



Chaturvarnyam Maya Srishtam

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Bhagavad Gita is the essence of Vedic knowledge and one of the most important Upaniṣads in Vedic literature. The title Bhagavad Gita translates as The Song of God and the text contains 700 verses that explore the nature of the Hindu religion. The Gita comprises part of the Mahabharata, one of two ancient Indian epics, but it is often regarded and studied as an independent work too. Gita is the conversation between a prince named Arjuna and the God Krishna that was held before the Kurukshetra war in the great Indian epic, The Mahabharata. There in the midst of both armies, Arjuna's mind reels as he foresees the imminent death of his teachers, relatives, and friends, mixing of castes, immorality of women etc. He throws down his bow and arrows in sorrow and decides not to fight. However, after discussions, clarifications and the instructions of Sri Krishna, Arjuna got ready to fight. After reading Gita, being a student of science, I felt many modern scientific topics are also discussed by Lord Krishna and Arjuna. In this essay, I made an attempt to link the system of Chaturvarnyam discussed in the Gita with the Law of Entropy discussed in Physics.

In Chapter 4, Verse 13 of the Bhagavad Gita of Jnana Karm Sanyas Yoga, Lord Krishna tells Arjuna that the four varnas of the society have been created by Him according to the qualities and actions of men. Though He is the Creator of this system, yet to think of Him as incorruptible and imperishable.

**चातुर्वर्ण्यं मया सृष्टं गुणकर्मविभागशः ।
तस्य कर्तारमपि मां विद्ध्यकर्तारमव्ययम् ॥ 13॥**
*chātur-varṇyamayaśṛiṣṭamguṇa-karma-vibhāgaśhaḥ
tasyakartāramapimāmviddhyakartāramavyayam*

In the Mahabharata and some Vedic and medieval texts, Varna means the "colour, race, tribe, species, kind, nature, character, quality, property, etc. of an object or person. In some ancient and medieval texts, Varna also means colour, race, tribe, species, kind, sort, nature, character, quality, property of an object or people whereas in Manusmriti, Varna refers to the four social classes. The difference between Caste and Varna is that a caste is a local group in the society whereas Varna refers to the general identity of a larger social group in Indian society. There are only four Varnas in India, but the castes are over three thousand. There is no dynamism in the Caste system, but the Varna system is dynamic. Oxford dictionary gives meanings of words caste and society as follows: Caste = Social class, especially in the Hindu system. Society = an organized community; a system of living in this. These meanings of the Oxford dictionary indicate that Caste has a specific purpose in society in general. It has been emphasized that the caste system has a special influence in the Hindu system. Now the status of this caste system is very controversial and endlessly debatable.

On the other hand, Thermodynamics is a branch of Physics that deals with the relations between heat and other forms of energy (such as mechanical, electrical, or chemical energy), and, by extension, of the relationships between all forms of energy. In Thermodynamics, Entropy is concerned with the study of order and disorder in a system. Nicolas Léonard Sadi Carnot (1796-1832) is considered the father of thermodynamics. Thermodynamics is the oldest branch of geography. All geological changes occur as a result of the transfer of matter and energy. The four laws of thermodynamics can be described as follows:

The First law of thermodynamics or the law of conservation of energy (the principle of energy infinity): - This law states that it is not possible to create or destroy energy. But energy can change from one form to another. When energy goes in or out of a system, it becomes internal energy in the system according to the law of conservation of energy. For example, when an electric bulb is lit, electrical energy is converted into light and heat energy. Similarly, when we work, the chemical energy stored in our muscles is converted into mechanical energy. Energy cannot be created or destroyed.

The second law of thermodynamics or the law of entropy: - This law describes the order and disorder of a system. This law states that the total entropy of the universe is constantly increasing with time. According to this law, when some work is done, essentially the energy goes from irreversibly viable to non-viable form. The higher the energy, the lower is the entropy. The concept of entropy provides an understanding of the direction of sudden changes that occur in many physical phenomena that occur every day of our lives. Its introduction in 1850 by the German physicist Rudolf Clausius (1822-1888) was a milestone in 19th century physics. Let us look at some examples.

1. The hot object cools down slowly. But a cold object does not heat itself without heating. That is, the process does not go in the opposite direction without expending energy.



2. Water flows naturally from top to bottom. It does not go in the opposite direction.
3. If it is not taken care of, the house becomes dirty. To restore order, we have to spend energy and normalize the situation at home. Unfortunately, the house can never clean itself.
4. Children create disorder in the house by their activities and parents again spend all their energy to correct them.

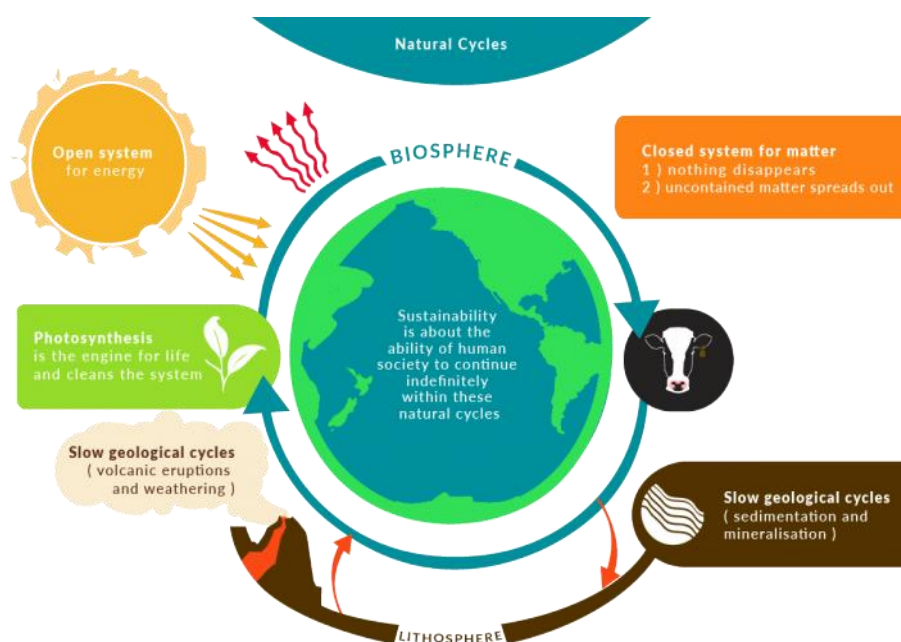
The Third law of thermodynamics:- The third law of thermodynamics states that at absolute zero (0°K or -273.15°C), the entropy of a system is equal to zero.

