, feudal republics, Papal States, knights and other mercenaries banded as Free Companies (possible models for French, Dutch and British Colonies). As environment hospitable to rats was created, both the soldiers and the plague contagion spread in search of new victims. Now it appears that the descendents of the survivors of the black plague carry a gene that also offers protection against the HIV and AIDS.

**Practices developed by animals**

* Cats go into ecstasy by nipping catnip (*Nepeta cataria*): A pheromone found in cat urine, Nepetalactone, is also found in the plant.

* Tukamo Indians of Amazon say that bark of Yaje vines, also eaten by jaguar, give them *jaguar eyes*. The effect is attributed to a hallucinogen found in the bark.

* Bighorn sheep grind their teeth on ledge rocks, presumably to scrape off hallucinogenic lichens.

* By middle of 9th century Abyssinian herders of Kaldi noted that goats became frisky after eating certain red berries. These are now cultivated as the coffee beans.

* Peruvian Indians noted that puma restore themselves to health after eating bark of cinchona tree. The active principle, quinine, has strong anti-malarial action.

* People of India noted that pigeons look spaced out after eating cannabis seed - a source of marijuana and hashish.

* Dogs eat certain grasses when infected with worms.

* Chimpanzees eat and rub certain tree barks when indisposed.

* The story of tea is not known but the first Handbook of Tea in China appeared in 779 CE. Tea seeds were stolen and smuggled out of Wyui mountains of China in 1840s for planting in India by Robert Fortune, an officer of the British East India Company.

**Famine**. The work force for the industrial revolution in Europe was fed on potatoes. Potato was introduced to Ireland through a shipwreck in 1588. The cargo found a perfectly hospitable environment. The soil and climate were well suited. At that time virtually all the arable land where wheat grew was under the British occupation. Since potatoes could be left underground, landlords and marauding armies could not confiscate the crop. It

needed little processing between field and the plate. Served with some milk potato formed a ready source of nutritious meal.

Plenty of potato had its curse. As the family size grew, increased work force lowered the prevailing wages in Ireland. Potato farming also shifted the economic gravity from south of Europe where wheat grew to the cooler north better suited for potato farming. Not only fewer people are needed to raise the same amount of calories in potato, but virtually no labor is need to store and process potato. Bounty of potato in Ireland also sowed seeds of the dislocation and famine that was to follow. The havoc came when this single variety of potato in Ireland was destroyed in a couple of years by a strain specific rot.

**Scourge of Scurvy.** James Lancaster, a British ship captain, noted around 1600 that sailors given lemon juice do not develop sore of scurvy. Since he lacked medical credentials his observations were not accepted. Around 1750 Naval Surgeon James Lind carried out the trials with lemon juice and confirmed the earlier results. These experiments are credited to be the first clinical trials in medical history. As a result citrus as the dietary supplement were adopted by British Navy around 1800 and by merchant marine in 1865. Imagine the number of sailors who needlessly suffered the scrooge of scurvy during the intervening years. Also consider the consequences if we had waited to identify the active principle, ascorbic acid or vitamin C, which was not identified until 1930s.

**Past-imperfect knowledge**. Humans as a whole do well unless hijacked by humbug and unreal. Without the understanding of the detailed science, plague, smallpox and scurvy were largely eliminated by reasoning with the facts of reality. Diseases that have been sequestered to only certain geographical regions and populations include cholera, tuberculosis, malaria, and Chaga's disease. It is a mixed blessing that for the first time in human

history more people overindulge than starve. Only pockets of hunger remain and malnutrition is on increase. The world-wide number of pot-bellied children suffering from nutritional deficiencies is now far smaller than that of the overweight adolescents that can not effortlessly carry out their daily activities. Obesity and related disorders are wide spread: Over 30% in some affluent populations, and many more in the populations that were not genetically well adopted for overindulgence. As we achieve stable food supply we find it is not necessary to carry around that extra weight. Yet the genes with memories of the leaner times still guide us towards overindulgence.

Ostensibly innovations spread by imitation, education and marketing to promote the new and critique the old without throwing the baby with the wash-water. The successes and the understanding behind such efforts have made us more aware of the necessity of doing something about things that can be done.

In the early stages knowledge can be diverse, incoherent, and even apparently contradictory. Making predictions that turnout to be true is part of the process that moves empirical generalizations towards laws of nature and theories. Such unified knowledge in turn relates to the underlying structure and behavior of at least a part of the universe. This is how we use past to peer into the future. Public perception of science has inspired the vision where prediction is central to decision making.

Around 1790 Laplace imagined: *Consider an intellect, which at any given moment knew all the forces that animate nature and the mutual positions of the beings that comprise it. If this intellect were vast enough to submit its data to analysis, it could condense into a single formula the movement of the greatest bodies of the universe and that of the lightest atom. For such an intellect nothing could be uncertain, and*

*the future just like the past would be present before its eyes.* This is the Laplace's demon.

It is a physical impossibility because a real entity can not know the complete state of the world at any given time. Even for a perfectly deterministic system, uncertainty in the variables precludes prediction of the future states of the world with any degree of certainty. The flip side of the dialectic is also unacceptable. Imagine the inaction that follows from *god wishes so* or *god moves in mysterious ways.*

Whether either ends of the dialectic are true or false makes no difference to the world. What matter is what it does? By the same token one could memorize all the accumulated knowledge without ever learning anything how a problem can be solved, or internalizing the lessons from the failures. The impact of a change lies in its consequences. Consider a relatively innocuous fact: The volume of steam is much larger than the volume of water it came from. Use of this fact unleashed the industrial revolution with disruptive social and political consequences. It continues to improve the quality of life of many if not most people alive now. Similarly, developments in the understanding of the nature of the atomic structure and the chemical bond ultimately gave us plastics, antibiotics, insecticides, and the computers. We continue to find use for them, and at the same time asymmetric concentration of wealth (power?) is also encouraged.

The power wielded by the products of science and technology has come to represent greater good and also the means of harm (grab and greed). We are learning to live with both. Considering the inevitability of the technological progress and its effect on the rest of society, checks and balances are necessary at all levels. Can only the market-forces deliver the ultimate good?

## IV-24 Bumbling Tool-Maker

Machiavelli's world is not about trial and error: It is a kind of empirical skepticism emanating from the observation that we live in an imperfect world. Appeal of apparently random behaviors of *going against method and principle* is to take out the element of predictability for the enemy. Such assaults and ways to deal with it are part of animal behaviors.

Tools mimic natural devices and behaviors that extend or substitute for the motions and sources of power. Humans have learnt to mimic animals, and use them as tools. Also animals get used to the human way of doing and looking at things. Not only all animals want to survive and thrive, they also seek pleasure (gratification) at significant expenditure of their energy and resources.

Human behavior is many things to many people. Behaviors have evolved to avoid harm and conserve bodily resources. Posturing with aggression reduces chances of violent fights. Empathy follows from pain. Rhesus monkeys know pain of others of their own kind, and stop hurting them after they recognize it to be the case. Some anglers are disturbed after finding out that fish feel pain when hooked.

Relative to post-ice age history, human behaviors have come to represent us as: The bumbling toolmaker who has depersonalized war; the glorified chimp who is in a constant power struggle; the babbling ape who has substituted gossip for grooming; and the loss of estrus has emerged as cryptic copulation as genes and environments create the follies of mind.

In the same vein (Natalie Angier): "*We are old-fashioned monkeys and futuristic apes. We are sympathetic, canny, crude, and dazzling. We are profoundly aggressive, and we have many loci of control over that aggression. We feel our way to the narthex of love and think our way down its nave. We are like nothing else that has even appeared on this threshing blue planet, and we will become, in the next few centuries, like nothing we can fathom now. And we will do it wearing our same old Stone Age genes*."

The purpose of dialectic about human behaviors and natures is to examine the consequences of the emerging insight that we cannot remain untouched from the influences of vast epigenetic world. No one anymore argues that the agricultural and industrial revolutions, or even the perspectives of the Dutch paintings enhanced by mirror and lenses, were the result of a sudden evolutionary restructuring of our brains. The Tao of Genes is not going to make us any wiser in our social choices than the Tao of Physics did against the means of mass annihilation.

Possibly more than anything else, individual and social behaviors are constantly manipulated with subtle and not so subtle influences. Unfortunately, some seek to educate and raise consciousness guided by ad hoc rationality and bring out the evil. Invented dogmas, beliefs, and wars are meant to empower and exercise control. With increasing pace of change, it is imminent that we have to find ways to coexist sooner rather than later. Desires and choices call for examination of what constitutes progress, development, growth, pleasure, and meaning. How such behaviors relate to human interactions and what it foretells about the future? Can technology be surrogate for human natures?

## IV-25 Evolution by Trials

.. dinosaur bones were just buried in the ground by God to test our faith.

-A biology teacher in a Christian school in USA

Ingenuity of survival by evolution comes from more than three billion years of trial and error. Evolutionary success is about learning by trial and error, and less about inventing a solution - let alone an explanation. Even those who arrived new to the scene found a repertoire of genes on which they could base new strategies. The evolutionary survival game is about living within the physical limits by following the chemical rules and metabolic constraints. It happens without any grand plan or knowledge of the analytical or molecular basis that goes into solving problems.

Success follows from feedback - that is changing behaviors early enough from modest failures or successes. As we learn from the evolutionary successes, one thing is clear: No single strategy works to the advantage of all. Yet we can read certain generalizations into the patterns of behaviors. After all at a very basic level the survival need of organisms are not too different. As the bearers of such traits become the evolutionary successes, their genes allow for the feedback with suitable behaviors when needed. Abilities to camouflage ward off the intruders and attract mates under a variety of conditions give understandable evolutionary advantages to the bearers of such traits.

Genes of the successful ones are to be found in the surviving mutations that also control the epigenic development through nurture. Those who could not deal with such issues are

lost into the oblivion of the evolutionary failures. Beyond this not only the individuals but also the species disappear by forces beyond their own control. What is the tolerance: How wide is the range of conditions that could have led to us? Or would carry us forward?

**Ant garden.** Workings of gardens tended by leaf-cutter ants for fungi-culture provide insight into sustainable agriculture practices. Ant fungi-culture is labor-intensive organized group effort on renewable materials carried to dark spaces underground or under the bark of dead trees. They cultivate and transplant multiple species of selected fungi. They practice crop rotation without use of external fertilizers. The practices do not compete with trees that provide fresh leaves for fungi-culture. Not only the colonies share germ-plast with others, but also beg, borrow and steal crops of other colonies in the case of crop failures. In addition, the ants have developed successful strategies to ward off *Escovopsis* mould by strategically applying *Streptomyces* bacteria that secrete antibiotic. Occasional mould infected parts of the crop are chopped off and hauled out of the colony.

The long term success of fungi-culture comes from the fact that the symbiotic practice is beneficial to ants, plants and fungi. Contrast this to agriculture by present day humans. Fungi-culture by certain species of ants are about 50 million year old, compared to the beginnings of human agriculture less than 10,000 years ago. More than 90% of the cultivated land and virtually 100% of the polluting agrochemicals ever used have come into use during the 100 years. In the process humans have destroyed thousands of potentially useful strains and species of organisms.

**The Hundreth Monkey.** A book of this title developed an anecdote to a parable. A monkey on a Japanese Island learnt to wash its sweet potatoes. Initially practice spread to other

monkeys on the same island, and then to the monkey populations in the neighboring islands. Did all the monkeys discover the practice around the same time, or the practice diffused mysteriously, or was it just a transformation by learning the advantages of washing potatoes, or something else? The factual basis for the practice seems to stem from a study on monkey behavior. Apparently, one monkey found out (by chance? Or by watching a scientist do it) the advantage of washing potatoes left out on the ground. Others apparently repeated the practice. As the children mimicked (learnt from) mothers, the innovation spread with the diffusion of populations.

Apparently this story is not true, but it has all the elements about what we would like to believe. Some decisions fall in place easily and some solutions follow naturally by trial and error. Humans learn through mimicry, initially from parents and then from peers. Such enterprises related to survival seem to come easily and naturally because during the development we learn to deal with such issues.

**Choices built on feedback.** The view from the world of inherited genes is cold and calculating. Biodiversity emerged from a universal genetic code and possibly diverged from a single starting point. We have come to accept certain results. All the genetic information about human organism is in 30,000 or so genes that form <10% of the human geneome. We share more than 97% of these with monkeys who can hardly talk, and about 50% are in common with a banana that cannot walk. Insects and birds are somewhere in between.

Biological survival is not just the survival of the individual. It is about perpetuating the species. Mutations make it possible by providing selective advantage through trial and error. Evolution from simpler to more complex occurs without major

redesign. Such evolutionary changes are necessary to increase the fidelity, control, and coordination of the functions distributed over the different parts and the environment of a more complex organism. Rather simpler changes in the instructions for control and regulation can lead to significant improvement. These are implemented with rather minor additions or changes in the existing instructions set.

Evolutionary change is not gradual but proceeds by fits and starts. As the evolutionary experience tends towards overall zero-error rate, natural decisions are made by trials, and some correct non-lethal errors. Such considerations are built not only into morphology, plurality, redundancy and niches, and possibly in the choices and preferences that guide organisms towards ensuring success of their genes. Other ideas about fitness, commonly interpreted as beauty and health are cultural artifacts.

Evolutionary success has come without guidance from the knowledge of the processes that go into it. Making babies comes easily and reproductive methods have evolved to explore alternatives within the boundaries of the species. With a desire for a different, and possibly better, genetic starting point most animals search for mate beyond the family or tribal boundaries. Without any analysis or proof most human and animal societies have learnt to avoid in-breeding. It is the sure way to repeat the same mistakes. One thing that can be said about cloning in the post-genomic world: Incestuous choices are inherent in the designer genes.

