CHANGE AND CHANGE AGENTS

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PREAMBLE

In the recent human history since 1990's the word 'knowledge' has been used in its various forms, often with different and imprecise meanings. Though changes were occurring extremely rapidly within and between the human society as well as around and within human beings, especially after the World War II, say since 1950's the word 'Change' as such never came to public discussion as much as it is being used now at the beginning of the twenty first century.

This 'realisation' about change is perhaps due to the present day complexity of day-today life for an ordinary person, complexity in business transactions and even in political decision making due to increasing impacts of globalisation as well as instantaneous transmission of 'news' in visual form some remote (unknown) place to many parts of the world. Human being is bombarded with visual and audio media at an unprecedented rate through many tens of channels; the very nature of this competitive creative industry keeps on emphasizing something 'new' and something dramatic to 'catch' the viewers. In the field of knowledge creation and consumption (be it science, technology, humanities, economics etc.) it is estimated that annual production of such written information is about one billion billion bytes(10^{18} bytes) or say about 500 million billion A- 4 size sheets ($5*10^{17}$ A-4 size papers). Except for those who are in unskilled jobs, every one has to face hundreds of thousands of information sources to keep updated and be competitive. Those who are with knowledge intensive tasks have many times more of information to deal with daily, weekly, monthly and yearly.

Given the phenomenal capacity for number crunching and storage available with modern computing systems, business and financial worlds are monitoring 'changes' in markets (present and future projections of markets) with many sophisticated mathematical tools. A whole set of 'derivatives' have been invented to reduce financial and investment risks.

Be it for weather forecast or for market fluctuations in a stock exchange or for performance of a company or growth indicators of a country, 'changes' with respect to earlier quarter or earlier month or earlier year are highlighted. For e.g. during the first quarter of last year production figure or revenues of the company was so-and-so on and in the current year first year it has gone up or fallen by such-as-such percentage, in the usual style of reporting. Often there are no

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causal connections for making such comparisons. But it has caught up as a fashion and many industry leaders and government officials are succumbing to such a reporting. Leaving aside the utility or otherwise of such comparisons, the key point is that looking for 'changes' has become a part of the culture and also receives considerable academic attention.

Keeping up with these fashions, fads or trends 'change' is being openly advocated in almost every major area of modern society: politicians promise change; academicians call for 'changes' in the way they work, teach, learn etc.; industry and business leaders often call for many changes in organisation, business strategies etc.; in healthcare systems lifestyle changes are strongly advocated; there are serious concerns about the human-made changes on nature; though these issues were being considered for the past few decades under various specialised disciplines of environment like pollution over utilisation natural resources etc., nowadays it has become fashionable to lump them altogether under the topic of 'climate change' (again perhaps more the fascination for the word 'change').

Let us briefly examine the evolution of the approach of human society towards 'change'. 'Looking at change' and the reasons thereof, most of the very early tribal societies had a static view of the world. Not only Sun and Moon, Day and Night repeated systematically; diseases, thunder and lightning, floods etc. were a part of the static world view-some anger or punishment form more powerful forces and gods.

More sophisticated religions, philosophies, and metaphysical systems which came later in different parts of the world, attributed part of the changing elements of their lives to the Will of the Superior (or Highest) being (s), but they also allowed some 'space' for free will of the Humans. If the Human uses the free will well he/she reaps good changes and if not used well (in accordance with some moral codes) then the changes can be bad and can even be disastrous.

The Renaissance in Europe and subsequent growth of modern science, developed a different world view. What we now see as Universe, Nature, Sun, Earth, etc. are a long chain of 'changes' over billions and millions of years. There can be explosive changes like 'BigBang' or 'Supernovae' or gradual collapse of stars or birth of stars from various forms of nebulous substances and so on. The 'unique' (as we now know!) thing like earth had various forms of continental drifts, which are slow moving changes over million of years to arrive at the present state of the globe. Even now changes continue. Himalayas one of the youngest of growing mountains continue to grow up in height by a very small measure every year. The various tectonic plates of the Earth continue to move, causing earthquakes at different parts of the globe. Weather systems have had continual changes for many millions and thousands of the years. Even during the past one century every day was different- i.e a change – though one can derive a gross common factors of weather- like summer, winter, long time trends etc.

Another biggest change in the human world view about itself took place when human researches intensified to understand the origin of life and its evolution. Considering the size of the Earth, the several thousands of complex molecules that led to life were very small, insignificant. Even when many unicellular organisms evolved, they were insignificant! But their further evolution over million of years have led to the evolution of the Human. Small, insignificant changes over millions of years lead to many drastic changes; this appears to the way Nature functions.

Even the arrival of the Human was not just a single breakthrough even. The evolution till the arrival of modern Human was a long tortuous process spanning millions of years. Many hominids which were the initial change agents survived for long but perished later. But the changes continued in different paths. One thing appears certain : the ability of the Humans to impact the environment around them was far more than other earlier life forms. Was it the reason for such an unprecedented growth of Homo Sapiens? But the history of Homo Sapiens is yet too small a period!