The fourth law of thermodynamics:- This law states that if two systems are in different thermal equilibrium with a third system, then the first two systems must also be in equilibrium with each other.

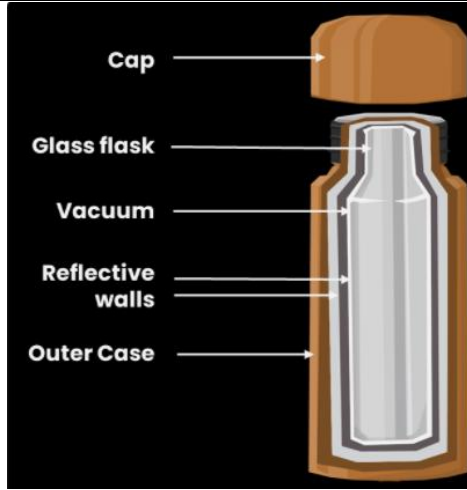
According to the law of entropy, there are three systems operating in the universe. They are Open system, Closed system and Isolated or Separate system:

Open system: - The system that exchanges matter and energy with the surroundings is called an open system. Example of an open system is the organisms living on the earth. Organisms take matter and energy from the earth and use them for their survival. Organisms increase the entropy of their surroundings by using matter for their biological activities. Animals get their energy from the earth. They exchange matter and energy for survival.

Closed system: - The system that exchanges only energy but not matter with the surroundings is called a closed system. Earth is the example for closed system. Earth does not interact with external systems. It only allows energy to flow in and out. The Earth receives no material from its surroundings (much less from the universe in the form of meteorites and meteorite dust) but that doesn't count). The Earth receives energy from the Sun and sends the energy back to space in the form of radiation. Systems in the Earth's atmosphere do not interact with the universe. Another thing is that in such closed systems, as time passes, entropy increases arbitrarily and reaches an irreversible maximum. So, if the material is consumed at a faster rate by living organisms on Earth, then after some time, the living beings have to suffer for their survival because they have to spend more amount of energy to get the same minimum energy from the earth.



Discrete or Isolated system: - The system that exchanges neither energy nor matter with the surroundings is called a discrete or isolated system. Example of discrete system is thermos flask. In a quality thermos flask, there is no exchange of material and energy with the surrounding environment. Thermos flask is constructed in such a way that the loss of heat due to conduction, convection and radiation is minimized. It is a two-walled bottle made of thin glass and the air between the walls is partially evacuated. The absence of material between the walls of the flask reduces heat loss due to conduction and convection. Silvering the outer surface of the inner wall and the inner surface of the outer wall reduces the heat loss by radiation. So thermos flask becomes a good example for discrete system.



It seems to me that the varna / caste system that Lord Krishna has explained to Arjuna in the Bhagavad Gita is based on this principle of entropy so that human beings in society live well as individuals and remain as a species, the Homo sapiens sapiens. Thus, a society with people who use material and energy resources wisely and economically / profitably will survive for a long time. A society that behaves contrary to this principle will soon be in trouble or have a hard time for its survival. Now, we will examine the aspects of varna/caste and community mentioned in the verses of the Gita and try to relate them to the law of entropy, the 2nd Law of Thermodynamics. For ease of writing, the verses were randomly taken directly from the chapters and discussed.

Chapter 4 : Jñāna Karm Sanyās Yog Verse 13

चातुर्वर्ण्यं मया सृष्टं गुणकर्मविभागशः ।

तस्य कर्तारमपि मां विद्ध्यकर्तारमव्ययम् ॥ 13॥

*chātur-varṇyam mayā sṛṣṭaṁ guṇa-karma-vibhāgaśhaḥ
tasya kartāram api māṁ vidhyakartāram avyayam*

Translation: - The four categories of occupations were created by Me according to people's qualities and activities. Although I am the Creator of this system, know Me to be the Non-doer and Eternal.

Comment: - The society is classified into four different varnas / castes. It is said that God created these varnas / castes based on the qualities they should maintain in society, the tasks they should perform, the mindset of individuals, etc. This appears to be logical because categorization makes works systematic, economical, less material & time consuming etc. This matches with the Law of Entropy where it is stated that entropy will be less in organized systems.

Chapter 17:- ŚhraddhāTrayaVibhāg Yog > Verse 7

आहारस्त्वपि सर्वस्य त्रिविधो भवति प्रियः ।

यज्ञस्तपस्तथा दानं तेषां भेदमिमं शृणु ॥ 7॥

*āhāras tv apisarvasya tri-vidhobhavatipriyaḥ
yajñas tapas tathādānamteṣhāmbhedamimamśhrīṇu*

Translation: The food that people prefer is according to their dispositions. The same is true for the sacrifice, austerity, and charity they are inclined (or predisposed) toward. Now hear of the distinctions from Me.

The four varnas / castes created by God are Brahman, Kshatriya, Vaishya and Shudra. According to Gita, the foods consumed by the people of these varnas / castes and the effects of various foods on those people have also been worked out in detail.

