WRONG Theory

GIRISH ABHYANKAR

This book is not an intended

BEST SELLER

WRONG Theory

for

The Sustenance of
a Joyous and Leisurely Life

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A ‘Geeta’ for Parth, my toddler grandson,
and also for parents of his generation

PREFACE

We, the mainstream, are currently living in an artificial, technological environment. Many of us are also impressed by an abundant supply of energy, water and food, by posh and massive constructions, gadgets and gizmos, by decorations, fashions, etc., and by high-profile professions that give us a certain status in social life. Modern vehicles offer fast and comfortable transport. We can fly/travel to any place: for holidaying and expeditions, business and employment, status and pastime, and to visit friends and relatives. We can communicate, transact and access information on-line. We have high-tech education and recreation. Our average life-expectancy is much higher now.

Problems? They are mostly due to human errors or natural calamities, aren't they? "What the heck? We have, like, automation, robotics and further advances in technology, dude!" as a friend's son says. After all, technology is nearing perfection and accidents will soon be history! Illnesses? We have clean and purified foods, germicides and sanitizers, 5-Star gyms and, of course, regular check-ups and screenings in modern Diagnostic Centres, Corporate Hospitals, and the latest block-buster drugs too.

We blame social or life problems, such as price-rise, unemployment, corruption, terrorism, aggression, violence, etc., on mismanagement by the governance-system: politicians, bureaucrats, bankers, the judiciary, etc., and on population growth. They provide some spice in breaking-news, media-coverage, and films. Criticizing them is an entertaining pastime. But we are expected to rest assured; scientists and technologists will have a solution to every problem in the near future. The media keeps reporting on pollution, global warming, water

and energy crises, and so forth. But, we can go green – use renewable energy, reuse, recycle and save the earth!

Despite these reassurances, I realised that my father used to work from 11 a.m. to 5 p.m. My brother worked from 9.30 a.m. to 5 p.m. Now my nephew works from 8 a.m. to 7 p.m. Annual monetary earnings have jumped 10 times with each generation. My nephew earns 100 times what my father was earning. Yet the house, the food and the necessities for living happily have not changed much. Gadgets for entertainment and facilities for holiday-travelling have increased, but the time and leisure to use them has shrunk drastically. Peace of mind is deteriorating by the day. I wonder what my toddler grandson's working hours and his options for leisure are going to be. What will the environment around him be like when he reaches adulthood? Will our attempts to provide our next generation with a good education, property, a healthy bank balance, etc., ensure a joyous and leisurely life for them? Are technological advances, progress, development, economic growth and power helping humans lead and sustain a joyous and leisurely life?

What are the *real* objectives of using technology? What costs does human society bear, in terms of efforts put in and possible harm, for the claimed benefits of technology? Are the claimed benefits serving the real objectives?

Can there be technologies that serve the intended objectives at very low costs, in terms of efforts put in and possible harm, while also sustaining the benefits for our future generations?

This book is an attempt at a unified theory addressing these questions and the related issues, the emerging philosophical aspects concerning human life and, finally, a case-study. The subject is bland and serious. So I shall prod, tease, mock and provoke to add some zing!

The internet has ensured that all of us have information at our fingertips. I have avoided duplication of such available information and data. This book tries to present the interconnections between the available information that I feel are beyond commonsense understanding and do not appear in our formal education either.

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Foreword

Objective of This Book

1) To evaluate **intense or hard use of technology (hard-tech)** vis-à-vis the sustenance of a joyous and leisurely life, against the backdrop of the Laws of Nature. Since the study of the Laws of Nature is called science, this evaluation is a **scientific** one!

2) To explore a theory that is in tune with the Laws of Nature i.e. a scientific approach for the sustenance of a joyous and leisurely life through **soft-tech** – a technology that (in terms of effort and harm) is a low cost one .

This book is not really for those who go more by their *faith, hope, and belief* in human technological ingenuity and in super-powers rather than by understanding *the Laws of Nature* i.e. by being *scientifically-minded*. I wish them good luck. They may, however, read it . . .

To mock – one of the highest mental pleasures[1].

To induce sleep *while* reading – one of the highest physical pleasures or, perhaps,
a **tranquil sleep *after* reading,** if this book addresses the reason for their disturbed sleep/insomnia[2].

To achieve – **Q**uality (pas) **T**ime **M**anagement
(QTM in management jargon),

and, possibly, to help me in my humble contribution (*of 'giving' or being useful*) to society.

Disclaimer :

Can't read clauses? They are in invisibly small print.

Why A Book . . .

1) When I share my views in interactions with large groups, I cannot avoid the "not really for them" category. Presenting my entire thesis at one go is not possible; nor is it possible to have multiple sessions. Queries remain pending or unanswered. The views I express are often inconvenient and discomforting in the current situation. Some may not be ready or open-minded enough even to hear them. They may be amazed and leave, or lose focus and retaliate. Some may feel too shy to ask for more details. Feedback or afterthought meetings are usually not held. A few people are too close to take me seriously! I thought that writing could overcome some of these problems and also allow me to present my theory precisely and in an orderly fashion.
   (Odd or seemingly irrelevant points in this book are not entirely due to my idiosyncrasies; they have also arisen out of matters raised by participants during my oral deliberations.)
2) To communicate with the younger generation (particularly my toddler grandson's) and those that will follow – this book is one of the ways to reach such an 'intended' audience.
3) When a man cannot spread his sperm he writes a book[3].

The Title . . .

Many experts, scientists, and economists suspect that there is something **'Wrong'** in my theory. Of course, in most human languages 'wrong' or 'bad' actually means "I do not agree" or "I do not subscribe to" and so forth. It follows that 'right' or 'good' carry the opposite meaning. But since 'might is right', influential and powerful members of society can create an illusion that their version of 'right' is the eternal truth.

If 'right' thinking is not in tune with the Laws of Nature it leads to more effort and harms us. If such increase in effort and harm occurs slowly over a few generations, it is not felt. In fact, undertaking such efforts and bearing such harms can

become glamorous and ensure high social status. Throughout history humans have been unable to distinguish between the *prevalent* 'right' and the truth.

When "might is always right" it follows that "weak is always wrong". I am weak. Ergo! My theory is the **'Wrong'** theory (note the upper case 'W' – it is a proper noun, not an adjective)!

I shall give justifications for this 'Wrong' epithet at appropriate places in the book.

Format of This Book

This book is written in the first-person singular or plural – but it is not autobiographical. I am an uncommon member of the main-stream informally presenting the outcome of my study. This is based on observations spanning more than half a century, or three generations.

Some parts of the theoretical discussion and concepts of physics are presented in the form of 'boxed' text. These can be skipped without losing the essence of my arguments.

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‘Hard-Tech’ Everywhere

Effects on Us, the Mainstream Human Society

Today, almost all our necessities are met by the use of hard-tech and all have a monetary price-tag. Only the ambient air is *currently* free. Obviously, earning money has become an absolute necessity of life. **We earn money by putting in efforts and/or bearing harm.**

We employ ourselves for earning money. ‘Any activity requiring a commitment of time (loss of freedom) for putting in the effort and/or for bearing harm (loss of comfort) done for monetary gains’ (by way of wages, fees, service charges, profits, etc.,) can thus be defined as a profession or **Employment**. Since money is controlled by governments, corporations and similar ‘non-human’ entities, everyone in the mainstream is, in effect, an ‘employee’ in their direct/indirect employment. Even after retirement we earn pensions, interest, dividends, etc., from them.

In the past, **formal education** was for ‘developing oneself to enjoy better’! Today it is for employment, which is considered a ‘necessity for survival’ in the mainstream mindset. It has become like a processing industry – converting youngsters into money-earning machines. The course of life for most youngsters is now set towards “career development” – formal professional courses followed by apprenticeship, probation and then profession or employment, hopefully with rising designations/labels and perquisites.

Losing freedom and comfort in such employment or profession and in the education which necessitates it is now equated with social status; professional qualification is the ‘specification’ and the educational institute or employer is the ‘brand’. Only under-aged children (excluding presumed- and/or forced-child-prodigies) and a few not-so-incapacitated

grown-ups are enjoying freedom and comfort (i.e. having no time and/or service commitments) *without any stigma*.

Thus, almost all employed '**real'**-bodied people work and bear harm for '**virtual'** bodies (governments and corporations) to earn and/or store money (a **virtual** resource), and expect to receive **real** goods and **real** services that are worth more than (or, at least equivalent to) the work put-in and the harm borne by them. We do not know of anybody who lives on free natural goods and services, or of anyone who is working only for themselves and who is hardly dependent on money. "How is it possible?" we ask incredulously.

The entire employed human population now spends ever-increasing time in employment and related activities: time spent at the work-place, for commuting (work-places moving further away from residences or home-towns), for official tours, delays in travelling, for spill-over work at home, and to attend to work-related calls literally *anywhere and everywhere,* even when unwell. Employer-sponsored outings, business parties, outbound trainings, conferences, etc., are a part of employment. We have no freedom and leisure.

Work-related pressures and tensions are mounting. We are expected to work harder, meet tighter deadlines, achieve higher targets, face increasing competition, follow a maze of rules and regulations and, as if this were not enough, keep proving our worth over and over again. We are looked upon as a 'Resource' (the exalted 'HR') just like other matter – raw material, water and fuel. But unlike these resources, we are dispensable (by other humans and machines). When automatic machines capable of doing more and better quality work replace us, we should actually be paid for sitting at home; instead, we are eliminated!

Good work in employment is rewarded by higher designations/labels and/or in monetary terms and other perquisites. These can include inflated reimbursements, opportunities for graft and earning hush-hush money, offers for "Platinum" Health-Check packages in posh hospitals, and so on! **But reward is never in the form of a reduced commitment of time and work-load, pressures and tensions.** In fact, we, too, take reduced work-load or relief from commitment as demotion, degradation or punishment.

The monetary cost of living is increasing continuously and we cannot decide how much money will be sufficient for our lifespan and for future generations to maintain the social status and dignity expected of us. Hence we try to earn more and more money by working hard and/or bearing harm. *This is out of genuine necessity and not greed.*

We are so hard-pressed in employment that we require holidays, weekly and annually, for finishing accumulated house-hold work, to make up for lapsed rest, to meet family/social obligations and to just escape or 'get away from it all' (popularly called 'unwinding' or 'recharging one's batteries'). But even during holidays we are 'kept' busy shopping, trying out pay-for entertainments, and travelling. We are hardly left with any time *to do nothing*. This is why I envy free birds.

In the good-old days, persons *sacrificing* sleep, tasty foods of one's choice, friends, family, joking, fooling, frolicking and leading a leisurely life were called 'saints'; today they are known as 'good' employees[4]. A jolly, healthy employee is looked at with suspicion.

In desperation, we try stretching old-age longer in the hope making up for lost freedom and leisure during our youth.

Views Not Put Forward

Work-Load, Tensions and Pressures in Employment

If advances in technology, sophisticated equipment, modern management practices and blah-blah are for our benefit then their use should have reduced work-loads, pressures and tensions. We should really be more relaxed and be spending less and less time in employment, since machines/robots having taken up all the drudgery. By now, working days per week and working time per day ought to have reduced to once a week and an hour per day or less. Instead, we are busier – despite machines/robots being deployed to full capacity. Is there any hope that hard-tech will ever bring our work-loads to an end?

Despite having technological power at their beck and call, even top-notch people in every field – politics, administration, industry, business, media, sports, research, education and entertainment – do not enjoy their senior positions and

superiority in any comfort. They, too, bear crushing work-loads, pressures of answerability and tensions of retaining their position and respectability. In fact, I see them as the most insecure and the most discomforted of the lot, both physically as well as mentally. If even the socially high-ranking ones are not, then who really are the beneficiaries of hard-tech?

The current theory of the continuous growth of the economy means that we have to increase our incomes by ever more work and ever-increasing spending (on borrowed or earned money) by falling prey to discounts, sale-offers, tourism packages, and by spending money for 'status'. The norms of status match the agenda of the 'growth of the economy'. Audio/video equipment or the internet really ought to be for our entertainment but is being extensively used for business/work purposes. Even sports and the fine arts, meant for entertainment, are invaded by the world of business and investment. Almost every aspect of our life is an 'economic activity' i.e. money transactions.

Since only humans (and not machines or robots) get paid for putting in effort and/or bearing harm in any economic activity, the activities that increase money transactions actually end up further increasing our own work-load, pressures and tensions. In effect we are working to increase our own work-load… rather than reducing it!

Time and Money in Employment

Since our employment keeps us so busy, we are not left with much time and energy for necessary household-work. So we pay for the use/purchase of gadgets to save time and effort. We pay for energy (electricity) to run them, pay for their upkeep and maintenance. These payments are made from the compensation paid to us in employment. So part of the time and work in employment is spent indirectly for the gadgetry!

Since our place of employment and enjoyment (on holidays) is not usually within walking distance from our place of residence or home town, we use vehicles. We pay for the use/purchase of the vehicle, fuel, repairs and servicing, etc., from the money earned in employment. Here, again, part of the time and work spent in employment is indirectly for the vehicle.

A further part of our work and time in employment

indirectly goes for employment-related insurance (health, safety), appearance (clothing, cosmetics) and status issues (now a necessity, as we are, and want to continue living in a society of 'employees') because we pay for them from the compensation-money we receive from employment.

Our 'employee-life-style' deprives us of physical fitness, the thrill of adventure and of moving freely and exploring the beauty of nature. So we use hard-tech to create surrogates and pay health-club fees, pay to watch sports, nature and adventure on-screen, or pay for eco-tourism, etc. This payment is also from the money earned in employment. Hence part of our time and work in employment also goes towards our health, entertainment and holidaying.

Thus, the majority of work done and time spent in employment *is for providing things necessitated by employment itself*. For example, we must use all sorts of vehicles to carry out work in employment. What kind of work is that? Making, running and maintaining vehicles and the infrastructure for the same! We use gadgetry because we have no time and energy for household-work. Why are we so busy and so tired? We slog for gadgetry manufacturers! The same is true for many products and services. Hard-tech creates employment and what do we do there? We *try* to address the problems created by the hard-tech employment itself, by using more hard-tech and create new problems – a multiplier effect. Hard-tech pollutes water. But the remedy – the production of bottled-water – causes more pollution[4]. This is true, in a sense, for most industrial activities.

Governments and corporations of the world are in the business of making goods and providing services *that are necessitated mostly due to their employment itself* for their own employees (i.e. for the entire mainstream). Even defence equipment (mostly attack weapons), is made for use against *human* enemies; they are hardly useful against natural calamities. Weapons create threats that are answered by more weapons. Competition in industrial products is no different.

Since **governments and corporations cannot make the *basic* essentials for living – food and wood (these are still exclusively made by the plant kingdom) –** most of hard-tech employment ("create requirements and keep addressing them")

is effectively just a pastime activity! Having some activity for pastime is important; but of this kind?

A very small time of the day in employment is 'quality-pastime' i.e. activities without any compulsions or strings attached. These consist of interesting but unassigned work, socialising, eating and gossip! But the majority of the time is spent facing compulsions, pressures, tensions, boring physical or mental work and conflicts – all a poor-quality pastime. Even people working in their 'areas-of-interest' sooner or later find themselves irked by the loss of freedom. Innocent people are lured by the bait of "job satisfaction" but we all know that it is actually an oxymoron! Employment pervades one's entire youth. How much real worth is there in slogging, struggling and suffering as a pastime?

Earning in employment is the carrot dangled before the cart-pulling horse – each one of us! The more the earnings, the more demanding (worse) is the occupation. I have to slog to earn money to buy (or rent), run, and maintain white goods (or white elephants!), a spacious house, gadgetry, vehicles, luxury goods and paid-entertainment. Hard-tech that makes all these things using vehicles, machines and robots as labourers, automation technology for execution, and computers for management, feeds on materials and fossil-fuels that are free in nature. Then why do I have to slog and pay for something that ought to be for free?

Hard-Tech Hassles

Gadgetry and vehicles that ostensibly save labour and time always follow Murphy's Law. Despite regular upkeep and maintenance, they break down at the worst possible time. Travelling on roads overcrowded with people or vehicles or both (and I contribute to overcrowding myself) by meticulously following traffic rules and regulations (if disciplined) or watching out for dangers (if undisciplined) is no pleasure. Driving tests, insurance, servicing, repairs, breakdowns, parking, road-rage, accidents, and police – all add to the hassles. Roads are continually being dug, worked-on and/or closed for one reason or the other.

Secure and pristine places of enjoyment are getting increasingly crowded by people, vehicles and constructions.

We are literally consuming all such places. Despite spending a lot of money, one hardly gets any joy. I am forced to 'enjoy' on-screen advertisements interrupted by programmes depicting problems and sorrows. Players in sports are almost like bonded labour. Watching a sports channel is no different from watching a business channel. Educative programmes on science, technology, wild-life or sociology indirectly advertise hard-tech. How much 'unadulterated' entertainment does hard-tech offer?

Hard-tech offers so many options that selection of any gadgetry, vehicle, equipment, clothing, houses, entertainment, and even food needs detailed study (or an expensive consultant!) to understand the terminology, to compare utility against the price, reliability, side-effects, not to mention status issues. I have to continuously acquire new skills and remember operating instructions, safety rules, and so forth. Small errors can result in embarrassment, complications or even in disaster/loss. Every time I ask Mr. Hard-tech for a helping hand, he gives it to me, but pulls me so hard that I fall into deeper trouble.

Technical snags/uncertainties are so much a part of our life that when friends part, the erstwhile "**Good-bye**!" has now been replaced by "**Take care!**"

A Counter-View

Some of the unfavourable effects of hard-tech may be a passing phase. Currently we seem to enjoy our employment, off-loading our work to gadgetry and machines, high-tech entertainment, travelling for work, holidaying, for meeting people, and viewing man-made and natural beauty, etc., though there is no leisure anymore. Most of us cannot perceive the non-monetary cost and benefits of technology. Amidst conflicting and weird views and opinions, we somehow carry on…

But for how long can we do so?

Energy Supply

Today, our jobs and our lives are desperately dependent on goods and services made possible through electricity, petrol,

diesel and LPG. If their demand and their prices rise, we have to slog harder to afford them; if they fall, our earnings will also fall. This is because employments in hard-tech depend on their usage or demand. There is not even the slightest indication that our life is becoming independent of these energy resources.

We would like to save on energy costs but energy-efficient gadgets or vehicles are more expensive. Their specialised maintenance costs are high. Costs of ecologically-correct methods of disposal of electronic components, batteries, synthetic materials used in them or that of energy-efficient lamps are very high. Do we really save any energy cost in using/running such gadgets or vehicles, or do we end up imposing indirect costs and harm on future generations by their use, and ecologically-incorrect methods of disposal?

The sun and the wind are promoted as renewable energy sources. Promoters of photovoltaic cells claim a small cost-recovery period as compared to the life of the cell. In other words, they claim that a lot more electricity is generated by a cell after recovering the electricity used-up in making that cell. That means a lot of excess electricity is generated without any cost. Then why does the electricity generated by them cost more than the grid connection?

I have a simple question to ask these people. I ask them to make another solar cell *using energy generated by the first cell* and then give me the first cell for free! I am willing to pay twice their usual profit. They should be more than willing, because their original cell has been replaced by a new cell (using totally *free* solar energy). Why is no promoter ready for this deal? The case is similar with the promoters of windmills. *Why are even renewable energy equipment manufacturers themselves dependent on fossil-fuel-generated electricity* (as per their own financial reports)?

I managed to install a few photovoltaic cells taking advantage of a large government subsidy (governments provide subsidies by incurring huge losses at our cost). But even then, electricity generated from them and stored in batteries was not affordable over time. Forget about the fast-deteriorating performance and the unreliability due to cloudy skies!

