

Big Tunnels in Bad Rocks

Tunnels of 10 to 16m span are frequently constructed for hydroelectric or transportation projects and many of these tunnels are excavated in rock masses of very poor quality. When the ratio of rock mass strength to insitu stress falls below 0.2, squeezing of the rock mass becomes a problem that can cause instability of both the tunnel and the face. A method for predicting squeezing conditions is presented and the practical options for prereinforcing the face and supporting the tunnel to deal with these problems are discussed. Indian tunnelling data fits well in the theory. Two case histories are included to illustrate how these prereinforcement and support measures can be incorporated into a tunnel design. Brief discussions are also given on water problems in tunnelling, the use of tunnel boring machines (TBM) in squeezing ground, and the construction for large tunnels in varying ground conditions.

*Thirty-Sixth Karl Terzaghi Lecture by Prof. Evert Hoek
Source: Journal of Geotechnical Engineering,
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Wonderful Law of Negative Entropy of Healthy Beings - Applications

Definition of Entropy

Entropy may be defined as the total unchannelized energy which is normalized with respect to temperature at any time. The positive entropy means energy of disorderliness. The law of thermodynamics is that entropy of matter in a closed system is always positive. This is evident from experiences.

Difference in Matter and Life

Life and matter are different and so their governing laws are also different (Vedas and Biochemistry). Unlike matter, entropy of all healthy living beings is negative and ever decreasing. The observation is that all biochemical reactions absorb heat. The law of negative bioentropy means perhaps that orderliness will evolve automatically in the growing phase of a healthy society, as the word law means automatic action. So orderliness will increase automatically and cyclically with time. Although the law of entropy of matter is causing anxiety in our minds. But, all the healthy living beings have the inner ability to organize the energy (and) particles for their growth and health. That is why organizing ability of all healthy young species had been increasing with time cyclically and automatically inspite of rising entropy of matter and mind. In other words, healthy life system is self-organizing. Of

course exception is the law. There is exception to every law of nature. Further, the motion of a living being is unpredictable and it helps in their survival. On the other hand, the motion of a physical body is predictable and easy to target.

There are apparently other major differences in life and matter such as reproduction, growth, perpetuality of gene and negative entropy. Symmetry is predominant in outside shape of bodies. Single gene can produce whole body. Thus whole is part. Microscopic life is same as macroscopic life. Pursuit of happiness and survival due to fear of death are a common characteristics of life as we see in the world. Matter is home of life. There is cyclicity in every body of matter. But there is no repetition of this cycle. The same body will not be born again. There are cycles in living beings. Yet biocycles are perpetual. Nature preserves the genes and seeds. According to genetic experts, life needs to be redefined. Life is appearing to be perpetual. More research is needed to find the basic differences in the life and matter to answer all doubts. For example, let us see a plant in a flowerpot. The pot is made of matter. So it starts decaying and weathering from day one. On the other hand, a healthy seed first decays, then it germinates into small pretty leaves. Then flowering occurs. The flowers also decay. Yet fruits appear. Finally fruits also decay. Then seeds are created. The same cycle is repeated again and again. Such is the grand power of healthy biosystems of creating perpetually orderliness out disorderliness in the environment. One may see the perpetual cycles of disorderliness and orderliness. It is wonderful. It is inspiring. It proves that bioenergy is organizing energy. On the other hand energy of matter is disorganizing energy. Hence we should use more bioenergy and less matter for our health and happiness.

Generalized Interpretation Of Entropy

According to the second law of thermodynamics, entropy of closed system is positive. Matter cannot organise its energy efficiently; and its entropy and disorderliness keep on increasing with time. It results in weathering and after-effects of chemical medicines. As such natural and fresh bio-food, fruit sugar, bio-drinks, herbal medicines and bio-friends are healthy natural choices (Herbal Sciences). Life is medicine of life. Allopathy and surgery are very advanced in modern times and very good in emergency cases. One has to pay some price for fast healing, such as after effects. In fact more persons have been healed by positive thinking than the chemical medicines. Integrated approach is need of the time. Needless to mention that chemical drinks, medicines and stored dead foods are harmful for health as as they have the characteristics of increasing disorderliness in the body and soul. It is well known. Chemical drinks cause stones in the kidney. The most popular chemical drink has been found to make bones weak. So we have more bone fractures in accidents now. Let us change our material liking and habits into bio-habits gradually for our better health and happiness. Let us value our ancient wisdom.

As expected from the law of negative bioentropy, herbal cosmetics and herbal tonics are popular world over, as chemical cosmetics have spoiled the skin. It is comforting to know that God is inspiring people to like jaggery (or juice of sugarcane) in place of sugar in the west to reduce entropy of their bodies. Right genetic solutions will reduce our entropy economically and efficiently in future. Healthy ecosystem is natural manager of entropy. One tree is equal to about five air conditioners. Indoor plants and outdoor trees can enrich micro-ecosystem within and outside homes and offices effectively at low cost in the cities. Farmers have found that the biofertilizers and the biopesticides are very effective in producing more agriculture products without side effects as expected, compared to the chemical fertilizers and pesticides.

Herbal hospitals should be opened in every village and town for low entropy health care without side effects. In fact herbal medicines should have good side effects also as it is likely to reduce disorder around a diseased part of the body. Further, the herbal medicine should be taken on the advice of herbal doctors. Beautiful ecological heavens are need of the time. Eco cities or eco hill cities will be sustainable and beautiful. Our anxiety of entropy will be thus reduced. Indeed the modern choice is more bio solutions in the new century. World history teaches us that conflicts make progress faster. We should prepare ourself to meet the challenge of ever rising entropy in the world of matter.