Brahmans: - They are the first class people in the society. Knowledge of science, experience of things useful to society, proper understanding of the past and guess work about future, guidance to kings to rule in acceptable ways, belief in God and things connected with Him, etc. To carry out these tasks, they must have physical strength and mental stability, control over bodies, refrain the intellect of the mind from secular pleasures in their thoughts, words and actions, etc. The effects are also finely crafted.

Chapter 17: - ŚhraddhāTrayaVibhāg Yog > Verse 8

आयुःसत्त्वबलारोग्यसुखप्रीतिविवर्धनाः ।

रस्याः स्निग्धाः स्थिरा हृद्या आहाराः सात्त्विकप्रियाः ॥ 8॥

*āyuh-sattva-balārogya-sukha-prīti-vivardhanāḥ
rasyāḥ snigdhaḥ sthiraḥ hṛdyā āhāraḥ sāttvika-priyāḥ*

Translation: - Persons in the mode of goodness prefer foods that promote life span, and increase virtue, strength, health, happiness, and satisfaction. Such foods are juicy, succulent, nourishing, and naturally tasteful.

Chapter 18: - Mokṣha Sanyās Yog > Verse 41

ब्राह्मणक्षत्रियविशां शूद्राणां च परन्तप ।
कर्माणि प्रविभक्तानि स्वभावप्रभवैर्गुणैः ॥ 41॥
brāhmaṇa-kṣhatriya-viśhāmśhūdrāṇām cha parantapa
karmāṇipravibhaktānisvabhāva-prabhavaairgunaiḥ

Translation: - The duties of the Brahmins, Kshatriyas, Vaishyas, and Shudras—are distributed according to their qualities, in accordance with their guṇas (and not by birth).

Chapter 18: - Mokṣha Sanyās Yog > Verse 42

शमो दमस्तपः शौचं क्षान्तिरार्जवमेव च ।
ज्ञानं विज्ञानमास्तिक्यं ब्रह्मकर्म स्वभावजम् ॥ 42॥
shamo damas tapaḥshauchamkṣhāntirārvameva cha
jñānamvijñānamāstikyam brahma-karma svabhāva-jam

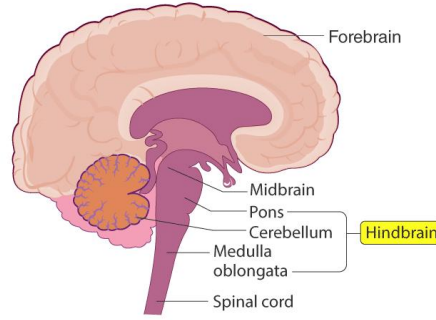
Translation: - Tranquillity, restraint, austerity, purity, patience, integrity, knowledge, wisdom, and belief in a hereafter these are the intrinsic qualities of work for Brahmins.

Comment: - In order to acquire and maintain these qualities throughout life and to pass them on to future generations, Brahmins must eat proper food and meditate for a long time. The diet prescribed for Brahmins is called Saatvikahara. This diet increases the life span; increases the power of the body to sharpen the intellect, inspires happiness. Food provides energy for a long time. To meet the energy needs of Brahmins, Hinduism advocates the adoption of a lacto-vegetarian diet (milk, dairy products, fruits and vegetables, etc.). On animal models, it is proved that the lacto-vegetarian diet provides calories and more protein food, increases life expectancy, strengthens the immune system, maintains the level of hormones and prevents the occurrence of many diseases. For example, milk contains 0.11% calcium (0.009% in meat) and 4.6% carbohydrates (lowest in meat). Calcium is used for muscle contraction and carbohydrates are preferred over fats and proteins by the body for immediate energy needs. When used correctly, a kind of glow can be seen from the faces of people who use Saatvikaram. **People who fit themselves in this structure of the society are called Brahmins.**

Brahmins have developed asanas, meditation, etc. to prepare the body to achieve concentration and to make effective use of energy resources. We may visualize the concept of entropy in yogic postures. It is said that entropy is low in ordered systems and high in disordered systems. For example, in Savasana, where the body is in a resting state body is in a high entropic state / low energetic state. While in other asanas, the body is twisted and organized in such a way that it is in less entropy or high energy state. It is in such high energy postures that Brahmins would focus on problems to be solved for the betterment of the society. It seems that different postures of the body are tailored to different people for efficient and systematic use of energy resources for prolonged durations.

It appears that during the Mahabharata period, the Brahmins understood the structure of brain and different areas that are involved to analyze the information received from the senses. There are three important areas in the human brain to process the information. They're as follows:

- 1. Instinctual/Intuitive part:** - This part of the brain is used by animals and children to analyze information. The hindbrain and medulla are responsible for survival and instinct in animals and humans.
- 2. Habitual part:** - The behavioural pattern is analyzed in this area. Actually it is the Cortico-Striatum-Thalamic Loop Circuits in the brain which is associated with the habitual behaviour of humans.
- 3. Frontal part:** - This is the most developed area in humans and evaluates various goals and determines the course of action. Its uses include voluntary movement, expressive language, and the ability to plan, organize, initiate, self-monitor, and control responses to achieve a goal.



The frontal area is better than the habitual and instinctual/natural areas and can override the information in these two areas. The habitual area is better than the instinctual/natural area and overrides the information in it (3 > 2 > 1). Hinduism advised Brahmins that in order to perform their activities, Brahmins should shift and focus their attention on the frontal area. To achieve concentration, meditation is proposed. The sages understood the functioning of the human mind and suggested Ashtanga Yoga to attain the state of Samadhi. The word Ashtanga is derived from two Sanskrit words "Ashta" and "Anga." "Ashta" refers to the number 8, while "Anga" means organ or part of the body. So, Ashtanga is a combination of eight limbs of yoga, a holistic system. Ashtanga Yoga includes Yama (moral code) Niyama (self-discipline) Asana (posture) Pranayama (breath control) Pratyahara (sense return) Dharana (concentration) Dhyana (meditation) and Samadhi (oneness with the Self).