Human inventive capabilities for fire, metals etc. gave the humans abilities which were far superior to the strengths of legs, hands, teeth etc of even more powerful and heavier animals. That capability made human different from animals. Humans can burn a whole set of forests to create more space for them to move; far humans can kill animals far more cunningly and effectively with their tools; cook the meat and store for longer time. In the later period humans mastered various cross-breeding techniques – for plants, birds or animals. This accelerated (or drastically changed) the paths of natural evolution which had its own 'slow' methods of mutation, selection, and propagation. Most importantly the domestication of plants and animals about 10,000 years ago was a major forward step for the human civilisation. Deliberate domestication of wild species by late Stone Age humans created genetic changes in plants and animals in a few centuries that would have taken millions of years under natural selection. Domestication of animals constituted a fantastic biological experiment whose success profoundly altered human being's relation to nature. (Ref.1 Mind from Matter, by Max Delbruck, by Blackwell Scientific Publications Inc, 1986, p.76). Thus human beings “control” over nature started about 10,000 years ago and is still continuously going on at an unprecedented pace. The 'human' who is thus a major and mighty 'change agent' has started effecting 'changes much more speedily. That is perhaps the reason for the current 'obsession' with 'change'.

This unique capability was possible primarily because of human 'scientific knowledge and skills'. The initial great biological experiments were at a time when their 'science and technology' had not grown anywhere to today's levels. At the beginning of the twenty first century human capability with genomics, stem cells, nanotechnology, etc. has given enormous capability to the humans to 'create new'life forms with specially designed properties.

In the 'non-life' areas of activities, human capabilities have been enormous even during the second half twentieth century. Human capability to manipulate matter (molecules and atoms) have led new forms of metals, materials, energy sources, transport etc. In 1945 that capability was demonstrated with a terrible bang against human beings themselves (part of them !).

Thus the capability to effect 'changes' both in 'non-life' and 'life' areas, by the humans is at an enormously high level since the later years of twentieth century and definitely during the twenty first century in most parts of the globe. This enormous capability has a definite impact on 'Nature' – which is being felt at various levels: micro-level pollutions of water, soil and air; high population destiny in some areas; scarcity of certain natural resources like water, etc. and also many new forms of diseases. Naturally there are various changes at larger meso – macro – global levels.

Thus Humans who were a product of slow cumulative 'change' of Evolution have themselves become the 'agents' of much faster (superspeed) 'changes' in nature : what takes millions of years for the Nature to accomplish are affected by humans in centuries and in the current century in a few decades. A product of 'change' has become a 'change agent' – collectively and individually. Let us examine various facts of this complex fact of human evolution. And also examine as to what it means for the 'Human kind' itself for other living organisms and the Earth which is the habitat of this unique product of evolution : 'Human being'.

A SKETCH OF HUMAN EVOLUTION

The theory of evolution is now mature with the thousands of scientific findings about different aspects of evolution. Except for some extremists' views and faiths, evolution is accepted as the fountain head of all changes which have occurred so far in the life forms including the human beings.

With increasing sophistication of scientific instruments, much deeper understanding of time scales and chemical and also about details of biological changes are possible now. Also simulations in smaller scales to verify hypotheses about some ‘change’ processes etc. are being done. Such scientific researches have resulted in the emergence of several superspeciality branches. The ability to work at molecular and genetic levels had added entirely new dimensions to the study of evolution. It is not the intent here to review them or even make a special reference with examples.

Nor is an attempt made to review when ‘precisely’ the human ancestors diverged from the apes about 5 million years ago. What were the different hominid forms? These are active areas of research given many modern scientific tools.

We briefly attempt here to look at different applications of evolutionary approach to human life. All of them result from enormous amount of researches over the past century. They attempt to trace the evolutionary changes that have taken place during the progress of Homo erectus to the current day Homo Sopien Sapien, the spices to which we all belong.

While there are a number of excellent books and articles on the subject, the author has drawn primarily from four books in this write up. Of course the thought processes from other streams also enter including from an attempted book by the author about the present day global dilemmas and how to ensure wealth and well being of all human being around the globle and the ethics.

In a seminal book “Mind form Matter?” Max Delbruck (Ref1) has attempted through twenty chapters, the evolutionary epistemology. Apart from the philosophical implications of what ‘reality’ means in terms of how human beings perceive the world around them and themselves, the book elucidates various processes of evolutionary growth of human cognition. The entire book in totality gives a clear impression that the process of evolution is not in a dead end and there are immense possibilities ahead.

This is told by Delbruck “The Stone Age people in England constructed Stonehenge 4000 to 5000 years ago….That probably thought very highly of themselves. Little did they know how much they didn’t know” Gunther Stent who is one of the editors of the book adds “And – what goes for them goes for us too.”

Since the time of Delbruck, neurosciences have progressed very rapidly. During the past few decades, instruments like functional Magnetic Resonance Imaging (fMRI) and Positron Emission Tomogramphic (PET) scanner have provided enormous amount of empirical data to understand the brain: the emotions, feeling, reasoning etc. These findings again reemphasize the evolutionary changes which have given rise to the modern human brain. More the understanding of the human brain, the more will be the human capability to change its performance further. One of the excellent treatments of the subject is given in the book by Vilayanur Ramachandran “The Emerging Mind” (Ref. 2). The author states (p.98) that many of the symptoms and disorders (of mental illness) seamless bizarre and disorders when viewed form an evolutionary standpoint that is form a Danwinian perspective. He proposes a next name: evolutionary-neuro-psychiatry.