Job-Demand

In the hard-tech era some people have to work in coal mines, thermal power stations, high voltage switchyards, on transmission lines, or on tall structures. Some work on oil rigs, in refineries, in the transport, handling and production of inflammables, hazardous chemicals, and radio-active materials. Some travel continuously as drivers, aircraft-crew or seamen. Hard-tech also produces huge waste, accidents and emergencies. A good number of people clean sewers, collect, transport, sort and dump garbage, rubbish, debris, and scrap. Some are involved in patient care or work in hospitals and in the fire-brigade. Army-men work at extremely remote locations in harsh conditions for securing or capturing energy and material resources.

All the above-mentioned people at ground level carrying out such **d**ifficult and/or **d**angerous and/or **d**irty jobs – or **3d jobs**[5] – may be working with proper safety-gear and adequate insurance cover, etc., but no amount of monetary compensation is enough for their sacrifice in terms of human value. They are humans working like robots. Hard-tech necessitated all such jobs in the first place, and *they have not been eliminated by advances in technology* over the years. A significant portion of the human population has to do them. No one in the mainstream can assume immunity. Are we, including our next generation, ready to do them? If not, do we have the moral right to use their services? Are we not exploiting them? The hidden cost of such exploitations can be terrible in the long run.

Health, Safety, and Peace of Mind

In last few decades, scientists have been reporting on the degradation of air, water, and soil quality on earth due to activities that are directly attributable to hard-tech. We hear of global warming, greenhouse gases, melting of glaciers and polar ice, etc. Many unpopular books and reports by NGOs predict the potential ill-effects of such changes on our health. They are very disturbing and worrisome.

Many ailments are blamed on current foods and life-style. But hard-tech decides about both; not me. How can I save myself from the toxicity in the foods I eat, the products I use

and the huge waste I create around me? Dumping of waste is a major problem; how can I protect myself?

Despite advances in science and technology, illnesses, accidents and violence are on the rise. Hospitals and pharmaceuticals are thriving, indicating deteriorating health. Seatbelts and airbags are mandatory, meaning that travel is unsafe. How can I assume that I will always be excluded? Enormous risks in my life inadvertently affect my health.

Crowds seen at fortune-tellers' booths and at places of worship indicate increasing insecurity and loss of peace of mind. The rise in the number of people keeping pets shows rising emotional insecurity. Crowding at holiday-resorts and courts-of-law shows increasing discomfort in normal life. All types of treatment and de-addiction centres are filled to capacity. Anti-depressant medications are among the top-selling drugs. More and more people are unwell. What do these deteriorating parameters tell us?

?

We hear a lot about scientists and their great theories, inventions and discoveries. But can their work ever provide a self-evolving, self-maintaining and zero-side-effect machine or a robot (almost a super-human) leaving us and our future generations to lead a secure (including security against most of the natural calamities), comfortable, joyous and leisurely life? If we do not survive this so-called 'passing phase' and succumb to rising work-loads, struggles, pressures and tensions, then most of the work by scientists and technologists will turn out to be only a pastime or entertainment for them as well as human society in general.

My View

Dreaming of advances in technology, and getting impressed and carried away by it, is okay only if technology has served its implicit primary purpose. Otherwise 'development, progress and economic growth through technology' will be just an empty mantra garnished with suitable statistics, with the vital 'human' component missing.

In my opinion, the objectives of advances in technology and education are :

To improve –

- Security: freedom from fear and uncertainties.
- Comfort: freedom from the burden of work or compulsive bodily efforts (muscular or cerebral). I am not talking about "doing nothing" or a laid-back life; rather I envision a life of meaningful work, study, research, innovation, experiments, exploration, etc., of *my* choice; the freedom to undertake or stop any activity, at any time, at my leisure.
- The peace of mind necessary for enjoying entertainment (like the frolicking actors in Bollywood songs who seem to have neither fear nor work-load commitments), for myself and future generations too.

These are indeed selfish-interest objectives. Since my childhood, 'selfish' has been a derogatory word. Our school preached about sacrificing self-gain for one's society, nation, humanity, etc. Later, corporate bosses added 'Company' or 'Corporation' to the list. Now leaders in government exhort us to make sacrifices for the economy – pay tax, contribute to GDP growth – borrow money, buy goods and services, work hard to repay…

I am also a part of such lists. But how can I help them before helping myself?

In case of a drop in cabin-air-pressure in aircrafts, do they not tell you to wear your mask properly *before helping others* lest both suffocate? How can it be different in daily life?

Everyone realises this paradox and goes for self-help as a top-priority, albeit indirectly – in the name of country, corporation (economy and technology) or philanthropy. Charity is also done for one's selfish interest of investment, glorification, goodwill, pleasure, satisfaction, security, advertisement, guilt-riddance, as a quality pastime, and also for disposing of un-usable money or goods. Strangely, such indirect selfishness is glorified and direct selfish-interests (*my* security, *my* comfort, entertainment for *me*) condemned.

Puzzled by the discrepancy between my expectations and reality, I began to trace…

Development of Technology – An Ecological Perspective

The animal kingdom has adapted to life and reproduction mostly fuelled by bodily ('internal') energy generated through food and a free supply of energy (solar light and warmth, wind, rain, etc.). In addition, human beings extensively use materials external to the body – soil, stones and biomass as raw material. The latter is also used as fuel for illumination and warmth, cooking, protection, processing raw materials for tools and goods, and so forth. Technology is nothing but the art and science of using such 'external' sources.

Over thousands of generations, technology has been an extra-somatic adaptation for :

1) **Security** – shelter for protection and storage measures to overcome uncertainties;
2) **Comfort** – tools and processes for reducing bodily effort and the burden of work-loads;
3) **Entertainment** – toys for refreshing skills and communication for sharing joy;

in this order of priority, supposedly as a 'survival and better-living' instinct.

These adaptations are reflected in anatomical changes in the human body. Compared to other mammals or apes, the human brain has grown in size. It is more versatile and consumes a large part of input energy. Skills and pre-requisites for survival in nature, such as strong muscles and teeth, are weakening. Body-hair and acuity of smell, hearing, night vision and the capacity to digest raw food have reduced. This is because technologies such as control of fire, shelters and covers, tools and processing have now merged into human life. These technologies are 'adapted technologies' (AT). This is equivalent to a natural adaptation; survival without them is not probable, just as birds cannot do without wings.

On the other hand, perception of insecurity, comfort, and entertainment is abstract and subjective and hence the development in technology towards these ends is never-ending. Technologies such as agriculture, animal-use and the wheel have pervaded human life but they are not natural adaptations as yet, i.e. we can live/survive without them. All substantiated

history of humanity dates mostly from the advent of such 'non-adapted' technologies – agriculture, animal-use and the wheel – onwards and it is mostly a record of a series of created problems and attempted solutions in an ever-escalating cycle.

Fossil-Fuel-Based Technology Leading To Hard-Tech

Easy and abundant availability of fossil fuel led to the rapid development of technology in temperate-climate regions where it proved useful in combating harsh conditions. But technologies in the development of weapons and firearms against *human* enemies have made mainstream human history a saga of oppression, exploitation, atrocities and tyranny.

Subjectivity in defining comfort and entertainment leads to the use of technology for luxury, novelty and fashions, too. Today, the advancement of technology has gathered a seemingly unstoppable momentum in that direction, and has gone astray.

Belief in "prosperity through hard-tech" led to industrialisation. Industries demand guaranteed and continuous supplies of resources. High-tech societies acquire resources from all over the world using weapons whenever necessary, not to mention Space expeditions. The heavy cost (violence, wars, massacres and genocide) of the industrial revolution paid by human society has been well documented.

Human males innovate and use technology as extra-somatic means for competing and showing superiority over other males to **A**ttract, **I**mpress and **R**etain (**AIR**) females (as some male birds use nests and decorations). I remember a cartoon in a German periodical that showed a man asking a young lady, "Is Peter's Porsche worth more than my Volkswagen plus my heart?" The real reason for the adage "behind every successful man there is a woman" is the need to 'successfully attract, impress and retain her!' Of course, 'success' means technological success.

Interestingly, a UK tourist guide-book asserts that, "Britain prospered mostly during the reign of the three Queens". (It did not happen during the reign of so many kings!) No wonder! Male-dominated society was busy impressing Queen Elizabeth I, who remained an eligible bachelorette throughout her life. Later, Britain started the industrial revolution and sustained it

so long because the queen reigned for so long! The adage can be modified thus – "behind every successful male-dominated-society, there are women".

In the second half of the twentieth century some industrialised societies (in temperate-climate regions) proclaimed themselves "developed countries" despite the fact that everyone there was required to work hard, i.e. without having achieved the basic objectives of technology! They also labelled the tropical and subtropical world, which did not require technologies developed by developed counties, as 'under- or un-developed'.

Media thrives on hard-tech and hence it is dominated and controlled by the 'developed world'. It inappropriately showcases the glittering and shining hard-tech life-style as a sign of 'developed-ness'. Annoyed by the adjective 'under-developed', tropical and subtropical societies are lured into blindly copying the 'developed world' and are somewhat condescendingly described as the 'developing world'.

Subsequently, we have had 'World Economy' – a social system supportive of hard-tech. It has nothing to do with the original meaning of 'economy' – the careful management of resources to avoid waste. Global extravagance or extravaganza is a better description. 'Developed-ness' is decided on the basis of 'per capita income', GDP, etc., but these terms indicate only hard-tech development. They have later added a 'human development index' (life expectancy, education/schooling, standard of living) which is also an indicator of hard-tech-use. But hard-tech reduces/shrinks human 'security, comfort, time, and leisure available for entertainment' – the real index of developed-ness.

'Developing countries' are following 'developed countries' by adopting high-speed transport infrastructures, industries, power stations, dams, canals, vehicles, gadgetry, high-tech housing, and the supporting systems: banking, finance, telecommunication, business schools, etc. This happens at the cost of overlooking the real issues – human security, comfort and peace of mind for entertainment.

Hard-tech is also a surrogate for sex. Every time my technologist friend borrowed money for a new hard-tech project, his bank official remarked, "Loan for **TO** – technological

orgasm!" I, too, have confessed as much, in my foreword, under point no. 3: 'why a book?'

Hard-tech is increasingly used for enhancing sex-appeal (cosmetics, and fashion), for virtual sex (through telecom, media), anonymous violence (remote-controlled weapons) and for status norms (with adjectives – complex, fast, large, latest, tall/high/deep/grand, automatic, exotic, luxury, lavish, fashionable). Such hard-tech developments threaten our health, security and comfort that ought to have a higher priority.

Animals mate depending on conditions in nature that are conducive for raising offspring. During their mating-season, males neglect safety since the propagation of the species is more important than the safety of the mating individual. Humans with shelters and capacity for storage (man-made conducive conditions) enjoy round-the-year mating and men disregard safety all the time! Many technologies have actually developed due to testosterone levels (to 'AIR' females); the necessary safety and security are often dropped (neglected). Thus, the effects of excess testosterone are endangering our sustenance and better living!

My Study

Many thinkers the world over (e.g. Henry David Thoreau and Mohandas K Gandhi) have objected to hard-tech development theories that do not (and assuming that they never will) address the true concerns and needs of human life. Do their thought processes have any scientific validity?

The Economy is about goods and services, i.e. matter and energy. Technology also deals with matter and energy. Physical phenomena in nature (that we exploit for our purpose through technology) are explained by science. Hence I revisited science – matter, energy and the universal Laws of Nature governing them – to understand the fallacies and discrepancies if any, as regards the correlation between technology-economy and the true concerns and needs of human life.

Methodology

My study is *not* based on statistical data (these have time-location limitations) *nor* on formula-based calculations (these have limitations imposed by some assumption or frames of

reference, or conditions that never exist in reality). I have based it on the Universal Laws of Nature that are valid everywhere, all the time, as have been accepted by contemporary science. I have cited a few examples from real-life experiences, though it may be argued that these are subjective and situational.

I have examined the *basic premise* – 'hard-tech for the sustenance of a joyous and leisurely life' – on the basis of accepted knowledge in science. My examination is not about the *incorrect or inadequate practise and application* of hard-tech.

This is a good opportunity for me to show-off that I, too, know a good deal of science and technology! But I shall endeavour to focus on how current social theories/practices miss taking cognizance of the Laws of Nature. I shall restrict myself to "a point of view and to information that has generally not appeared in text-books or media", except for some material that I felt was necessary to maintain connectedness or the flow of the narrative.

□

The Laws of Nature

We, the members of the human race, make observations in Nature. Certain observations remain consistent under similar conditions, for all observers. Observations give us hints. Imagination is then needed to create generalisations from these hints and to guess at the underlying pattern[6]. The 'Laws of Nature' are summary statements of such patterns. Of course, *the obvious limitation is our ability to observe, imagine and unravel the pattern*.

The laws that have been observed as being valid in the entire (known) universe are called **The Universal Laws**. All natural phenomena or real things in our life comply with, or are governed by them; with no exceptions observed till today.

The Law of Gravitation is about the force of attraction between two masses. We observe its effect – unsupported objects fall to earth. This seems very obvious and simple, but it is not always so. A piece of paper dropped from a tower does not fall but, instead, remains afloat for a long time or may even move upwards. Here it is supported by invisible air, something not too obvious. Birds and aircraft do not fall down as long as they or their wings are in motion. What supports them – air or fuel or both? Satellites do not fall. They have no wings, no fuel and there is no air either. What supports them? Thus, this law though obvious and simple *prima facie,* is neither obvious nor simple. Other Laws of Nature, too, are neither obvious nor simple, and their effects can surprise us vis-à-vis our expectations.

The Law of Gravitation has a direct, immediate and perceivable effect – we surely fall if unsupported. We must take care to be supported or balanced all the time (of course, falling can be fun, but only if we are trained to get support

from air by opening our parachute at the right time). But unlike the Law of Gravitation, the effects of 'not being in tune' with the other laws are usually indirect and delayed. They are imperceptible, slow-acting yet potentially harmful. It may even take generations before the cumulative effect is felt. We ought to know enough about them and be in tune with them.

Universal laws have been realised for many centuries and were formulated a century ago but there is enough evidence to show that they have been valid ever since the evolution of life on earth. We have evolved with them and cannot survive without them; in fact we are part of them. Even if they are inconvenient to us, we cannot expect them to change, nor can we pass a bill in parliament to change them!

Our unawareness of these laws is no excuse; we have to pay the price for not complying with them. In fact, their knowledge would save us from possible harm caused by our actions that are not in tune with them; ditto for our costly and risky experiments. It is wiser to be in tune with them – "if you can't beat (violate) them or escape them, join them!"

Imaginary things are, however, out of the purview of the Laws of Nature (though imagination itself is 'formed' by particles in our brains that are governed by these laws). We take advantage of this loop-hole and can violate the Laws of Nature in our imagination and express this as art, for example.

Money is not 'real'. It is a promise (or an assumption i.e. human imagination) of human services. Metal or paper or a codeword is used as a token for ease in exchange of human services. Physical human services that are based on human energy are real and hence under the purview of The Laws of Nature, though money *per se* is not.

Matter and Energy

The universe is made up of particles such as molecules, atoms, ions, photons, etc. The very existence of particles gives rise to various interactions, i.e. gravitational, electro-magnetic and the two nuclear forces, all acting on each other, which result in their motion as well as their bonding. **The motion of particles is what we call 'energy'**. Thus particulate matter and energy are linked.

Kinetic energy

This is nothing but the **motion of particles** and it is used by us in the following different forms :

The **free**-motion of particles (in fluids) and **free**-vibration of molecules and **free** diffusion of electrons (in solids) is called **thermal energy or heat.** This motion is expressed in terms of *Temperature* in ^{o}K. Free motion can be constrained partially by external means, e.g. by using insulators.

The **free**-wave motion of photons (Infra Red – IR, visible light, microwaves, radio waves, X-rays, etc.,) is called **radiant energy**. The motion of photons is expressed in terms of *wavelength* in meters or *frequency* in Hz. It can be constrained partially by external means, e.g. by using a lens or a reflector.

The **constrained** motion of all the molecules forming a 'body', e.g. a piston or turbine, is called **mechanical energy**. *Velocity* in meters/sec or RPM is a measure of this motion.

The motion of electric charges **constrained** to move through a conductor from one electrode to the other is called **electrical energy**. This motion is expressed in terms of the rate of flow of charges, i.e. *current* in amperes.

Potential energy

This is defined as energy deemed stored, due to the specific positions of particles.

The energy deemed stored due to the location of a body at a height is **gravitational energy** and is used as the mechanical energy of a falling body. For example, hydro-electric : energy is deemed stored in water at a height; falling water rotates a turbine; a coupled alternator generates electricity.

The energy deemed stored in a configured bonding or composition of atoms/molecules is **chemical energy** and used as thermal and radiant energy (by burning biomass) or energy stored as ionised molecules in a battery used as electrical energy.

Energy deemed stored in the nucleus of enriched uranium is **nuclear energy**.

Energy in a loaded spring (or any elastic material) is 'stored' mechanical energy.

The accumulation of electric charges in capacitors is 'stored' electrical energy.

'Energy-In-Use' is always kinetic energy. *Potential energy is converted into kinetic energy and is used for our purposes*. Energy to activate this conversion is called **activation energy** ('match-stick' or 'triggering' energy).

In any given system, all forms of energy are present simultaneously; a piston is hot, electrically-charged, radiating and moving; only the constrained (channelized) movement – mechanical energy – is tapped for use.

Both gravitational and chemical energies are present in fuel, ammunition, or a heavy battery located, say, on top of a hill; only the chemical energy is put to use.

Both kinetic (mechanical) and potential (nuclear) energies are present in a high-speed missile carrying a nuclear warhead; only the nuclear energy is used.

All real matter and energy is under the purview of the universal laws. They are . . .

The Law of Conservation of Energy and Matter : Total mass and energy in the universe is always constant; they are neither created nor destroyed; only their form is changed.

On earth, matter is grossly constant. We draw raw materials (from mines) and oil from under the surface of the earth and process them. As per this law, these continue to remain above the surface in different forms – slag, rubble, scrap, goods, garbage, and toxic and dangerous pollutants. Attempts at destroying them result in merely changing their form.

On a micro-scale, external energy received on earth in the form of radiant energy of the sun is temporarily stored in bio-mass as chemical energy, in clouds as potential and thermal energy, in winds and tides as mechanical energy, and so on. But on a macro-scale, almost all the energy received from the sky is radiated back into it. The sub-surface energy (geothermal, fossilised biomass) of the earth is also lost to the sky by radiation through volcanic eruptions, burning of coal and crude oil. This energy balance (wherein energy received equals the energy lost; neither created nor destroyed), unless disturbed by some reason, keeps the average temperature of the earth's surface grossly constant.

The Law of Entropy : Entropy of the universe is always increasing[6].

The dictionary meaning of 'entropy' is "lack of organisation". For almost a century, entropy was assumed to be a measure of 'disorder'. But 'disorder' was not adequately defined. It is not as if 'all that is pleasant is order and all that is unpleasant is disorder'[6].

Technologists expressed entropy as measure of, or indicative of "availability, usefulness, and waste of energy and matter". But it was never stated as to whom and for what "availability, usefulness, waste" referred. Energy available for making bullets may be useful for those who have guns; surely not for those who are shot at. Scrap is a waste but useful to the scrap dealer. Thus the 'human context' (and not physical attributes) often misleads us when trying to understand the concept of entropy.