Yama: - The yogi is taught to suppress his inclination tendency towards sex, violence, theft, etc. With this, the yogi reduces the use of his instinctual/natural area and is able to shift his attention gradually to the frontal area.

Niyama: - The yogi should suppress the use of his five senses (eating delicious food, seeing beautiful girls, listening to good music, etc.) and observe self-discipline. With it, the natural area is suppressed further and the focus is shifted on to the frontal area.

Asana: - Yogi keeps the body healthy and painless. Asanas help to change the place of information processing from the natural and habitual parts to the frontal territory.

Pranayama: - Has a similar effect on his body and provides enough oxygen to the body to achieve concentration.

Pratyahara: - The yogi has to isolate his concentration from other things and focus more on the frontal area for processing of information.

Dharana: - This state enables the yogi to focus his attention on a single subject. This means that enough energy is used to solve the problem.

Meditation: - This will allow the yogi to analyze information in only one area of the brain.

Samadhi: - This is the last stage or goal of yoga. At this stage, the yogi continues to process information in the frontal area of the brain. The people who perform these functions or activities are undoubtedly the so called first class people in society. Only those people in the society who are capable of such capacity are called Brahmins.

Kshatriyas: - Kshatriyas are classified as the second category individuals of people in the society. Their duties include display of valor, fearlessness in the battlefields, intellect, giving gifts to people etc.

Chapter 18: - MokṣhaSanyās Yog Verse 43

शौर्यं तेजो धृतिर्दाक्ष्यं युद्धे चाप्यपलायनम् ।

दानमीश्वरभावश्च क्षात्रं कर्म स्वभावजम् ॥ 43॥

*Shauryamtejodhritirdākshyamuddhechāpyapalāyanam
dānamīshvara-bhāvaś cha kṣhātraṁ karma svabhāva-jam*

Translation: - Valor, strength, fortitude, skill in weaponry, resolve never to retreat from battle, large-heartedness in charity, and leadership abilities, these are the natural qualities of work for Kshatriyas.

Comment: - In order to achieve fearlessness and display valor and valor in times of war, Kshatriyas should consume high protein foods like eggs, meat, spices, etc. in sufficient quantities. The foods that produce these symptoms are called rajasic foods. These foods have a negative effect on the body.

Chapter 17: - Śhraddhā Traya Vibhāg Yog Verse 9

कट्वम्ललवणात्युष्णतीक्ष्णरूक्षविदाहिनः ।

आहारा राजसस्येष्टा दुःखशोकामयप्रदाः ॥ 9॥

*kaṭv-amlā-lavaṇāty-uṣhṇa- tīkṣhṇa-rūkṣha-vidāhinaḥ
āhārārājasasyeṣṭhāduḥkha-śhokāmaya-pradāḥ*

Translation: - Foods that are too bitter, too sour, salty, very hot, pungent, dry, and full of chillies are dear to persons in the mode of passion. Such foods produce pain, grief, and disease.

Comment: - Therefore, it is said that in order to digest high-protein food, Kshatriyas must perform heavy exercises, which will make their body suitable for their functions. It has also been scientifically proven that heavy workouts protect against the harmful effects of bad cholesterol in a meat-based diet by increasing the level of good cholesterol to some extent. Kshatriyas are naturally interested in conquering other kings and have a constant craving for physical pleasures. The Kshatriyas depended on the Brahmins for guidance to perform their duties. That is why they were called the second category of people in society.

Vaishya (Baniya) or merchant: - Agriculture, animal husbandry and trade are their duties. Special diets are not recommended. They are given third position in the society.

Shudra: - The only duty of Shudras is to serve other castes so that they can do their work. Their work requires a high-calorie high-protein diet. They are advised to take beef, pork, etc. People who eat this type of food are called tamasic diet. These foods are described in Chapter 17, Verse 10 as foods pleasing to them.

Chapter 17: - Śhraddhā Traya Vibhāg Yog Verse 10

यातयामं गतरसं पूति पर्युषितं च यत् ।

उच्छिष्टमपि चामेध्यं भोजनं तामसप्रियम् ॥ 10॥

*yāta-yāmaṁ gata-rasaṁpūtiparyuṣitaṁ cha yat
uchchhiṣṭamapichāmedhyaṁbhojanaṁtāmasa-priyam*

Translation: - Foods that are overcooked, stale, putrid, polluted, and impure are dear to persons in the mode of ignorance.

Comment: - The dietary characteristics described here indicate the consumption of alcohol and alcoholic beverages. Consuming these alcoholic beverages can relieve the tired body. It is natural for alcoholics to be lazy and interested in performing their duties out of carelessness, frivolity, etc. Therefore, he was given the fourth position in society.

The general scheme of society and the functioning of the four Varnas in society may also be compared in an interesting way with the functions of the four major organ systems of our body.

Brahman - Brain / Nervous system
Kshatriya - Muscles / Muscular system
Vysya - Blood / Circulatory system and
Shudra - Kidney or Skin - Excretory system

No one underestimates the importance of these vital organs/systems in human body. Similarly, it is said that no varna/caste should look down upon other castes by looking at their actions. It is also said that one can adopt any varna and follow it faithfully. It is said that the three gunas - sattvik, rajasik and tamasic - dominate a person's nature depending on the situation. How to determine which nature dominates and which other nature is explained in the 10th verse of the 14th Chapter Gunatraya Vibhag yoga.