From the glimpses into the intellectual endeavors and achievements of the last several millennia a broad range of knowledge-related activities touch on issues of the *I am that exists in relation to the rest*. The range of human behaviors is determined by epigenic variables. From the evolutionary and historical

continuity follows the philosophical premise that the knowledge of the inquiring self lies in the genetic reality of the physical self in the broader epigenic context. Criteria for the viable methods and searches lie in the sustainability of the results and products ranging from the languages to technologies. Although not necessarily genetic in their origin, such epigenic traces of human activities have orthogonal influences on human behaviors.

Epigenic world is also about learning from the choices and feedback. We still work with the set of the same stone-age genes that the humans had about 10,000 years ago. There is advantage to behaviors that change much faster than the genes. Often we shape our worlds through choices made haphazardly. Their outcome is learnt empirically through trial and error. The cost of such practices is lost in the evolutionary oblivion.

Considering the interdependence of the life-forms, the very biological instinct of survival can not prevail without survival of most if not all. The on-going revolution in biology is now an integral part of human tinkering. Its influence on our collective behavior and practices is a necessary part of social discourse. Individuals, as well as the society at large, will continue to examine and elaborate the implications to reconcile the changes until they are ingrained in the collective conscience as the epigenic behavioral trace. By emphasizing a need for consilience of a broad range of human activities, one hopes that we learn to live with new knowledge and antecedent technologies.

## IV-26 Interdependence for Independence

For an individual purpose lies in opportunities offered by the chance to further the purpose of the group that can not rely on chance.

We are not alone, and we have we achieved utopia. Even the most techno-optimist among us yearns for simpler times. Most people also appreciate the futility of such a romantic desire because very few would like to go back to the conditions of even hundred years ago. A more realistic question is: Can we achieve an egalitarian balance for sustainability in a garden of our own creation? It calls for looking into the way we make and avail choices as individuals and as groups. How do we address problems built into the human natures? Are these ingrained in the self-image?

We need a strategy for defining the problem in a solvable way. The challenge of integration of new insights and technological changes makes us ponder basic precepts and reconsider prior assumptions. The underlying process is probably a primordial search motivated by the perception of interdependence, if not oneness, with the biological diversity to guide us beyond predatory individualism. It is an understanding of the continuity that brings us together in our enterprises and survival interests. It is like the *imaginings that reflect everything else in the self, and the self in everything else*.

Much of what distinguishes humans is of epigenic origins. Having established the physical basis of biology in genes, it is fair to ask how epigenic variables determine the apparently chaotic

diversity. Human genes have hardly changed in the last 10,000 years. Even if we want to go the way of designer genes to move beyond the evolutionary trial and error, do we know what we want even as an individual? We do not yet know how even the simplest behaviors are controlled by the gene products. We are beginning to discern when the genes go wrong, and soon we may be able to fix such mishaps.

**Killer primate?** Most animals and many human cultures have sustained and flourished with their concern for life rather than preoccupation with death. If *man styles himself in the image of his gods*, with such socially acceptable role models it is easy to see how some cultures have adopted judgmental, exploitative and vindictive codes of conduct.

In the aftermath of violence of 20th century humans often see themselves in the image of "killer primate." Such aggressors who believe that *they know better* have shaped most of the human political history. Aggression and impulsive actions that lead to conflicts are integral and necessary part of nature. Whether or not we are born with such tendencies, many social interactions encourage if not celebrate it.

On the other hand, reconciliation and peace-making are also integral part of primate behaviors. We may not necessarily be born to be good. We learn through dealings that it pays to be good, cooperative and conciliatory. It may avoid conflict if exercised before a conflict, and avoids future conflicts if exercised after a conflict. Desire to avoid potential conflicts is also the basis for altruism. However what is unnatural is to use of violence to resolve conflict. Such unnatural behaviors are encouraged through beliefs and technologies. Virtually all the recent studies seem to redeem the other primates, whereas humans in the image of omniscient try to find redemption through violence.

Not a single organism can be described satisfactorily as a protein computer. The system poses a challenge for analytical methods of interpretation. The number of possible variables is too large for a meaningful description by the methods that have been so successful in the physical sciences. Simply put, there are far too many epigenic states spread over a population of individuals. For such group behaviors we lack sufficient criteria to identify and distinguish the meaningful differences that support diverse and chaotic states. Although some events and functions can be described, our ability to provide insights and predict future outcomes of diverse groups is far from satisfactory.

Analytical approaches necessarily build objectives into the starting assumptions. Grand successes of the analytical worldview championed by physics have established the physical limits of reality as the boundary condition for viable thought. It has come with the conviction that all reality can be sensed, perceived, and interpreted ultimately in energetic terms related to the structure and motion of atoms and molecules. As the search for Truth has gone to the way-side, these empirical insights have fundamentally become the dogmatic and axiomatic view of reality. There is nothing obviously wrong with it. But in a perverse way, the value of the analytic world-view is that it is value free. It calls for glue for synthesis from the parts.

**Interdependence for independence**. Can rational insights be obtained within the paradigm of biological diversity with which we share common goals? At a very basic level, evolutionary and survival paradigms connect us through our interdependences. Although the hierarchy and connectivity is based on chemical and molecular processes, the higher level of hierarchy emerges into web of social, political and economic relations. Sustainability of an individual as well as the class follows from the sum total of the

interplay of the internal abilities, genetic attributes, environment, and the forces of the external world. It relates survival needs to the ability to retain one's identity as an entity as well as the group.

According to an ancient tradition the range of necessary and sufficient criteria and conditions for dependence and interdependence for humans is covered by six attributes: food, body, sense organs, awareness of the environment (shelter), language (communication), and sensibility to put it all together into making suitable choices for existence (decision-making). In the Euro-centric context such ideas have been celebrated piece-meal as freedom from want and freedom of choice - misplaced in the context of notions of competition and individualism. Justification for the necessary and sufficient conditions for interdependence is intrinsic in questions such as: When do goals become rights? What do we get from others and what do we give in return?

Independence and interdependence are intertwined for sustainable existence. Beyond the direct survival needs lies the attribute of language that calls for the independence for communication to share, process, and transfer experience. It is a critical requirement for the evolution, survival, development and perpetuation of viable societies. It is not a mere coincidence that virtually all movements towards independence of nations start by reverting to the language of the common people. Modern biology is beginning to realize the importance of language communication among the birds, insects, and mammals. Survival value of communication through chemical senses of bees, ants and other insects is also beginning to be appreciated, as well as our interdependence on such life forms.

Consequence evaluation is integral part of sustainable independence. Random acts do not add up to anything in

particular. Ability to nurture sensibility and *to put it all together* enhances chances of survival. Epigenic behaviors build on the short term feedback between thought, experience, words, and actions. Actions with a defined trajectory cohere into desirable outcome that create value and opportunity.

**Consilience or just reasoning?** Crux of reasoning through altogether different but all-inclusive means is called consilience. It is the propensity for seeking validation. Through such inquiry one endeavors to find naturally hierarchical structures behind observations and criteria. It is also a way to rationalize the world-view connoted by the words to describe the worlds that we are trying to understand yet lie beyond our grasps. Inquiry begins with representation (describe, examine and rationalize) to find structure behind observations. *How will you look for it if you do not know at all what it is?* Numerous solutions have been offered to the various incarnations of this *how do you know* question. In scope they range from *anything goes* to the game theory and Turing computational procedures. None are entirely satisfactory.

Distinguishing between distinct inferences and probable premises forms the basis for establishing knowledge and its utility. In the end, the relationship between facts and syllogistic reasons for a hypothesis may be a matter of philosophical debate about a system at equilibrium. In search of a strategy for viable behavior for sustainability we have to think about situations that are not at equilibrium and about which we cannot even intuit. Dealing with the evolutionary steady-state dictates prudence of a relationship with feedback. *We may be able to design a perfect human being long before we know what those traits for perfection are.* It is insightful.

## IV-27 Is There a Bio-Logic?

All myths use the human model of teaching and creating, yet their answers are ultimately sterile and self-referential. After suffering consequences of such tinkering, in the end we settle for a second chance. Curiously, asking limited questions turns out to provide more, and more general but factual answers to fix the limits of what is considered possible.

If politics is the art of what is attainable tomorrow, logic of survival is about the long haul. The collective experience of organisms offers lessons in dealing with the extant reality. To guide the deliberate course of human actions, the appeal of rationality of biological evolution comes from the realization that such processes are grounded in the reality of practice and nothing else. Existence of an organism *as it is* is highly contingent: Many historical events could have wiped it out and many of the branches that lead to us could have become extinct. Lessons from the evolutionary selection are forward-looking. Variation on a theme of the past successes is explored for optimizing the future, although a desired future is not guaranteed. In its appeal to the nature of *what it is* it tends towards *what it can be* in relation to the rest of the universe.

Diversity means each has validity. Beyond seeing another day, the purpose of an individual organism is in sustainable survival of the specie it represents. The potential of an individual may be somewhat unique, but one would not know unless it is expressed. What works is true enough. Beyond this regrets are minimized, and dead-ends are to be avoided. Selection is for something right - not for complete validity. Its value is in

serviceability, not the ultimate or strictly-so kind. In search of instrumental and serviceable, biological survival is shaped by deterministic laws contingent on the unpredictable circumstances.

Biological behaviors are grounded in the reality of the individuals and species, as well as all the resources they depend on. On our planet it has been at work for well over 3 billion years during which organisms come and gone. The snapshot of the present says little about why many perished on the way. Also individual functions that assure genetic viability of the species in the niche environment have little to do with the overall fitness of the individuals judged by other external criteria.

The collective experience of evolution offers lessons in dealing with reality in niches. Certain strategies have worked often enough for charting a course of action for survival, continuance, and sustainability. Individual with traits critical for survival in a niche environment flourish. Those with preexisting functions adapt. Members of species with suitable genetic makeup, and the ability to change behaviors, manage to survive. Often with minor evolutionary changes preexisting functions adapt or remove an organism as un-fit. The functional changes emerge randomly in individuals of a species over a period of time, the population genetics takes care of the rest. In the end, the snapshot of the current state of a species reflects a chaotic mix of the changes that has thus far led to the reproductive success for survival in the niche environment. In effect, evolutionary success is a measure of *fitness* to past reproductive success.

**Evolutionary hypothesis building.** In our hurry to arrive at a hypothesis with a reductionist mind set we pick and choose facts that fit our rationalizations. Motives, biases and rationalizations can hardly be peeled away from such actions. A fact may be correct, but for a valid hypothesis one must explore all the

relevant facts - direct, consequent, implicit, and possibly of other kinds. A fact may be true but for a valid hypothesis one must consider all the relevant facts - direct and consequent. Can the lesson from the experience intrinsic in biological evolution be used to reshape our goals? Or to choose methods for dealing with biosphere and to carry out the chores of living for some time to come? Can the lessons from the suspected disasters of biological evolution be used to reshape our goals and methods?

The pace of change is at issue. Flight in the face of danger is part of cunning and intelligence. Rapid movement also relates to an appropriate level of opportunity. At the level of human organism, the rationale for the graded processing of sensory information in stages probably lies in the use of processed output for deliberate and instinctive responses. Clearly, it is inefficient, if not impossible, to process all the current information for the choice mechanism. High information density in the sensory inputs does not permit prepositional processing or presentation. The underlying process must involve some sort of vector and parallel processing with efficient tree pruning strategies.

Irrespective of the mechanism of the input processing, it is quite likely that the past experience stored in the neuronal network acts as a template to guide the instinctive actions and behaviors without significant processing of the new input in rapid formulation of the choices for the present. By bringing in the not-present factors into the processing a role is introduced for the choices.

# IV-28 Innovation Diffusion

Science thrives best in glass house, where everyone can look in. When the windows are blacked out, as in war, the weeds take over. When secrecy muffles criticism, charlatans and cranks flourish.

*- Max Perutz*

Tools and innovations build on information. Methods to learn from the study of natural phenomena, including the human behaviors, are widely used even by those who object to the value of the irrelevant technologies and mindless consumption. Consider the extent of impact of some of the simple innovations like sliced bread, home appliances, contraception, antibiotics, immunization and public hygiene. If one believes that the best of science is the triumph of reason, certainly it can not be construed to triumph over the reasonable. In its microcosm science may not be concerned with changing social, political and economic fashions, but such concerns about asymmetry and non-equilibrium in the information, innovation and resources are integral part of the enterprise. Science depends on social support, and such innovations diffuse in the public commons. How can methods of science guide a rational course for political decisions?

As an enduring lesson of History: Violent upheavals replace one form of tyrannies with others to serve those who pretend to know-all. Propelled by controlled information, minds regress to protect self-interests. Reactions follow if the philosophies are perceived to be recipe for tyranny, such as the philosophy of a predetermined path in the Plato's recipe for

authoritarian *rule of the wise few over the stupid multitude*. Plato eulogized the noble class, and relegated peasants and slaves as the *plaything of the god* or the tribal dictator. In trying to imagine perfect philosophical ruler his political thesis prepares the grounds for the conquest of feudalism: Whosoever comes in authority grabs the garb of the wise for controlling the flow of information and resources.

Innovations have to be accountable. All group efforts are information-seeking processes. Reliability of information is of crucial importance not only for the methodology of science, but also a valid social concern. Efficiency and pragmatism come later. Establishing reliability requires wading through levels of cognitive difficulties. Evaluation and elaboration of the available information in elaborate details is a necessary first step. Next come issues of limitations of the knowledge, controversial issues, and the unknowns. Consensus emerges if the qualified opinions converge or areas of disagreement are identified.

Information transforms the decision problem. Use of information for decision making depends on complex relations. Perfect information exists only as what worked. Considerations for relevant information include: Precision and scope; reliability of the source and utility; nature of the evidence; awareness of the problems that surface with practice; and cost of sufficient information. Being informed is about having a question answered. Misinformation can lead to regret. Ultimately decision and consequences of contemplated actions bear on prediction and the study of future behavior with goal relevant choices. In the game-theory sense this may be a regress of the type *he knows that I know he knows*.