There is no basis in physical science for interpreting entropy change as being 'one involving order-disorder or available-unavailable or useful-waste'. Frank Lambert[7] recently suggested that **"entropy is a measure of dispersal"**. His very vital contribution to science has been his assigning of physical significance to the law of entropy. The Law reads : '**Particles are always dispersing in space'.**

A logical explanation for the dispersal phenomenon –

Entropy : Forces are interactions among particles. The influence of a force depends on the distance (inverse square law, for example). The resultant of all the forces acting on a particle causes its motion. At any given moment, every particle occupies a unique position in the universe (since one particle is occupying a particular position, there cannot be any other particle in the same position at the same moment) and experiences a unique resultant force acting on it; hence, the motion of every particle is also unique at that moment. Thus, it is highly improbable that the motions of particles are identical in respect of their magnitude and direction; in other words, their motions are irregular.

As per The Law of Statistical Behaviour[8], the irregular motions of particles in a given space result in their spreading all over i.e. in the **dispersal** of particles.

Corollary : Random or irregular motion of particles is the reason for -

1) **Uncertainty** of everything related to the behaviour of matter and energy. This corollary is known by different names : Murphy's Law, Fuzzy logic, or in saying 'God knows'!

2) **Diversity** in objects: An object is formed by the bonding of particles. If the motions of particles are unique, the objects they form by bonding or configurations are also unique. Identical objects or identical configurations of particles are improbable. Even the simplest of all, two atoms of hydrogen, are not identical in respect of the positions of their electrons.

This diversity or non-uniformity of material composition is the reason for encountering some friction (in the motion of matter) and resistance (in the flow of energy) everywhere.

Pattern of Dispersal

Particles follow a pattern in their dispersal; it is not chaotic as one might expect.

Particles are always dispersing in space, i.e. moving away from each other. Dispersal is from denser to rarer regions. Wind blows from high pressure to low pressure regions, solids wear off, dissolve in liquids, and powders disperse into air, liquids evaporate.

The dispersal of 'particles in motion' is 'energy dispersal'. For example, heat 'flows' from a higher temperature to a lower one. Electrically-charged particles flow from their higher 'concentration' (higher voltage) to a lower one (lower voltage). Mechanical energy (motion) goes towards a stationary state (due to friction). All energies finally disperse in air as heat, and radiate to the rarest populated space – the sky. When things are left to themselves, the automatic concentration of particles and the build-up of temperature or voltage (reverse of dispersal) are highly improbable or impossible.

Particles and energies disperse the most through the path of the lowest constraints. Thermal and electrical energy disperses mostly through the path of least resistance, such as metal conductors. When a fluid is kept in a closed container, particles disperse through all leakage possibilities.

The rate of dispersal depends on the capacity (energy) of particles to overcome constraints. Such constraints are due to

forces such as gravitational force, electromagnetic force or bonding, and nuclear forces. External restrictions, such as containers, constrain the dispersal of powders, liquids and gases, and barriers restrict the flow of fluids. Rails or channel-guides and bearings constrain the dispersal of mechanical energy. Laser-guns constrain the dispersal of photons. Bonds among particles that make up solids (including constrainers such as containers, barriers, rails or channel-guides and bearings) eventually weaken and collapse and the particles of the constrainers and those constrained by them disperse.

For a given set of constraints, the rate of dispersal is proportional to particle density, or potential. For example, the rate of air leakage (dispersal in space) from a compressed-air-tank is more when the air pressure inside is higher than when it is lower. The rate of energy dispersal by conduction and radiation is more when an object is at a higher potential (temperature or voltage) than when it is at a lower one.

Dispersal is uniform when particles experience a uniform constraint on their motion. This is because non-uniform dispersal means 'accumulation' or 'non-dispersal' in some part of the system; not probable as per the law. An explosion in an open field throws out particles and sound-waves uniformly in all directions. The composition of air (oxygen, nitrogen, etc.,) at a given height is very uniform. Dust deposition on a plain open surface (table or floor) is very uniform. The intensity of light or heat emitted (the dispersal of photons in visible and IR range) from a hot source is uniform in all directions.

Here 'entropy increase' is seen as leading to uniformity which is perceived as 'order' by the human mind. The erstwhile notion of 'entropy increase' meant 'disorder'. Thanks to Frank Lambert, we now do not get confused with the terms 'order/disorder'. We see this phenomenon as 'dispersal'.

Entropy increase (i.e. dispersal) continues all the time, under all conditions and does not depend on the type of particles/energy nor on the type of process that leads to change in the form (of the matter and the energy). In thermodynamic terms, this certain function of 'entropy' (i.e. **the entropy condition)** depends only on volume and temperature[6] – the probability of particle/energy dispersal.

Entropy in Nature

Examples of increasing entropy : Precise observations have shown that the universe is expanding, i.e. the matter and the energy is dispersing in space. The matter and the energy dispersing from the sun, is received by the earth as solar radiation. Denudation of mountains, soil erosion, water evaporation, widespread rainfall, rain and the water from melted glaciers flowing to lakes and sea through streams and rivers, and burning of biomass are all examples of increasing entropy.

Decrease of entropy is the opposite of dispersal – the collection, accumulation, gathering or constraining. Part of the energy released (during increasing entropy) can cause temporary collection or accumulation or gathering (entropy decrease) through various interactions (forces which act on each other) among the dispersing particles. This can result in their bonding and the formation of new, diverse objects and/or the constraining of their motion (constrained energy, such as mechanical or electrical energy). *De novo* decrease of entropy, i.e. without a preceding larger increase in entropy, is impossible. The net effect is always an increase in entropy, as per the law.

This phenomenon is akin to the one described below :

At a construction site, say we have 5 kg of sand on an upper floor. As per the Law of Conservation of Energy, it is quite improbable that this sand will spontaneously (and without any external help) rise upwards. However, it is possible to drop 3 kg of sand to the ground and use the gravitational potential energy thus released, to raise 2 kg of sand upwards by a pulley-rope-bucket arrangement[8]. The dropped weight is always more than the raised weight and the net effect is always more sand on the ground than on the floor above.

Examples of entropy decrease : Matter dispersing on the explosion of big stars can come together to form new, smaller stars. Energy dispersal on the sun, causing the collection of water and electric charge in clouds, high air-pressure regions on earth and dispersal of geothermal energy, causes a gathering of matter (to form continents, mountains or hills).

Living Organisms and Entropy

A living cell is also nothing but a configuration of particles; a 'living' example of entropy decrease. Diversity in cells and diversity in the organisms formed by them is bio-diversity.

Commonalities in the behaviour of diverse 'living organisms' are due to the fact that they are all composed of cells and all cells are made up of very few 'basic building blocks'.

Only 92 basic elements and very few 'basic building blocks' of cells are observed on earth because the probability of free particles forming a large number of 'elements' and many 'basic building blocks' of cells is very low due to the phenomenon of entropy.

Entropic changes in (the process of) 'living'

Solar radiation reaches the surface of the earth mainly in three frequency ranges. About half lies in the infrared (IR) range, the other half is in the visible range and a small remainder lies in the ultraviolet (UV) range. The frequency band of IR radiation generally matches the natural frequency of many molecules over the surface of the earth. The free motion and/or resonating vibrations of these molecules is the heat on the surface of the earth. Thus most of IR radiation gets converted into ambient heat, in a process that is similar to heating in a microwave oven.

The plant kingdom uses the other half of radiant solar energy – visible light and UV – to synthesise biomass from carbon dioxide in the air and water and salts mostly from the soil, in a process called photosynthesis. This is a process of descreasing entropy using solely the energy from solar radiation (a perennial source), not superseded by any other method by any life-form on earth for millions of years. Biomass is the only low entropy energy source available for the survival and reproduction of most life-forms on earth. Living organisms do decrease entropy (in processes such as reproduction, making goods, etc.,) but, only by a correspondingly larger increase (as per The Law) in the entropy of biomass (food and/or fuel).

Ageing is a cumulative effect of dispersal of the configured

particles (matter and energy) in the cells of a living organism (entropy increase) marked by continuous deterioration in their functioning that includes weakening of the thinking capacity and the fading of memory – the tendency of configuration-retention. Disease is the disturbance in the configuration caused by external factors. Both affect the performance of the 'living'. The dispersal rate depends on the original configuration and constraints such as security, maintenance and replacement, living environment, hibernation, medical treatment, etc. A configuration that keeps an organism 'living', when disturbed by dispersal or by external factors beyond a critical point, turns it into a non-living one, such as death. *Dispersal can be slow but it never stops and hence no living being is immortal.*

Organic substances produced by all living beings and man-made goods are artificial configurations of particles. They are also an example of entropy decrease. Performance and the life-span of such goods depend on the rate of entropy increase, its constraints and external factors, as is the case with the 'living'. Entropy increase is marked by continuous degradation of their properties due to chemical changes and the weakening of structural bonds – rusting, wear and tear, deformation, etc. These eventually render them useless for our purpose. Thus they have a finite useful-life (whether they are put to use or not).

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Technology and the Law of Entropy

As per the law, entropy is always increasing, i.e. dispersal is a certainty in every process. Technology is nothing but the processing of matter. Hence, matter and energy released from fuel always disperse in every technological processing; only a part of the input matter is used. So also, only a small part of the energy released can be gainfully used. This is summarily stated as "*the output is always lesser than the input*".

Conversely, if no dispersal is possible, there cannot be any 'technological processing'. For example, if an engine's exhaust is blocked (i.e. the dispersal of matter is stopped) or the engine cooling system fails (i.e. the dispersal of energy is stopped) the engine halts (seizes). *Technological processing cannot proceed without the dispersal of matter and energy*. From the user's point of view, dispersals are losses or wastage. In other words, losses or wastages are not preventable; they are inevitable. Thus, *every technology is inherently inefficient as regards the input and output of matter and energy.*

Entropic Changes in the Technological Processing of Matter

Converting raw materials into goods is 'decreasing entropy'. This is made possible by using part of the energy released by burning fuel, i.e. artificially accelerating the 'entropy-increase' of fuel. The human effort-cost to carry out this process depends on the entropy condition of the raw materials available, i.e. the volume and the temperature. On earth, the temperature of most matter is close to that of the ambient air (except perhaps that of water in hot springs) and hence temperature is not relevant here; volume is the only criterion. For the purpose of their use in technological

processing, materials on earth fall under three categories based on their entropy condition.

Low entropy : a large number of particles in low volume or high population density.

Kinetic energy in this state as available on the surface of the earth: none.

Fuels : High energy matter in small volume – coal mines, crude oil-wells and wood-stock.

Raw materials : forests, stone quarries, ore deposits, sandy river-beds, soil in flood plains.

Our effort-cost of using them by technology is low at the place where they are available.

High entropy : low population density of particles or matter held by weak constraints.

Kinetic energy in this state as available on the surface of the earth : solar radiation, wind and water flow, geothermal.

Fuels : Low energy biomass such as grasses, herbs, shrubs, leaf-litter, bio- and natural gas.

Raw materials, goods and energy that are spread out (dispersed) and are required to be gathered or collected are in a state of high entropy. Those at a farther distance (requiring collection – transportation is 'linear gathering') are also of high entropy. Our effort-cost of gathering/collecting, or of deploying technology and energy for the same, is very high.

Equilibrium : the rate of entropy increase is infinitesimally slow and virtually no further dispersal is possible. Particles are uniformly distributed with very low constraints: ambient-air, sea-water and soil useful for dumping technology-generated waste such as hot exhaust gases, pollutants, heat and radiation, scrap and rubble.

Example

Crude oil molecules are constrained (do not disperse) when stored in a tank. Such crude oil is of low entropy and therefore it is useful. If the storage tank is wrecked and oil spreads on land or sea the entropy of the oil increases and reaches equilibrium. *This oil does not remain useful in technology although*

its calorific value remains the same as before. If a container of coal overturns, larger pieces (low entropy) can be recovered, but only after spending energy in recovering them. Thus, the entropy condition of the resource is a very important parameter as regards our effort-cost and possible harm.

Three Basic Technological Processes

1) Release of Heat & Light : Entropy of any dry biomass is increased by burning. Released thermal energy is used for roasting and cooking in earthen pots, and also for protection from harmful animals and micro-organisms. Released radiant energy is used for warming and illumination. Dispersal of smoke is almost automatic. Dispersal of ash takes little effort.

2) Making of Goods & Tools : Entropy of wood, coal or crude oil is increased by burning. Released energy is used for the thermal processing of raw materials – for refining fuels, pyrolysis or for making tools, components in products (metal refining, forming, etc.). Refining, forming, tool-making is nothing but 'temporarily changing raw materials to useful forms and properties by retaining/collecting desired matter and removing or dispersing away the unwanted. This process is 'decreasing entropy'. It is obvious that more is dispersed (heat/radiation/evaporation and waste matter) than collected or concentrated. In other words, the 'entropy increase' is more than the 'entropy decrease'. The net effect is entropy increase as per the law.

Further, entropy increases again by way of wear and tear, rusting, breakage, etc., during the usage of goods. Dispersal of flue gases may be automatic or take little energy. Ash and other residues are generated in considerable quantities and their dispersal requires an additional input of energy.

3) Converting Thermal to Mechanical Energy : Entropy of high energy-density fuel (derived mostly from coal and crude oil) is increased by ignition. Less than half of the released thermal energy moves a piston, rotates a turbine or moves a vehicle by recoil (e.g. jet or rocket propulsion). A major part of the energy released is wasted through cooling, hot exhaust and IR radiation. This conversion from thermal energy to mechanical energy – decrease in entropy – is always less than half of the increase of entropy by the burning of fuel and the

net outcome is an increase of entropy as per the law. As per the Carnot cycle, the slower the conversion rate, the better the efficiency of conversion but, in any case, the conversion efficiency is always less than 50%.

Expression for maximum achievable conversion efficiency in mathematical symbols –

If Q_1 is the heat at an initial (at the start of the conversion process) temperature T_1 °K,

Q_2 is the 'unconverted' heat (i.e. the heat dispersed to the atmosphere as exhaust) at temperature T_2 °K and

W is the work done (mechanical energy), then

$W = Q_1 - Q_2$ (As per the law of the conservation)

$W < Q_2$ (As per the law of entropy)

Eliminating Q_2

Maximum achievable conversion efficiency $\frac{W}{Q_1}$ works out to $< \frac{1}{2}$

Maximum achievable efficiency as given by the Carnot cycle $\frac{T_1 - T_2}{T_1}$ is also then $< \frac{1}{2}$

And so, T_2 is always $> \frac{T_1}{2}$

i.e. the exhaust temperature is always more than half of the initial temperature.

Text books on thermodynamics incorrectly assume T_2 to be ambient temperature, giving efficiency higher than 50%. This is impossible as per The Law of Entropy.

Generated mechanical energy is used for mechanical machines such as pumps, vehicles, machine-tools, compressors

and for the generation of electrical energy. Entropy increases again during movement (used to run machines) by way of frictional heat, electrical energy converted back to heat and radiation, wear, deformation, breakage, etc. Dispersing of flue gases, soot, ash, etc., requires sizable energy, thus reducing the overall efficiency of the process to a very low value.

The Effect of the Number of Steps in Processing

At every step in processing energy and matter, dispersal or losses are suffered. Total dispersal losses depend on the efficiency of each step and the number of such steps. Energy efficiency has to obey the Carnot cycle limit. If the number of steps is large, there are huge losses even at the best possible efficiency.

In current hard-tech, a large number of interrelated processes are involved in converting thermal energy into mechanical, electrical, and many other forms of energy. Matter also undergoes several transformations. Here is a list (non-exhaustive) of operations and processes :

- Locating resources – crude oil (wells), coal, ores (mines), wood and other organic matter (forests and plantations) – and assessing quality and quantity for their intended use.
- Creating the infrastructure for extraction and transportation, setting up fuel-processing units (refineries or coal-washing, grinding).
- Transporting ready-to-use fuel and providing storage facilities for the same or generating electricity and transmitting it up to the place of utility. Machinery, tools, vehicles, equipments, gadgetry and instruments are required for all the above processes and operations: making and running them, up-keep and maintenance, for safety and health measures, etc.
- Disposal of waste generated, environmental protection, peripheral services such as management systems, finance, communication, R&D, HR.

Uncertainty increases with complexity; the list lengthens

due to errors, failures, redundancies, accidents and calamities.

Thus, out of the total energy extracted from resources, a very large quantity is used up in footing the huge bill of energy-dispersal for the above processes in hard-tech. Only a little remains for our use (security, comfort and entertainment). Dispersal of energy and matter is in the form of heat (most of it radiated to the sky but a little trapped in a green-house like atmosphere), pollutants, ash, slag, rubble, garbage, rubbish, scrap – harming us directly and/or indirectly by affecting the environment.

Effort Inputs and Harm Suffered By Humans in Using Technology

Operations and processes in every technology entail physical and mental effort (labour), harm (to health), pressures of commitments (loss of freedom), tensions, and risks (loss of peace of mind). These effort-and-harm-costs of technology ultimately cause discomfort and insecurity. Correlating and evaluating the benefits and their costs is easy if they are direct and obvious. But if the costs are indirect it is very difficult to perceive their worth against benefit.

Example

I see that there is a benefit in the availability of free, ready and nutritious food at some distance. My cost is the effort and harm I bear in reaching that place. I am able to easily judge that the free food is worth going for if I perceive the benefit to be greater than the effort and harm cost to me.

My friend is a smarter guy. He takes up a job and earns money to buy a tiffin-carrier and also to pay a courier service to fetch him that same free, ready and nutritious food. But he is not able to judge whether the free food is worth the indirect cost of the effort or harm he bears in the employment and unreliability of the courier service he contemplates!

If the food quantity diminishes or the serving-counter moves further away, my effort and possible harm (due to consuming that food hurriedly for fear of shortage, and also due to an occasional stampede!) will keep increasing. It will then become obvious to me at some point that the benefit of free food is not worth the effort and harm I am bearing. I may

have to look for alternatives such as collecting local food and cooking it myself. My friend, too, has to slog longer in his job to pay for the rising charges of the courier service and yet face uncertainty despite paying more. He keeps slogging endlessly. The need for evaluation doesn't occur to him.

Coal and crude oil are high calorie fuels and available for free (no 'making' cost to us). But they are not in our backyards and even if they were, they would have very little direct use. As in the case above, they are available at far distances and many human-unfriendly activities are involved in making them useful. The total effort put in to use this free energy and bearing the harm in its usage is large as compared to the very little that remains for our use after huge dispersal losses. As in my friend's case, hard-tech benefits and costs are neither direct nor obvious enough for us to judge whether the benefits are worthwhile. We keep slogging endlessly like my *smarter* friend.

Coal and crude oil reserves are reducing and we have to go deeper; untapped reserves are already far away (high entropy). How long can we sustain suffering efforts and harm, including harm that may occur due to claims for a limited resource to be shared by a large number of users? Increasing complexity in accessing energy resources reduces overall reliability with uncertainty taking its toll; providing surpluses and redundancies increases losses further.

Energy Sources for Current Patterns of Energy Usage

Easily accessible fossil fuel – coal and crude oil – reserves are exhausted by very high dispersal-loss processes in 'Converting Thermal to Mechanical Energy'. The effort-and-harm cost of accessing fossil fuels is now very high and their rampant usage damages the environment. But we cannot imagine life without this energy. We want electricity, petrol, diesel, LPG, oil (or equivalent) as most of our gadgets work on them. Mainstream society is now desperate for an energy supply. Most scientists and researchers are tapping all imaginable energy sources with no understanding of the Law of Entropy.

Solar radiation, wind, nuclear, hydro (rain and tidal) and natural gas are harnessed for electricity generation. Farm

produce is converted to high density fuels as an alternative to petrol and diesel. Biogas, hydrogen and geothermal are also thought to be energy sources. They are claimed to be renewable, environment-friendly and are considered 'green' energies.