Chapter 14: GuṇaTrayaVibhāg Yoga Verse 10

रजस्तमश्चाभिभूय सत्त्वं भवति भारत ।

रजः सत्त्वं तमश्चैव तमः सत्त्वं रजस्तथा ॥ 10॥

*rajas tamaśhchābhībhūyasattvaṁbhavatibhārata
rajaḥsattvaṁtamaśhchaivatamaḥsattvaṁ rajas tathā*

Translation: - Sometimes goodness (sattva) prevails over passion (rajas) and ignorance (tamas), O scion of Bharat. Sometimes passion (rajas) dominates goodness (sattva) and ignorance (tamas), and at other times ignorance (tamas) overcomes goodness (sattva) and passion (rajas).

Classifying society into four castes or varnas may also be understood in terms of the four physical dimensions that we see in the world. They are length (first dimension), width (second dimension), depth / height (third dimension) and time (fourth dimension). Here Kshatriyas, Vaishyas and Shudras may be considered as the first three dimensions and Brahmins as the fourth dimension. They're as follows:

1. First dimension - length – shudra

2. Second Dimension - Width – Vaishya
3. Third dimension - Height / Depth - Kshatriya and
4. Fourth Dimension - Time – Brahman

It may be seen that the first three varnas/ castes are working in 3 dimensions of space and Brahmins are working in the 4th dimension or time. So, there are three categories of people who are protecting the society from invasion, helping in trade, food production, distribution, are serving other castes and so on and one category of people is protecting the society from the point of time.

Further, Lord Krishna explained to Arjuna in verses 33 and 35 of Chapter 2 about the duties to be performed by people of different varnas, the importance of swadharma and the loss accrued if they are not done accordingly.

Chapter 2: - Sāṅkhya Yog Verse 33

अथ चेतत्वमिमं धर्म्यं संग्रामं न करिष्यसि ।
ततः स्वधर्मं कीर्तिं च हित्वा पापमवाप्स्यसि ॥ 33॥
*athachettvamimamdharmyamsaṅgrāmaṅnakariṣhyasi
tataḥsva-dharmaṁkīrtim cha hitvāpāpamavāpsyasi*

Translation: - If, however, you refuse to fight this righteous war, abandoning your social duty and reputation, you will certainly incur sin.

Chapter 3: - Karm Yog Verse 35

श्रेयान्स्वधर्मो विगुणः परधर्मात्स्वनुष्ठितात् ।
स्वधर्मे निधनं श्रेयः परधर्मो भयावहः ॥ 35॥
*shreyānswa-dharmoviguṇaḥ para-dharmātsv-anuṣṭhitāt
swa-dharmenidhanamśhreyaḥ para-dharmobhayaāvahaḥ*

Translation: - It is far better to perform one's natural prescribed duty, though tinged with faults, than to perform another's prescribed duty, though perfectly. In fact, it is preferable to die in the discharge of one's duty, than to follow the path of another, which is fraught with danger.

Also the fate that befalls a person who is constantly contemplating erotic matters is clearly stated in verses 62 and 63 of chapter 2.

Chapter 2:- Sankhya Yog Verse 62 and 63

ध्यायतो विषयान्पुंसः सङ्गस्तेषूपजायते ।
सङ्गात्सञ्जायते कामः कामात्क्रोधोऽभिजायते ॥ 62॥
*dhyāyatoviṣhayānpuṁsaḥsaṅgastēṣūpajāyate
saṅgātsañjāyatekāmaḥkāmatkrodho 'bhijāyate*

Translation: - While contemplating on the objects of the senses, one develops attachment to them. Attachment leads to desire, and from desire arises anger.

क्रोधाद्भवति सम्मोहः सम्मोहात्स्मृतिविभ्रमः ।
स्मृतिभ्रंशाद् बुद्धिनाशो बुद्धिनाशात्प्रणश्यति ॥ 63॥
*krodhādbhavatisammohaḥsammohātsmṛitivyabhramah
smṛitibhraṅśādbuddhināśho buddhināśātpṛaṇaśhyati*

Translation: - Anger leads to clouding of judgment, which results in bewilderment of memory. When memory is bewildered, the intellect gets destroyed; and when the intellect is destroyed, one is ruined.

Comment: - If you leave your religion and follow another religion, you will definitely be a sinner. It is better to demonstrate our natural righteousness, even if it is with faults, than to demonstrate the righteousness of others. We are now doing things in quite the opposite way. We eat food to please our tongue; we listen to please our ears, we watch to please our eyes, we go to any extent to please our skin. With all these things, the pressure on the mind is increasing and psychological problems are increasing in the society. Such people are a disgrace to society. **It may be assumed that a person's mindset is determined by the type of food he is eating and the nature of duties he is performing.**

From the above description, it may be observed that the concept of society, its classification, the types of food to eat, the functions of individuals and their needs are very well defined. In such society, food, work, security, etc. was available not only for individuals but also for their future generations. Krishna told Arjuna that he taught this concept of yoga to the Sun God

and Manu learnt from Vivasvan. Lord Krishna told Arjuna in verses 1 and 2 of chapter 4 that the later generations left that knowledge gradually and it got lost in time.

Chapter 4 : Jñāna Karm Sanyās Yog Verse 1

श्रीभगवानुवाच ।
इमं विवस्वते योगं प्रोक्तवानहमव्ययम् ।
विवस्वान्मनवे प्राह मनुरिक्ष्वाकवेऽब्रवीत् ॥ 1॥
śhrībhagavānurvācha
imaṁvivasvateyogaṁproktavānahamavyayam
vivasvānmanaveprāhamanurikṣhvākave 'bravīt

Translation: - The Supreme Lord Shree Krishna said: I taught this eternal science of Yog to the Sun God, Vivasvan, who passed it on to Manu; and Manu, in turn, instructed it to Ikshvaku.