Relevant information is knowledge. Natural laws emerge as hypothesis is guided through practice with feedback from the

users. The end and means arguments for ethical concerns are necessary part of the use of incomplete knowledge. Thus knowledge is always provisional.

Scientific reasoning is a kind of dialog between the possible and the actual, between what might be and what is in fact the case. Along these lines, it is said that information relative to a problem, whatever that means in the sum-total, leads to better decisions for future action. Unintended consequences from this arguably justifiable belief in one desire or the other include: population problem from improvement in the survival rate; over use of resources built into the criteria for economic progress; social instabilities rooted in duplicitous international policies.

Rarely can one wipe the slate clean and start over again. Little can be done to undo the past. Past actions often continue to bear consequences. There are many ways in which the past and present information impinges on the decision making process. Timely reform from the inside is all one can expect if we take lessons of history to our heart. Attitudes from inside and out determine the nature of future relationships. Therefore, consequences of tinkering complex systems, including the reforms, will always be uncertain. Starting from the best case scenario, pragmatism calls for gradual, non-violent, and non-coercive changes.

## IV-29 Greed and Grab

I have a rule for this situation too, which is absolute: You can not extrapolate any series in which human element intrudes. History, that is the human narrative, never follows and will always fool the scientific curve. I can not tell you what twists it will take, but I expect that like our ancestors, we too will muddle through.

*- Barbara Tuchman*

*Guns, Germs and Steel: The Fates of Human Societies* by Jared Diamond is a perceptive book (III-15) with broad implications. In a thought-provoking way, with a human touch and intuitive continuity, it discerns patterns of human and technological evolution since the end of the last Ice-Age. The premise of the book, "Why many are called, yet few are chosen," explores biological variables as the basis for the development of technologies. Important among the factors that shaped the evolution of complex human societies and their technological innovations were the environmental and biological constraints. Effects of broader patterns of interactions of different human groups, with each other and with plant and animal species resulting in domestication and depletions, are identified and judged.

Primarily, the book identifies the expansion trajectory of a group of Eurasians, whose descendants now dominate the consumption of virtually all non-renewable resources at an unsustainable rate. As with any important lesson from the past, the arguments in the book bear on broader contemporary issues. A more provocative and perhaps compelling case emerges if one

takes the liberty of extending to our present situation these patterns of behavior from the past. From this point of view, resource constraints and geopolitical borders that shape pressing problems of development and survival in the form of economic and market forces become almost invisible. When selectively used as guises for rationalizations, these forces lead to subjugation and *de facto* genocide.

Diamond points out that until about the beginning of the 16th century, people from areas north and west of the Alps contributed little technology of significance; they were mainly recipients of developments made in the regions bordered by Ethiopia, India, China, and the shores of the Caspian and Eastern Mediterranean sea. Examples of such basic technologies include domestication of plants and animals, coupled with the use of the plough and the wheel to harness animal power, permitting the transition from hunter to herder and from gatherer to farmer. About 6000 years ago people from these areas had developed the basics of urbanization, trade, social and administrative organizations, metallurgy, written language and mathematics. Unique factors contributing to this burst of innovation so soon after the end of the Ice Age included a fertile land mass with a climate favorable for agriculture, generous availability of a genetic stock of seeds and animals suitable for domestication, and human migratory patterns that promoted continuous development through exchange of materials, ideas and experiences. Not surprisingly, there are very few other instances of independent or parallel developments because such a confluence of factors was not to be found elsewhere at that time. As if to attest to the critically fundamental role such factors played in the initial surge of innovations, such a confluence did not come to northern Europe until about 500 years ago.

Innovations from the East, such as horses and carts, were brought to central and western Mediterranean shores by the Persian invaders. Phoenicians introduced ships to this region. Attracted by the riches and knowledge, and inspired to eliminate once and for all the threat of the Persian Empire to Greece, the army of Alexander swept through Central Asia to the borders of India. These events accelerated a westward transfer of technologies, funneled through Greece that transformed the hunters of Europe into organized seafaring societies during the last millennia. By the middle of the current millennium, transfer of the Arab libraries also resulted in the translation and re-interpretation of the compilations and libraries that fell into the hands of Jesuit monks and European universities. Without this interpretation, and grand synthesis of the events spanning the last four millennia, the achievements of the ancient Greek world, to which modern European civilization owes its roots, stand in isolation as a discontinuity.

It is intriguing that many of the technological innovations have been turned into means of exploitation. The Steel from South India was used by the Assyrians to make Damascus sword used by the top-brass. Romans armed their colonial armies of peasants with short swords. The black-powder technology from China was turned into guns and cannons. Technology of paper in combination with printing was first used to proselytize the masses.

To put it simply, innovations rarely thrive in isolation. As the simpler technologies beget more complex ones, useful technological innovations are cumulative synthesis from independent innovations. Collectively developed technologies

create value, and markets make the intellectual property available to the society at large. However, narrow and stifling profit-oriented innovations stifle incremental motivations from the parallel technologies and empirical observations from the public commons. Insights into development and transfer of technologies squarely demolish theories perpetuated in terms of the genetic, philosophical, or cultural notions of superiority of a sub-group. Although such arguments have never withstood critical scrutiny, self-serving sound-bites promoting mis-measures of man maintain and mobilize the structures for the subjugation and exploitation.

Unquestionably, human interventions that lead to large-scale technological innovation and implementation not only unleash forces of greed and grab, but also lead to biological catastrophes and environmental disasters. During the last 500 years, the Europeans, physically armed with "guns, germs and steel," and blessed with missionary zeal under the garbs of half-baked rationalizations, have moved far beyond their borders to occupy three other continents. Many more continue to be subjected to the market, political and cultural imperialism.

Colonial mind set very much part of globalization. It relies on the knowledge, labor and resources of others assimilated by market forces. The pattern of unprecedented exploitation continues as "progress" defined by aggression, control and subjugation. From this point of view, rationales for protracted geopolitical and economic policies are not fundamentally different from those that motivated "winning the American West" by destruction of the food-supply (buffalo herds) and infection of the native populations by sending them blankets pre-used by smallpox patients. In a short period the guns and germs of the U. S. Whites destroyed 95% of the native North American population

of over 20 million. They also eliminated the diversity and genetic viability of these human populations, as well as a large number of other species deemed necessary for progress at the time. Sinister methods, motives and point of view were perpetuated in the name of bringing civilization, religion, and culture to the barbarians.

In many cases, given the late transition from a hunter-gatherer society to one of farming and production, there has not been enough time to develop less violent means for conflict resolution. In this sense, the European grab for land and power by exploiting serendipitous accumulations of useful technologies at the right time is not unique in world history. Armed with divine blessings, Pharaohs, Mongols, Incas, and the like in their own ways also terrified large groups of people for the benefit of a few who over-consumed resources. Even in the 20th century, the colonial powers, Nazis, Soviets and Chinese with their own agendas have subjected large populations to plunder and murder. What are particularly threatening about this latest march of history that we are being swept along with are the unprecedented rate of dissipation of international non-renewable resources and the degradation of the global environment in order to maintain an unsustainable way of life. Ominously, without being even aware of the consequences, a growing percentage of the world population is being subjected to the onslaught of technologies controlled by the few. Of course, once the problem is recognized in earnest, the hope is that solutions will be found before it is too late.

Coming to an agreement and striking a balance is a collective task. Like evolution, although on a somewhat different time scale, democratic and market approaches maximize the potential of most individuals in a group by increasing the wealth

of a sub-group - defined as success.

Technologies help in fulfilling the promise of this premise by permitting more people to perform skilled tasks. For example, a considerable amount of skill is needed to use a bow and arrow. Guns, requiring far less skill, turn more people into effective hunters - and possibly indiscriminate killers. Like evolution, technological, market and democratic processes also lead to distortions and dead-ends. So a key question emerges: what ends are to be achieved by the powerful means at hand? Can individuals and smaller groups be protected from the meaner edge of such tools, methods and institutions, which are increasingly more powerful, distant and broader in scope?

Human-friendly technologies make up for lack of talent. Material progress promoted by technologies helps in controlling the drudgeries of life for most people. One may wonder what factors contributed toward the rapid development of technologies led by the Europeans during the last 500 years, and what we can learn from this experience. New energy sources and machines have opened new territories, improved productivity, and ostensibly freed a greater fraction of the population for innovations. The ideal of democracy extends the promise of such prosperity to "all." Yet a lack of political will promotes unsustainable consumption patterns for a chosen few. The failure of the self-regulatory aspects of the market forces is also obvious in the experience of the last 50 years with tobacco, asbestos, DDT, and the arms industry. Other time-bombs with global implications are ticking away in the form of excessive use of fossil fuel and antibiotics. While for-profit industries transfer social costs to the society-at-large, the environmental costs are being increasingly transferred far away from the consuming nations.

To promote consumption, mechanisms have evolved to

control marketing and distribution. The social and environmental costs of over-consumption are transferred across international boundaries without benefit of the checks that a functional democracy can implement internally. As a result, the reality of the damaging consequences of open international markets is virtually dissociated from concerns for the international community. With the realization of this fundamental contradiction, the forces of greed extract value by exploiting local in-equilibrium (niche), rather than by creating value in harmony with broader interests. Treatments prescribed by the international agencies for the economic ills are often formulated by banks and institutions with an indoctrinated faith in their own efficacy - that may be as misplaced as that attributed to the usefulness of blankets pre-used by smallpox patients. It is not surprising that the international cure-alls are not well received by the naives.

Rational ideals of democracy and markets can and do degenerate into schizophrenic world-views that are at dissonance with itself. The reasons for this are quite fundamental: democratic solutions within national boundaries cannot control international and global exploitation by the consumer markets. Even under the best of conditions markets privatize the profit and socialize the risks of an enterprise.

From this remarkable inquiry by Jared Diamond emerges a lesson, which, without blaming the victim, interprets long-term developmental events and patterns in terms of the biological, environmental, and resource variables. Many were "killed, infected or driven off" for the technological progress claimed by the few. As we sit back, it is reasonable to ask, can short-term market forces governed by instincts of grab and greed be trusted to promote the wide-spread use of technologies, especially the ones that impact all of us by promoting an unsustainable

consumption behavior? Or if time is here to more actively balance the interests of all? Obviously, an acceptable answer must have something to do with the well-being and survival in the broader biological context of live and thrive by letting others live and thrive.

## IV-30 Exploitation of the Commons

Find out cause of this effect.
Or rather, say the cause of this defect.
-Shakespeare in Hamlet

The heritage of public commons is about knowledge inherent in the traditional practices and products based on experience of centuries. Knowledge of the people who have lived sustainable existence is highly desirable because sustainable diversity and plurality is intrinsic in all viable traditional practices that balance the forces that shape existence if not survival. It is reality-based because it has evolved by the method of trial and error that thrives on anything goes within the bounds of reality. Diversity and stability of the common intellectual and physical resources at micro level of bio-habitat are now being increasingly exploited and sacrificed to sustain the macro level demands unleashed by globalized consumption pattern. People at the micro level rarely benefit from such one-way flow of resources and knowledge. They do not even benefit from the value created by the marketing of their products. The experience has raised issues about sustainability and indigenous rights in the context of international piracy and robbery.

**Unilateral Charter for International Exploitation.** Salient facts of modern means of global exploitation are intrinsic in the first move made by Portuguese in late 15th century. Based on the information from some Arab sea-farers, Vasco de Gamma arrived in Calicut (India) by taking a direct sea route from Malindi on the Central East coast of Africa. Within few months the king of

Calicut ordered Vasco de Gamma to leave the port when it was noted that unlike other traders who visited this international trading port Vasco de Gamma was dishonest in his dealings. A few years later another Portuguese returned to Calicut with a Royal Decree from his king that not only the Portuguese are not required to pay taxes for trading in Calicut but all other ships using the Indian Ocean are required to pay taxes to the king of Portugal. To reaffirm their intentions they destroyed dozen of ships in the area.

When British took over India, in recognition of the one-sided European Charters, they left the *possessions* of Portugal and France independent. Yet they never recognized the sovereignty of the local rulers. Even at the dawn of the new millennium, strategy of unilateral charter and preemptive actions remains the corner stone of the instruments of the Western foreign policies backed by destructive technologies.

**Forked tongue**: European practices have earned them the reputation of forked-tongue where ever they have come in contact with the traditional societies of Asia, Africa and the Americas. The culture that has evolved through collusion of Church and State emphasizes the second order pride where individual achievements are credited to the race, whereas their misdeeds are ignored as individual aberrations. They sermonize the world about virtues while hiding their own filth and depravation. Modern prophets of Human Rights hide their own inequities that require incarcerating 1% of their population. A permanent underclass is indoctrinated to find meaning trough war.

Traditional societies did not reinvent because they never assessed themselves by external measures, nor did they judge others by their own standards. There is nothing for them to lie about.

**Hunting, Poaching and Piracy in the Commons.** Virtually all cultures have tales to the effect: Whenever little man chances upon a big fortune, he finds only trouble. At issue is impact of asymmetrical practices on the life and resources. Term *tragedy of commons* was coined to polarize thinking behind mindless use of the resources on a small planet. The political wrath of Hardin's characterization of the problem was directed towards the under-developed countries where the problem of growth was exacerbated by population increase (Malthusian doom and gloom) in the short run due to an increase in the life-expectancy following introduction of immunization and antibiotics. The other shoe dropped as it became apparent that the real tragedy is from over consumption of resources and the pollution of the environment. The metaphor is common to the desire of a herder who wants to increase the size of his flock grazing on the public land, to the parents who see more children as the way out of poverty and perpetuate their genetic resource, and to the acts of governments that defend life style of their subjects, including the right to drive gas-guzzlers, by claiming and depleting the resources outside their sovereign national boundaries.