But are they really so?

The intensity of solar radiation received at any location on the earth's surface varies greatly and continuously, throughout the day and year. Solar radiation also diffuses or disperses while passing through the earth's atmosphere. Due to high dispersal and no constraints, solar radiation as received on the earth's surface is high entropy energy. The IR part of solar radiation is converted to heat. Differential heating of earth's surface produces winds, clouds and rain (water flow/fall). These energies also are high entropy entities.

The conversion of high entropy solar radiation, wind, cascading water and tides, to low entropy electricity or the trapping of heat involves decreasing entropy. This is made possible by burning coal and crude oil (increasing entropy) for making, installing and maintaining photovoltaic cells, windmills and hydro-power stations or solar heating units.

As per The Law, an increase in entropy by burning coal and crude oil is always **more** than a decrease in entropy made possible by photovoltaic cells, windmills, and hydro-power stations (this is similar to the example cited earlier – dropping 3 kg sand to raise 2 kg of it upwards). In other words, energy generated by these power stations in their whole life-span is less than the energy spent in making and maintaining them. Or, the energy generated by one photovoltaic cell does not suffice to make another photovoltaic cell of the same capacity. The same is true for windmills and hydro power stations.

Natural gas : Gas trapped underneath the earth's surface and bubbling out is unconstrained, free gas and therefore, high entropy. The energy density of natural gas as available on the earth's surface (STP) is 39.6 kJ per litre as compared to 37300 kJ per litre of crude oil. *Using coal and crude oil energy*, natural gas has to be first compressed to 250 bar pressure (CNG) to increase its energy density to 11160 kJ per litre, or liquefied (LNG) by further compression to increase its energy

density to 25780 kJ per litre. Only after that it can be used as fuel that is somewhat closer to petrol (34920 kJ per litre) and diesel (38520 kJ per litre) in terms of energy density. As per the Law of Entropy, the energy spent (increase in entropy) in compression is always more than the energy compacted or condensed (decrease in entropy) in compressed or liquefied natural gas.

Farm produce : Sunshine is spread-out, and so are the biomass-producing plants. The energy density of 16000 kJ per kg of spread-out biomass is raised to 40476 kJ per kg (35600 kJ per litre) in bio-diesel. As per the law of entropy, crude oil and coal energy spent (increase in entropy) in cultivating, collecting farm produce from a very large area, processing it, making and operating equipment for the same is always more than the (decrease in entropy) energy compacted in bio-diesel.

Nuclear energy and hydrogen : U-235, the isotope of uranium, is the only fissionable substance naturally available on earth, and it is always found much diluted by the heavier unfissionable isotope U-238 (0.7% of U-235 and 99.3% of U-238). This hinders the development of the progressive chain-reaction in natural uranium. It is in fact only because of this dilution by the inactive isotope that the highly fissionable atoms of U-235 still exist in nature. Without it they would all have been destroyed long ago by a fast chain reaction.[8] Since natural energy dispersal from the raw material (minerals) used for nuclear energy has virtually stopped, the 'resource' is at equilibrium. The entropy is the highest and therefore it is not at all an energy resource.

The same is true for hydrogen separated from water and used as fuel because water is at equilibrium and therefore the entropy is the highest.

Enriching uranium or separating hydrogen from water is done using coal and crude oil. As per The Law of Entropy, energy from this coal and crude oil is always more than the energy liberated from fission of the enriched uranium, or burning of the separated hydrogen.

Other non-conventional sources : Sources for biogas are spread out. Human/animal-generated mechanical energy is

obtained from food that is spread out on a farm. Geothermal energy and wastages such as methane from sewage, garbage as fuel, energy in exhaust-gas, etc., that are products of a hard-tech life-style are also spread out. They all are high-entropy energy sources and hence their conversion to low-entropy electricity is not possible without spending more energy (from coal and crude oil) than the energy that can be made available from them.

We do not tap the free or unconstrained motion of soil and stones in landslides, of ice in an avalanche, of raindrops, or of electric charges in lightning, as energy resources because it is high entropy energy. Non-conventional energy sources fall into the same category. Why then are we tapping them?

Conclusion : 'Renewable' or non-conventional or 'green' energy sources actually use more coal and crude oil energy than the energy they deliver during their lifetime. They release more green-house gases for the same job (perhaps that is why they are called 'green'!), not to mention the damage they cause to the eco-systems, and make a section of society suffer in providing the infrastructure for and in the operation of such power plants. Hence, they are neither environment-friendly, nor a real substitute for coal/crude oil.

Machines and gadgetry converting high-entropy energy into low-entropy energy with no external energy input are called perpetual machines of the second type; they are impossible as per The Law of Entropy.

By observations over several generations, humans are subconsciously aware of the effects of The Law of Entropy. Hence no individual human generates 'green' energy, thereby becoming self-sufficient as far as energy is concerned. The call for 'green' energy is being made by non-human bodies (governments and corporations); there is no question of them being (genetically) aware of The Laws of Nature.

Solar Direct

We use solar energy through the plant kingdom (decreasing entropy by photosynthesis). Can we do photosynthesis ourselves? No, we humans are not adapted to do it. Can we

not genetically modify ourselves for photosynthesis? Theoretically, yes, but then we will be plants, not humans!

Scientific reasons why we cannot live as humans on energy by photosynthesis –

To live as humans we require huge mechanical energy for movement of the body and its internal organs such as the heart, and electrochemical energy for physiological processes, data processing, internal communication, memory, etc., as adjuncts to body-movement. Both these energies constrained in our body are low entropy. Solar energy is of low power (energy per unit time) and high entropy. We will have to stand for a very long time in the sun and/or require a very large surface area to gather solar energy for our living. This means we will have to be practically stationary, just like plants.

So we use nutritious (low entropy) food as our input energy source and convert it into mechanical and electrochemical energy. Energy dispersal or entropy increase necessitated (as per The Law of Entropy) by the process of conversion is in the form of heat we give off to the ambient air; this in turn is made possible by keeping our body-temperature slightly above the ambient air temperature. The plant kingdom synthesises biomass by being spread out over a large area and/or at a very slow rate, using solar energy. But plants cannot move, even to defend themselves!

Can we not invent technology that is better than photosynthesis and use solar energy directly? Yes, theoretically we can! But since biomass – a photosynthesis product – is easily available to us (plants neither run away nor put up any resistance, except through thorns, when we draw biomass from them) it is easier to invent better (low effort and no harm) technology to use available biomass and live a joyous and

leisurely life than make efforts inventing such technology and further worrying about its long-term effects.

The Cost-Benefit of Technology Governed by the Laws of Nature

The Cost of Technology

Every technology demands a cost in terms of effort and harm, before we can reap its benefits. The cost for benefits from technological processes, such as 'Releasing of Heat & Light', is small; for those from the process, 'Making of Goods & Tools', is low – in both cases a small group of individuals can bear them. Costs start rising from the process, 'Converting Thermal-to-Mechanical Energy'. The costs rise rapidly with further transformations of matter and energy; many more people are then required to share them.

Some people can (or are made to) share some efforts and/or harms better/more than others. They are glorified as 'skilled and professional' so that they carry the burden of those efforts and harm with dignity! But professionalism or skills divide human beings unequally giving rise to undesirable social repercussions.

The sharing of costs then takes the form of an exchange of human services. Exchange of services by barter can work only with friends, relatives and in the neighbourhood. Metal coins and paper money systems linked to a finite resource (gold) assumed importance as the area of operations grew larger. Costs kept rising due to the depletion of low-entropy-resources and the proliferation of Inherently Inefficient Technologies (IIT), necessitating an increase in the number of people to share the costs.

Any 'activity for employment-generation' results in more people sharing the effort and harm costs of hard-tech. Most employees have a share in the products and services made available, though this share is unequal. This stirs a multiplier effect. Technology – more people to share costs and benefits – hard-tech – global human population growth to share the rising costs. Current hard-tech provides an avenue for remote exploitation. Regions out-sourcing their needs and using guest-

workers' services can keep their native population low or under control at the cost of large population growth in supplier-regions, that bear a lot of effort and huge harm.

The scale and interrelations of the operations and the rising number of processes increase these costs and so technology comes to pervade all areas of human life. The rising cost of hard-tech necessitates either shut-downs or further growth in the number of cost-sharers; small enterprises merge into medium-scale ones, corporations merge into multinational corporations. Growth also happens through the out-sourcing of all needs. Even in the distant past, families had to grow bigger by bearing more children, and society chieftains had to grow into bigger governments employing more people to share the costs.

Organisation and its growth is nothing but 'lowering entropy', achieved and maintained through external energy supply on a continuous basis. Governments and corporations are subjected to various unequal, imbalanced interactions within them, and to external forces such as limitations to the supply of resources. Unwieldy structures start collapsing. Then we hear about 'downsizing', 'sticking to core businesses' and such phrases. *Every growth limits itself at a certain point when the rate of decrease of entropy matches that of its increase.*

If we do not want to increase the number of people, then those in employment will have to share all the rising 'effort and harm costs'. Hard-tech reduces physical labour but increases mental labour and psychological problems – pressures and tensions due to risks. People hoping that they will somehow get rid of the problems with money are willing to put in more mental effort/time and bear increasing harm in exchange for more money. Money linked to finite gold does not suffice and therefore money is de-linked from it. Thus the rise in the number of people (growth) and/or the rise in the money supply (inflation) become a necessity for sustenance in a hard-tech society.

Costs are unevenly divided over human society in relation to time, location and situation. Some bear effort and harm physically, others bear it mentally and psychologically. Who bears what, when, how much, and also what one feels about it

can only be guessed at. Hard-tech is sustained because the majority of cost sufferers feel that/are made to feel that they are better-off than the rest, or would soon be so!

Effort and harm costs start affecting us right from our childhood. Education (investment for employment) encroaches on children's freedom. Our average life-expectancy is higher but when we have the vigour and the capacity to enjoy freedom in our youth, we are bogged down by employment-related commitments. Stretching old-age longer is a pathetic attempt at making up for lost freedom and leisure during our younger years.

Expected Benefits

Security : As listed under 'health, safety and peace of mind', there is no improvement in security in a hard-tech era. Earlier, we feared the natural environment; now we fear an artificial environment given by hard-tech, sometimes even more than the natural environment.

Comfort : Societies with more of hard-tech-made things (with adjectives – complex, fast, large, latest, tall/high/deep/grand, automatic, exotic, luxurious, lavish, fashionable) suffer much more hard work, 3D-jobs, more hassles, pressures, tensions and hardships.

Uncertainty in Nature is countered by technology, but its complexity makes it unreliable. Countering this unreliability by providing a lot more than what is necessary (redundancy) further increases our effort and harm costs.

Entertainment : Yes, we do have far more avenues for this, but the peace of mind, freedom and leisure necessary for enjoying our entertainments are missing.

Compromises and Social Engineering

Many people inevitably adapt themselves to this situation and begin to enjoy their insecurity and loss of freedom/comfort. They go for the enjoyment of possessing gadgetry, vehicles, real estate, investments, etc., by hard work, busy time schedules and clockwork discipline, which they enjoy. When they do it at others' cost they create a security problem for themselves and 'enjoy' insecurity. Enjoying rising numbers, competition,

power-over-others, taking risks and adventures, consumption of unhealthy or unsafe stuff is actually to blank out the insecurity and discomfort (created by hard-tech) they feel inside themselves. In other words, they *enjoy* the loss of 'freedom and peace of mind'. Education, media and social policies engineer such enjoyments that are then perceived as status symbols. For example, undergoing a bypass surgery at a 'Corporate Hospital' becomes a status symbol! Living long in this situation is living through a long period of helplessness.

The Limitations of Hard-Tech

All observations in the current hard-tech model are explained on the basis of The Laws of Nature. We can therefore make detailed predictions about future observations – assuming The Laws of Nature remain valid. If they do not, we will not survive and there will be no question of our future.

The laws clearly indicate the limitations of technology. Hard-tech can never work like a magician's wand/mantra to make a self-evolving, auto-maintaining and zero-side-effect machine or a robot (almost a super-human) leaving us to lead a joyous and leisurely life.

Technology has been instrumental in making observations, i.e. formulation of the Laws of Nature; but these formulated laws show up the limitations of technology. It is akin to what happened to our language-teacher in school. He taught us how to write a 'grievance-complaint to authorities'. It backfired when we immediately wrote a complaint against him to our principal!

Another Justification for the Title of This Book

Thus, "hard-tech, as the solution to all our problems" is a **wrong theory** (note the lower case w; it is an adjective).

Reality Show

Human Cost

Hard-tech societies have struggled heavily. In the recent past, expeditions, colonialism, migrations and settlements were forced on many, particularly on the young in search of (to capture or gain control over) resources (including human

resources) necessary for supplies to industry. This is an enormous human cost demanded by hard-tech. Suffering of the hard-tech societies is reflected in contemporary literature, films and other media.

Hardships were subdued or glorified as status symbols of adventure, bravery, imperialism, victory, supremacy and nationalism. Today we sublimate them under the name of "saving the world" from weapons-of-mass-destruction, dictatorship or terrorism. But hardships suffered serve only to keep the engine of hard-tech running. Hard-tech takes virtual bodies – nations and corporations – to great heights, powers and superpowers but the human contributors keep slogging, struggling, suffering and sacrificing.

Economics

Economy is about goods made of matter and about services, both using energy resources. Some matter is reusable but energy is not. So the crux of the economy is the availability of matter and energy and their use for the claimed welfare of human society. Money is only intended for the easy exchange of human services. Resources are important in an economy; not money. The entire economic theory is flawed since it does not take cognizance of The Laws of Nature. Economic indicators – like GDP, per capita incomes, consumption of goods and services in money terms, even the human development index – indicates hard-tech usage. But since hard-tech reduces personal security, comfort and leisure for entertainment, such economic indicators have an inverse relation to a joyous and leisurely life.

"What is good for the economy (through hard-tech) is bad for human beings" – Author

Currently, possession of money or goods (hard-tech creations) is the criterion for being considered rich. While money may be infinite, at least theoretically, possessions will always be finite (as per The Law of Conservation). Their unequal distribution makes for the divisions – rich and poor. Rich and poor are two sides of the same coin. The agenda of eradicating poverty is then also an agenda of eradicating riches; no wonder it remains only a slogan.

The rich possess money and goods and look after them either by hard work (loss of freedom) or by dubious work

(loss of sense of security). Hence, they hardly have leisure and peace of mind to enjoy them; the sense of possession is the only joy they derive. It is ironical that despite increased wealth, my requirements – healthy food (2000 Calorie/day), a bed for sound sleep, and 'personal privacy/space' – have not increased.

Why slog, struggle or sacrifice peace of mind and suffer for a mere *sense* of possession or power or similar status-related achievements? A mere assumption that I am rich, superior, and accomplished can produce the same enjoyment! Don't we all enjoy the delusion that 'human beings are the most intelligent of all on earth' – a mere *sense* of superiority?!

False Perception

Local and immediate convenience makes us opt for energy inefficient technologies. The convenience of using electricity is that it provides easy and precise control by switch, no pollution or noise at the user's end, and availability on demand by (little) storage in battery cells. But, heating by electricity requires many times more fuel (coal and crude oil derivatives) than heating by burning the same fuel directly. Motion by electric motor requires many times more fuel than motion by fuel-run heat-engines. Illumination by electricity takes a lot more fuel than a fuel-lit illuminator. We do not perceive the disproportionately heavy effort and harm costs we pay (for the setting-up of the electricity generation, distribution network, etc., and by way of pollution due to excessive consumption of fuels) for a small convenience. Energy in electrical form is used efficiently only for data processing and wireless data transmission; their energy-demand is so low that it can be easily met by a local engine-generator set.

We do not perceive that the disposal of huge quantities of waste generated by hard-tech also entails the use of energy, creating more waste in different forms, at different locations. Burying this waste (landfills) causes soil damage, floods and water pollution. Dumping this waste in the sea affects seashores and fish-catch. Hard-tech cannot address this self-created problem without creating a different and bigger problem. As per the law of conservation, waste cannot be destroyed and as per the law of entropy, it increases further with every attempt to destroy it (using energy). The only solution is in 'not

generating it'.

Very rich societies are the highest consumers of resources; their richness is indicated by the huge amount of *filth* they create out of resource-use and hence they are called the 'filthy' rich! They keep their working territories clean by transporting filth, by treating the sewage they generate, and by using CNG, or battery-powered vehicles. But they do not perceive that a "**n**ot **i**n **m**y **b**ack**y**ard" (NIMBY) policy is not the solution. Air pollution is eventually equally distributed everywhere (as per the law of entropy) and affects the rich as well. NIMBY policy delays the realisation of reality and only aggravates the problem.

Social Aspects

Erstwhile children could learn that they fall down when left unsupported (the law of gravitation), that everything in life is finite, and comes at some (effort and harm) cost and with an expiry date (the laws of conservation and entropy) and so forth, as they grew in a natural setting. In the current artificial setting we do not experience The Laws of Nature because our parents, relatives and social systems do not leave us unsupported; money is not perceived as being finite; we can get anything without perceiving the effort-cost that has gone into getting it. Before having reached expiry, old things are replaced by new ones. The Laws of Nature remain in books and we remain ignorant.

Mainstream boys grow (physically, mentally!) and so do their toys (in size and scale)[9]. Little boys play with construction models, toy vehicles, toy guns, etc. As men, they play with the same things, albeit of bigger size and on bigger scale – towers and palatial buildings, dams and canals, flyovers and tunnels, cars and bikes, etc. Their age increases in years but most of them do not mature; they remain adult-size children. Outdoor games turn into paid-sports and gang-wars. Indoor games such as 'monopoly' and 'chess' turn into realty, investments, share-markets and politics. Their *work* is their play. Some men treat women (paid-sex, vulgarity), kids (child-abuse) or animals and plants (pets, their shows – zoos and botanical gardens, animal races and fights, games) also as toys.

The argument that boys copy grown-ups through toys is

not valid because it is the *fathers* who provide them with such toys. Children play for pastime and fun, with little danger of injury, but grown-ups *play* hard-tech for socially-engineered ideas of social status, and pastime or enjoyment with a huge risk of suffering a lot of effort, hassles, and harm. Household-work is the only *real work* in human life. Employment-related work is really household-work done indirectly and, therefore, is carried on with more effort and more harm, with little time left for entertainment.

Hard-tech developments are mostly creations by men with high levels of testosterone. Governments, Corporations and Societies dominated by Big Boys concentrate on improving, increasing their toys and pastime games (inviting more and more problems) at the cost of our security and comfort, as well as that of future generations. Their attitude towards women's rights, women's roles in society and women's innate skills, intelligence and synthesising nature through which they lead the most important and the only real work in human life remains unfair, belittling and chauvinistic.

Science, Technology, and Wisdom

Researchers ignorant of the effects of The Law of Entropy are creating newer and more severe problems by employing 'new technologies' with a multiplier effect. Examples are: superconductivity, nanotechnology, hydrogen from water by photosynthesis, most of the pollution-reducing activities, such as capping carbon dioxide underground, etc. (Recycling of plastic-waste is actually a recycling of mistakes.) The same is true for most progressive and developmental activities. Science and technology journals publish papers and the media report on research for, and development of, such 'new technologies' (mostly by institutions in 'developed countries'). They are, however, mostly about addressing problems created by 'old technologies' that they themselves had developed, ignoring the effects of The Law of Entropy. Such papers and reports serve only as advertisements for jobs and GDP growth opportunities. Public funds are thus used mostly for entertaining the fraternity of researchers and those impressed by convenient, one-sided statistical data.