Future implications on human kind of this knowledge and its applications, may be tremendous. It can be performance enhancing even for “normal” persons desirous of a change for “better”. Thus not only at the genetic level but also at neuron (or brain) level, human engineering could take place, to accelerate evolutionary changes, (as it happened with domestication animals and the plants in the past)

To clarify, these are the current author's speculations and not of the author of the book in reference 2. There are interesting discussions about the "free will" and some of the current neuroscientific experimental results, in that book. He further elaborates about the mirror neuron system (perhaps unique to humans) and how they become sophisticated enough to acquire the remarkable ability for imitation and mimesis.

This mirror neuron system thus liberated humans form the constraints of a strictly gene based revolution, allowing them to make a rapid transition to Lamarckian evolution, say about 50000 to 75000 years ago as a great leap forward which helped the sudden dissemination of a number of one-of-the kind accidental innovations like fire, tools etc.

In the present century with much more deeper understanding of 'brain' (model making, 'self' mimicking etc.), would it be too rash to speculate that another greater leap forward, could occur? Will it follow the path of current day genetic engineering or will it be much different?

Now let us look at yet another perspective. Even while the study of individual brain is very important (such a study itself leads to linkages with others as given in the examples of modeling, mimicking etc.), examine present human condition form the view point of sociobiological approach to evolution. These aspects are discussed in a book by John Hurrell Crook "The Evolution of Human Consciousness" (Ref3). The author covers a whole set of subjects such as the biological function of the mind, social environment and its evolution, social setting and altruism, monkeys, apes and man and the ascent of humanity. Then he deals with the behavioural elaboration of hunting hominids: and their intelligence, language and exchange: sociobiology and human societal evolution. Then he goes on to describe a whole range of subjects like psychobiology of a person:
self, attitude and values; troubled minds; consciousness flow etc. He has further dealt with subjects like meditation; quest for meaning and religion; etc touching upon Zen, Buddhism as well.

The last chapter deals with the dialectics of change which have topics like the biological function and progressive development of the human person; social identity : the interface of societal and personal processes; dialectics and equanimity in life.

Some quotes from the book will be in order especially the last chapter dialectics of change :

"The extent to which human behaviour results from the interaction of causal dimensions that are inherited is still debated. There are a number of reasons for supposing that dimensions of dominance – submissiveness and openness – closeness in relation to others determine the patterning of human relationships.

Interactions both create and occur within super-ordinate societal structures, the village, the community, the state. The information that programmes these structural tiers is at each level independent from that below it, yet constructed from elements important there.

Biosocial evolution has thus created super-structural organization as an environment within which individual person resides. In particular the way in which a person's view of himself relates to the values he sets on the social groupings with which he identifies and which may exist on more than one of the tiers of the super-structure is of crucial importance in processes of historical change.

Categorization of one's resemblances to others in common interests or grievances leads to a sense of communality called one's social identity. A negative evaluation of one's social identity can lead a person to change his work and affiliations until he reaches a social position in which he is content. This is social mobility. Societal conditions may preclude mobility however whereupon social identity may be strengthened, a sense of deprivation and a common course with other deprived people developed and action taken to bring about social change. Much of the action of history is constructed from social mobility and social change. The values that are generated in these processes provide the prime determinants of personal ethics.

Grievances between factions are settled at a higher tier in the superstructure. While the 'rights' of majorities are easily respected those of minorities and dissidents generate debate and conflict in which 'justice' for all is rarely assured. While the evolution of ethics has included a broadening of the target population for altruism such values can still collapse under conditions of prejudice and conflict when a dehumanization of the opponent permits cruelty and brutal humiliation. The generalization of human rights to wider target populations continues to develop slowly. Essentially such rights are recognizably similar to those that obtain between close kin. Thus among civilized people there is a tendency to recognize any fellow human as a member of the same family."

How far there is the last sentence of the author's quote is the dilemma we face today in the modern societies within nation-states and between nation states.

The author also points out that speed of change in the meaning individuals attribute to life often leads to situations where the young and old virtually inhabit different worlds of thought. It is also true even between youths from underprivileged and economically underdeveloped areas and the youths who are involved in frontline knowledge economy activities of today.

At this point it will be appropriate to refer to a book by Lou Marinoff "The Middle Way: Finding happiness in a world of extremes" (Ref.4) The book has a Chapter "Tribal Extremes : Natural Dispersion and Cultural Commingling in the Global Village". Marinoff says that he would have titled it as "Human Sociobiology 101 :

The Evolutionary Roots of Tribalism". He states that "the vital common factor that makes political and religious matters the subjects of endless debate and dispute is, in a word, tribalism. Whenever and wherever human groups become bound or united by a myth, totem, flag, party, credo, slogan, ideology or a book etc they experience two things : themselves and others….. The core social unit is called "a tribe" and it was a fundamental unit of human survival for a very long time. In Darwinian terms the tribe enabled humans to survive for tens if not hundreds of thousands of years, by dispersing them in small bands throughout every conceivable habitat on the planet, but at the corollary cost of inevitable intertribal hostilities. In Lamarckian terms, different tribes acquired and transmitted different tools and symbols, both for sustaining themselves and for competing against others. Wherever nature and nurture complemented each other well, human tribes flourished; where nature and nurture did not complement each other well, human tribes vanished.