A critical boundary condition to the scope of the problem emerges with the recognition that the prevailing models of progress are based on quantitative growth: It is unsustainable because such practices by few exacerbate limitations of the physical resources. A more sustainable model of progress could be based on creation of value by qualitative change. In the current version of the global market place, the critical issue is inequitable flow of the resources (capital, raw materials and labor) and the products of the technological change. Economic development is rarely in accord with indigenous social and political changes necessary for innovation. As communities are subjected to

devices and methods beyond their comprehension, resulting conditions create new opportunity for wholesale corruption and unchecked exploitation beyond the control of the caretakers of the commons. In effect, centralized practices of the globalization model are fundamentally at odds with the innovation diffusion among and from the under- and un-represented classes of people.

For centuries traditional knowledge and practices have been available free for taking. Such societies were guided by the vision that *the use improves the knowledge*. It is certainly the case if the value that is created remains in the commons for sustainable improvements. However, during the last few centuries and now more than ever before, the goodwill is being exploited by those who have no legal, ethical, intellectual, social or economic obligation to the source communities. The bounty of mineral resources, music, and plant pharmaceuticals to timber, has been liberally taken away from the local cultures decimated by the forces of asymmetry.

Contrast the asymmetry of attitudes and behaviors of the copyright holders of software and music disks in which the work is based on lyrics and notes *borrowed* from other cultures. Motive to secure markets is the beginning of asymmetric practices inherent in patents, copyrights, trade secrets, and specialized deals and treaties for protections. In this tug, the term intellectual property has become a surrogate for protecting secrets of one party and to appropriate the property of the other as *unprotected* by alien set of standards and criteria. Its effect is same as those of the Colonial practice to outlaw traditional values and languages. It stifles ways of thinking and innovation.

Considering what has been done so far, the demand for local sovereignty and control over resources and cultural information appears tame. In the international arena, issues of the

control of resources and responsibility for the commons are still in the hunter-gatherer stage. Prospecting for the indigenous knowledge, practices, and germplast (seeds, cultivars, strains) constitute the basis for much of the modern agriculture, medicine and biotechnology. Many of the traditional musical instruments, arts media, stories, tunes and melodies have also found their way into the entertainment industry. Even the names of food products need protection. Should *the semi-synthetic velvety slime concoction of dozens of chemical additives for color, flavor and texture mixed with milk products* be allowed to sell as cheese? Such outright deception is not a legalistic distinction of category. The rich common heritage of generic names and processes is being robbed, exploited and corrupted in thousands of products marketed today.

Contributions of the common heritage were never compensated and their value was never recognized in any of the international treaties. On the other hand, the modern copyright and patent laws governing globalization condemn as *piracy* the use of the practices and products resulting from industrial espionage. It has been argued that diffusion of common heritage is difficult to trace or it was not considered necessary. In any case, such problems can now be addressed.

Public commons is fast becoming casualty of global homogenization. Recall that the potato-famine in Ireland was the result of agriculture built on a single genetic variety. Now chemically intensive farming of genetically engineered Russet potato uses *chemical sand*. Here the objective is that all McFrench Fries have to be of the same length with the fat-fried hue of California-blond. On the other hand, traditional agricultural methods suited for local environment are based on mixed-duration and resistance classes of crops. Agro-ecological coping strategies are built into farming practices. For example the use of

straight versus curve sickle changes the mix of the harvested seed: straight sickle selects certain strains of crop plants.

**Tragedy is in the loss of practice**. Local communities are not empowered for international sustainability. In biodiversity role of marginality and plurality is in transfer of risk. In situ conservation of crop genetic resources occurs through maintenance of traditional farming systems. At the same time, the farmers who nurture such crop genetic resources are economically and technologically isolated minorities. These groups are likely to be most marginalized by nation states, and more so by globalization. Consider the paradoxes and contradictions:

(a) Foundation and health of agriculture in industrial countries largely depend on their access to the rich crop genetic diversity found in Third-World countries. Yet the very same germplast resources most sought after for their potential application in biotechnology are constantly threatened by the spread of modern agriculture. In the area of seed-selection alone we do not know what we have lost in terms of hardiness, fecundity, survival, and yield potential.

(b) It is now generally appreciated that at the end of twentieth century more than 70% of the drugs in the market have their first generation relationship to the lead-chemicals obtained from the indigenous medical knowledge appropriated freely by Ethan botanists. Less than 0.001% (one penny out of $1000) of the profits from such drugs has ever gone to the indigenous people including who lead researchers to them.

(c) Inequities, if not the contradictions, are a part of a more fundamental paradox: Tendency to charter and incorporate - to make the other the same as the self - is strong even in the face of the possibility that such a transformation may contravene the long terms interests.

(d) Then there is paradox of perceptions: *Indigenous people have in effect been engaged in a massive program of foreign aid to the urban populations of the industrialized North. Genetic and cultural information has been produced and reproduced over the millennia by peasants and indigenous people. Yet the fruits of this work are given no value despite their recognized utility. On the other hand, when such information is processed and transformed in the developed nations, the realization of its value is enforced by legal and political mandates.*

(e) Even the do-gooders do not see contradiction in their opposition to cut-and-burn operations in Argentinean jungles and their own use of cheap dog-food from the cattle raised on these lands. Many of the problems of resource and environment degradation resulting from over consumption have now moved out of sight to the less vigilant countries in the private hands.

(f) People are quick to bad-mouth and attack growers of coca plants and poppies. Yet the same people and governments do little to curb the demand for cocaine and heroin in their own countries. Asymmetrical international trade practice is also part of trade in tobacco, liquor, insecticide, cigarette, and pornography. Other asymmetric practices include threats from genetically-engineered organisms in the biosphere, overuse of antibiotics, restrictions on the migration of labor and jobs without a control on the flow of capital and products. Pushing preconceived notions and potions in the guise of principles for reforms *to do good.* Should the asymmetric practices of encroachers and poachers not be outlawed - rather than supported as the foreign policy instruments.

(g) Not many nations are free to evaluate impact of smart money - let alone deal with the consequences of attached strings. Such alien influences and products breakdown the internal controls and cause social, economic and environmental dislocation. A serious

unexpected consequence of the disruptions is that the checks and balances of traditional practices and methods of innovation are passed on to or succumb to the forces that are not under local control.

**Homogenization on unequal turf**. Not-knowing what is optimum is at the roots of fiascoes that follow from mindless march towards progress and change introduced from outside. We think and innovate by controlling what is available around us, including the resources and the building blocks. Clashes of ideas, values and products are intrinsic in the diffusion and development of innovation as well as the common heritage. Here choices have to be adequately evaluated for desirability.

The internationally funded renovation project of Angkor-vats temple in Cambodia (South-east Asia) attracted the elite because it meant money from the International tourists. Many local people were slaughtered in the conflict and many others were uprooted. Such experiences point to gaping holes in the current practices of regional and tribal exploitation with imported capital, resources and technologies.

Monopolies of nepotistic tans-national elites and oligarchs mask the democratic controls that ensure social justice. This experience is a rule rather than an exception for major development project all over the planet. For example, the Farm Forestry Research and Development Project supported by US Agency for the international Aid selected the same 3 to 5 "most important" species of trees, presumably to facilitate project wide administration and research activities. This center-based imperative failed.

For the programs for alleviation of poverty and want it is assumed that there is a relationship between knowledge and economic status. Also the knowledge and material benefits that

become national resources are likely to be far more accountable than international corporations. Often the assumption is that the benefits from external appropriations may not reach the marginalized farmers. Even under best of conditions, it is also true that the resources from the center rarely reach the peripheral community except through changing it. Therefore, one need be fully aware of the perils of centralized conservation efforts, and the fact that there is no guarantee that the imported technologies will assimilate or preserve it. The empiricism of expediency is not much different than that of cutting corners or shooting for a limited success in a shorter time.

The basis for the traditional conservation practices derives from other local practices developed through trial and error. While some transplanted technological solutions to the local problems integrate in the traditional societies, many more do not. Transfer and introduction of practices requires deliberate and well thought out changes in the traditional societies as well as the market approaches. Without such understanding of the local relations, even the well-intentioned international academic and development community can become part of the problem, rather than offer a solution. The web is broken by the accelerated rate of resource degradation by industrialization and consumption promoted by markets. For example, bicycle has been integrated in most places. The use of electricity and tractors has not developed to the point that the local know-how can take care of all the maintenance needs and fuel supply. Such asymmetries can not create a stable and viable system of *give and take*.

**Tragedy of asymmetry**. Asymmetrical practices unleash forces that diminish the resources. Tragedy lies in the concept of external intervention and incorporation of the local knowledge into central and global political-economic system. As is already

clear from the uncompensated transfer of genetic resources it is not an adequate model for integration of innovation. Can the international intervention be a part of an acceptable solution in a broad social-economic and development context? Possibly so if it is based on premise of fairness, and if it recognizes the current inequity in the transfer of shared knowledge and resources (genetic, biological) from the less-developed to the more-developed ones.

To make any solution stick it is necessary to break the hold of imported technologies that degrade the resources. Empowered communities have stake in the development of local solutions to help the trends towards sustainable resource use, and towards creating the new resources and solutions suited for the local environments. Other considerations are:

(1) A viable system of value creation can develop if the local knowledge can be used to develop technologies. Is the just compensation enough? Would the resulting technology solve the problem? Could it create another vehicle for another round of wealth and resource transfer?

(2) One could debate the benefits of transferring benefits to the local elite in terms of creating local capital if it can be assured that the capital would be reinvested locally. Smart-money has no stake in the long term well-being and viability of the population. Feudal families and band of oligarchs in power have no interest in correcting the socio-economic inequities. It is not clear if the demand for equitable distribution would follow the awareness and flow of resources.

(3) Is development and democracy a ploy to reduce international tension for the control of petroleum and other resources being overused by profligate countries at unsustainable rate? Development intervention, howsoever well-intentioned, is a

double-edged sword because it comes at a cost in terms of the technology and good-will. Provision of economic resource without political resource is often problematical. On the other hand, economic empowerment that comes from the local control of resources creates climate for social and political change locally as well as elsewhere.

Beyond these basic measures lie the concerns: Would a centralized intervention begin to safeguard interests and rights of citizens? What can be done to preserve the knowledge that is intrinsic in the traditional practices? How the knowledge and resource can be used towards a desirable goal? What can be done to recognize the contributions of the cultures? Do the well-intentioned volunteers and members of academic communities contribute by creating a dialog?

## IV-31 Unintended Consequences

With more choices we loose certainty, but gain realism of unintended consequences and additional limitations.

Often noble experiments and good ideas turn out to be failures in public practice. If science is about extracting generalization from the particulars, delivering science to customers (technology in the market place) is a transition from goals and desires to the particulars in different contexts of reality. Rather than relying on the grandiose, art and politics of technology relies on incremental changes that provide market feed back. Our ability to deal with such a mix goes right to the heart of how to make meaningful choices including the choice of no-choice both as an individual and as a society.

Paradoxically selection criteria for choices also reduce the number of choices. For example as we select from the natural diversity more and more species go into extinction. The same happens to ideas and cultures. Also choice of violence and other forms of extreme behaviors to resolve conflict eliminates virtually all other options. Choice of having a car eliminates the choice of public transport. At a deeper level the distinction between the multi-culture versus monoculture follows from a difference between the sociologically imposed choices versus the individual preferences. Unintended consequences of some well-intentioned choices as part of innovation diffusion are outlined below.

**Genetically modified organisms**. Evolutionary experience is that sex is good, if it maximizes diversity. Passive genetic engineering with natural and low-tech methods has been used for millennia

for domestication and selective breeding of plants and animals. Thus we have selected strains of animals that do well in their niche environments. In recent years selection pressures have accelerated with the population and consumption demands. Even before the GMO runoff there were fertilizer and toxic agrochemical runoffs from the energy intensive practices. Society is still trying to come to grips with such short term runoffs. For the long term we hardly know what else is there in such Pandora's boxes. At the moment we do not even have ability to ask suitable questions, let alone device solutions against such encroachments.

The term genetically modified organism (GMO) is reserved for those organisms in which the genetic material has been tinkered by human whim of certain perceived advantages. The laboratory technology of gene transfer is orderly: Genes are inserted in the genome of plant tissue literally by shooting beads coated with the DNA of the new genes, or by infecting the host tissue with a pathogenic *Agrobacterium* containing swapped genes. The fist technique seems to work well with grasses and the second with plants with broad-leafs. In both cases, besides the desired gene, the inserted DNA also includes a gene that offers antibiotic resistance. The last capability is necessary to get rid of all the genetic material that is not modified. In such screens the freaks of the genetic stability are also discarded by trial and error.

GMOs encroach on traditional practices. Rather than consideration of food and nutritional value, GMO seeds are chosen for the needs of industry that require uniformity of the product. GMO farming becomes a recipe for another economic noose around the neck of the farmer. Seeds for every crop are sold to the farmers because the GMO seeds often loose their viability in few generations. Beyond the loss of diversity and variety, long term consequences of GMO mixing with natural

germplast are hardly understood. One of the most direct effects of this technology is that in less than a decade GMOs have spread beyond control. In eighteen common crop seeds in USA the GMO content has been found to be 0.05 to 1% in 2003. The modified genes from GMO crops in open fields are beginning to show up in the heritage organisms, such as the traditional corn crops in the far off regions of Mexico. Constraints of traditional organic farming require a deeper understanding of all the factors and forces that balance the ecosystem at the microscopic level. Is the terminator gene inserted in GMO on loose?

**Unintended consequences of GMO diffusion**

***Bt* gene in crops**: This insecticide gene from *Bacillus thurigensis* was transferred to larvae of monarch butterfly that feed on weeds that grow in the vicinity of the genetically modified crop.

**Gene transfer** across unrelated species is not uncommon. This is how agents of animal diseases (influenza, SARS, HIV, mad-cow) jump to humans.

**Self-replicating biological pollution**: Besides seeds, plant products are also used as feed, fertilizer and building materials. GMOs present the risk of exposing other organisms to self-replicating pollutants that do not dissipate with use.