In ancient Greece, some people fought among themselves

to show off their superiority and caused damage to society. The Olympic Games were invented to provide an outlet for the surplus energies of a few and society lived in peace. In recent times, societies provide sports facilities and competitive events to players, parliaments to politicians, and laboratories to researchers. These help the concerned to show off their power, sense of adventure, superiority, and inquisitiveness so that society may live unharmed and in peace. But players, politicians and researchers live by hard-tech savvy and this has defeated ancient Greek wisdom.

Language and Literature

Word-based language is a relatively recent tool of communication, not yet fully adopted by us (as children, we still have to learn it). It proves very useful and necessary in communicating problems arising from, or involving, technology and hence the number of words in any language keeps pace with the development of technology. Those using less technology face fewer problems and require lesser words. The fewer the words in the language of any society, the smaller must be the problems for them! I could not have worded anything related to hard-tech in my language, Marathi. Hard-tech words, such as entropy, thermodynamics, engine, etc., did not originate in Marathi as we never needed them!

Today, most of us see language as one of the most distinctive attributes of human-kind, the thing that elevates us above bestiality (the merely intuitive life of eating and rutting). Works of the imagination - poetry, drama, epic, fiction, history - encapsulate the most significant mental, emotional and spiritual achievements of humanity. Languages rich in words and in literature are a matter of pride and glory for the people speaking them. But literature mostly deals with the hard-tech-induced human effort, harm, problems, difficulties, sorrows. Even the humorous types are mostly a mockery of the hard-tech-induced problem situations! It seems that the prerequisites for literature are the hard-tech-induced human hardships, harm, problems, difficulties, sorrows necessitating mental, emotional and spiritual achievements through them. Languages rich in literature indicate that people speaking those must have suffered more of hardships, harms, problems, difficulties and

sorrows. What are we really glorifying and being proud of? There are other media, too, for the mental, emotional and spiritual achievements.

Of course, language and literature have other important functions too, in a hard-tech life-style. Criticism/mockery is an entertaining pastime. Also, along with sounds : hooting, untimely clapping, whistling or honking on roads, using (bad) words/language and literature to express or to give way to anger, hatred and displeasure (and feel victorious!) causes no physical damage; at least in the short run!

Good security, comfort, freedom, and leisure are better expressed by body language and through art forms such as music, dance, pictures, etc., than by words; in fact, words are not necessary. The languages of people living a joyous and leisurely life are poor in words and in literature; these societies are enriched by their art forms – music and dance – languages of the body. Even in the mainstream, the literature promoting a joyous and leisurely life does not deal with the hard-tech induced human effort, harm, problems, difficulties, sorrows, anger, hatred and displeasure. It is a commentary on music, dance, other art-forms, pristine nature, and on leading a joyous and leisurely life. Since the mainstream lifestyle deprives us experiencing them directly words/ language becomes necessary. Well-made films need no commentary!

Word-language and literature is disproportionately glorified; we have seen silent movies by masters of body-language – Charlie Chaplin and Laurel-and-Hardy.

One More Justification for the Title of This Book

The current 'right' theory of hard-tech is a 'wrong' theory**;** **WRONG** being an acronym for – **W**isdom-missing, **R**obotic (hard-tech for the sake of hard-tech), **O**blivious (of The Laws of Nature), and a **N**arcissists' **G**uilt

The Comedy and Tragedy of Hard-Tech

Hard-tech is like a Laurel and Hardy film. While attending to some trivial matter Laurel (Low-tech) creates a small problem. Hardy (Hard-tech) goes to correct it and ends up in a bigger problem or mess. But here we are not watching this

film sitting on a sofa sipping our drink accompanied by 'fry-fruits'; we are taking the beating and drowning in a mess of our own making.

Hard-tech is :

- Taking efforts to make a time-clock and then enduring harm by being time-bound.
- A big house but with hollow beams.
- Like going on an iceberg-watching expedition on board the *Titanic*.

□

The Phenomenon of Entropy and Human Life

We face uncertainty and diversity ('un-identical' characteristics) when using man-made goods and energy-based services. This is because these goods and services are made up of particles having irregular motion (phenomenon of entropy). Any attempt at data quantification relating to matter and energy, or to goods and services is, at best, always an estimate or approximation because of inherent dispersal losses and distortions suffered in the process of data collection, handling, measurement, survey, or comparison.

Our Knowledge and Understanding

1) Acquiring knowledge is a process that happens through particles e.g. vision through photons, hearing and smell through air particles. The position of the acquirer matters because particles carrying information are subject to forces or interactions along their way. They reach their goals partly, by changing direction and original characteristics, or may not reach them at all (e.g. diffusion, refraction, reflection, bending or stoppage of a photon-stream).

2) The capability or resolution of our measuring (or judging) devices has to be of a much higher order to minimise the effect of losses and distortions. For example, we can never judge the accuracy of a measuring-scale by another one of similar resolution; one computer cannot judge the capabilities and limitations of another one with similar hardware and software.

3) Ever-increasing entropy makes every process theoretically irreversible.

So :

- We can never know **exactly** what happened in history. Hence the importance of history is only to learn from the gross mistakes of the past; the rest is nothing but an entertainment.
- We can never know **everything** about the basic building-blocks of cells because our brain cells are also made up of similar 'building-blocks'.
- The conscious mind can never **completely** know about itself. We can never know **the exact** configuration of the particles that keep us alive and conscious.
- **Perfect** or mathematical relations of the type 'y = f (x)' do not exist in nature (no wonder most of us are not good at 'that type of' mathematics!). Applied and statistical mathematics are useful for the estimation and understanding of probabilities. Any inference by extrapolation, far beyond the observed data, is unscientific. (E.g. scientifically speaking, the observation that the Universe is currently expanding cannot be extrapolated to say that at some stage in the past it must have been condensed, as postulated by the 'Big-Bang' theory.) Perfect mathematical relations are possible only in artificial situations – accountancy, integer-number-games, etc.
- We are 'inside' and part of it, and hence we can never know **everything** about the Universe and its components – the particles and their motions (matter and energy).

We ask each other questions in day-to-day social interactions. Valid questions are those that have answers that sound convincing to our reasoning or logic. This logic is formed by our understanding of any situation as it exists *then*. Some questions such as "Where is nothing?" or "Who is no one?" have no answers, and asking such invalid questions is just idle talk.

Many questions relating to natural phenomena often occur to us. If we form our logic or reasoning by understanding any condition *that is always in existence*, i.e. the Laws of Nature (and the improbabilities, uncertainties, diversities and the limitations of the type mentioned above that come with them), then we get convincing answers to all valid questions.

Important ones, including those relating to our perception of space, time and relativity, are covered below. We can then, also identify the never-answerable or invalid questions such as "What is the origin of The Laws of Nature?" "Is there only one set of Laws?" and so on. They can, of course, be a topic for idle discussion and entertainment.

It is wiser to search for knowledge concerning our security and comfort than in taking pains for gaining information that comes with severe limitations and hence is probably useful only as entertainment. Striving for such information can endanger our security and comfort and/or that of our future generations – our first priority. In any case, entertainments that are safe and comfortable are available in plenty.

Communication

'Feelings' or 'thoughts' and information are configurations of particles in (the minds of) the 'living'. Transfer of the same among them through sounds, gestures, and smells, etc., always suffers losses or distortion due to particle dispersal or entropy increase. Genetic information is also lost or distorted despite the constraints of DNA coding.

Most animals express themselves through sounds and body-language. We humans try to use word-based language to express something that cannot be expressed by body-language, or to negate what might have been expressed by our body actions! There are many processes involved in communication by the use of word-based language. Thoughts and feelings are converted to chosen words, sequences, syntax, sentences, stresses, pauses in utterance or reading, etc. The same process in reverse occurs at the listener's/reader's end with probable dispersal/distortion losses at every stage. Digitisation may be able to constrain particle dispersal and therefore limit distortion in inter-gadget communication, but miscommunication and loss/distortion of meaning is almost certain in inter-personal communication! Minimising such occasions by adopting self-reliance is the only way to protect us from possible losses arising out of this phenomenon.

Behaviour

The behaviour of the 'living body' is the actuation of signals

generated by particle configurations. Diversity in behaviours is due to diversity in configurations. Adaptations are strongly constrained configurations resulting in behavioural similarity in species (more prominent in non-humans).

Humans are differentiated from non-humans by weakly-constrained configurations in the part of the brain called 'the conscious mind'. Such configurations can be temporarily constrained externally (by training, education and media-information) for the purpose of uniformity in some thought and action. Somewhat stronger configurations evoke sharper responses to certain aspects and generate artistic tendencies. Somewhat weaker constraints lead to novel, abnormal, great (or antisocial) actions and behaviours.

Exactly identical entities are improbable in the universe; so too are humans, diversified in their physique, thinking, behaviour, experience, and lifestyle. Living together, sharing, working for/under others, a one-size-fits-all approach through mass production, standardisation, etc., is always a compromise and can be a reason for discontent and/or conflict. Limiting occasions of interactions (and not increasing them as is currently advocated!) by adopting self-reliance would minimise compromises and conflicts in human relations and the inevitable sorrows arising out of them.

Natural Instincts

Survival and better living is a natural instinct of all living beings, achieved by increasing entropy faster than the rate of entropy increase in nature, i.e. the entropy increase of non-living matter. The advent of technology, that accelerated entropy-increase, proved useful for longer survival and offered a quick way to better living.

The effects of a small dose of alcohol encourage one to go for larger doses that finally intoxicate. So, also, the effect of a small dose of "accelerating entropy-increase" encouraged humans to go for larger doses. After so many generations, the tendency to go for increasing doses ("accelerating entropy-increase") has become almost a natural instinct. This is reflected in technology becoming hard-tech and causing growth in GDP, population, fire-arms and explosives, migration, travel, spreading knowledge (education) and information (media),

spreading of religions and beliefs, thoughts and ideologies, etc., including works-of-art by artists and theories by 'scientists' often going astray.

Many of us are intoxicated. Some of us experience disadvantages – harm and dangers – but this larger dose of hard-tech cannot be reduced due to strong withdrawal symptoms.

The majority of the human race instinctively opts for decisions and actions whereby entropy increases (over and above the natural rate). Its behaviour and the options exercised are thus predictable. (E.g. most of the mainstream talks a lot about reducing pollution but does not actually reduce it. No wonder! *Talking is an act that 'increases entropy' (when compared to keeping mum), but reducing pollution is not*.)

Beware! Murphy's fundamental Law: "If entropy can increase (over and above the natural rate), it will!"

However, longer survival and a quicker way to a better living are preferred through **indirect** selfishness, by working for non-human bodies. This is mainly because non-human bodies are good for attaching blame in case of failures and for avoiding inter-personal enmity. This is necessary for survival and better living. This escape is not available to those who are self-reliant or those who indulge in behaviours that are motivated by **direct** selfish-interests (*my* security, *my* comfort, entertainment for *me*).

Our Perception of Space, Time and Relativity

Entropy is always increasing, i.e. matter and energy is always dispersing. Dispersal implies a 'position' – 'before' and 'now'. A change in 'position' is the concept of space. Dispersing photons from a source reaching our eyes (or instruments) is the range of visible (or perceivable) space. The operating space of living organisms is the distance they reach by the increasing entropy of food and fuel assisted by air and water flows or gravity.

'Before' and 'now' also imply a separation of events – the concept of the passage of time. The rate of entropy increase causes the relativity of time; the higher the rate, the faster the passage of time and vice versa. In the case of living beings, the rate of increase of body-entropy is very low in hibernation and

so is the passage of time for the hibernator.

Our measure of time is based on the rotation of the earth (solar calendar) or that of the moon (lunar calendar). The rate of entropy increase of our planetary system (i.e. the earth and the moon dispersing away) is unnoticeably small and hence the duration of a mean solar day and that of a year is perceived as being constant over generations. Smaller intervals of time are perceived by our body rhythms i.e. increase of body entropy. The principle of our time keeping is by counting oscillations of a pendulum, a timing-spring, a quartz crystal or an atom i.e. (almost) a constant-rate entropy-increase.

The phenomenon of entropy thus interlinks space and time, i.e. the concept of 'relativity'. 'Always' implies that there is no 'beginning' of the universe (big bang) and that there is no 'ultimate end' of the universe. It also implies that space and time are unlimited. Starting from our childhood, we are used to listening to bedtime stories with a beginning and an end. We get hooked onto 'beginnings and ends' everywhere, in movies, in human life, etc., and we want the same to be applicable to the universe as well. Imagining 'the beginning (and what was before it) and the end (and what will be after that) of the universe' can be a good pastime.

Any activity by us is increasing entropy (over and above the natural rate); the higher the rate, the faster the perception of the passage of time and vice versa. Thus, active people are always short of time. When the entropy only of food is increasing, time passes slowly (leisure time). Time passes quickly when we are increasing the entropy of both, the food and the fuel (working in hard-tech). Thus the rate of entropy increase is linked to perceiving the passage of our time – busy working or leisure. The higher the rate, the more work and the lower the rate, the more leisure we have!

If we match the rate of the 'entropy-increase' of fuel (i.e. our working) with the rate of the 'entropy-decrease' of the plant kingdom, i.e. biomass production – the sole fuel available on earth – the net rate of entropy-increase reduces considerably. Then we will have less work and more leisure. Can we achieve this and also sustain it?

□

Exploring the Sustenance of a Joyous and Leisurely Life

We (the interested) need to first look comprehensively at how we live on earth. What are our necessities, how do we get them with the least (effort and harm) cost and enjoy a secure, comfortable and entertaining life for generations?

'Life-Tour Packages' (Similar To Holiday-Tour Packages)

A human life-tour comes in different packages. The components of the package and its details are :

- Services and their costs.
- Free time (freedom) for enjoyment (similar to free-time for shopping, sightseeing in conventional holiday tour packages).
- Duration – short duration (similar to N nights, N+1 days in conventional holiday tour packages) or life-long, and extending to future generations.
- Conditions apply!

Services

We have evolved and adapted to live by breathing naturally-circulated air (the phenomenon of entropy ensures a uniform composition of air at all open places on earth), and drinking rain water. Both are available for free. Bright sunlight for day-time chores, auto-dimming for sleep-time comfort levels, solar warming and wind cooling, too, are all for free. But today, depending on the way we live and where we live, we have to work hard to pay for fresh and clean air (fans and filters), for water (storage and transport, disinfection and filtration, distribution and management services), for bright

light (lamps) and for a comfortable ambient temperature (warmers/coolers).

The sole low-entropy energy source – biomass, i.e., ready-to-eat or raw foods, fuels and raw materials – is available from plants that neither resist nor run away nor demand payment. Micro-organisms decompose (again, for free) biodegradable-waste produced by us into salts for reuse by the plant kingdom to synthesise new biomass (completing the material cycle necessary as per The Law of Conservation). Today we work hard to pay for the transport and management of food supplies, cooking fuel, wood and the disposal of wet-garbage.

Their Costs

Services in our infancy (similar to the complimentary welcome-drink on a holiday-tour) or ambient air (similar to salt and pepper in an eatery) may be free but otherwise everything comes at a cost in the hard-tech life-style. We pay these costs through money earned by putting in hard work and bearing harm somewhere, or by surrendering our security (in hazardous jobs), peace of mind and self/social respect.

Free Time

Free time is inversely proportional to the cost paid. When the cost paid (as described above) is high, there is less freedom and *vice-versa*. High-cost holiday-package tours are jam-packed with things to do that leave little free time. In a low-cost holiday-package we have far more leisure. We are left to ourselves with ample free time to do things of our choice. The same is true for the life-tour package.

Duration

High-cost packages quickly tire us and deplete non-renewable resources. Either we or the resources do not last very long. Low-cost packages can last for a long time, for generations.

Conditions Apply

Governments, corporations or civil societies are supreme authorities; participation in, and contributions to, most of their decisions are mandatory with very little room to shirk or escape.

Governments, corporations or civil societies are (man-made) bodies. How do they function?

Body Function

Cells 'form' and 'work' for the body, the human body. They struggle, suffer, sacrifice themselves and replicate for the survival of the body. But the converse is not true. A group of cells that forms the conscious mind (that calls itself 'I') has very little control over the *functioning* of the body. This group responds to the environment by 'making' some cells 'suffer' more or suffer before other cells. This group's own troubles are reduced by alcohol, tobacco or drugs, making life miserable for the cells of the liver, lung and brain. Brain cells are more taxed by opting for hard-tech. This group even opts for sacrificing some cells to save other cells or the body. The systems of the body put up a good fight against external dangers (e.g. infections) but make a poor show of it in the event of internal (systemic) malfunction. These systems are vulnerable to environmental factors, internal failures and increasing entropy towards equilibrium, i.e. death.

Real bodies (human individuals) 'form' **virtual** bodies (governments, corporations or civilisations) and 'work' for them. Human individuals struggle, suffer, sacrifice, replace themselves for the survival of the **virtual** bodies. But the converse is not true. A group of ministers/directors/social leaders may be policy-makers but they have very little control over the total functioning of the virtual body. They can at most decide which section of human society 'suffers more' or 'suffers before' others. This group can make some individuals suffer very heavily; even sacrificing them for growth (a necessity for hard-tech survival). The virtual body system fights external threats better. But diversity in individual members' up-bringing, education, skills, roles, functions, psychology, local environment, etc., makes it highly improbable that all of them decide on a unified action plan to get rid of internal problems, such as their own suffering of hardships due to the high effort and harm costs inherent in hard-tech. The virtual body is subject to environmental factors, such as a failure in the supply of resources, including human ones.

In the current hard-tech or fossil-fuel-powered civilisation, the majority of individuals responsible for the present level of fossil fuel usage or accelerating entropy-increase have almost reached or are on the way of reaching their 'self-limit' as regards the time available to them (24 hours max!), and their capability for putting in more effort and/or bearing more harm. This stage can continue for some time, maybe a generation or two, before there is a downward trend. This is because the human capacity to put in effort and/or bear harm is finite. It will keep falling short of the ever-increasing demand (of efforts and harms) in obtaining and using the fossil fuels; their stocks are rapidly going farther away from us.

Human individuals (of any rank or calibre) are like cells of the body. It is beyond their purview to fundamentally change a system that they are part of. Unlike body cells, human individuals are free to live out of, or on the edge of a hard-tech virtual-body system or in a dispersed civilisation. They stand better chances of escaping hard-tech-induced struggles and suffering, as well as ensuring survival in case of a total collapse (the higher the entropy, the lower the rate of entropy-increase towards equilibrium). Virtual bodies – corporations, governments and civilisations – have collapsed many times throughout the course of history but every time individuals on the fringes have survived. So how do we sit on the fringe of a hard-tech system or in other words, upgrade our life-tour package?

Upgrading of the Package

The precise reasons for heavy effort-and-harm costs and little freedom in hard-tech are :

1. High entropy resources – long distances travelled by raw materials and finished goods.
2. The large number of steps involved in processing, with loss at every stage (poor energy efficiency).
3. Hard-tech necessitates large operational systems that cannot meet diverse demands.

The precise reasons why benefits of hard-tech are short-lasting (non-sustainable) :

1) Security, comfort and entertainment are not sought in their order of priority.
2) The availability and affordability of non-renewable energy is limited.
3) Rising effort and harm costs reach a 'human self-limit'.