After an interesting discussion of several aspects of evolution and modern symbols of tribalism' he concludes :

"Thus nature bequeaths to human beings a terrible paradox of nativity: We are born needing to belong to a social group, yet we also need to separate smaller social groups from larger ones and from the universal one. We understand intellectually that "All men are brothers," as every humane religion and philosophy teaches, yet we are evolutionarily almost incapable of living together as brothers. To do so, we must diminish or nullify the repulsive forces between one group and another: the xenophobic hatreds of racism, the ruthless prejudices of ethnocentrism, and the demonizing myths of tribalism."

But in order to achieve it, he recommends not the adversarial debates but the Middle Way, he expounds as derived from ABC (Aristotle, Buddha and Confucius).

After these relatively long and heavy discussions, it is time to cut loose from rigors of academics, science and caution. It may be necessary to enter into areas where "angels fear to tread" in order to understand the complexity surrounding us and yet greater complexity of the knowledge available from super-specialities and newer super special areas of researches resulting from them.

Therefore the current author would like to derive some general features of human evolution and also venture a few statements aimed at common good of survival of humans, other living beings and the Earth itself.

(i) Much superior level of evolution achieved by the humans now, is still conditioned by the evolutionary continuity : be it in biology, or consciousness or group behaviour or socio biology. For example the human brain still has functional parts of it derived even at the reptilian stage though in more evolved form. Sociology has many aspects of old

social groupings though in different stylized forms. Despite high levels of achievement in consciousness, humans are conditioned by their biology and the genes.

(ii) While retaining this evolutionary continuity, another aspect of evolution, that is the continuing experiment with changes, has also worked through humans exceptionally well. Not only the human beings have evolved to the current levels of capabilities of brain or social structures, but they have also been great change agents of everything around them : forests; rocks; minerals; plants; animals; water; yes almost everything in nature.

(iii) Above all, the human capability with the unique brain and consciousness, has led to understanding of nature, albeit partially, and use that knowledge to speed up the 'changes'. The current capabilities of genetic engineering are much more faster in timescales than the humans were capable of earlier through domestication of plants and animals. And also compare the capability for creating fire with the current day human capability for thermonuclear fusion or from early herbal medicines to current day healthcare systems. So the human capability of cognizing nature's working, has given enormous power to effect very large changes in it, in a very short time scale. A single human's life experience can now see 10 different drastic and disruptive changes.

(iv) Human beings have also created many beautiful images in their emotional and intellectual domains : literature, poetry, arts, science, mathematics, religions, philosophy; law etc. All these may have an evolutionary continuity, if not a compulsion. But they have all raised human capability and human social organizations to entirely new levels which never existed before.

Even though most of the above discussions have been largely based on science or description of scientific findings, the current author is deeply aware and believes 'knowledge' for the humans does not come only from modern scientific methodology. Science is not the only source. The current author has dealt with human knowledge in one of his recent book "In Pursuit of Happiness" (Ref.5).

In a section on traditional knowledge or ethno-knowledge, he points out in that book, how many of the tribal knowledge systems have been either destroyed or absorbed into other systems. Despite this, a number of them survive during the twenty-first century, but in danger of perishing fast wherever the older person of the tribe dies.

A quote from the book in reference 5 which also carries a quote from Murray Gell-Mann.

“Upsurge in the rationalist thinking and the emergence of deterministic scientific knowledge bases during the eighteenth and nineteenth centuries made it a general fashion to ridicule most of the tribal knowledge as superstitious and irrelevant. The roots for this ridicule or neglect are not superficial but have deeper philosophical basis about universal outlook. We will discuss it later briefly. At this juncture it is important to note that modern scientific and technological thinking has radically changed its approach to such traditional knowledge bases. To quote from the ‘Quark and the Jaguar -= Adventures in the simple and the complex’, (1994) by Murray Gell-Mann, winner of the Nobel Prize in Physics :

“Just as it is crazy to squander in a few decades much of the rich biological diversity that has evolved over billions of years, so is it equally crazy to permit the disappearance of much of human cultural diversity which has evolved in a somewhat analogous way over many tens of thousands of years. But human unity (as well as solidarity with other life forms of which we share the biosphere) is now a more important goal than ever before. How can those concerns be reconciled?... Imagine….the knowledge of the properties of plants in the minds of tribal shamans. Many of those witch doctors are dying without replacements…..every time such a shaman dies, it is as if a library has burned down….”

What Gell-Mann says would equally apply to several other knowledge and skill bases of artisans, and other traditional workers.”

Under the section on other knowledge forms, current author describes in his book on Happiness that Indian (South Asian) religious and spiritual thoughts and practices are now spreading in renewed forms to many countries including the developed world. Interest in meditation and yoga is growing in many countries. In a similar way many wonderful experiences from Africa, Australia, Arab countries, Iran, Central Asia, South East Asia, Oceania, Latin America etc would need to be identified for universal enjoyment.

He has also discussed what is truth in arts.