**Terminator** genes have been introduced in some seed crops. At the very least, the collective shared experience with a crop can not be developed further in the form of a seed. Nature is stopped from experimenting through mutations that may adapt to the local environment.

**Nefarious practices** of the self-destruct genes included in GMO seeds prevent germination in the subsequent generations. It takes out the control and decision-making, as well as the possibility of the potential benefits that come from the practice and selection.

**Lack of label** is like an envelope with no return address, i.e. the producers are not willing to take responsibility for their product. This form of primordial deceit by the GMO producers and users raises issues about intellectual honesty.

**Flaw in the premise and the argument**: It has been argued that the potatoes containing the Bt gene are safe because potatoes are not known to be harmful, and that the Bt gene product is not known to be harmful to humans. Here a lack of substantial evidence one way or the other is being substituted for safety.

**Asexual reproduction** appears to have some advantages, especially for biotechnology. However, it does not make up for the advantage that after a few generations the sexual modes of reproduction are able to take care of the accumulated genetic defects.

**Property rights**: GMOs have been claimed on the germ-plasm and genes stolen from traditional crops from the world over.

Uncertainty about the future consequences prevails at virtually all the levels of agricultural biotechnology - ranging from the use of chemicals (fertilizers, insecticides, weed killers) to the seed varieties. A major concern is about the accumulated effects. Unintended consequences of accumulated DDT ingested through the food chain affected the egg-shell of birds that were not directly exposed. Used in increasing strength these insecticides selected for resistant insects and mosquitoes. Overuse of antibiotics in the animal farms and hospitals have triggered selection of the antibiotic-resistant microorganisms.

As for the experience with GMO, consider the case of NewLeaf potato. This GMO is based on Russet variety preferred for the appearance of the fries. Not only nutrition is not a concern for such a selection, their taste has to be spiked with animal

extracts and garnished further with salt and ketchup. The Russet variety is far more prone to diseases. Monoculture of NewLeaf potato requires a large variety of chemicals along with a heavy dose of fertilizer. In fact, about half the price of the produce is used up for such treatments.

**Global Warming**. Svante Arrhenius in 1896 published a study showing that a doubling of the carbon dioxide levels in the atmosphere would lead to 4 to 5$^{o}$C (8-10F) warming of the earth's atmosphere. This is virtually half of what has already happened in a century. As a result ice-sheets in the Arctic Ocean are thinning and the glaciers are receding, heat-loving animals and plants are migrating a little closer to the poles. Weather seems to be more freakish than usual and the El Ninos cycle has shrunk from every seven to four years. For the first time in the recorded history tornadoes have appears along the coast of Brazil.

It is virtually certain that a large part of the global warming is the result of industrialization. The natural cycles of temperature change are part of long term geological history of the planet. Without any credible evidence of its own the oil and other interests continue to attack the credibility of the independent results and conclusions. Increased level of atmospheric greenhouse gases, such as carbondioxide formed from the use of fossil fuels like petroleum and coal, that trap heat in the lower atmosphere is something recent. Systematic measurements of carbondioxide levels began in 1950. Based on this data concerns were raised in 1970s about the green-house effect. This attracted worldwide attention. Netherlands started measures to reduce the carbondioxide levels. In spite of a US Congressional hearing in 1989 the warning signs have not translated into action. U. S. produces about 30% of all such emissions on the planet. Only in 2008 the US administrations has grudgingly yielded to the idea of

an international negotiation about reducing levels of such emissions.

Even if we stop using the fossil fuels that are the source of virtually all the new carbon dioxide in the atmosphere, by some estimates the global warming will probably continue for almost a century before the natural corrective processes kick in. In effect, considerable buffering capacity of nature is responsible for slow equilibration - in both the directions.

**Ozone-hole**. Depletion of the ozone layer is a related story with a happier ending because several decades ago the worldwide action was taken to reduce the rate of depletion of the ozone layer in the stratosphere of the upper atmosphere. This thin layer, at a height of few miles, acts as a filter for ultraviolet radiation from Sun. The radiation is mutagenic and causes increased risk in the incidence of skin cancer. Did this happen because people with lighter skin do not have natural protection from the sunlight?

In late 1950s Rowland and Molina showed that the chlorine derivatives of the small organic compounds reaching the upper atmosphere are degraded by sunlight. A degradation product, chlorine free radical, starts a chain reaction in which millions of ozone molecules are converted to oxygen molecules by a single chlorine radical. Not only the science was compelling, but it suggested that the chlorofluorohydrocarbons (CFC) were the culprit. In the preceding thirty years CFCs had been widely used as the chemically inert refrigerants and propellants for the spray cans of lubricants, furniture polish, antiperspirants and perfume. At first sight cheap, nontoxic and inert CFCs were reasonable alternatives to the toxic ammonia that was used as refrigerant before.

The size of the ozone-hole over the southern hemisphere and the polar cap regions increased as these human-created gases

wafted to the upper atmosphere in ever increasing quantities. Its effect, an increase in the incidences of skin cancer was perceived to be immediate and imminent danger. Chemical companies tried to discredit the science and the observed facts. Thanks to the activism when the facts could not be ignored a tooth-less accord was reached in 1985. As the size of the ozone hole kept increasing the evidence was reconsidered in 1987 and the agreement in Montreal considerably reduced the use of CFCs. With these measures, the ozone-layer depletion has apparently peaked at the 2001 level. It is not clear if ozone is being replenished.

**Rituals of innovation diffusion and room for activism.** There is no substitute for good science. Often we can not predict outcomes of recent developments, much less convince others of their consequences. For example, many of the technologies inherent in the order created by Linnaeus taxonomy and by Mandelian rules of genetics are just now taking shape after more than a century. Ironically, often more certainty is perceived when distance from the cutting edge of science is maximized.

Natural phenomena may be certain and its technological use may be perceived legitimate. However elements of controversy evolve around certain potentially fallible aspects. The champions of a new-paradigm always have sustained optimism and an unshakable belief in the effectiveness of their means of technological salvation. When faced with counter-evidence, buzz of self-referential word-boxes replaces arguments. Such words include efficiency, value for the money, transparency and accountability of decision-making, empowerment of the practitioners, self-directed learning, multidisciplinary, consumer choices, job-loss. Such strategies are apparent in attempts to fight controls against tobacco, asbestos, solvents, drugs, public health measures, water-gate burglary, ploy of WMD to attack Iraq, and

the debacles of hiding and misrepresenting results of clinical trials of drugs pushed prematurely in the market. Here the goal is to create appearance of controversy until the profit is already maximized and the risks are socialized. The court settlements for such misdeeds ever reach 5% of the profit.

Beyond the fog of mis-information, cry from the interest groups for more evidence is a devise to buy time. Data collection, like exploring a poorly understood territory, plays an important role. There are mechanisms to reduce the uncertainty in poor data. Selectively filtered data from the interest groups can only create confusion. A better understanding of the relations, variables, constraints and hierarchy of a system, while getting feed-back from the results of prescription, is useful for charting a rational course of action based on models that have predictive value.

**Need for activism**: Clearly there is role for public, beyond the market forces, in the shaping of the technology for social use. The appeal for social activism gains momentum with major disasters. Such events are much more widespread than implicated by events in Bhopal, Chernobyl, Challenger, or Three-mile-Island. In such cases *the closure* refers to perceived legitimacy without admission or assignment of guilt. In science-based policies and projects the public perception of the electorate is a key element in evaluating the spell of science and technology on the society at large.

Disenchantment and intellectualization appears to have replaced the naïve optimism of early science. More information hastens demystification, which probably has little to do with scientific certitude. This is the area of attitudes and beliefs about science uncovered by polls. These are often used as guide for the political spins, pronouncements and leaks. Obviously, the public perception is based on a variety of complex factors skillfully

molded by the army of opinion-makers from the governments, press, industry, and other interest groups. Some of the problems may be amenable to standard non-expert study in terms of the existing laws or known scientific expertise. For example the epidemiological data for the health care needs and its relationship to smoking, exercise and dietary habits. Still other problems may border on the scientifically controversial or unknown where one can only render opinion based on what is known. There are unknown on both sides of decision-making about complex issues. Often what is known is not always relevant to decision making, and what is needed for the decision-making may not be known.

Decision-making is forward-looking anticipation for prediction, adaptation, and prevention of contingencies and emergencies. Public consumption of technologies requires framing the problem in terms of good science, cooperation and consultation. As for any complex system, with multiple variables and relations, there are no magic bullets, no quick-fixes, and no tool boxes. Art of listening to people for feed-back is part of the multi-faceted approach to institutionalize a change. It is to be tailored to specific purposes and fitted to particular circumstances. Agencies capable of building trust and credibility are likely to generate real change. Policy decisions for managing risk (warding off unfavorable or at least protection from its full impact) require elaborating details in a complex situation with varying degrees of technical difficulties. Since there is no formula for future, there is always room for judgment but not for prognostication that may have significant bias and lead to confusion.

## IV-32 Prediction

The problem is not that prophets were lacking - they have been in good supply at almost all times and places. Quite the contrary, almost everything that has happened, and its opposite, has been prophesied. The problem has always been to pick and choose among the embarrassing riches of alternative projected futures; and in this, human societies have not demonstrated any large foresight.

*- Herbert Simon*

Survival instinct includes quest for *tell us what will happen in the future*. It is ingrained deep in the language (Box below), self-consciousness, and all creative expressions. We want to know future happenings even if we know that *in this world, nothing is certain but death and taxes*. Such robust assertions are not very useful because the time of death remains in doubt until the event has already happened. Meanwhile measures that reduce impact of such eventualities are much sought after.

Absolute certainty is rarely to be found. As we anticipate fluctuations, prediction is the art of dealing with anxieties as a mix of certainties with defined doubt to evaluate risks. Consider response to risks of low probability but of high consequence events. In the aftermath of the terrorist attack on September 11, 2001, Americans avoided flying. As a result deaths from car accidents have exceeded those from the attack. A similar mindset distinguishes delusion of the gambler from the wealth of the casino owner.

Unpredictable can not be avoided. Debates about risks

and rewards generate strong emotions that are tempered with cost-benefit analysis for accepting a level of risk. That is where experts come in the cycle of defining, perceiving and estimating risk as a part of rational decision-making. In such cases consequence evaluation is not mere calculus of probabilities. The prediction process is aided by the fact that the artificial fixed cost is generally simpler than the cost of natural uncertainty. Better understood variables of the artificial often save us only from the consequences of the unpredictable.

**Terms for conclusions about future events**

***Anticipation***: act of taking up beforehand (before the happening of the event).

***Clairvoyance***: ability (keen insight) to discern objects and events without sensory inputs. Often it is believed to be a power associated with mesmeric trance. Likes of Nostradamus "prediction" negatively impact public's regard for the predictive science.

***Estimation***: the outcome based on known variables (rough calculation of amount, value, importance; appraising or evaluating).

***Forecast*:** to contrive an event beforehand (foresight and forethought).

***Foreshadow*:** to indicate beforehand, prefigure, presage.

***Foreshow:*** to show beforehand.

***Foresight:*** An accurate view of future for the best forecast and strategy of choices

***Forethought***: consideration without knowledge of its significance

***Judgment:*** to appraise events and ascertain relations from the arguments and facts (discernment, discrimination, decision). Judgments should not violate natural laws.

***Prescription***: an ad hoc solution for treatment for the damage control (not cure)

***Prognostication:*** judgment about probable course of an event (diseases, recovery).

***Prediction:*** predicate to an inference, and thus it demonstrably relates to the intrinsic.

***Projection***: something that sticks out based on trends and patterns (throw forward).

***Prophesy***: to foretell (utterance) in any way (often claimed to be with divine guidance).

Timing the catastrophic events, like death and disease, earthquake and floods, or the stock market crash, has been of interest ever since the awareness developed that such events always occur. *Acts of god* or truly ambiguous events occur at random and out of nowhere. They happen but cannot be prevented. One can still make a calculated bet on their outcome and consequences to distribute the risks. Protection for the survivors comes at a cost that depends on whether there is a clear enough future (aging), or there are alternate (medical care) or range (education) of futures. Such wide ranging services and products (insurance, options, futures) offer protection for a risk premium. Such options are far more cost-efficient than offerings to oracles.

**Forecasting weather**. Uncertain outcomes are rarely driven linearly by instant cause and effect. About 4000 years ago Sumerian and Egyptian priests noticed a relationship between the position of the sun in the sky and the regularity of the rainy season that flooded the rivers to mark the sowing-season. They developed lunar and solar calendars to formalize the relationship. Such a division implied a contribution of the position of the sun to

the comings and goings of the seasons. Rulers were interested in this information to tax their subjects. For the tax collectors it introduced a predictable order for the economic stability of the agrarian societies in the flood planes of rivers where most of the population centers were located. In the leaner years some of the *benefits were trickled back* to the masses in the form of construction projects (pyramids, canals).

**Star gazing: Standardization of Meaning in Regularity**

There is fascination with the future whether foretold by horoscope, or prognosticated by oracles, or gleaned from precepts of wisdom. Like the seasons, the time between the death and birth could also be divided into parts (days, weeks, months and years). Use of horoscope (positions of the planets at the time of birth - a substitute for birth date before the invention of generally agreed calendar) was a logical extension of the remarkable success of the almanac (with the Arabic prefix *Al* or *the* added to the Prakrit word *manak* for the standard for comparisons) for the position of Sun, Moon, and planets in relative angular inclinations to earth at regular time intervals of day and months of moon cycle. These tables evolved into the Moon-based calendar, which were later standardized to the modern sun-based calendar now in international use.

Around 1000 years ago for the Gregorian calendar both the birthday and birth year of Christ is arbitrarily fixed. Based on the available evidence, Christ was not born on December 25, or in the year 0000 of the modern calendar. According to some estimates the birth date would be 6 years earlier around January 9.