एवं परम्पराप्राप्तमिमं राजर्षयो विदुः ।
स कालेनेह महता योगो नष्टः परन्तप ॥ 2॥
evaṁparamparā-prāptamimamrājarṣhayoviduḥ
sakālenehamahatāyogonaṣṭaḥparantapa

Translation: - O subduer of enemies, the saintly kings thus received this science of Yog in a continuous tradition. But with the long passage of time, it was lost to the world.

To nullify human actions and to undo the effects of pollution created by the population, amazing technological techniques called yajnas and yagas were invented in Mahabharat or pre-mahabharat times. This is explained in Chapter 3 Karmayogam verses 10-16.

Chapter 3: - Karm Yog Verse 10-16

सहयज्ञाः प्रजाः सृष्ट्वा पुरोवाच प्रजापतिः ।
अनेन प्रसविष्यध्वमेष वोऽस्त्विष्टकामधुक् ॥ 10॥
saha-yajñāḥprajāḥsṛiṣṭvāpurovāchprajāpatiḥ
anenaprasaviṣhyadhvameṣhavo 'stviṣṭa-kāma-dhuk

Translation: - In the beginning of creation, Brahma created humankind along with duties, and said, "Prosper in the performance of these yajnas (sacrifices), for they shall bestow upon you all you wish to achieve."

देवान्भावयतानेन ते देवा भावयन्तु वः ।
परस्परं भावयन्तः श्रेयः परमवाप्स्यथ ॥ 11॥
devānbhāvayatānenatedevābhāvayantuvaḥ
parasparambhāvayantaḥśhreyaḥ param avāpsyatha

Translation: - By your sacrifices, the celestial gods will be pleased, and by cooperation between humans and the celestial gods, great prosperity will reign for all.

इष्टान्भोगान्हि वो देवा दास्यन्ते यज्ञभाविताः ।
तैर्दत्तानप्रदायैभ्यो यो भुङ्क्ते स्तेन एव सः ॥ 12॥
iṣṭānbhogān hi vovēvādāsyanteyajña-bhāvitāḥ
tairdattānapradāyaibhyoyobhuṅktestenaevasaḥ

Translation: - The celestial gods, being satisfied by the performance of sacrifice, will grant you all the desired necessities of life. But those who enjoy what is given to them, without making offerings in return, are verily thieves.

यज्ञशिष्टाशिनः सन्तो मुच्यन्ते सर्वकिल्बिषैः ।
भुञ्जते ते त्वघं पापा ये पचन्त्यात्मकारणात् ॥ 13॥
yajña-shiṣṭāśhinaḥsantomuchyantesarva-kilbiṣaiḥ
bhuñjatetetvaghampāpā ye pachantyātma-kāraṇāt

Translation: - The spiritually-minded, who eat food that is first offered in sacrifice, are released from all kinds of sin. Others, who cook food for their own enjoyment, verily eat only sin.

अन्नाद्भवन्ति भूतानि पर्जन्यादन्नसम्भवः ।
यज्ञाद्भवति पर्जन्यो यज्ञः कर्मसमुद्भवः ॥ 14॥

*annādbhavantibhūtāniparjanyād anna-sambhavaḥ
yajñādbhavatiparjanyoyajñāḥ karma-samudbhavaḥ*

Translation: - All living beings subsist on food, and food is produced by rains. Rains come from the performance of sacrifice, and sacrifice is produced by the performance of prescribed duties.

**कर्म ब्रह्मोद्भवं विद्धि ब्रह्माक्षरसमुद्भवम् ।
तस्मात्सर्वगतं ब्रह्म नित्यं यज्ञे प्रतिष्ठितम् ॥ 15॥**
*karma brahmodbhavaṁvidhibrahmākṣhara-samudbhavam
tasmātsarva-gataṁ brahma nityaṁyajñepatiṣṭhitam*

Translation: - The duties for human beings are described in the Vedas, and the Vedas are manifested by God Himself. Therefore, the all-pervading Lord is eternally present in acts of sacrifice.

**एवं प्रवर्तितं चक्रं नानुवर्तयतीह यः ।
अघायुरिन्द्रियारामो मोघं पार्थ स जीवति ॥ 16॥**
*evaṁpravartitaṁchakraṁnānuvartayatīhayaḥ
aghāyurindriyārāmomoghaṁpārthasajīvati*

Translation: - O Parth, those who do not accept their responsibility in the cycle of sacrifice established by the Vedas are sinful. They live only for the delight of their senses; indeed their lives are in vain.

Comment: - Verses 10-16 of Chapter 3 contain important considerations of Meteorology and Ecology. Yajna is a Hindu ritual performed since ancient times, in which Lord Agni acts as an intermediary between humans and deities. Yajna means "worship," "sacrifice" or "offering." Yajna is a means of ensuring the well-being of human beings and their safe passage to heaven after death. Yajna is the divine remedy for all human problems of the Vedic world. According to the holy Bhagavad Gita, it is believed that yajna calls the superior energy into one's soul and as a result the soul merges with God. In the Bhagavad Gita it is said that in the yajnas the impulse to renounce is created in the nature of the soul. Rigveda, Yajurveda and Atharvaveda say that Yajna is that which holds the entire universe together. The important thing in sacrifice is to "heal the environment and the healed environment will heal us." Yajna is of universal importance and makes the whole world healthy. The disciples participating in the yajna also get special benefit from the blessings of the Guru. In the Chandogya Upanishad, yajna is described as the best means to combat environmental pollution. It is said that the yajna removes atmospheric impurities, eliminates pollution and cleanses the surrounding environment. Experiments have shown that the smoke produced by burning the mixture of ghee and sugar kills the germs of certain diseases. The odour is neutralized by the evaporation of various oils and the diffusion of smoke into the surrounding environment. It has been found that these gases can purify the atmosphere, help in the formation of clouds and cause good precipitation by acting as CCN (Cloud Condensation Nuclei) to form liquid droplets. Therefore yajnas significantly affect the water cycle and produce rain. It is said that yajna using the right wood and havan material can also be used as medicine against various physical and mental diseases and mental disorders. Through a simple technique called yajna, a person is able to change thoughts, words and actions. It is also believed that all aspects of his life can be spiritualized.