Another quote from the book of reference 5 :

“What it comes to art, the human knowledge acquires a new dimension. It is not like scientific, technological, economic or legal type of knowledge base. All of them contain the strong component of search for truth or reality and a search for methods of applying that knowledge of truth for practical purposes in life. In art, the search for truth is more complex a process. Nirmal Verma in a book ‘Concept of Truth in Art’ (1996) states :

> "This does not mean, as is often assumed that the reality of the world of art is closed to the world outside. It only means that it creates an alternate reality, which would remain strange and unknown to us, till we come into contact with it….It is this inarticulate feeling of 'beyond', which connects the work of art with the spirit of the sacred….All works of art in this sense are an attempt to recover the memory of divine. 'Beyond' in art is not something what is to be attained, but to remember that which has been forgotten….Hence the crucial role of memory in art which is to recover in art what has been lost in life. To be able to do that art makes us return inwards, towards the depth of our own self. But it also makes us move in the opposite direction, towards the world outside…."

In spite of fall these 'great leap forwards' in human evolution, many of the sociobiological features of the evolutionary past, still persist in a form that is dangerous to the human beings and the environment around them. In simple English these atavistic tendencies pose a great danger to humanity. The great 'change agent' is becoming a danger to himself/herself. It is somewhat like a story in the Hindu mythology of 'Bhasmaasura' who acquired special powers from God that when he touches somebody they will turn to ashes (Bhasma). Finally at the request of the gods, God in a different form makes 'Bhasmaasura' to touch his own head! Is humanity going towards this phase ?

The tension between the enlightenment based universal outlook and the cultural diversity which is the product of evolution cannot be easily wished away. The cultural diversities have in them some dangerous elements of "tribalisms" as well. One also hopes that those who take an enlightened universal view themselves don't become parochial.

Some ideas as to how human-being may prevent becoming a Bhasmaasura are given in a sagely book by Murray Gell-Mann "Quark and the Jaguar" (Ref.6)

A quote :

"The tension continues today between our need for the universality envisioned by the Enlightenment and our need for the preservation of cultural diversity. In discussing the future of the planet, using the results of scientific investigation and attempting to employ rational ways of thinking about the implications of those results, we are hampered by the prevalence of superstition,. The persistence of erroneous beliefs exacerbates the widespread anachronistic failure to recognize the urgent problems that face humanity on this planet. We are, of course, severely threatened by philosophical disunity and especially by destructive particularism in all its many forms. Such particularism is still manifested in many places in the ancient form of tribalism, but today it may be related to differences in nationality, language, or religion or to other differences, sometimes so small that an outsider can scarcely detect them, but still sufficient to give rise to deadly rivalry and hatred under suitable conditions.

Yes at the same time, cultural diversity is itself a valuable heritage that should be preserved: that Babel of languages, that patchwork of religious and ethical systems, that panorama of myths, that potpourri of political and social traditions, accompanied as they are by many forms of irrationality and particularism, One of the principal challenges to the human race is to reconcile universalizing factors such as science, technology, rationality, and freedom of thought with particularizing factors such as local traditions and beliefs, as well as simple differences in temperament, occupation, and geography."

(v) Or is it that the 'change agent' who is a product of billions and millions of years of evolutionary change, though at a speedier pace during the past several thousands of years, has no control over the 'change making process'? At this point one has to assert one's belief and hope that Nature, though ruthless in her destruction very often, never has intended to make her great 'change agent' powerless against 'self destruction'. (May be it is a blind belief or a naïve hope !).

It is with this hope and belief, the issues are addressed in the rest of the paper.

HUMAN POPULATION

The most important issue facing the humanity (and the globe – Earth, environment etc) is the question of human population (i.e. population of the great change agents). It is a difficult political, religious, ethnic, etc question and hence "ducked".

Our early ancestors, hominids lived, multiplied and all of them are totally extinct now. Only about 40,000 years ago our close cousin by race, namely, H. Sapiens neanderthalensis was totally exterminated by ancestors of our species H. Sapien Sapiens (Ref. 1 p.5).

Yes our species survived multiplied at a mind boggling rate; no doubt there were natural disasters; diseases; internecine wars and killings.

In spite of these, the very capabilities derived through the evolution of human consciousness and the attendant social systems, helped human beings to reproduce faster and disperse to different parts of the world.

But still up to about the middle of twentieth century, the total human population was about 2 billion. But thanks to human inventions of machines; chemical substances including fertilizers and pesticides; faster transport , antibiotics; vaccination, etc helped human beings to reduce death.

At the times of famines, food was rushed from one part of the world (or country) to another to avoid starvation deaths. Humans came together to help in natural

disasters, even when they were otherwise fighting at times of no disaster ! The newly invented human superstructure like United Nations institutionalized disaster relief, food aid, etc. Bilateral aids also flow.

The relative security after the end of World War II and more importantly due to advances in science, technology and global trade, overall wealth available with human beings have increased tremendously though there is poverty in many parts of the world.

During the first millennia after the common year (0 A.C.E to 999 A.C.E) the world population grew six fold. There was very little change in per capita income during this period. In contrast over the past millennium (1000 A.C.E to 1999 A.C.E) the world population has grown by 22 fold over what was at the end of the earlier millennium. Per capita income grew by 13-fold and world Gross Domestic Product (GDP) grew nearly 300 fold! Further details will show that bulk of this growth is after 1820 A.C.E. Population and wealth are still growing. By 2020 A.C.E world population may be around 8 Billion and by 2050 A.C.E. Around 10 Billion.