Selective or Soft Use of Technology (Soft-Tech)

As per the Law of Entropy, *every technology is inherently inefficient, i.e. output is always lesser than the input in energy terms.* Despite this limitation, we have to use technologies already adapted by us and pay their costs because now we cannot live without them. Upgrading is a selective use of technology; selection being based on a cost-benefit analysis. Even in this hard-tech era we are selective; many of us do not use weapons – guns and words, 'recreational' drugs and chemicals, as their harm costs are perceived as being greater than the benefits. We have to choose low (effort and harm) cost technologies, keeping the order of priority as security, comfort and entertainment. Soft-tech automatically makes for a package of ample freedom that can last for generations.

The Role of Technology is to convert a given problem to one that is more convenient to face vis-à-vis our capability. For example, putting in an effort and bearing harm in building a shelter of, say, stone or wood is more convenient than having our body face the environment head-on. The effort of cooking food by burning wood is more convenient than digesting uncooked food. The effort in making and maintaining clothing using cotton or wool is more convenient than 'wearing' body-hair (I am bald but TV ads depict elaborate measures necessary for the care of whatever little hair remains!). Hairless individuals radiate body-heat easily. Bald-headed people are cool-headed (in terms of temperature). In any case, we have hair only to the extent necessary for some protection and other minor functions. The effort put into making tools, artefacts and protective gear is offset by the convenience and safety of their use.

Technology also increases reliability or reduces the impact of uncertainty, e.g. strong shelters, storages, processing food for longevity, protecting goods from the environment. But all

this convenience and reliability is worthwhile only if we use a low-entropy matter: biomass (entropy having been decreased by the plant kingdom), such as wood, cotton or wool (of grass-fed sheep), and stones soft enough to sculpt, etc. Heating is convenient only by burning biomass and not by rubbing stones together. *The crux is to balance benefits and costs (effort and harm).*

Effort and Harm Cost Is Low If We -

1) Use free natural services to the maximum extent possible.
2) Use low entropy local materials, mainly biomass, to the maximum extent possible.
3) Use non-local resources in quantities inversely proportional to the distance of transporting them.
4) Use gadgetry requiring low energy input in making, maintaining and running them.
5) Use technologies involving fewer processes and based on self-help or locally available skills.
6) Use only bio-degradable and recyclable materials, e.g. wood and steel.
7) Procure material by barter or purchase from small, local producers.
8) Use industrial materials only to the extent of necessity – such as cast iron, mild steel, stainless steel, glass, rubber, synthetic matter – only and only where their special properties are required (and where such requirements are few).
9) Work for fulfilling the local needs of goods and services; not for export.
10) Learn carpentry and ironwork, masonry and pottery, thread-drawing and weaving; understand palliative and symptomatic medicines, besides domestic work-skills.

In low-cost holiday packages, we use natural services such as the open air, firewood and spring water, local food and local goods and common services, and abstain from 'use-and-throw' littering. Skills such as swimming, trekking, tree-climbing, fishing and managing personal chores are useful. The sky, flora and fauna, and 'art-literacy' all provide us with

good entertainment. We can afford low-cost packages of longer-duration. On the other hand, high-cost holiday packages offer exotic foods and goods, luxuries and high-tech entertainments. But we pay for them out of our own slogging, before and afterwards (through EMIs). Effectively, they leave us more exhausted than refreshed. Hence only high-cost packages of shorter duration are truly affordable.

Many soft-tech models have been in use for a number of generations. But not all are in tune with The Laws of Nature. We can emulate, modify or develop new models (based on knowledge from hard-tech) as per our local requirements.

Examples

Energy Source and Usage

- Local biomass and products thereof, not useful otherwise: to burn for warming and cooking.
- Non-edible seed oil : lamps for a continuous-flame source and as a night-lamp.
- 'Self-energy' : mechanical work (with the help of hand-tools) and local transport.
- Coal : only for heating to high temperatures.
- Crude oil derivatives: only for electricity generation and long-distance transport.
- Electricity : only for data-processing and transmission, for portable and emergency lighting.

High-entropy solar, wind and geothermal energy can be used at a negligible cost but only in the direction of increasing entropy: the drying/germicidal effect of IR radiation (solar), the separation of light and heavy particles, evaporative cooling (wind), hot water or natural gas (wherever geothermal is available). Examples of wind and solar energy that can be used at a little higher cost are: Sail boats (wind) and passive house warming (solar radiation).

Conditions Apply!

The measures stated above, to reduce effort and harm costs, are possible subject to favourable environmental conditions

and the perennial local availability of low entropy resources. An ecological perspective enlightens us on how to ensure this.

A Scientific Approach to an Ecological Perspective

The Environment

Our environment is comprised of "everything under the sun, including the sun", i.e. air (gases, vapours and suspensions), water (and other liquids), soil, rocks, and ice (solids) in numerous forms, components and compositions (including complex living organisms – the biosphere). All constituents are in a dynamic balance close to equilibrium. External and internal natural events or our actions disturb the balance and stimulate interactions among all the constituents. Interactions cause changes in the composition in the direction of, and up to, the highest entropy or a (virtual) equilibrium.

The earth's environment is influenced most by the sun, the moon and geothermal energy. The storage and release of solar energy (in and from biomass, clouds, rain, winds) and gravitational forces (causing tides) change local environments in cycles of short duration. Geothermal energy (earthquakes, volcanic eruptions and tectonic movements) causes topographic changes, which in turn influence regional environment. The increase of entropy of soil and rocks on the surface of the earth (denudations, erosions and fragmentations) causes a continual change in the overall environment.

Rarely, there can be extreme changes in the environment due to large terrestrial objects striking the earth or due to the sun's position in the galaxy (the cause of an ice-age) or due to other factors unknown to mankind. Such changes are out of the purview of ecology.

Every action of ours (and we can act only through handling and/or mishandling of living or dead biomass) theoretically results in a change in the environment. The change and its effect may not be measurable or perceivable. Its outcome (whether favourable or unfavourable), the time required to feel it and how long it will last is unpredictable (though simulation studies can give some indication). We all know that it took a few generations to feel the effects of air pollution after

the advent of boilers and IC engines.

Environment and the Living - Ecology

Living organisms (including humans) keep adapting to changes in the environment on a macro- and micro-level. Observations of adaptation suggest a pattern – the law of ecology.

Patterns of Adaptations –

- Adaptations are for survival and for better living (i.e. more benefit over cost).
- Systemic (bodily) adaptations are effected very slowly and automatically (not by any conscious effort or technology) over a number of generations.
- Functional (behavioural) adaptations can be quick but are traumatic; the slower ones are smoother.
- Changes in the environment can result in struggle and suffering till there is either a restoration of the changes to the original or adaptation over generations (if the species survives till then).
- Extinction, mutation and new formation are also probable outcomes.

A Reminder

As part of the universe, all living matter is under the purview of universal facts, e.g. particle composition and the universal laws, such as the laws of conservation and entropy.

The Human Race and Its Environment

Natural events such as storms, heavy or no rainfall, severe summer/winter, floods, wildfires, volcanic eruptions, earthquakes and tsunamis affect land surfaces, water bodies and the plant, animal and micro-organism kingdoms. All these change environmental conditions for the human race. We have adapted to a changing environment – somatically through physique and melanin to suit local environmental conditions, extra-somatically through technologies, and physically through migrations.

Quick changes in the regional environment cause the living to struggle, to suffer or even to become extinct. Scientific studies

have revealed that the internal systems of the human body have remained largely unchanged over the last 10,000 generations or so. This suggests that there have been no **slow** major changes in the environment. Minor and quick changes in the environment, if any, must have been taken care of by 'adapted technologies' (AT).

Until around 500 generations before the present one, the human race lived with adapted technologies. According to experts, the long period of 9500 generations prior to this was perhaps the happiest of all for the living. Not much of this period is known as history perhaps because all was well; there was no 'breaking news', nothing to report. No news is good (news). *Any* news is often no-good!

The actions of our last 500 generations or so are causing changes in the environment by extensive interference in natural processes through the increasing application of technologies.

The burning of fossil fuels has caused the fastest change in our environment in recent times. We cannot adapt to such fast changes and therefore we struggle, suffer and have to make sacrifices too.

Lessons from the Last 500 Generations That Have Been Changing the Environment

1) The natural growth of plants is diverse and scattered. The human effort of concentrating on certain grasses (agriculture) or plants (horticulture) means decreasing entropy. Our effort and cost in terms of harm due to the uncertainty of the weather, the water supply, the timely availability of labour, fertilisers, pesticides (crop is an *en masse* food for pests too), etc., is much greater than the benefits.

A very small part of any crop (seed, pulp, oil or juice) is used as food and a large chunk (stalks, oilseed-cake, shells and the remains of fruits, sugar-cane, etc.,) is removed from the field and transported for post-processing, requiring much energy. Agro-waste, left-over and undigested food (faecal matter) is disposed of elsewhere and not returned to the same soil for reuse by the subsequent crop. Thus, soil is continuously depleted of nutrients necessitating their replenishment by fertilisers (as per the Law of Conservation).

Food-grains have a small size, and are individually packed.

Their use as food involves a large number of post-processing operations such as collecting from the farm, unpacking, segregation, storage and grinding, etc. The effort involved and the dispersal losses in these operations are high. Compared to this, the use of food of a larger size, such as roots, fruits, leaves, and large-size seeds, involves lesser effort and dispersal losses. The only advantage of food grains is that long-term storage is possible, especially if stored in their original encapsulated form.

Today, just as industry converts raw materials to useful goods, agriculture converts the energy from sunlight into food using huge fossil-fuel-based energy. Food (as with any industrial product) is gathered from shops and malls (as our 'gatherer' ancestors did from the wild); even most of the small farmers do not grow all the food that is required in their households.

Sustainability issues could not have been perceived. Clearing the natural wilderness for agriculture causes enormous damage to the environment, not recoverable over several generations. Private ownership of agro-land, too, leads to so many problems for generations : land-owners have been confined to their lands for agro-chores, protection, land divisions in succession, soil degradation, and also malnutrition (no square meal) due to mono-cropping, etc.

2) Animals generate mechanical energy and 'make' things (e.g. milk, wool, silk and honey) for their own survival and that of their next generation – not for human needs. Unlike plants, animals react against human actions. Redirecting animals for human needs is a technological process of decreasing entropy. The effort and harm costs to keep, tame/breed, train and maintain animals or insects are always greater than the benefits through the goods (food, wool, milk, silk and honey) or services (labour or entertainment by pets) delivered by them. The same is true for services by humans, unless they are self-motivated (self-energies constrained intentionally) – no net benefits are possible by force or through slavery.

Today, keeping animals is like an industrial activity requiring huge fossil-fuel energy inputs. Most of us do not keep animals but gather animal-products from shops and malls (as our ancestors gathered them directly); a few of us keep

pets at a cost of more effort and harm than the benefit of entertainment (our ancestors were entertained directly, living quite close to animals and birds). Grazing off the land causes almost the same problems as those caused by agriculture (noted above). Zoos and sanctuaries are interventions in the natural system; their effects are not perceivable today.

3) "The wheel is one of the greatest inventions of mankind". This has been impressed upon us from our school-days. However, rotating-wheel-based transportation requires a path or road. Therefore, wheel-based transport systems are not naturally seen in living organisms – no animal has wheels! We require a carriage of certain minimum specifications. Energy for making and maintaining the path, the carriage and carrying additionally the weight of the carriage is much greater than the energy spent in walking. Energy calculations show that walking on four legs requires less energy than walking on two, and humans are the only animals doing so. Humans also use inefficient wheel-based transport systems, which also raise safety issues.

Today, the wheel (powered by an engine/turbine) has become the cause of maximum changes in the environment – pollution, industrialisation, roadways, railways, runways, waterways and related structures. Ease in the movement of people (tourism, migrations and armed forces) and of goods (export-import of undesirables, particularly weapons and anti-social goods) is causing social challenges which jeopardise our security, comfort, and quest for a joyous and leisurely life.

Current Times

Most of the damage blamed on natural calamities is really due to our hard-tech actions. Loss due to floods has a direct connection with deforestation, interference in natural water flows, hard surfacing of soil, and soil compaction by heavy agricultural machines. Tourism and military activities are melting glaciers. Settlements and constructions in flood-plains, earthquakes/tsunamis, and avalanche- and landslide-prone areas are the real reasons for the loss and damage. Dense population inviting epidemics, monoculture inviting pests, canal-flood irrigation inviting soil-salinity are a few examples of the many problems caused by hard-tech.

Design (adapted) conditions and performance

Any operating system performs at its best only under the conditions for which it is designed. For example, a vehicle is made to run on a specific fuel, a proper road, etc. It runs at its best under the designed set of conditions. But it huffs and puffs, or performs below par on adulterated fuel or off-the-road and fails under conditions beyond its tolerance range.

Human bodies have adapted :

1) Mostly, to the conditions that existed for a very long time, around 9500 generations (hunter-gatherer lifestyle).

2) A little to conditions that have changed slowly in the past 500 generations (agrarian lifestyle), and

3) Not at all, to rapidly changing conditions in contemporary times spanning a few generations (hard-tech lifestyle).

Even after a few hundred generations, many of us still struggle to digest agro-technology products: grain, oil, sugar, salt and milk. Today, processed foods using these ingredients are available in plenty but books on nutritional health include them in the list of foods not-good-for-health that runs longer than the list of foods good-and-safe-for-health. These are mostly less-processed organic foods. These books advise us to consume our daily food requirement divided into smaller portions (as did our 'gatherer' ancestors), many times in a day, rather than having two or three large meals. Our body is not yet adapted to digesting a heavy gorging at lunch and dinner.

Our bodies react against synthetic materials: clothing or shoes, body-cleansing chemicals and cosmetics, drugs and medicines. Dermatitis, diminishing immunity (due to over-cleanliness) and many systemic ailments in youth are due to the changed environment, such as night-shifts, sedentary/ 'robotic' jobs, multi-tasking, road acrobatics and artificial (enclosed, noisy and congested) work places.

In many and different ways, in hard-tech life, too, we have begun living our lives similar to the way we lived 500 generations earlier. We are back to hunting which can be considered to be "taking out whatever is wanted". It was 'taking

flesh, honey or eggs from animals by trapping, and by stoning' in the past. Today animals and plants are trapped in cages/stables/farms, or chained for the same, adding entertainment to this list. In addition, we have a situation where 'work, money or self-esteem is extracted from humans by trapping them in employment, or in mono- or oligopolies, and through restrictive trade practices or laws'. Bullets have replaced stones. We in the mainstream are already back to gathering – earlier it was from plants, now it is from shops and malls. We are also back to the jungle – the previous plant wildernesses now replaced by urban structures, and vehicles. We are back to eating food on-the-move. Those kept outside the mainstream – farmers – are trying to enter it. Urban dwellers look out for nearly-natural places such as open landscapes or seashores and enjoy wearing barely-sufficient clothes, and behave without any inhibitions, thereby reliving the life of their ancestors.

We have seen the struggles of the previous generation, are witnessing an increased struggle by our own generation, and observe the upcoming generation crushed under the accelerated changes in the environment. A higher level of struggle and sacrifice (ill-health/death) at a younger age clearly indicates that changes in our environment caused by our own actions are happening faster than our capacity to adapt.

Responding to Eco-systems

The word ecology is derived from '*oikos*', meaning 'habitat' or a 'natural home' of the living. We humans live in an ecosystem: a natural system comprising of landscape and soil, rainfall and water, flora and fauna, temperatures and humidity. We also live in a man-made social system made up of family and relations, society and economics, science and technology.

Natural (i.e. with no interference by the conscious human mind) ecosystems are diverse due to the phenomenon of entropy. Thus humans live in diverse landscapes and on soils such as mountains/hills, plains, grasslands, forests, deserts, wetlands, seacoasts, etc. They live by streams, rivers, estuaries and lakes. They live alongside a large variety of living organisms, i.e. plants, animals and micro-organisms. They also live in hot, cold, dry and wet climates.

Humans have evolved, lived with, and hence adapted to

natural diversity in every respect. The human experience of nature is one of diversity and uncertainty. For better living and for overcoming uncertainty, humans try to bring in uniformity and provide for redundancy, through hard-tech (using fossil fuels); but fossil fuel is a high entropy resource at most places on the earth. Also, as per The Law of Entropy, technological solutions come with human suffering (huge effort and harm), and they are not sustainable either.

Ecological solutions : Befriending **diversity** is a wiser way to better living, and for overcoming **uncertainty** – one effect of the phenomenon of entropy used against the other.

Befriending Diversity for Better Living and Overcoming Uncertainty

Diversity amongst the living is biodiversity, indicated by 'wildernesses'. Forests provide a variety of biomass useful as foodstuffs and spices, medicines and preservatives, wood and leaf-litter as fuel, oils and perfumes, adhesives and cleaning reagents, wood and fibre as raw materials for shelters, storages, hand-tools, artefacts, gadgets, toys, etc. Everything is bio-degradable and renewable. A good jungle up-stream holds rain-water like a sponge, releasing it slowly into the stream that makes it our perennial water-source. Nutrients formed in the forest are carried by water to deposit them on flood-plain making good quality soils to grow our food. Most of our household necessities can be at a walking distance. Forests provide a habitat for insects, birds and reptiles that have a role in pollination and the control of pests. Many books give detailed information on this subject.

A natural forest is very useful in reducing uncertainty: reserve food and fuel stocks, resilience against varying natural conditions such as excess/low, concentrated/scattered, early/late rainfall, i.e. protection from droughts or floods. Extreme temperatures and hot sun, dusty and dry winds are toned down in their severity.

The landscape and bio-diversity is also recreational. It provides picturesque views, nature trails, flora and fauna for observation and study, open-air theatres and concert halls, playgrounds and painting studios, materials for toys, collections, musical instruments, etc.

Thus, living with natural bio-diversity or living in the adapted conditions and using soft-tech are the key factors to upgrade the current lifestyle package. The restoration and preservation of bio-diversity is an important mantra for our optimum performance, reducing uncertainties and sustaining a joyous and leisurely life-style extending to future generations.

True Justification for the Title of This Book

WRONG (an acronym) **– W**ilderness **R**esourced **O**pulence; **N**aturally **G**ainful

Implementation of Upgrading

For the last few generations, our condition has been similar to animals born and brought up in stables, zoos or circuses, or like that of caged birds; we are fed, sheltered and cared for. But we have to dance to the rhythm and tune of (hard-tech) masters most of our lives. How can we free ourselves?

Rapid changes in life-style can be traumatic (caged animals are not able to quickly adapt to their natural life when freed). Most of us actually fear real freedom. Changing slowly and steadily is smoother and more effective. However, ecosystems and bio-diversity are getting damaged rapidly and their revival takes a long time. Therefore, a quick beginning towards change is important.

Life-styles depend on micro-climates in places where one wants to live. Due to the diversity in micro-climates and to the aspirations of individuals, there cannot be any standardisation or formula for change. However, common guidelines can be summarised as follows :

1) Our energy source is produced by the plant kingdom and our waste is cleared by micro-organisms. Both kingdoms do their jobs at a time-rate of their own. *Using their services by matching their rate* is the key to the sustenance of a joyous and leisurely life.

2) The number of available alternatives gives us the ability to combat uncertainty. This is the indicator of *real* richness. We should concentrate on becoming and being rich in terms of biodiversity, as it gives us the maximum number of alternatives, compared to monetary riches. As far as the provision of

protection against uncertainty is concerned, monetary riches have many limitations (money is only a promise); an important one being the actual availability or otherwise of goods and services.

3) The change in our environment (caused by the consumption of goods and services) should . . .

- Be small, quickly and automatically restorable in nature, i.e. requiring no effort on our part.
- Be local, i.e. not causing trouble to others at a distance, thereby ensuring our security.
- Affect us directly, to ensure an automatic check on our actions.