The corrections for fixing the position of Sun in terms of the length of the day and year are quite cumbersome. The 28.4 day cycle for Moon required extensive corrections to match the daily

and yearly cycles of Sun. In the current version of the Sun-based calendar a year is divided in nearly equal 12 months of 30 days each (approximating the moon cycle). The 365.25 day yearly cycle of Sun is accommodated with 7 months of 31 days and 28 days to February. The extra quarter day is added as the 29th day to February every four year. This arrangement (to follow the angular displacement of Sun) still requires correction of a few seconds that are added to clocks around the world every few months. This standardization of the science of planetary positions has evolved over a period of 4000 years as the technology of time-keeping (*ephemeris*, *horaries*, clocks).

Simplification and standardization of elapsed time through convention brought an order not only to agrarian societies, but also provided a *manak* (standard measure) for all time-based dealings, events and happenings. Seasonal cycles of rain and temperature determine the time to sow and harvest. Knowledge of seasons is intricately related to survival in fertile flood plains of rivers. Even to this day, major commodity dealers have their own weather-forecasters. Understanding seasonal cycles is associated with the general well-being of all societies. Such information is useful for planning water-supply, public hygiene, transportation, and the recreational needs. Nutrition and susceptibility to diseases is intricately tied to seasons (as in the flu or allergy season).

It is no surprise that the access to the planetary positions was the purview of priestly and ruling classes whose station in life depended on the well-being of the tax-payers. *Oracle who misspoke* would probably loose daily offerings, if not more. In the absence of suitable knowledge connection of sun to weather appear far-fetched to most individuals. Therefore it is very convenient to attribute cycles of individual and collective prosperity to the

planetary cycles. It appears that a primordial fascination with the star-lit sky is still exploited by the astrological forecasts published in newspapers, magazines and internet sites to rationalize chaotic events. A well-written forecast can be justified as a psychological tonic just the same as suitably chosen kind words can be uplifting in weaker moments, and ill chosen words can be insidiously violent. Such prognostication can nudge people into action at opportune moments. Only an ardent believer would totally rely on such tools for planning the course of ones life.

Improved quality of weather prediction is a critical part of the economic prosperity. Then as now, goal of any weather related public policy is to mitigate effects of catastrophic events, such as to minimize loss of lives and damages to property. The order of weather related losses of human life in US is in the order temperature extremes, lightening, and floods. Weather related rituals and knowledge relieve people from uncertainties associated with chores of living, and not just production of food and fibers. Effects of weather are wide-spread on virtually all aspects of life. Industrial sectors that routinely rely on weather forecast include vegetable processing, off-shore oil drilling and exploration, insurance, all kinds of transportation, electric power, and emergency managements of the various kinds.

**Why the weather worsens on a hike?**

Most people don't start a hiking trip in a storm even though weather is almost certain to get better. Of course, this wisdom depends on the knowledge of the local weather patterns and the characteristic times. From such insights, the accuracy of hurricane tracks predicted 1 to 3 days before the event has improved in the last 30 years by a factor of 1.5 to 3. A part of this improvement is

by including more of the coastline in the prediction. The tornado warnings date only to 1948. The number of deaths from tornado in US has decreased from about 2 deaths per million of population in 1820 to about 0.1 in 1990. A similar decrease has also occurred in the lightening related deaths. Besides improved forecast other factors are communication of warnings, better housing, movement of people from rural to urban area, less time being spent outdoors.

For modifying the model for future use it is critical to monitor the effort, evaluate the outcome, provide feedback, and fine-tune. This is a general relationship for the flow of all knowledge to users in a reliable and timely manner with longer lead times.

There has been significant gain in the sciences, technologies and infrastructure that provide the basis for modeling the prediction and risk premium. Evaluation of the policy outcome in terms of the impact of such measures is difficult for a variety of reasons. For example, there is general perception that there has been significant improvement in the impact of weather forecasting along with the progress in many areas of weather predictions. The statistical certainty of predictions of models is based on the relations of wind, temperature and pressure fluctuations with the longer range patterns. Historically unprecedented events can confound the predictions and response capabilities. However the contribution of individual decision-making and compliance is still a major factor.

**Taking and covering risk**. Perception of the reverse relationship of good health with disease and death is innate to humans and most other higher animals. Risks are recognized as certainty in an uncertain world. Realizing that catastrophe can not be adequately predicted or averted, protection against catastrophes has been

taken to a level of sophistication, i.e. to find ways to minimize the adverse consequences. Since we may not know who will be affected and when, risk management is about minimizing the impact catastrophe on the survivors. Risks are distributed in the form of taxes, options and insurance premium. Such instruments may not be perfect they reduce the impact of vagaries of nature, including acts of God and Man, on the survivors. As ways of dealing with catastrophe life insurance does not forestall death, car insurance does not avert accidents, and health insurance does not guarantee good health.

Along similar reasoning, with an increased level of production, there is less concern for the supply of resources. Therefore, fluctuations in the supply assume greater significance for ascertaining the economic health of the system. Insights about fluctuations provide opportunities for the risk-takers and speculators of all stripes. Such instruments buffer the markets from the major catastrophes of market cycles.

Although we cannot predict precise timing of catastrophic events, the probability of such occurrences and their adverse consequences is significantly lowered by certain precautionary measures. This is the basis of the preventive health care that includes common notions about hygienic conditions as well as the life-style changes such as exercise, food, and stress-free environment. Most of these commonsense measures are free, yet people pay for cigarettes and get the risk factors in the bargain. Consider the extent to which people use the common-sense prescriptions in the rituals of food, health, habits, or choosing mate. Is the causality too distant to grasp, or are we swayed by momentum from peers or markets? To an extent social and home environment can point the way. Yet in the end, use of available knowledge and compliance is an individual decision.

There is conflict between the pros and cons of structural solutions and the individual risk-taking. Insurance and government help tend to reduce acceptance of personal responsibility for risks associated with faulty choices about location to live. For example, vastly improved flood control mechanisms have saved many lives, yet the property damage continues to increase. Publicly managed dams and levies are part of the wider water resource and wild life policies. Such projects impact on choices related to power generation, flood control measures, fisheries management, water resource allocation, and recreation. Land use and construction practices controlled by local codes also contribute. For example by permitting hog-farms in a flood prone area has caused seepage and flooding of sewage. Do we need more science or more awareness of the consequences?

**Asteroid hazard**

Impact-scare is the subject for movies and e-mail hoaxes. Cosmic debris hits earth's atmosphere regularly. Most of it burns away before hitting the ground. Chances of more than a kilometer wide asteroid hitting the earth's surface is once every million years or so. Last such impact possibly occurred 65 millions ago, which led to extinction of dinosaurs. The probability of such events happening within our lifetimes is exceedingly low – virtually approaching zero. Since 1600 such objects are known to be in the vicinity of earth, the possibility of the extinction of human race by such impacts is real.

Even such low probability *acts of god* could some day succumb to human interruptions. As a thought experiment, consider what steps can be taken to prevent such events in the foreseeable future, and at what cost? Prediction of potential impacts is becoming increasingly more feasible as the course of

near-earth-objects in the Space Age is routinely monitored for establishing satellite orbits. As it appears now, there are very few objects out there that could have a viable minimum orbital intersection distance with earth. Of course, the prediction of such probabilities requires highly accurate data to chart the bounds of certainty. Serious calculations to chart the course of micro-astronomical objects have been initiated.

**Evaluation of the outcome.** We do not always know what may actually happen. Imagine the fate of priests who divine the impending *famine or feast*. Now it is routinely done by taking long or short future positions for the gains. All forecasting exercises have differing degrees of plausibility because of their probabilistic (statistical) relationship to the underlying events. To peer through the uncertainties the forecasters (astrologers, prophets, oracles, seers, men-of religion, gamblers, futurists, experts and other talking-heads who spot market, political and social trends) have been accorded status that is commensurate with promise of the tomorrow revealed: *Sometimes the praise is not convincing and sometimes the condemnation is obviously from nowhere*.

With the realization that actions have immediate and future consequences, key elements of a policy outcome with a view of the future include prediction, communication, and evaluation. The advantage of using more transparent technologies for predictions is that the blame can be shifted from the expert to the model or inadequate data. For valid predictions worthy of a reputable profession, even in a perfectly deterministic world one needs sufficient knowledge of the fundamental variables and relations that can be quantitatively modeled. It is also necessary to have an understanding to identify and quantify uncertainties that can make the prediction meaningless. In the

context of the inputs, prediction is about knowing what characteristics of a system can make it better for decision-making.

Improving reliability of the prediction requires knowledge of all the inputs and rules of the game. The rules have to be applied correctly in the suitable deterministic context. This is nearly impossible even for a simple physical or non-living system. Scientific information on group behaviors is probability based. In the modern game-theory sense we can improve the chances of success through certain behaviors. Successes of such models attest that reliance on the reality-based facts about the situation is far more desirable than taking a pot-shot.

Like hypotheses, predictions relate to the truth value of the evidence and the knowledge base. Both guide the sound judgment and practical wisdom for decision-making by allowing us to identify relevant variables and relations for solving problems. Evaluation of risk amounts to identification of the yet unidentified variables and relations, and distinguishing these from foreordained conclusions. At least in principle, decisions based on reliable data, such as the relationship of season to a calendar, can be value free, and allow us to bypass dialog and negotiation of horse trading in establishing some of the technical merits.

**Use of Imperfect Knowledge to Create a Perfect World**

Science, technology and open-minded decision-making control our public and personal expectations. Such decisions have to be made with incomplete knowledge within the constraints of time. Often what is known is not always relevant to decision making, and what is needed for decision-making may not be known. Invariably, conflicts have to be overcome to satisfy very different backgrounds, motivations, and aims of the interest groups. Thus premature closing the options may deprive us of all

potential benefits of new technologies forever.

Evolution of the calendar was based on observed reality with astronomical basis in fact. The process pretty much reflects the chaotic ways in which stating with imperfect knowledge methods of science reduce uncertainties in steps. Science implies the pure pursuit of fact-based knowledge. It is collective consensus building where all conclusions remain tentative within the bounds of the data. Scientific prediction is often portrayed as a precursor to and source of objective information for rational action based on the known behavior of the real world. Miracles may happen but they cannot be trusted for charting the course of life events.

Increasingly science bears fruit of technologies in conjunction with political and market processes. So what comes out of the process bears only a superficial resemblance to the knowledge base on which the relevant science is established. In the public arena, long term consequences of a new technology for the society bear on wealth, resources, population demography, and effect on the competing technologies. Effective action need not wait until we are more certain about details, and win-now strategy. Political decision-makers include probabilistic versus categorical (individual and particular) predictions; diversity of perspectives and considering the alternatives, political will and social cost, and distribution of outcomes rather than consensus. In all contexts expertise means not just having relevant experience and knowledge, but having demonstrable competence and clear evidence to justify doing things in a certain way rather than another.

There are unknown on all sides of decision-making. Policy decisions for managing risk (warding off unfavorable or at least protection from its full impact) require elaborating details in a

complex situation (multiple variables and relations) with varying degrees of technical difficulties. Problems often border on the scientifically controversial or unknown where one can only render opinion based on what is known. Inputs are need in defining the problem, identify alternative approaches, evaluate potential solutions, and find solid answers. Experts are advisors with whom politicians have a history, an inevitable overlap of beliefs, and faith in the prediction. Thus, often the role of predictor is to change the perceptions of the decision-maker and influence policy.

Unequivocal predictions about outcome of an event, though highly desirable, are virtually impossible. For all decision-making the central issue is uncertain future, and therefore predictions are often based on unknowable unknowns. Of course, often what one does not know does matter. The cost of ignorance (or ignoring what is known) is to revisit the wrath. Rational planning is forming an intention to act on the basis of ones desires and beliefs. As a part of the wider circular relationship between science, technology and society, social cognition tends to be honest, shallow and tedious. In such contexts understanding the limitations of prediction requires an understanding of the accuracy of the data and uncertainty about the underlying relations:

1. The natural hazards happen to us. Note that many of the natural phenomena were once considered act of god, and often the plausibility was taken as provable. Such a belief did not offer any viable solution, and it prevented further investigations.
2. Sometimes we happen to nature (beach erosion, nuclear and chemical waste). In all such cases decisions have to be made – including the decision not-to-make-a-decision (inaction). What you know can hurt you!

3. Conscious decision to do something is a decision to take action and to intervene to shape future that will have winners and losers.
4. Chances are good that not all the variable have been identified. Our knowledge base for the observed behaviors is based on few decades of experience with very limited means and in very biased contexts.
5. Models are oversimplifications. Assumptions, limitations, alternatives and uncertainties in the input data should be transparent. Imperfections in the model that introduce doubt and limitations include identifiable assumptions, such as of rapid equilibrium, scaling on size and time, universal applicability and linearity of the parameter values, fudge factors and adjustable parameters, prototype, practical considerations, and the current state of knowledge.
6. Models are useful for learning structures, including learn from mistakes: Don't throw baby with the bathwater; don't disregard model on the basis of assumptions alone - observe its veracity on the basis of actual behavior; consider contingencies and exigencies.
7. Events have characteristic times. For social cognition decision-making focuses on the context for the various aspects related to the event. Events of very different characteristic times are to be approached in different ways - such as flood versus lightening. Few people have only a vague sense of slow events such as global warming, depletion of resources, impact of accumulated waste.
8. One can generate reliable information on the short-term and frequent events.
9. Three interacting factors are of interest: nature (observed event, human-impacted world), observer (scientists) and users (decision-makers).
10. Flexibility is required for a focus on good decision. Decision

makers learn from experience, question predictions, search for alternatives, and utilize the feedback by evaluating progress with respect to goals.

11. What is delivered is projection. Often predictions are not possible because the underlying science is not sufficiently developed. In the end what matters is making good decisions (not good predictions).