It will be ironical to call for stop of reproduction. The whole of evolution is aimed at maximising reproduction and preservation of the species. But the law of population cycle in nature as exemplified by the population of rabbits and foxes, do not apply to the human beings. They can cognize many 'changes' and guard against them. They can increase food production; they can create optimal food distribution system; they can store and transport food.

The current increase in population is due to : (a) increasing reduction of infant mortality ratio, (b) increased life expectancy and (c) normal reproduction though now at much reduced rates in many parts of the world.

All these especially the first two are considered as high points of human values as given in Human Development Indices. The reproduction though limited is but natural. Total stoppage will mean destruction of the species in the long run : an evolutionary “No! No!”.

But continuing increase of human population means increasing consumption from nature even if per capita consumptions are brought down. To bring down consumption of energy, it cannot be through energy efficiency measures alone; laws of thermodynamics point out limits to energy efficiency.

The current day per capita consumption of human beings vary violently between many parts of the globe : between the developed countries and the developing one; and even within countries. Can these consumption levels frozen on an “as is” basis. On one side the human evolution had reached a stage of the concept of equal human rights. Is it possible to back track from it even conceptually during the 21st century that these concepts have never worked for the human society as

whole except perhaps for small groups for small periods (compared in the scale of human evolutionary history)?

If one considers different forms of distribution of the wealth and consumption between human beings, will the egalitarian concepts work or will the atavistically derived “tribalisms” come into play? We should also remember that human evolutionary history has seen many thousands of tribal wars. It is the concept of common human ideals, human rights, common ideals of law, etc which allow the “tribes” to cease the wars even for short periods. If the “common human destiny” is taken off, in order to reduce consumption from nature, how can humanity hold its “tribal” instincts in check? The speedy transports, faster communications and deadly weapons are dangerous tools available with human tribes now, unlike in the past. These dangerous tools add a newer dimension while tackling the problem of human consumption from nature, as human consumption is ever increasing in per capita terms and also due to continual increase of human population.

The biggest challenge to the human beings is to face this issue of increasing population. Will colonisation of Space, Moon, Mars etc solve the problem? How long will it take?

There are more questions than answers available. But the importance of the issue, is staring before the 'change agent'.

Problems in local demographic changes, fall of youthful population in developed countries and increasing number of youth in developing countries, is another problem of skew in today's “tribal” balances. Also most of the youth in the developing world are not educated and skilled enough to meet the demands of the modern globalising world. These ill-equipped youth can easily be inspired by “identity politics” of several forms, which are but extensions of “atavistic tribalisms” of the past giving a hope for self-preservation.

The solutions will perhaps lie in the evolved parts of human consciousness to think of new models of human transactions between humans themselves and also transactions with nature, and transmitting them to other human beings through oral, visual, textual and other practical forms. The human capability to emphathise and therefore to imitate and to mimic, has to be utilised in major forms. Can media help? Can technology help?

GLOBALISATION AND LOCAL IMPACTS

As can be easily conceptualised if we examine the human evolutionary history, mobility, speedy acclamatisation to newer lands, winning over new areas etc were a part of the evolutionary necessity to survive and to preserve and propagate the species. With the increasing evolution of the human brain (and consciousness) and therefore the cultural aspects of human groups, this impulse

for exploration of new, took different forms: winning empires; finding new lands; navigation; etc. The growth of S&T, a product of human consciousness increased the pace of actions resulting from this global impulse.

Currently compulsions of the economics of S&T, trade, the pace of new developments etc have made globalisation as an inevitable change to be accepted.

Even when some tribes prospered with new discoveries, Stone age humans were left out in their pockets in the past. In a similar way there are now many people (in fact a large majority of the human population) left out in the "darker" side of the economic – divide, knowledge – divide, skill – divide, trade – divide, etc. Partly it is "tribalisation" in action; partly it is because of the constraints of social structures which have been formed by human beings through the period of their evolutionary journey to the current period of 21st century. Some of these constraints are linked to the very process of evolutionary changes. For example a new invention or a mutant has to be incubated in a smaller group; successfully brought up to the next level; then it has to go through expansive phase before coming to a standardised phase when every body can imitate and mimic.

This process does cause pockets of higher inventive capability – over a short period (decades or more), before a challenger with new mutative inventions can come up.

But the globalisation is not merely in economics, trade etc. The sale of deadly military weapons not to talk of weapons of mass destruction, is also increasingly globalised. Military trade and therefore the associated underworld trade of lethal weapons between many non-state actors have become a major part of world economy and national economy. These are also closely linked with high income employment.

Thus while globalization is a natural and perhaps desirable part of human evolutionary change, it has developed many danger points which can seriously damage the overall achievements of positive changes so far, as well as the change agents.

There are many articles and books addressing how to overcome these difficulties. The current author (Y.S. Rajan) has also addressed many of these issues in his book "Empowering Indians on the economic, business and technology strengths for the 21st Century (Res.7). In the Chapter 12 of the book "Technology as a Binding Force in an interdependent world", the author has addressed as to how the world and humanity can be brought together despite many of the divides mentioned in the earlier part of this section.