Now let us consider the present scenario. The traditional religious, scientific and technological system that operates in this way has been misused by modern humans to pollute the environment and release polluted elements into nature. The varna system is transformed into caste system based on individual's birth has made the qualities and actions of human beings irrelevant to their diet and Psychology. With the advent of modern man in the world, the prevailing eco-friendly systems have been disrupted and focus shifted to material consumption for human survival at any cost.

In a way, the world of modern man can be considered a "machine world," where machines helped humans in all spheres of their life. Three men, Francis Bacon (1561-1626) of London, Frenchman René Descartes (1596-1650) and Sir Isaac Newton (1642-1727) of England, inspired the ideas of the machine to be imprinted in people's minds. Francis Bacon said that by acquiring knowledge of nature, we can master nature, medicine, mechanical powers, etc. René Descartes insisted that Mathematics is a powerful tool of knowledge and the source of all things. Sir Isaac Newton discovered the laws of motion and explained them mathematically. These laws / principles have turned the world into a mere material thing. At the same time, England's John Locke (c. 1632-1704) and economists Adam Smith (c. 1723-1790) incorporated key concepts and ideas of the Industrial Revolution into the workings of Government and the economics of individuals. Later British naturalist Charles Robert Darwin (1809-1882 AD) explained the guiding factors for the evolution of organisms or man with his book "Origin of Species by Natural Selection." People thought that Francis Bacon removed God from nature and John Locke removed humans from nature. People are regarded as physical objects interacting mechanically in society. The accumulation of material features is considered the highest progress and system in the modern world. Science and technology have become twin tools to achieve this goal. The views of these scientists and economists seemed quite contemporary and logical. Objections of other contemporary scientists and economists have been ignored the warnings that humans have natural limits as humans and that we must live within them for our survival and to maintain balance in nature were totally left to rot. Therefore, their ideas were wasted like fuel poured into the ashes.

Humans have used their intelligence to develop tools that do not originate from their bodies called Exo-somatic instruments (Exo = External; Soma = Body) or instruments made outside the body. From wheel to computer, atomic bomb, ship, scientific instruments, etc man-made instruments are some of the examples. But, animals have to depend on their natural or endo-

somatic instruments (Endo = Inside; Soma = Body) like nails, claws, poisons, etc. for their survival. **Man, being an open system, depending on the closed system of the earth, has to obey the law of entropy and work within the limits set by the law of entropy for his own survival and that of other plants / animals on the earth.** This entropy affects everything that we do. If we are careless in our attitude and activities, then the regularity that exists in nature gets damaged with time and goes towards irregularity irreversibly. Organisms take in energy in the form of matter during their lifetime and increase entropy. Humans use thousands of times more energy than any other living thing because of their intelligence, science and technology. Thus they disturb the balance of nature and caused pollution.

Population is the main cause of all human problems. In 10,000 B.C.E., the world's total population was estimated to be between one and ten million. It grew to about 4 million between about 10,000 BCE to 1700 BCE. In 1800, the world population was 1 billion. By 1930 AD it had grown to 2 billion (100% growth in just 130 years). In 1998, there were about 6 billion people (an increase of 600% in less than 200 years) worldwide. By 2025 population will be around 800 million (810 million in 2024). To meet the needs of so many people, humans had to struggle to survive by developing different technologies in different areas. After the industrial revolution or industrialization, technologies dominated the activities of life and reached a level where it was impossible to move forward without their help. The Industrial Revolution is the shift from making things by hand to machines. The more technologically advanced a country is, the more energy its population consumes. A technologically advanced country with a small population consumes more energy than a developing country with a much larger population. Actually, 25% of the world's population living in First World countries consumes around 75% of the world's resources. When technologies become unaffordable or useless in developed countries, they are shipped to developing countries. This is further increasing entropy growth in developing countries also.

As a result of man's immersion in physical processes, the natural resources stored in the earth for millions of years were consumed in a very short time (less than 200 years). In this way resources are used and waste released due to the use of resources beyond the natural recycling limit. **By his activities, modern man converted vast available energy resources into an unavailable energy source.** This makes it very difficult to get the desired amount of energy with the available technology. We are forced to look for alternative technologies to achieve minimum energy at higher cost. To survive, man must develop technology that is better than what he has today. The more modern the technology, the faster it will be able to use the Earth's resources. So, the rest of the population and the future generations will suffer equally. **Therefore, from the point of view of entropy, it may be said that our current society is becoming more chaotic and harmful to our own existence.**

From the above discussion it may be said that in the Mahabharata and before that, society was following the laws of entropy whereby the flow of energy was orderly and use of natural sources economically viable, and the natural balance of nature was not seriously disrupted. Yagnas and yagas were performed periodically and regularly to purify the environment. However, now modern humans are ignoring the rule of moderation and eating all kinds of food for their survival and are ready to do any kind of work irrespective of caste or creed. So we are not in a position to judge the character of a person on the basis of his actions and birth. **With all the efforts to break free from nature, we are reaching a point of no return in terms of more chaos and entropy.**