12. Cost of computing power versus productivity.

13. Role of the bureaucratic buffer between science and policy. It is clear that these questions are addressed to differing degrees of success. Some emergencies require short-term adjustments, whereas others raise complex policy dilemmas that are international in scope (petroleum resources, acid rain, climate changes).

**Camel is a horse conceived by a committee**. Governments and other public bodies routinely use expert advice for decision-making. If experts agree, their united qualified opinions set the foundation for the future course of the decision-making. If they disagree, they can find a common ground for the advisability of the future course of action. In all cases, the task is to distinguish the types and levels of advice and the expertise (knowledge base) behind it. Unlike most other types of advisors who advocate a particular course of action, experts also base their arguments on the assumptions built into a general knowledge base. Limitations of the experts include pretence or at least a sense of omni-competence. Also the experts are not accountable to mass-media, public-opinion, or other forms of checks and balances.

Experts are likely to assess scientific and technological risks and evaluate the cost of a well-defined problem by asking: what is the problem? Who knows what about the problem? What is the information to be used for? How is the advice to be

institutionalized? One can guard against overconfidence by seeking advice from sources near the cutting-edge and can impart the uncertainties involved. The liabilities built into expert-opinions are often less serious of a problem than those in many other forms of inputs in the democratic process, such as the ad hoc decisions of elected officials, free markets, plebiscite, lobbying, or direct referenda. If carried out without too much external interference, such forms of public involvement open the process to the sources outside the decision making bodies.

The producers of knowledge funded through public money and the consumers of the technology in the society at large interact in a diffuse environment with conflicting undercurrents. From the nature of the inquiry through the expert advice, it is clear that the producer-consumer approaches of the market place often become more difficult when the problem is less clearly defined, or if there are multiple and conflicting sources of advice or political interests to capture the problem and associated resources. In addition, absence of knowledge may well exclude certain groups from participation. Openness of the proxy advocacy and well-balanced social values and theories is often useful for looking after the needs of the consumers of knowledge.

In short, desirable elements of expert advice include answers to questions that can sway a decision maker (user) by addressing risks and uncertainties inherent in any prediction. Such information is used to set policy goals, impact on the society, effects of predictions on the policy process, and the effectiveness of implementations. Objective predictions are not only the source of reliable information but also the first line of defense against political backlash. Interest groups hijack such political and market processes.

## IV-33 Chaos of Premature Ideas

Let the mind wander. Many things are out there. We may not be looking for them in the right way. We are not following the right track. We're following what may be important tracks, but we miss many possibilities. Ideas come up from time to time. But what makes them really significant is seeing what is important, and demonstrating them in a way that is convincing. Social reactions to the presentation of a new thought decide who wins and who looses. Resonance and dissonance include a combination of all the usual things that scholars do: patient argument, intimidation, ridicule, character assassination, amassing of facts, careful review of logic, mischaracterization of opponents' views, and scrupulous analysis.

Timing may not be everything. It can be critical for the success of premature, preemptive, or even preeminent. Both prudence and risk-taking have rewards in dealing with doubtful certitudes. Management of dread-risks can have more dreadful consequences than biding time. Premature overt actions are part of risk management: Novel solutions follow sneakiness and deviousness, and those who did not act in time are wiped out. Decision to act on the basis of incomplete information is integral to all real time decisions in virtually all spheres of human activities. Personal and social cost from misplaced and premature ideas can be far reaching, if not astronomical. Certainly the perpetual *I don't know* is not the way to live, although at times it may be prudent to choose nothing rather then suffer the consequences of nonsense.

Of course there are many dud ideas and many more misfire. Also in some areas it is necessary to be aware of managing change by manufacturing consent, or the interest groups that marginalize the significant to alternate. Policy oriented intellectuals and experts can also internalize the norms, if not be tools, of the state or the market.

Premature actions, as well as the range of responses they evoke, allow for learning from trial and error. It is the dynamics of transition from being taken over by common sense of the *tried and true* to being overtaken by the uncommon sense of doing something about the tired and indifferent. Personal and social reactions follow from the thought and behaviors that apparently ignore the current expediencies (based on available body of knowledge, facts, experiments, observation, data and information) to build on the not-so-obvious mechanisms, implications and alternatives.

**Reactions of people with what is not on their radar screen?**

Frustration follows if the search path is not predictable, systematic or linear. As the convincingly identifiable breakthroughs run into conflict with theory (dogma, taboo), perceptions try to grasp the new through stages of ridicule, opposition, and self-evident.

**Dissonances** deal with the doubt and the non-paradigmatic. Consider a doctor's disdain for the patient who outlived prognosis. One Professor Cremorini greeted the telescope of Galileo: *.. and besides, looking through those spectacles gives me headache*. Einstein is said to have greeted quantum mechanics with a comment: *God does not play dice*. Reactions to what can not be ignored fall somewhere between death, wars, inquisition, scorn, derision, rejection, skepticism, and innuendos.

**Resonance** is change of attitudes on seeing ideas in action: Raising questions to identify issues, acknowledge gaps, predict what and where to look for. Reward may be in not being ignored, to grudging acknowledgement as the *apparently impossible*, to the *expected* or *obvious*. At one time or another such apparent impossibilities have included ideas of flying machines, continental drift, quantum mechanics, laser and maser, the internet revolution, as well as the idea of peaceful means for conflict resolution and coexistence.

**Vindication** can come in unusual forms.

- Lord Rutherford believed: *Science is physics and all else is stamp collecting*. Few years later for his work Rutherford was award the Nobel Prize for Chemistry.
- Near the end of the twentieth century the Vatican authorities accepted the idea that spherical Earth orbits around the Sun. The idea has been around for the last 3000 years and the compelling evidence was already established 400 years ago when the wrath of the Church had peaked. Did it make a difference to anybody else except the Church itself? Cleansing its soul?
- US Supreme Court in 2003 ruled that what two consenting adults do in their bed-room is not a concern of the State. Was it mere affirmation of a wide spread practice?

Resonance and dissonance from dynamics of point and counterpoint, or pro and con, is an integral part of validation process. It is a necessary precondition for the acceptance by the peers, and also for practice by the community at large. The canonical knowledge may at times appear to be created by the powers-to-be (courts, experts, divine), but often they put their seal of approval (affirmation) when the ideas are already in wide spread practice.

Practice of seminal ideas evolves through trial and error. The process is democratic and chaotic: Not because each person is equally empowered but because for validation, and to sooner or later weed out the wrong or contradictory, the process gives a chance to all relevant arguments. Concern and caution affirm behaviors built on probable worlds. Although not evident to the observers at the fringes, the best of ideas are about the methods and outcomes that take advantage of premature thought. The approach is hijacked when we are told that *this is what it is, that is what is meant to be, and that is all there is*.

Then there are the quasi-, pseudo- and omni-sciences which abound in public and market arena. With the emphasis on the proven theories and without an explicit appreciation of the real particulars, the science taught in schools amounts to a quasi-science. Pseudo-sciences rely on ad hoc theories that attempt to account for everything without ascertaining veracity. Such groups can hardly distinguish the reality of an airplane from the mere ideas of UFO, extrasensory perception from what is in front of them, perpetual motion machines that run on water from the automobiles. Similarly, reliance on omni-science goes nowhere like a cart without a horse. Justified with flimsy excuses such blinders relegate the impossible to couch ignorance and biases. Tests for screening such irrationalities include testability, falsifiability, verifiability, predictability, Occam's razor, paranoia.

**Uncommon sense**

Premature does not include anything that contradicts or violates the basic laws of conservation of matter, energy and information. The law that *something cannot be created from nothing* rules out all manners of perpetual motion machine and omniscience. It takes an uncommon sense to grasp variations on

the theme that *a real entity cannot exist at two places at the same time*. Almost everything that stands beyond such limits imposed by the reality can be considered possible. All together, uncommon sense is required to realize the potential of what appears counter to modes of reality.

It requires common sense to appreciate what lies in the realm of feasible. Uncommon sense makes us realize what lies outside the realm of reality. Common sense has survival value because it recognizes niches of here and now. Mechanisms to correct the course of an endeavor lie in its demonstrated utility. Often it is difficult to distinguish or grasp the significance of that is not here and now. Elements of the resonance and dissonances emerge as precursor to the uncommon sense. Realization of what lie ahead comes in stages as we begin to perceive, see, notice, appreciate, accept and evaluate. At each stage implications are examined through disbelief, disagreement, skepticism, humiliation, derision, silence, and versions of *trust me*. Open-minded honesty with compassion, and not mere logical argumentation, is probably more effective. Acceptance beyond the disciplinary and cultural boundaries demands demonstrated relevance to the local concerns.

As a way of knowing, validity relies on feedback. This is how resonance and dissonance to premature validate experience. Beliefs increase the threshold for the alternatives. Successful outcome requires a healthy respect for the tension that comes from *show me how do you know before I make up my mind*. The value of doubt is in finding relevant truths, and then in figuring out relevance of truth by minimizing uncertainties, and then in addressing skeptical concerns for acceptability.

As some outcomes are deemed desirable, many more are

regretted. One can only respect the human propensity for what matters to each is his own opinion. If every idea is to be tested, most will also be discarded. One should not draw a line before hearing out the case even if in the market place of idea one is *damned to argue the same questions over and over and over and ..*

Explorations through variations on theme are worth defending. The pragmatist believes in the sufficiency of human practices, and is not dismayed even if those practices are shown to be grounded in nothing more or less than their own traditions and histories. The impossibility of tying our everyday meanings and values to the less local environments does not suspend their reality. Suspect is the form of thought that would deny this and the means of empirical search.

## IV-34 Rationality by Practice

First they ignore you. Then they laugh at you. Then they fight you. Then you win."

*- Mohandas K. Gandhi*

In 1925 both Gandhi and Einstein signed a document against forcing men into Military service. At the end of the century both, along with Adolph Hitler were judged to be the three most influential persons of the 20th century. Albert Einstein is remembered for developing the current understanding of matter and energy in relation to space and time. In the pursuit of his belief in the superiority of his strain of humans, Adolf Hitler annihilated 100 million people within a decade. On the other hand, Mohandas Gandhi is called Mahatma, the great soul, for practicing nonviolent means of conflict resolution. In emphasizing a practice-based conduct he argued against arbitrary principles and beliefs.

Paradoxically, based on their individual beliefs, each followed a *rational* course of action to address widely perceived problems. In each case the course of action was contrary to the prevailing belief system. Clearly, their efforts were not directed towards self-goals, nor were their vision accomplished in their lifetime. Yet they continue to influence choices available to virtually all of us.

Some considerations for rational foresight, judging behaviors for planning and decision-making are outlined below: (a) Just as self-reference, deontological a priori (axiomatic, moral, ethical and legal principles and values) is also a matter of arbitrary interpretation that leaves a gap between theory and practice. Such

*a priori of reason and cause* is a comforting guide because certain kinds of actions are often considered inherently right or wrong. Such action choices are rationalized as morally, ethically and legally defensible. Pure deontological *rights* and *wrongs* without concern for consequences are virtually nonexistent. Such idealizations from the Judeo-Christian-Islam tradition for serving the powers-to-be are rarely backed up by self-practice. Responsibility for consequences through faith ends up with *the grace and judgment*, and not with the individual. In the Brahminical tradition the priori follows from the status quo of the past-practices. The Confucian *a priori* comes from the ancestors (heavens) and the emperor. Possibly appeal of patriotism and related precepts also by-passes the need for the moment-to-moment vigilance for decision-making and consequence evaluation. Such make-beliefs stay with us, and faith-based rationality continues to be influential even when irrelevant.

(b) As commonly conceived, truth is a static term for a facet of reality. For specific purposes we often confuse truth with facts of information and other particulars. Truth accumulates baggage as it falls short in dealing with reality. As it barely touches upon the potential, it is hard to be rid of liabilities of truth and faith. Beyond serviceability, qualifications like coherence and correspondence do not peel the truth away from ad hoc. Apparently, the problem stems from the fact that we still do not have a theory of truth (Robert Nozick): *To know the correct and deep theory of truth's nature requires far more than the mere ability to state particular truths. It requires knowledge of the ultimate dependence relations, and of the ultimate explanatory and ontological factors. A theory of truth, therefore, arises closer to the end of inquiry than to its beginning. Do not be surprised that we have not reached it yet*.

(c) Rationality of behavior lies in communicability. Language and

communication abilities are integral part of natural behaviors that contribute towards development of viable social institutions. Organisms interact and respond in a commonsense way with the imminent and the immediate. Determinism of the tit-for-tat is apparent in the instinctive behaviors of all animate beings. As captured by virtually all models of successful group behaviors, human rationality lies in treating one's fellow being well with benefit of doubt, and then reciprocation on subsequent encounters. In reality, individual behaviors of all shades are based on internal models that rely less on the grand universals or inherited traits, and more on what we learn from contingent and local contexts. Apparently the pattern is followed both by rational and irrational variants of behaviors. Emotions come into play: We are rarely concerned unless we are one of the victims or identify with one.

(d) Behavior with consequence evaluation follows a trajectory of actions and outcome guided by goals, decisions, strategies, feedback for mid-course correction, and damage control. As future is touched by the past, the process is forward-looking and remains rooted in reality. Whether or not we like it, in the end, through trial and error, survivors recognize and choose what may be acceptable. This is how we come to accept the consequences of the past actions as the best of the possible real worlds. Learning from trial and error, metamorphosed as the path-based approach, relies on the outcome of multiple events. Such knowledge is a way to intuit facts and construct empirical reality in hypothetical terms.

(e) Experience guides synthesis of reality through diverse areas of inquiry - arts and philosophy to technology and sciences. It is not clear how individuals integrate *learnt* inputs into lasting perceptions, and then arrive at a clear recognition that reality is

not an arbitrary construct. Otherwise, even the most useful representations and intellectual interpretations become listless. Instrumentality and serviceability of representations lie in the observer participation. Synthesis of beliefs in practice motivates concern and action to be integrated with contemplation. The unformulated models that interfere with the individual perception of reality behind awareness are ultimately weeded out.