INDIA NOW AND 2020

Almost every statement told about India will be partly true. It will be an exercise in listing dialectical opposites or trying to resolve paradoxes.

Blandly put, India is now growing at a rapid rate in its GDP. Though most of its firms and most S&T institutions are yet laggards or followers in global terms, the desire to catch up through follower mode, is increasing.

When the major national exercise for Technology Vision for India 2020 was undertaken by Technology, Information & Forecasting Council (TIFAC) during 1994-1995 and when the exercise resulted in reports during first quarter of 1996, many Indian establishment elites were still skeptical about India's growth. This was partly because of the earlier decades of very slow planned growth (during which time population however grew nearly four fold !) and also due to the global financial crises during 1995. There was a general gloom or pessimism.

Therefore the projections of Indian GDP and its growth as can be seen from the book by A.P.J. Abdul Kalam and Y.S. Rajan "India 2020 : A vision for a new millennium" (Ref.8) reflected figures which have been far exceeded now. World GDP also has grown much more speedily then projected.

In many sectors India has performed much better than envisaged in the Vision exercise and therefore in the book. Steel sector has grown in a totally unanticipated manner. The book projected Indian production figures. While growth in domestic production is not as rapid, Indian companies have emerged as global giants by purchasing foreign steel companies.

Indian agricultural growth has been nearly stagnant or very slow. The book had recommended multiple measures. Especially the measures recommended for a large number of marginal farmers (which were also practically demonstrated in fairly large communities of farmers in Bihar, UP, Uttarakhand etc during 1998 – 2003) were not taken up in a sustained manner by the governments and public institutions.

Similarly manufacturing sector including small and medium enterprises were neglected as the establishment elites were more obsessed with IT enabled and financial services as prime moves of wealth generation. As a result while real estate emerged as a major growth area, generation of employment for large number of Indian youth and the income of marginal farmer families took a severe beating.

The current author who used to believe in pushing ahead with projects (big and small) to effect changes, is now much more deeply aware of the issues of evolutionary changes in institutions, especially given the constitutional framework

India has inherited for governance. Indian systems have some inherent time-constraints, which the current author had termed as Indian time-rate-of-interaction (Reg.9).

Projections therefore towards 2020 will have certain caveats. The projection of about 8% continual growth for 12 more years can show that utter poverty can be removed. Current push for elementary education through Sarva Shiksha Abhiyan may remove illiteracy. Public health system may improve.

The major concern is that the skill levels of most of the economically active population will be fragile given the push of global changes. This means a continuing anxiety of economic insecurity for a large number of Indians. Even now the percentage of those employed in organized sector is going down during the past two decades and it is 6% now.

Another concern to sustain rapid growth would depend on the ability of Indian firms and S&T institutions to create new knowledge capital at the global levels; to own Intellectual Property Rights (IPR's). It is very low currently. The current author with three other co-authors has elaborated on it in a recent paper submitted to Forum for Global Knowledge Sharing. (Ref.10).

The third major concern is about the governance; due to identity politics and large scale corruption of public institutions and individuals who run them, India has become a very soft state prone to terrorist attacks. The "liberal" elites have paralysed the Govt. institutions thus preventing them from taking actions to pre-empt or eliminate such attacks on people. This has long term implications as the domestic and foreign investors may choose other safer destinations like China etc.

Why is India mentioned in this paper? It is but an example of a large chunk human population. It is about 16% of world population and is likely to be of similar percentage during 2020 as well. Though the population by and large is much less desirous of change (evolutionarily perhaps more conservative!), a push towards speedy changes has begun and is likely to continue to gather momentum. Given the extensive coverage of modern media with about 100 TV channels including foreign ones competing to bombard Indian population with visuals and messages in local languages, the messages of 'change' are rapidly spreading. That is the reason one finds various forms of protests and violence.

The right to better living and equality etc, as well as the higher concepts of human evolutionary concepts and group behaviour, are trying to find ways to come into practice. No doubt various forms of 'tribalisms" domestic and foreign are also at work. We have mentioned about the terrorist networks in India, earlier.

If India can effect the 'changes' which are more or less fully demonstrated by the earlier evolution of other human beings in the developed and some advanced developing world, fairly peacefully and without any major disasters, it will be a good example for many others and will also increase humanity's hope.

WORLD 2020

Of course other parts of the world cannot wait for India to complete the set of changes. Africa, Latin America and many parts of Middle East countries, some of the South East Asian countries and also countries in South Asia around India – all of them need urgent actions to achieve minimum levels of human well being, security and dignity.

When all these developments (and changes) take place in India and in other parts of developing world, the totality of 'changes' to humanity and the collective achievement of human being as a 'change agent' will be unprecedented in human history.

However biggest question is : will the 'tribalisms" dominate? Or will the higher human concepts of equality and human rights prevail ?

There are no simple answers. None of the collective human codified knowledge (in science, economics etc) will help fully. Solutions will have to come from much deeper instincts of this highly evolved (and evolving) change agent, the Human – individually and collectively.

HUMAN INDUCED CHANGES

So far we have considered the human being's evolution; changes in human systems and human capabilities; inter se problems within human beings e.g. tribalisms; growth of human population; the catch up attempts by large segments of human population in countries like India, Africa etc to reach the high levels of evolutionary changes obtained by advanced segments of humans; etc.