Example

These guideline criteria can be met by using the majority of locally-grown biomass (mostly from surrounding wilderness) as a source of food and fuel. Carbon-dioxide from smoke and gases, salts from ash by burning of biomass, and from bio-degradable matter (kitchen-waste, left-over material, faeces, etc.) decomposed by micro-organisms are taken up by the local plant kingdom for new biomass formation. This restores the changes in the environment quickly and automatically. The burning of biomass directly affects us by way of smoke and ash, and can act as a deterrent to excessive use.

This is what can be called becoming a **conscientious consumer**[10].

Are we going back? No! Upgrading is a post-modern view of progress and development. We know the Laws of Nature or Science, Ecology and Soft-tech. We have a list of negatives from the practice of technology. We can refrain from repeating our ancestors' mistakes. We can make choices for implementing our ideas of a joyous and leisurely life.

□

My Blog

I studied the "importance of landscapes and bio-diversity in sustaining low effort and low harm i.e. a joyous and leisurely life-style" in a course conducted by Prof. Prakash Gole, founder of The Ecological Society, Pune, India. This was a revelation. I learnt important facts that had never appeared in my formal education, and had never occurred to me during my professional or personal life.

Now I am developing my upgraded life-style either by directly imitating existing soft-tech practices or by modifying them to suit my requirements or by innovating new ones. I am sharing them because, the basic building blocks of our cells being very similar, commonalities, too, are probable in this world which is otherwise full of diversity.

This is my slow, steady, step-by-step, non-comprehensive account of upgrading. Life-style changes are difficult but not impossible. Habits are not congenital; they are formed and hence can be changed; the slower the change, the smoother the transition. It is wiser to start taking early steps than having to face fast changes that may become inevitably thrust upon us, and prove to be traumatic. This is a journey of gradual transformation from hard-tech (brilliants') **hell** to soft-tech (fools') **paradise!**

Steps towards Change

As a conscientious consumer I started by reducing/ stopping my purchases of 'forced necessities' and 'non-necessities'. It was easy to recognise them; these were the goods and services needing frequent or regular ads. Even in the case of deemed 'necessities', I am now sensitive about using high-cost (that reflect high effort and harm) goods and services and

try switching to low-cost alternatives that are normally available. I do not use goods made of leather (making someone do a dirty job for me) or silk (killing insects for my pleasure). I avoid things that demand hard work, and frequent money transactions or travelling, all of which have changed our environment the most.

My practise of conscientious-consumerism in such small measures looks like a mere Band-aid due to its general disregard by the majority. Yet I practise them for three reasons :

1) Doing (what I feel) the right thing is a matter of self-esteem, a vital issue for me.

2) It serves as a model for children (and also for interested grown-ups), who learn by imitating.

3) They are a step towards the sustenance of a joyous and leisurely life.

I have reduced my employment to a low-key, non-demanding, local, flexible or part-time job; an activity just enough for meeting cash requirements. With the objective of upgrading, I apply my 'hard-tech' domain knowledge for soft-tech development.

Low (Effort and Harm) Cost Options

The Energy Source with the Lowest Cost : 'Self-Energy'

Spending this energy is equivalent to a work-out in the gymnasium, and is necessary for my fitness. I design my working environment, tools, gadgets, etc., to suit my capabilities, limitations and dislikes, for an effective throughput and with minimum inconvenience. This is similar to industrial-engineering or work-study practices but with the focus on self-, not employee-exploitation. I hate drudgery and toil. Safety is of prime importance. I use hand-gloves, shoes, leg or knee pads, sealing-type goggles, a filter on the nose, a hands-free umbrella, etc., as and when necessary.

I am an average person (weight 60 - 75 kg, BMI 20 - 25, age 15 - 45 years).

My normal capabilities (suitably down-rated depending on working environment, age and health) on an everyday

working basis are :

I can easily and comfortably :

- Make natural, non-straining body movements such as walking and climbing.
- Use my hands for tensile loads and my legs for compressive loads.
- Carry loads on my shoulders up to 20 kg (one third of my weight).
- Work @ 80 kJ per day on a daily working basis.
  (Food digested @ 8000 kJ and Carnot cycle efficiency of 1%.)
  (80 kJ is equivalent to my climbing 136 m or 800 steps or 42 storeys).
- Work up to a maximum of 600 kJ (40 km walk/50 km cycling). But this is done only occasionally.
- Work at a rated power output of 60 W (as many watts as one's weight in kg) with a 50% duty cycle (equal periods of work and rest) e.g. a Marathon-distance walk in 5-6 hours.
- Deliver 10 times the rated power output (up to 600 W) momentarily (e.g. a kick).
- Achieve a work-rate by limb movements, in tune with my normal pulse-rate (wherein muscle cells receive extra energy and oxygen through the blood, exactly when they need it).
- Work standing for short durations, and sitting on a chair/ stool for a longer duration. I avoid sitting on the ground because I spend @ 600 J lifting my own weight every time, in getting-up.
- Work in a ventilated environment, at around 25^0 C ambient temperature and 50 % RH (relative humidity).

I am not meant for (limitations)

- Work involving heavy impact, such as using a hammer.
- High-speed actions (Carnot cycle efficiency is better at slower speeds).
- Carrying heavy loads on the head.
- Frequent bending and holding loads.
- Working in hot sunlight, pouring rain and freezing cold.

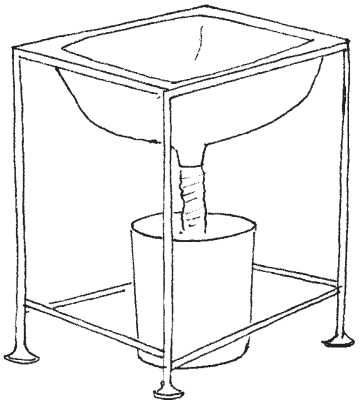
- Cumbersome or repetitive work requiring close attention for long periods.
- Working under close observation. Freedom and leisure are important to me. I do not want to forgo joy of working differently; this may be considered to be foolish and stupid.

I get bored

- When I am doing someone else's work.
- Working in enclosed spaces.

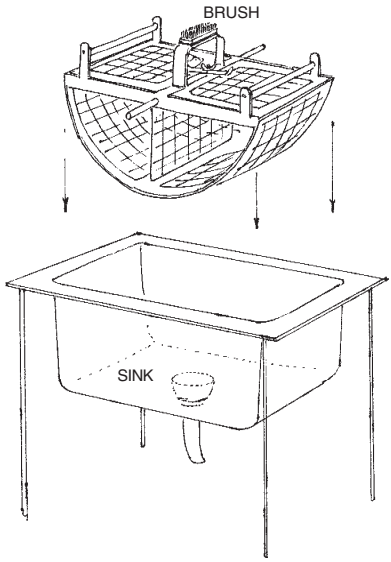
Example

I use a lightweight, portable, height-adjustable, stand-mounted sink with a side-table for my clothes and utensil washing (*see* water handling details under water management write-up). Sinks can be moved to any place; the veranda being my favourite.

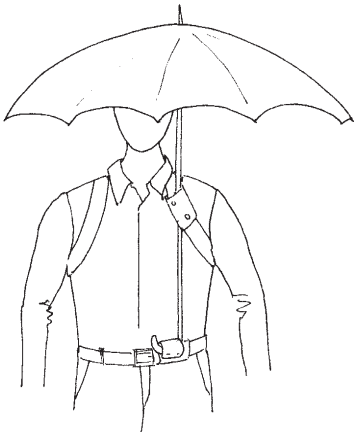


Utensils Washing Sink

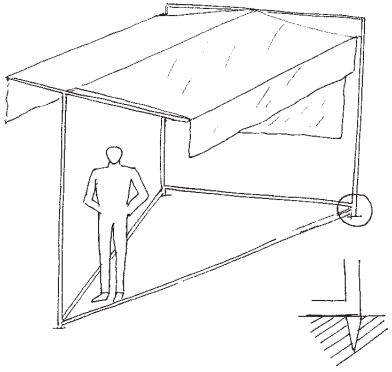
Basket for clothes swivelling in the sink



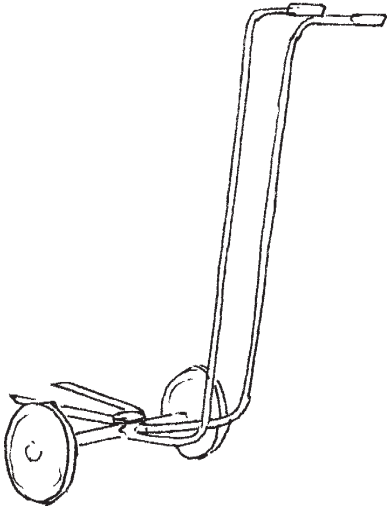
Washing Machine



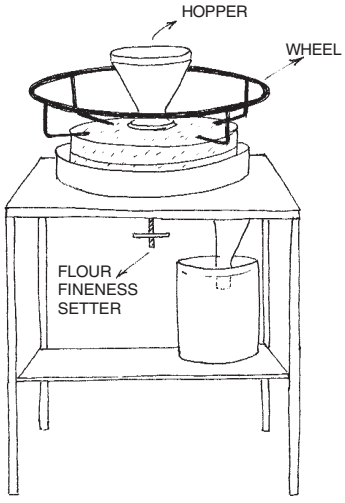
Hands-free Umbrella



Portable Sunshade



Walking Grass Cutter



Standing-Flour-Mill

Food

1) I am vegetarian. Plant-produce is the origin of every food, hence my effort and harm is the lowest.

2) No milk and dairy products. Milk involves high (effort and harm) cost to obtain and is also not my natural food. I am phasing out first milk and then curds (that is partially digested milk externally); this causes less effort for my body to digest and less harm too.

3) No honey. Recognising the contribution of bees in pollination, and supporting them by not robbing them of their livelihood (honey), is more important than my consuming it.

4) I am phasing out grains produced by monoculture, mainly wheat. Rice will be in the next phase because rice (unlike wheat) requires low effort and less energy to cook it.

5) I am switching from sugar to jaggery, oil to oil-seeds or nuts and reducing salt intake.

6) I am turning to foods grown organically and locally, with fewer processes, and foods requiring no electrical gadgetry for cooking or storing, such as refrigeration. They are: soups, salads and boiled vegetable recipes; pulses, fruits and nuts. Spices are added only to the extent that they are necessary for a better taste without hampering the natural flavour of the original ingredients.

This food requires low effort getting it and causes low harm digesting it because it is close to the food my body has been adapted for. This food affects the environment the least.

Stepping Out

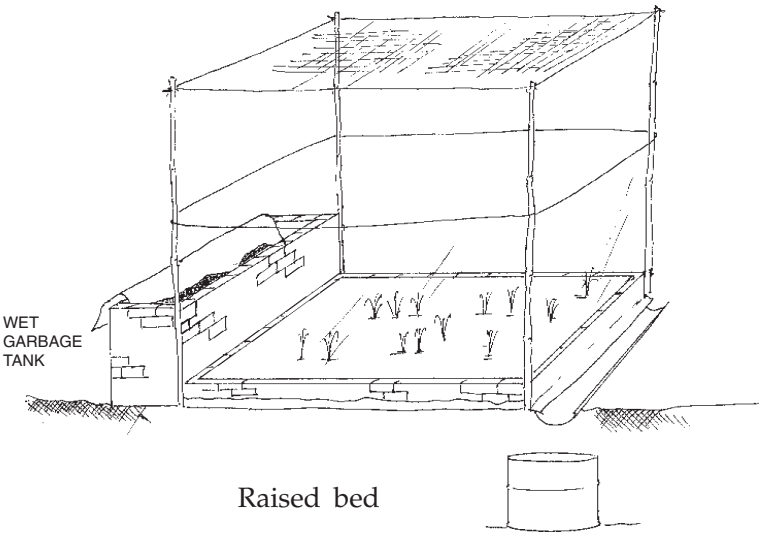
Practising ecological solutions in an urban setting is currently not possible. I had purchased a piece of open land in a rural area. This was financed by liquidating the investment in my larger urban house and moving to a smaller one. I scaled down my normal urban spending. Life-style changes also reduced my money outflow. An early start allows slow adaptation to upgrading; the issue of whether land is owned or hired or made available for free, etc., can be sorted out in due course.

I built a shelter and provided essential services, such as food, fuel and water as described below :

Growing Food

Farming vegetables, pulses, fruits, nuts and spices around one's dwelling is an age-old technology; now revived as a non-commercial, multicultural, organic and human-powered activity irrigated by rain and local water (including urine and chemical-free domestic waste-water). Any new wilderness (for 'wild foods' and other benefits) or plantations for fruits, fuel, fibre and wood take fairly long to become established as per natural processes, hence the need for an early beginning.

To start with, the 'raised bed' [11] method is an optimal, intensive, food-growing technology.



Raised bed

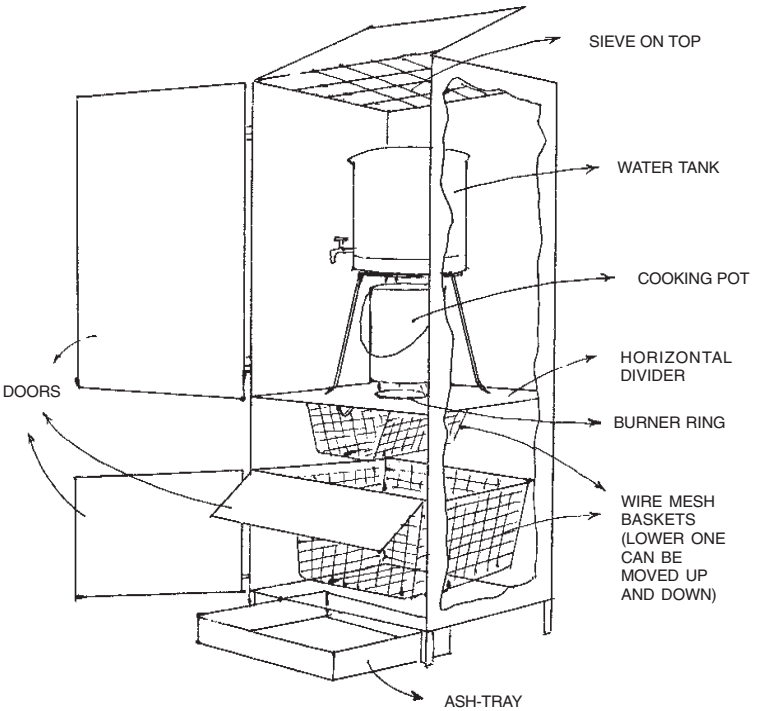
The Girish Stove

Trees have no excretory system like animals have. They dump all unwanted mass in their outer trunks, distal twigs, leaves, etc., and shed it as skin, finger-thick sticks, yellow leaves, etc. This and other waste wood, biomass, provides no-harm-to-plants and no-cutting-effort-to-me fuel for my stove. This stove is for use in a veranda or in the open.

Construction : It is a modified steel-cupboard (500 mm wide, 350 mm deep and 1800 mm tall) standing on 100 mm

high legs. It has a horizontal divider at the centre, three front doors but no top or bottom. An undersize ashtray at the bottom lets in air through clearances. A wire-mesh basket - LL (size 300 mm wide, 300 mm deep and 300 mm height) is kept at a suitable height from the ashtray. Another front-open wire-mesh basket - W (225 mm wide, 350 mm deep and 150 mm height) is placed 150 mm above the LL basket. A horizontal divider with a hole is for keeping the cooking pot on the burner-ring.

Operation : I fill an LL-basket with leaf-litter (or any inflammable bio-mass) and a W-basket with high-calorie, woody, bio-mass. I use two pots - a water-filled outer one with a lid and an inner, for food to be cooked. I light the leaf-litter and close the doors. The leaf-litter burns out in few minutes, but in sufficient time for the woody stuff to start burning. Smoke escapes from the top; the cupboard-height serves as a chimney. I can add fuel, 'on-line', by opening the lower doors



Girish Stove

momentarily. The fire can be extinguished by closing the air supply to the fuel.

The outer pot is blackened but is 'left as it is' and can be used again and again. Ash, soot and litter drop into the ashtray. A water-filled tank with a tight lid placed above the cooking section gives hot water as a by-product, recovering some of the waste-heat. A sieve placed at the chimney top serves as a drying platform for the next day's fuel-wood, and also filters the rising smoke.

I neither need a blower nor a wind-pipe nor an inflammable fossil fuel like wax or kerosene. I have no trouble in switching this stove on and no problems due to smoke or ash.

Field-Gadgets

I am not capable of some field operations such as digging, ploughing, transporting loads, etc., using traditional tools or gadgets. I have devised new tools and gadgets that suit me.

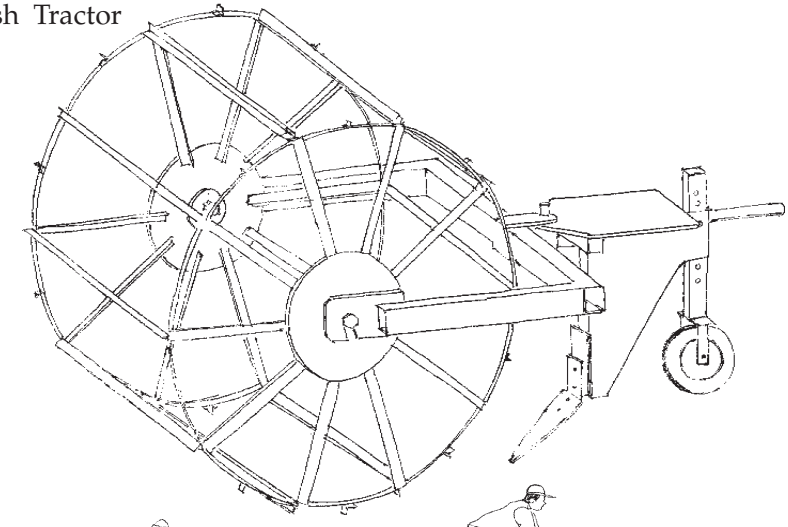
The Girish Tractor

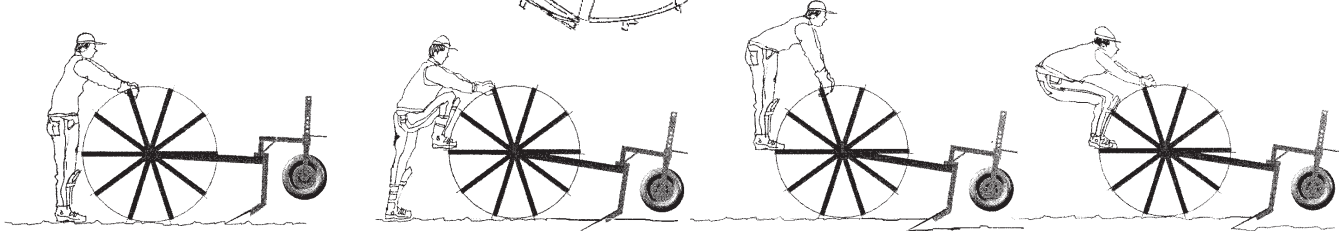
This converts my downward-acting self-weight force into a horizontal-acting hauling force.

Construction : It is a caged wheel (as if a wide ladder had been progressively bent into a full circle) of 900 mm diameter and 750 + mm width. A U-shaped frame connected at the axis carries the tine. A trailer-wheel is for the rolling support during idle movement or reversing, keeping the tine above the ground level.