(f) Ground for reason, or reason for believing something, are perceived through conceptual schemes that guide us in real-time decision making. This is possibly the way we interact with the awareness of events and happenings to extract meaning. Thus reason is an instrument for defining the goal as well for attaining the goal. Reasonable goals may be attainable goals but are not necessarily worth having, and thus they differ from rational goals. Reasons themselves have been used as evidence for what they are reason for. This is often the justification for the belief that reasons with connection to all relevant facts about the world must guide action, at least as the basis for the consequential actions.

(g) Reason guided by what seems evident at the surface is not necessarily meaningful: Wars give meaning to hollow lives and meaningless existence. Modern law and justice systems make a direct causality connection to reason. Consider the consequences of keeping the *undesirables* off the streets: Even if some are stopped from doing wrong, locking away petty criminals also tends to make them more determined. Such threats are certainly not effective in stopping the political corruption, accounting manipulations, and corporate wrongdoings. The white collar crimes cause far greater damage to innocent individuals and shake confidence in institutions of organized society.

(h) It is often recognized that rationality is rooted in conceptual schemes. Depending on what motivates us and what we desire

we make principles to justify actions legally, morally and ethically. We know too little to consider the interests of everyone to arrive at a utilitarian or deontological utopia. Thus we speak of bounded and other forms of rationality in human behaviors.

(i) To perceive worlds through conceptual schemes, we use knowledge to construct and develop principles as standards of rationality. Most social activities of our lives are driven by principles thrust upon us. Specific principles guide us through learning physics, making marriages work, negotiating mergers of corporations, making pronouncements about the systems of education and government, and even for bad-mouthing others. Whether or not we learn the basis of these principles, as social beings we all learn to mimic the principled-responses. In fact, in some cases the chasm between words and behaviors is so deep that the correspondence between the principle-based social expectations and personal beliefs becomes unbridgeable.

**Principles are not immutable.** At the very first level, principles do provide a road map for steering through the chores of living. Operational principles change as we learn more about the system, and sometimes they have to be pushed out. Consider the utility of the following principles of behavior:

- Intellectual principles permit acceptable decisions as they constrain and restrain personal factors. One example would be following the precedents. This does not assure that a principled decision would necessarily be a correct decision.
- Interpersonal principles assure adherence in the face of temptations and inducements: Reducing distractions increases the range of interaction and cooperation with others.
- Personal principles define one's physical being and intellectual identity. Self-regulation to overcome temptations is an important part of personal growth. Such commitment makes certain

decisions easier, but at the cost of one's missing out on some opportunities.

- Sometimes principles come to symbolize the standing and meaning of a person and society. Such second-order pride seems to carry the individual to a plane from whence he may be induced to take otherwise irrational actions. Would the leaders sponsor a war if they knew that they would at the front lines? Does it make a difference if the war is sponsored by: Islamists, or Christian missionaries, or Superpowers, or Governments, or Corporate CEO? On your own would you be able to make out the difference?
- Principles are also teleological devices that transmit evidential support and probability. Through give-and-take, they transmit utility from some actions to others.

In search of rational behavior guided by principles it is worth examining what motivates us to justify our actions. People rarely take responsibility for what they did not formulate. For such reasons at some stage principles become dissociated from reality with role playing and peer pressure as the judge.

**Living with incompleteness:** Reality of incomplete information demands that we come to grips with the appeal of *maybe it is so for a reason, and maybe it is also so for another set of reasons.* Its value lies in the recognition that even a hypothetical world let alone a real world can not be completely represented. Beyond that even in search of the episodic outcomes, pragmatism requires not digging dry wells in the pursuit of self-referential contradictions that cannot be proven or falsified.

*Inspired by the works of Robert Nozick*

## IV-35 Mathematics Tracks Reality

Virtue of logical proof is not that it compels belief but that it suggests doubts.

- Nietzsche

Probability is nothing more than a measure of our ignorance. Our feeble intellects are unable to perceive all the influences operating in a particular situation, and therefore we declare the outcome to be unknown, or that one outcome is no more improbable than another. This is illusory.

- Laplace

Every equation cuts the number of readers in half.

- Wisdom from quantitative sciences

Reality shapes the reason as well as the quality and quantity of information. In some cases it is possible to identify the invariance of inference with facts of reality, as in inference of fires from the smoke. Facts of reality also adhere mathematical constructs, as in the spiral pattern of nautilus shell and the spiral patterns of florets in sunflower correspond to Fibonacci sequence. Mathematical descriptions of physical worlds have provided great insights into the common motifs of the universe. The wisdom is *Thoughts must also compute for their completeness to assure their validity and ensure that love will stay true*.

Reality based descriptions permit processing of evidence in terms of tangible connections to the facts as we know. As commonly used the word "know" has flexibility built into it. For example, beliefs ranging from *I know I am going to win a lottery* to *I know my youngest son's name is…* have degrees of doubt built in the assertions. Approaches that increase the reliability of what we

know and how we know follow acceptable procedures that identify and address particular concerns. Incremental validation of the knowledge relies on justification of existing beliefs - not only by new inputs of facts but also by critical examination of the implications. Ultimately all this has to compute to come together.

**Reality and mathematics share consistency**. Methods of logic and mathematics keep reasoning grounded in reality. Its power and beauty appears unreasonable to some. It may not be intuitive to many but mathematics starts with the simplest relationships based on numbers, operators, and assertions that follow from the discreteness of entities and events. Mathematics is effective in describing real world behaviors because such manipulations of discrete parts have correspondence to reality. Such methods of reasoning and interpretation with parts are inevitable for natural science as well as any other reasoning that aspires to be consistent and free of contradictions.

Ability to deal with symbols of language and numbers is probably hard-wired in human brain. Very early we also learn syntax ability that facilitates cognition though the symbols of language. Manipulation with numbers, ratios and fractions, is also to be learnt early. There is compelling evidence that both ability to recognize syntax and do ratios and fractions can not be easily learnt after the age of 11 to 13. Such abilities to manipulate parts systematically is paramount in the use of motifs of language as well as in natural sciences where we deal with reality-based relations and functions between multiple variables.

**Instances of mathematics-based beliefs**. Mathematics is more amenable to transformation of quantities without concerns for the quality. Plato regarded numbers as the closest thing to reality, and the forms and geometry as the knowledge of eternally existent. Pythagoreans clearly saw, if not heard, the *music of the spheres* in

the regular movements of the heavenly bodies. Towards the end of nineteenth century Henri Poincare suggested that geometry is invention of human mind, if not mere convention. When Einstein used non-Euclidean Geometry, God the mathematician was also relegated to the pantheon of the lesser gods realized by humans with a few assumptions and transformations.

The question of existence and nature, epistemology and ontology, of mathematical truths has been debated. Pascal, Descartes and Kant support an intuitive character. Others in the footsteps of Plato's forms suggest that mathematical structures exist in their own right waiting to be discovered. Godel resonated the conundrum with: *It seems to me that the assumption of such objects (sets) is quite as legitimate as the assumption of physical objects and there is quite as much reason to believe in their existence.* However, he warned that all such constructs are necessarily *incomplete*, i.e. from such sets one cannot infer about the worlds that are not included in the construct. It shows futility of attempts to reduce all mathematics, and therefore pure thought, to a purely formal structure based on a finite number of axioms.

**Mathematics has been unreasonably successful.** This provocation is attributed to Eugene Wigner. Mathematics is useful in natural sciences to consolidate ideas to generate new physical insights. Mathematical descriptions are almost always approximations when applied to physical systems. Several physical phenomena and models may have similar mathematical form. There are many mathematical concepts for which there are no known physical counterparts. Also there are many physical concepts for which there are no known mathematical forms. Is it just a question of improper fit? Or the garb of mathematics is not fashioned for the complexity of the physical world. Does that

means that bulk of the real world will remain untouched by mathematical abstractions?

The foundation of mathematics is rooted in physical reality, and therefore all real world behaviors have to conform to mathematical constructs. An not the other way. Success of experimental sciences, physics to biology, is impressive, especially in terms of the technological outcomes in manipulating materials and organisms. It is all the more impressive because the tinkering is based on the choice of simple problems and approximate descriptions. Not that what has been accomplished will be inconsistent with what lies ahead, but that often mathematical abstraction is not useful for thinking about laws and forms of the more complex real world situations.

Molecular biosciences have definitely placed mathematics to a subordinate role - although simulations and modeling with mathematical tools continue to be helpful every step of the way. The nonlinear and chaotic constructs of complexity, as well as empirical models and simulations, offer promising insights into the rules for the higher level and multivariable interactions for emergent patterns of group behavior. The predictive power of such mathematical tools is not significant, which does not mean that these systems do not obey physical laws of reality.

**Is there structure to complexity?** Representation of the chaos of the real world may also be an apt metaphor for the thought processes. Think of the patterns intrinsic in a tree, cauliflower, lightening, or coastlines. On a more abstract level, the chaotic behavior of storm, tornadoes, earthquakes, and social upheavals, distribution of personal income and other aspects of group behavior have similar fractal forms. Such forms begin with a simple trunk, from which appear in succession branches, twigs, leaves and finally the visible fibers from the stem of each leaf. The

blood circulatory system, as well as the lung and brain tissues, also has basically similar form. These structures arise from arrangements of bundles of molecules each produced from genetic blue print where subtleties are managed with microscopic changes.

In the evolution of hierarchy the meaning of the relationships and values of the variables remain in the range of plausibility. In such situations apparently minor features offer marked advantages over a time period. It is not the kind of evidence on the basis of which one can convict somebody. In the same vein, the appeal to quantify forms of evidence, practice and management does not call for substitution of sensible course of action. The stock markets may also have similar behaviors, where the risk takers rely on the fluctuations in the branches that sway with winds of uncertainty, whereas the long terms investors rely on the organic growth of the trunk.

Analogously thought processes can also be viewed as branches and trunk, where the trunk remains unperturbed by new information. Yet the branches of knowledge extend wherever there is light and space. The main property of the fractal and chaotic forms is to repeat itself at smaller and smaller scales - not just a variation on a theme but built in instability and local fluctuation lead to a somewhat erratic translation in different dimensions in order to absorb the perturbations. Clearly, in order to go beyond superficiality such a description has to be applied with sense and care. Here forms may resemble but not necessarily correspond to function. For each system the underlying drive and detailed dynamics at the microscopic level have unique characteristics. That is what makes cauliflower different from brain.

## IV-36 Abstraction as But-nothing-else

It is a paradox of journey into mind that we celebrate certainty when there are too many doubts, and we celebrate doubt when there are multiple certainties. These are the dreams that our conceptions of reality is made of!

We strive for certainty and arrive at it in stages as new information is assimilated. New information and data is redundant if we assume that the world is lawful. Reliable data from the past is critical for identifying patterns and for testing theory that can be useful for the future. Both for man and machine in an information rich universe the stored information had limits in terms of the capacity and resource allocation for acquisition, storage, updating, and retrieval for an application.

Need to know, access to emerging information, is critical for all spheres of decision-making where meaningful attention to specifics is required. Thinking becomes a scarce resource with the information-overload that follows from abundance - sort of spoil of the riches. Yet forethought in social interactions is important for running affairs of ones own life as well as of any organization.

Desire to break away from the facts of one sort or other requires an earnest faith in empiricism. In the realm of experience we deal with notion of relationships with the surroundings in search for caring and curing spirit in the deeper recesses of mind. Probably we all experience this natural state to emulate our desires. In such dreamlike states in search of meaning one is more likely to express and conceptualize juxtapositions. In a more overt

state of awareness we often repress incongruities and contradictions to stay in touch with imposed reality. However, in all such states of thought, dreams to scientific theories, experience is released from the observations as the perceived reality is symbolically transformed to explore the ranges of possible, probable, plausible and feasible. No matter what the path, struggle of reasoning devices is apparent in the journey of mind.

A necessary outcome of language is that all knowledge is a shared enterprise that thrives if validation relies on repetition and reproduction in different contexts. That is why we explore and validate each tool and technology through logic and philosophy articulated through word and also the outcome of practice and use. As a model for how-to-do-things, science and technology is one of the most successful forms of shared knowledge.

The initial choice was made by tool making ancestors. We have not looked back. In spite of recognized limitations, technological solutions have done far more for the social ills than any other approach conceived by humans. It is also true that many groups experience a much share of threats of technology in terms of encroachments from protracted wars and markets. For improving the human condition without exploitation it is also useful to develop suitable decision procedures to deepen understanding of knowledge and to broaden viable alternatives. Technology of shared knowledge involves experiences that develop in niches but later cut across time and space boundaries.

Knowledge of a snowflake is in all snow flakes - *just as universe resides in a grain of sand*. We wonder what lies behind the symmetries and the fractal chaos shared by snowflakes. To remove ourselves from the path of falling objects requires knowledge of the effects of all such events as well as the particular object in the real-time. Once out of danger we can contemplate on

the nature of gravity that underlies such events everywhere in the universe. Such syllogisms verging of mysticism are part of explorations of unknown and tentative, provided we do not take detour of the nonexistent.

The explanation versus the prediction line, howsoever vague it may be, separates the sciences from the ad hoc, nonexistent, contradictory and self referential constructs. Reality-based hypotheses contribute towards development and maturity of shared knowledge supported by data and emerging information. The hypothesis it self may not be mathematical but its cast in a mathematical form helps us explore the limits of our constructs. Correctness of hypotheses is judged not only by its ability to explain and rationalize the observations, but also as a forward-looking process validated by exploring the logical consequences within the bounds of reality. If the predictions come true we have a basis for validating the evidence intrinsic in the perception of the experience, observations, and also the knowledge-base for the evidence. It is critical for the development of collective knowledge about complex systems - whether it is about the potential of the human genome or any other measure of the web of life.