In Arjuna Vishada yoga, in verses 38-44, Arjuna laments over problems by the destruction of varna, the ill effects of varna hybridisation and the ill effects of changed behaviour of humans in the society. **In my view, they may be considered as some factors responsible for the spurt of entropy in the society.**

Chapter 1: - Arjun Viṣhād Yog Verse 38-39

यद्यप्येते न पश्यन्ति लोभोपहतचेतसः ।
कुलक्षयकृतं दोषं मित्रद्रोहे च पातकम् ॥ 38॥
कथं न ज्ञेयमस्माभिः पापादस्मान्निवर्तितुम् ।
कुलक्षयकृतं दोषं प्रपश्यद्भिर्जनार्दन ॥ 39॥
yadyapyetenapaśhyantilobhopahata-chetasah
kula-kṣhaya-kṛitamdoṣhammitra-drohe cha pātakam
kathamñajñeyamasābhīhpāpādasmānnivartitum
kula-kṣhaya-kṛitamdoṣhamprapaśhyadbhirjanārdana

Translation: - Their thoughts are overpowered by greed and they see no wrong in annihilating their relatives or wreaking treachery upon friends. Yet, O Janardan (Krishna), why should we, who can clearly see the crime in killing our kindred, not turn away from this sin?

कुलक्षये प्रणश्यन्ति कुलधर्माः सनातनाः ।
धर्मं नष्टे कुलं कृत्स्नमधर्मोऽभिभवत्युत ॥ 40॥
kula-kṣhayepṛaṇaśhyanti kula-dharmāḥsanātānāḥ
dharmaṇaṣṭekulamkṛitsnamadharmo 'bhibhavaty uta

Translation: - When a dynasty is destroyed, its traditions get vanquished, and the rest of the family becomes involved in irreligion.

अधर्माभिभवात्कृष्ण प्रदुष्यन्ति कुलस्त्रियः ।

स्त्रीषु दुष्टासु वार्ष्णेय जायते वर्णसङ्करः ॥ 41॥

*adharmābhibhavātkṛiṣṇapraduṣhyantikula-striyaḥ
striṣhuduṣṭāsuvārṣṇeyajāyatevarṇa-saṅkaraḥ*

Translation: - With the preponderance of vice, O Krishna, the women of the family become immoral; and from the immorality of women, O descendent of Vrishni, unwanted progeny are born.

सङ्करो नरकायैव कुलघ्नानां कुलस्य च ।

पतन्ति पितरो ह्येषां लुप्तपिण्डोदकक्रियाः ॥ 42॥

*saṅkaronarakāyaiva kula-ghnānāmkulasya cha
patantipitaro hy eṣhāmlupta-piṇḍodaka-kriyāḥ*

Translation: - An increase in unwanted children results in hellish life both for the family and for those who destroy the family. Deprived of sacrificial offerings, the ancestors of such corrupt families also fall.

दोषैरैतैः कुलघ्नानां वर्णसङ्करकारकैः ।

उत्साद्यन्ते जातिधर्माः कुलधर्माश्च शाश्वताः ॥ 43॥

*doṣhairetaiḥ kula-ghnānāmvarṇa-saṅkara-kāraikāiḥ
utsādyantejāti-dharmāḥ kula-dharmāśh cha śhāśhvataḥ*

Translation: - Through the evil deeds of those who destroy the family tradition and thus give rise to unwanted progeny, a variety of social and family welfare activities are ruined.

उत्सन्नकुलधर्माणां मनुष्याणां जनार्दन ।

नरकेऽनियतं वासो भवतीत्यनुशुश्रुम ॥ 44॥

*utsanna-kula-dharmāṅmanuṣhyāṅjanārdana
narake 'niyataṁvāsobhavatīyanuśhuśhruma*

Translation: - O Janardan (Krishna), I have heard from the learned that those who destroy family traditions dwell in hell for an indefinite period of time.

Comment: - It seems to me that Arjuna has described the anticipated spurt in the societal entropy in terms of varna destruction, mixing of varnas, prevalence of anarchy, immoral behaviour of women, birth of unwanted children, destruction of caste, attainment of hell, etc. Similarly, with use of machines, indiscriminate exploitation of natural resources beyond the limits of nature's ability to recover, the challenge of obtaining energy from available sources has become increasingly challenged leading to random increase in entropy. Identification of new natural resources for energy at economical costs and harnessing them for the use of humans is posing further threats to science and Technology routinely. **With our myopic anthropogenic activities, we are ultimately turning the earth into a hell.**

To sum up, varna / caste system explained and followed 5,000 years ago in the Bhagavad Gita seems to be an internal social adaptation of the Law of entropy described in thermodynamics discovered in the 19th century. However, these principles are not directly represented in Sri Krishna's discussions in the form of physical equations. That is why the scientific and technical details of this concept are not found in the verses. According to Bhagavad Gita, first position in the society is given to Brahmins because they are intelligent and have control over their emotions to solve problems of the society. Kshatriyas are given the second position because they are brave, intelligent and fearless. Vaishyas are offered third position due to their distributive functions and Shudras the fourth class in the society because do not require any specific talents like other varnas and they become the helpers of the above 3 classes. Fundamentally, foolish Brahmin, ignorant, impudent king, an unprofitable businessman, a lazy servant cannot be the part of a good developing society. Even in today's society, if these principles are truthfully understood and followed, good decisions can be taken and the flow of energy in society can be tamed profitably such that we, the humans may survive as individuals and as a species for more time. I strongly believe that, there may be a possibility of getting more accurate information about the points I discussed, if experts in the field of Thermodynamics and entropy get a chance to read Bhagavad Gita. **आनोभद्राःऋतवोयन्तुविश्वतः । ऋग्वेद- 1.89.1 ānobhadraḥkratavoyantuviśvato Rig Veda 1.89.1 Let noble thoughts come to us from all directions.**