Yes, they were all human-centric. Because human being is not only the result of change but also the change agent, now becoming very powerful and fast acting!

All through evolution human being has impacted other lives and things around her/him in a major way. We have discussed these as well in parts of the other sections of this paper.

But now the human impact has reached a stage where the whole of earth appears to be threatened. Some of the examples of this large scale impact are :

(i) Large scale pollution of air, water, and land now reaching to outer parts of atmosphere and interiors of oceans.

(ii) the presence of excessive amount of carbon dioxide, and other molecules, giving raise to the phenomenon of global warming, long term consequences of which can be devastating to the Earth's ices, water, etc.

(iii) extinction of many species of flora and fauna and continuing extinction of many more.

(iv) Generation of various kinds of new mutants of bacteria and viruses, whose effects on humans have been felt recently but whose impact on animals is yet unknown.

(v) Human capability with nuclear weapons (many stockpiles around the world) and biological weapons (the physical capabilities for which have been destroyed under an international treaty – but knowledge base with humans still remain !) pose great dangers to nature, if ever they are used; and

(vi) The continuing growth of knowledge of human being about his/her own genetics/genes and therefore the ability to manipulate/change them; continuing growth of such knowledge and capability about other life forms; and above continuing growth of knowledge about human 'brain' which is the CORE CHANGE AGENT. The latter can give human beings the capability to change (or enhance) the capabilities of human brain by artificial (human induced) means. That is the CHANGE AGENT is changed to effect faster changes! Can these processes go out of control even with very low probability ? Also some neuroscience findings question the basis of free will and only neural activity is considered to be the cause of actions. So what is the impact on ethics, morals etc. Is evolution a mere change driven automaton with disasters as the only feedback control ?

One extreme view can be – So what ? If there is a large scale destruction of humans, animals, plants etc through global warming, climate change, pollution, genetic changes, neurological experiments etc., at worst the current human species may perish. Evolutionary changes in Earth can any way continue with different routes. People with such views can also pose a question as to what we can do if there is a sudden continental drift in Earth or if a major asteroid hits the earth.

Some parts of such questions are still pertinent. Human being cannot arrogate to himself/herself that he/she and their community are in total command of the Earth and that whatever happens to the Earth is decided by them and corrected by them. Earth itself has several unknown things;

human knowledge of Earth, its interiors, its evolution etc is very limited. Something can strike them any time. We still have very limited capability to predict an earthquake. We can predict cyclonic movements after the cyclone has nearly fully developed. Even then, though, we can track the path of movement in close intervals of time, the cyclone can spring surprises on us by changes in path. About continental drifts we have very little knowledge.

Similarly Earth is not located in a secure place in the planetary system. While it is relatively far away from the perils of severe solar bursts, asteroids near the Earth pose unpredictable danger.

So it is good to take a humble view of human role and capability vis – a - vis Earth or Nature.

However it does not mean that even with such limited capability, the human being has not caused major changes in Earth and its environment. Potential dangers from these changes are a cause of concern for human beings themselves.

Also a cause which is big and situations which may threaten the whole of humanity uniformly, have much greater potential to channelise human capabilities towards a collective good and minimize “tribalisms” and other negative socio-biological behavioural remnants which cause frictions between human beings.

It is necessary therefore to ensure that issue of minimum essential prosperity for all human beings; minimum health care for all; minimum assured levels of personal safety and security. It can be a big human cause to work for.

Approach to issues like climate change, natural and major human – made calamities, etc. should take on a global human view. The human kind ought to create new social systems (probably with evolutionary changes derived from the past systems), which can help them transcend their “tribal barriers” at least for some minimum number of items (commonly agreed upon).

The ‘change agents’ may have to be trained to look at collective good rather than individual and group changes which dominated in the past. Will our biology permit it? What do neurosciences have to unravel for us? No ‘free will’?

A HOPEFUL END

I, for one, want to have even a blind belief and hope that humanity as a whole will be able to solve the problems posed by nature and also the problems created by it on nature.

Human-beings will learn to evolve further out of their past evolutionary remnants even by using their newly emerging understanding about human mind, brain etc. and also with advances in other fields.

At this point I would also like to refer to a seminal book by Susantha Goonatilake "Towards a Global Science, Mining Civilisational Knowledge" (Ref.11) in which he has unfolded a great drama of knowledge exchanges between civilizations and the evolution of current pre-eminence of Western scientific methods. He pleads for grafting other epistemological approaches which had been developed in different civilizations including South Asia to the current day approaches which are shaped by Eurocentric sciences.

Such an approach would, I think, greatly help in grafting into the new human collective endeavour, different "tribal" strands which have developed along with human evolution. That may give new insights and also perhaps a comfort factor for all the human beings who populate the Earth and those who will be born, thus reducing the pangs of the current knowledge-divides which sharpen human conflicts rather than prepare them for a collective human endeavour to redirect the 'change agent' to save the Earth, its living beings and non-living ones.

That process induced by the redirected 'change agents', may lead to several changes which may take human beings to a much greater leap forward.

Individual and collective evolutionary impulses may share a greater part of 'sense of humility' in the collective whole and also a feeling of compassion, for all, even while retaining the primary roles of reproduction and propagation of the species.

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