Operation : The trailer wheel is raised upwards and locked such that the tine digs in the soil due to the self-weight of the frame or by my pressing it down. Then I stand on a rung which is at about half a cage-wheel-diameter height from the ground. My self-weight forces the caged wheel into rotational motion. The tractor starts moving in the backward direction (with respect to my face). Traction is achieved because the rungs keep locking into the soil. A force almost equivalent to my weight is sufficient for ploughing. My effort is equivalent to (jerky) ladder-climbing. The tine is continuously visible to me to negotiate large stones or clod, root-clogs, etc., I lean low and backwards (for increasing the leverage that applies more torque at the axle) to overcome hard spots.

Girish Tractor





Schematic of Girish Tractor in use

Sources and the Management of Water for Domestic Use

Domestic-use water is classified into four categories (distinguished by colour-coding).

1. Potable (blue)
2. For washing purposes (grey)
3. For use in a urinal (yellow)
4. For use in a latrine (brown)

Harvesting Rain-Water for Drinking - The Girish Tank

Rainwater (falling on roof and floor) collection systems have been in use for some time. These systems carry the risk of water contamination because the catchment area may not be free from human and animal use. Pathogens have been reported and hence such methods are not suitable for potable-grade water-collection and storage. My system collects rainwater (or snow) which has fallen onto the tank-top (that can be kept free from human and animal use) and stores it in the tank in such a way that no 'food' can be formed in it by photosynthesis.

Principle : Clean rain water collected and stored carefully in a container devoid of any food remains free of microbial growth and is therefore potable for a long time.

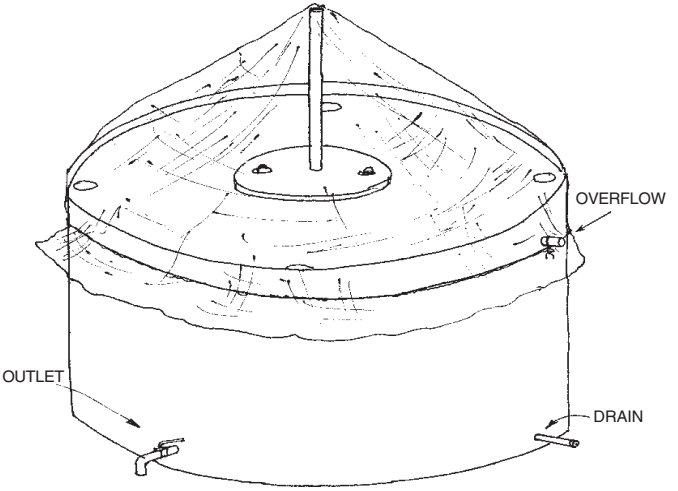
Quantity Requirement

I use potable-grade water only for drinking, cooking, washing of vegetables or fruits, final rinsing of food containers, and for mouthwash. I require 800 (Q) liters annually.

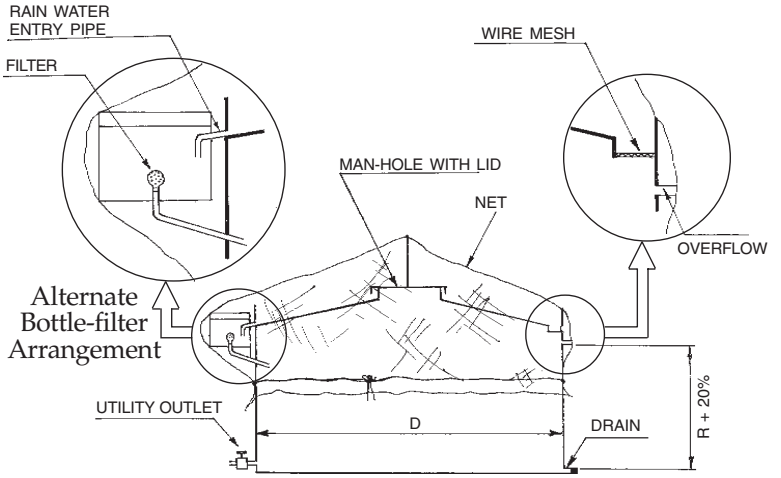
Construction (Please refer to drawing)

The "Girish Tank" is a vertical-axis cylindrical Ferro-cement tank with a gently-sloping conical top. The vertical wall is raised above the sloping top by about 100 mm to form a skirted rim. Four equally spaced holes on the lowermost part of the top adjacent to the rim are fitted with stainless-steel wire-mesh strainers. The arrangement ensures that all rainwater falling on the tank-top is drained into the tank. Alternatively, the water is passed through a bottle-filter arrangement and led into the tank.

Girish Rain Water Tank



Schematic



Leak-proof, anti-moss paint ensures that it is sealed and food-free inside. An overflow channel prevents the accumulation of water on the tank top if the tank is full. Stainless steel wire meshes at the rainwater entry holes and at the overflow

channel prevent the entry of mosquito females. The tank top is covered by a net raised at the centre and stretched lightly over the rim to prevent the accumulation of leaf-litter and other debris on the tank top, as well as discouraging birds and animals from using it. In seasonal (monsoon) rainfall areas, a rubber stopper placed in the entry-holes or covering the top completely protects the water collected in the tank from dust and other particles during the dry season.

Dimensions

The height of the tank should be about 20% above the average annual rainfall of the area.

The diameter **D** in meters can be calculated as,

$$\mathbf{D} = \sqrt{\frac{4NQ}{\pi.R}}$$

N = Number of beneficiaries

Q = Quantity requirement in liters per person per year

R = Average annual rainfall in mm.

A family of 5 requiring 800 liters each per year, living in an area that receives an average annual rainfall of 500 mm will need a tank of 3.2 m diameter and 600 mm height.

There are certain technical limitations to manufacturing Ferro cement tanks. The diameter should be between 0.9 and 4.25 meters and the height between 450 and 1325 mm.

Alternately, a tray fitted with a waste-coupling at the bottom, placed on a container suitable for potable-water-storage, also serves the purpose. Care is to be taken that the tray does not rust or get blown away in the wind. Covering by a net, etc., is the same as above.

The height of the tray edge: 50 mm is adequate.

$$A = \frac{NQ}{R}$$

A = Area of the tray in square meter

Location

The tank should be placed in such a position that rain (and nothing else) directly falls onto the tank top.

Water Quality

The tank fills to capacity during monsoons. Initially, samples were collected from the harvested rain-water by opening the manhole lid of the tank intermittently throughout the following year. The coliform counts were monitored using the standard MPN (Most Probable Number). No coliforms or mosquito larvae were found in any of the samples. This tank water has always met the accepted quality standards set for potable water.

Limitations

This system is unsafe where the air is not clean, e.g. in the vicinity of mills, where organic particles are suspended in the air. They are likely to accumulate in the tank leading to the growth of pathogens. Chlorination or another suitable method is necessary in such cases. Acid rain or other local problems, if any, are to be dealt with as necessary.

Maintenance

The tank-top is to be kept absolutely clean all the time, by wiping and not by washing. The tank is to be drained, cleaned and repainted with anti-moss and leak-proof paint every five years. Net and rubber stoppers are to be replaced as and when required. Ferro-cement tanks last over 50 years if maintained properly.

Additives

Minerals (powder, tablet or solution) may be added to the water before consumption.

Water for Washing Purposes

Water for washing the body, clothes and utensils, or for wiping the floor, etc., is colour-coded grey. Water sourced from another GIRISH Tank suffices by conscientious use/recycling.

Body

A sponge for cleaning, a shower for freshness and a dip or a bath for pleasure! The bottom platform of my body/foot-wash cubicle is raised sufficiently to allow me to collect the

drained water from sponging or showering (this contains body-fluids, dust and dirt as contaminants). I do not use soap. I can safely reuse this water after treatment for *my* sponging and showering.

I plan a tank 900 mm long, 600 mm wide, 1000 mm height, with a removable top cover, and an inside-seating arrangement to serve as a vertical rain-water bath-tub.

Hands and Face

I use the two- or three-bowl (old European) system. The water can be reused.

A Cleaning Process for Clothes and Utensils

I use a sink (described under the 'self-energy' example) for the purpose. Soaking the objects to be washed in water for a longer duration dissolves and loosens the particles to be removed reducing my effort in dislodging them by the relative motion between objects and water through agitating, rubbing and brushing (soaking-and-squeezing for fibres).

I do not use chemicals and synthetic materials for dissolving oil/sticky matter, or for disinfection; plain hot (above 60^0 C) water (a GIRISH Stove by-product) serves the same purpose. I wear wrist-long, thick cotton gloves and cover them with elbow-long rubber gloves to protect my hands when washing things in hot water. Alternatively I use biodegradable cleaners. Grey drain water is collected for reuse.

Removing water from washed clothes by squeezing or spinning requires considerable efforts. I dry them by hanging them in the open (over a plant bed or where dripping-water is no problem) on double-wire hangers for their all-round surface exposure.

Reuse

Water containing organic matter in large quantities (utensil, and hand or mouth-wash effluent containing food particles) is of high Biological-Oxygen-Demand (BOD) and is used for watering plants.

Water containing inorganic matter such as dust, and dirt or body fluids (low BOD) can be reused for the same purpose.

Thus effluent left after clothes and non-food articles have been washed can be used again for a similar purpose; that left after wiping the floor can be reused for wiping. For this, the effluent is collected separately for each cleaning activity.

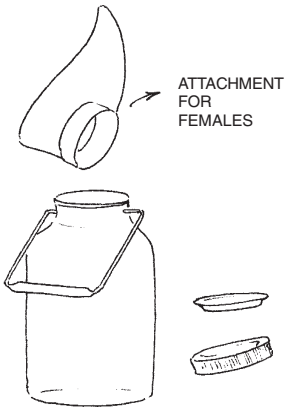
Treatment

Separation by gravity : Used wash-water has some insoluble matter. Storing this water overnight in a tall container separates insoluble matter; the heavier matter sinks and the lighter matter floats. My container has an arrangement to draw water from in-between.

This water is either filtered by readily-available low-cost, non-chemical, non-electrical filters (such as sand, or coal-based ones) and/or aerated. Aeration of water helps aerobic bacteria to consume dissolved organic matter within a short time and the water can be reused for washing. The remainder in the container is used for watering plants.

I treat water for reuse (a cumbersome process requiring many containers) only in the case of water-shortage. Untreated drain-water can be safely used for watering plants.

The Girish Urine Disposer

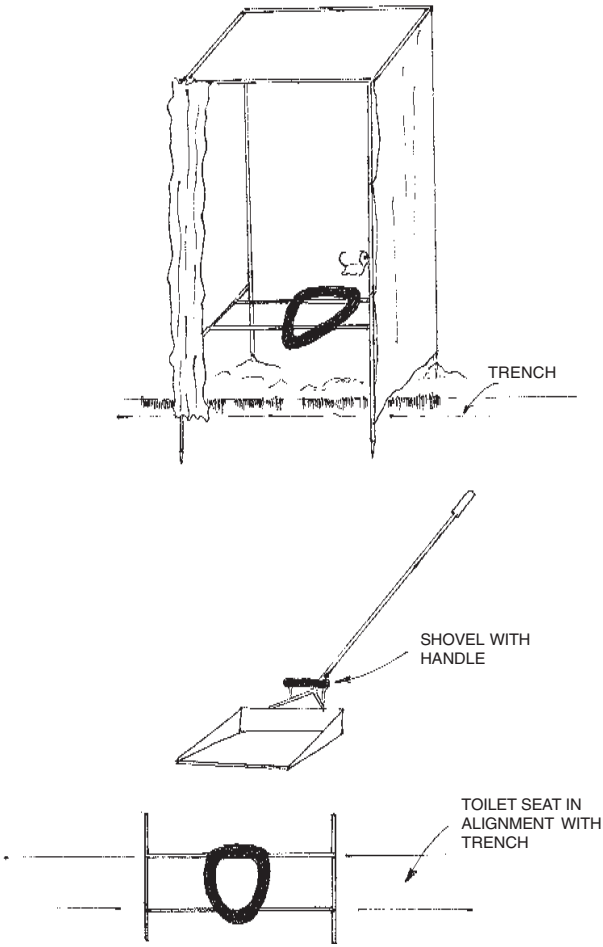


I urinate about 2000 times (a total of 500 litres) annually directly into a large-mouth bottle (females can use an attachment; there is a separate unit for every individual). The bottle comes with a double sealing lid and a hanger-handle for holding it conveniently. The urine of a healthy person is sterile as excreted and remains so in the sealed bottle for over a day or longer. I dispose of the collected urine without dilution (except with a little of the cleansing-water I use) in my plant beds. It acts as manure. The odour quickly disperses in the open.

Many people raise objections to watering plants with undiluted urine. But I have tested this. Soil alkalinity neutralises urine-acidity; no harm is caused, and the plants thrive.

The Girish Trench Latrine

Domestic cats dispose off their excreta scientifically,



Girish Trench Latrine

correctly. I use the same principle.

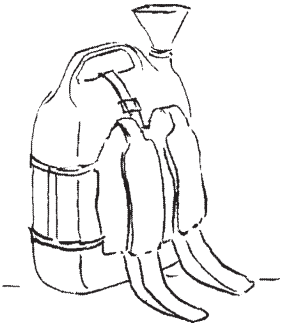
Using the GIRISH tractor, I dig a trench 300 mm wide, and about the same depth, and a meter or two long on a dry patch of land near my house or shelter. The excavated soil is heaped on one side along the length of the trench. I use a portable, canvas-screened cubicle one meter by one meter in area and two meters in height as my latrine. A toilet seat is fixed on bars attached to the inside of the cubicle. Bars serve as guides to visually align the seat with the trench so that the excreta drop exactly into the trench. Instead of toilet paper I use a soft cut-to-size waste cloth. I cover the excreta and the used cloth-piece by ash (another GIRISH stove by-product). A large spoon comes handy for this.

I shift the cubicle along the trench-length as it fills up. Using a shovel I cover the ash with the soil heaped next to the trench. The filled-up trench containing manure and loose soil can subsequently be used for planting trees. The Girish trench latrine cannot be used during heavy rains and during water flooding. For those few days I use a watered latrine connected to a small overhead Girish Tank, and to a septic tank below.

Thus waste matter, faeces, urine (for decomposition by soil micro-organisms) and partly decomposed biomass (ash) is returned back to the soil for reuse by plants. My annual yellow and brown water requirement is down from 25000 to a few litres. Also, I neither generate nor release any sewage.

Transporting Loads

By removing the U-shaped frame and supporting the axle on a stationary stand, the GIRISH tractor can be used for lifting or pulling loads by a rope wound around the caged wheel.



A rucksack is the most ergonomic way of carrying loads; I use a jerry-can, harnessed as a rucksack, for ferrying water to the vegetable beds and the saplings, about 20 litres per

trip.

I load a 'long' item such as a crow-bar, hoe, spade, shovel, etc., on a bicycle and walk with it. I load stones, soil or sealed water-cans in a hemispherical-bottomed steel bucket with a belt-hole near the top rim and drag it by a belt on grassy soil.

Illumination

I use sunlight for almost all my work requiring intense illumination. We are adapted to rest (whether dozing or awake) from sunset to sunrise. Fasting during this period ensures complete digestion and some rest to the digestive system. Our performance and health is optimum when we are in tune with this circadian rhythm. Artificial light considerably reduces the rest that our body gets.

I meet my occasional requirements of bright light by a portable and intensity controllable LPG-mantle and that of dim light by an oil-lamp. In an emergency, I use battery-light.

Electricity

I use electricity only for running my laptop and charging the batteries of my mobile phone, torch, etc. A small petrol-engine-driven alternator (of my two-wheeler) is sufficient to do this work.

Healthcare

Safety and health is the top-most priority for me. Keeping good health depends mostly on our life-style and philosophy. Prevention is better than cure. I live a joyous and leisurely, bother-free, youthful life in an up-graded package and so enjoy good health.

I prefer to treat my ailments on my own, except, of course, surgical procedures, if any, including dental problems. Professional medical practitioners have to undergo prolonged training and study to treat a variety of patients. My job is easier; I have to study only to treat myself. In case of any ailment, I support my body's self-curing system with the help of symptomatic and palliative medicines, and by resting more. I know my symptoms and I am the best judge of my body's response to the treatment. There is no communication gap! Since I lived my youth in tune with my expectations, I do not

need to extend my old age longer by regular check-ups and screenings, and consuming block-buster drugs.

Self-Reliance

As per the Law, I am the only provider that meets *my* standards of the desired quality and reliability in services. There are no inherent losses in communicating with others. This is the most efficient way because my direct handling reduces the number of processes and corresponding losses.

Free natural goods and services accessed from the wilderness, learning carpentry and ironwork, masonry and pottery, thread-drawing and weaving, using palliative and symptomatic medicines, practising low-effort and no-harm domestic work-skills, etc., can achieve 80% self-reliance. 15% of the remainder can be met by a barter system, and only 5% may require cash. But the disadvantage is that I have no one else to blame in case of the inevitable occasional failures!

Education, Entertainment and Pastime

A self-reliant life-style keeps me occupied without too many compulsions. There is plenty of scope for study, research and innovation, all at leisure. The same is true for recreation in the form of nature walks, making observations, soft and liberal art (music in particular), soft-tech games (that can be played even in moon-light), star gazing, etc.

Participation in educating the local community on the restoration and protection of the wilderness and of biodiversity, besides other subjects, is a very important and good pastime.

□

Postbackside

(If books open with a pre-face,
why not close them by a post-backside?)

Objections and Rejoinders

O : This book promotes an unbridled and hardly-working stupid class.
R : Yes, it is they who live a joyous and leisurely life; not the hard-workers and the smart ones.

O : Writing might have fixed some problems of oral deliberations but posed many new ones.
R : Yes, 'writing' is a technology. It fixes some problems and creates many new ones.

O : A book opposing hard-tech but written and printed using hard-tech.
R : A thorn pricked in the body is removed by using another thorn.

O : The entire book should have been in a very small font size – a standard practice while printing inconvenient matter. This book has been written because sperms can't be spread, but it is spreading venom instead.
R : Increasing entropy anyway…

Yet another Justification for the Title of This Book

Possible argument by the mighty 'right' :
wrong interpretations of The Laws of Nature,
wrong ideas of a joyous and leisurely life,
'living a joyous and leisurely life' is **wrong.**

Apology

My apologies in case I have unintentionally offended any individual or any section of society

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1. Dadasaheb Anturkar
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4. Mrunalini Vanarase
5. Arun Deshpande
6. Feynman Leighton Sands, *The Feynman Lectures on Physics Volume 1* (Narosa publishing House 1997) pp. 566, 568, 588
7. Frank L. Lambert, Professor Emeritus Occidental College, Los Angeles, CA. http://entropysite.oxy.edu/boltzmann.html
8. George Gamow, *One Two three . . . Infinity* (Bantam Books, 1979) references appear serially pp. 200, 228, 186-7
9. Vijay Karmarkar
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□

About the Author

Girish Abhyankar is a self-styled independent researcher, just like everyone else.

The research papers and the articles published by him in several scientific journals and periodicals of national and international repute and the acclaimed and bestseller books written by him are nil.
(He is poor at writing.)

His participation as an organiser, a speaker, and invitee in several local, national and international conferences, symposia and workshops is zero.
(He dislikes travelling.)

The honorary degrees, fellowships, decorations and felicitations awarded by highly rated universities, and research and social institutions to him number nil.
(When did The Vatican recognise Galilean theory?)

Chair or position in apex bodies (previously held by renowned personalities and also) held by him, is none.

Chairmanship, trusteeship and the board membership of several acclaimed social organisations bestowed on him is nil (who wants a leg-puller in their midst?).

In social activism, he is always in the "rearfront" or absent (he is a 'passivist').

He holds a degree in engineering and in management. Vital contributions and grand successes in high-tech domain and spectacular corporate achievements to his credit are nil.

He lives a joyous and leisurely life.