- Contributed by Faculty of I. I. T. Roorkee

Message from Prof. John A. Hudson, Editor-in-Chief, International Journal of Rock Mechanics and Mining Sciences

Congratulations to the ISRMTT on a decade of activity. I am pleased to have been associated with the ISRMTT - even if only in a small way. It must be gratifying for Indian colleagues to have seen such successful development. Well done!

The year 1992, the founding year for the ISRMTT, has additional significance for me because in that year I organized the first Eurock conference in Chester, UK, on rock characterization. And, whenever I am in India, I stand awed by the majesty of the Himalayas and wonder if we are not tackling too large a task in trying to characterize these rocks.

Hopefully, after the decade of ISRMTT development, the stimulating lines of Sir Rabindranath Tagore do apply to the ISRMTT and the rock mechanics tasks ahead: "...my sword is forged, my armour is put on, my horse is eager to run. I shall win my kingdom."

Best wishes for an even more successful future from the International Journal of Rock Mechanics and Mining Sciences.

Special Lecture by Prof. Bhawani Singh at National Workshop on Application of Rock Engineering in Nation's Development

We welcome you to attend the first conference on Rock Mechanics of the millennium at the new would be IIT, Roorkee, in the new State Uttaranchal. We pray God for success of this conference and for joy in your life. You are all enlightened engineers and scientists. I hope you will forgive my confusion, my mistakes and my weaknesses. My survival is due to kindness of colleagues and students of their love for us. I feel deeply honored by this IGS Conference. The real credit should go to our team of colleagues and students. A field of knowledge may become popular if its socio-economical relevance is proved repeatedly. Global commercial relevance is better. The word repetition is important. There is immense power as the public memory is short. This is one of the roles of conference.

Our prayer to God is development of hygienic society. We need to perhaps undo past mistakes. We should love to mention a thrilling discovery of entropy of living beings. The biochemistry has proved that entropy of living systems is negative. In other words, living systems have inherent ability to reduce disorderliness in nature continually for all the time. As such, there is urgent need to use healthy bio-systems to recreate a hygienic environment. Simultaneously use of unhygienic technology should be stopped to cut down increase in the entropy or related disorderliness or chaos. We should encourage clean technology even if it is costly and slow, as there is nothing precious than health for all here.

The aim of technical education is to enable engineers and researchers to be self-reliant. We should try to become self-reliant in selected fields like Rock Mechanics, Tunneling Technology, Engineering Geology and Geo-technical Engineering. We should perfect our own appropriate technologies and strategies. Europe is the living example of developing self-reliance even after crippling wars.

Importance of Rock Mechanics and Geology is now realized by even Chief Ministers of Hill States. They are inviting companies for clean hydropower development and landslides control in Himalaya. It is unfortunate that vast damage during recent earthquakes has made our leaders and people realized the utmost importance of Civil Engineering over all other branches of engineering. Civil Engineering is the heart and soul of a civilized society.

In third millennium, young engineers and scientists may like to know history of R&D in Rock Mechanics in India. Kindly correct me where I am wrong. I learnt Rock Mechanics in USA under guidance of Prof. C. Fairhurst, from 1970 to 1973. The first IGC conference on Rock Mechanics and Tunneling was held in 1973 at Kurukshetra. University of Roorkee participated in the national mission on R&D of Rock Mechanics from 1974 onwards. Simultaneously IIT Delhi and BIS also took active part. UOR was fortunate to

join soon the well-established CMRI team of experts. Later, CBRI and UPIRI joined our team of dedicated scientists. In last decades, CSMRS took the lead and created INCRMTT to fund research on Rock Mechanics and Tunneling Technology. INGISRM and ISRM TT were established and played important role in popularizing Rock Mechanics in India. Equally vital role was played by companies (NJPC, WAPCOS, NHPC, THDC, JPA, HCC, etc.) is so well known. Most of our lessons have been learnt in the field projects.

We realized that Himalaya is the best field laboratory for the world-wide engineers and scientists to learn Rock Mechanics. God helped us and we started field-oriented research in Himalayan projects. Reliable field data is like a diamond if it is correlated. Thus, we were blessed with God Given ideas and practical knowledge.

We hope that we have given a field-tested knowledge base for R&D in the 21st century. It is interesting to know that simple solutions are possible for many complex and fuzzy problems of Rock Engineering. Our desire was to prove very simple classification approach to be crude and irrational. Yet life long research proved it to be amazingly successful. It is a great joy to find simple analysis giving realistic results of field problems such as landslides.

I thank you again for inspiring research on Rock Mechanics in India. I am very grateful to all the sponsoring authorities and organizing committee.

Excerpts: Proceedings of National Workshop on Application of Rock Engineering in Nation's Development (In Honour of Prof. Bhawani Singh), Deptt. of Civil Engineering, University of Roorkee (Now IIT Roorkee), April 27-28, 2001.

Love is the Foundation of Human Existence

The reason why love and compassion bring the greatest happiness is simply because our nature cherishes them above all else. The need for love lies at the very foundation of human existence. It results from the profound inter-dependence we all share with one-another. However capable and skilful an individual may be, left alone, he or she will not survive. However vigorous and independent one may feel during the most prosperous periods of life, when one is sick or very young or very old, one must depend on the support of others.

Inter-dependence, ofcourse, is a fundamental law of nature. Not only higher forms of life, but also many of the smallest insects are social beings which, without any religion, law or education, survive by mutual cooperation based on an innate recognition of their inter-connectedness. The most subtle level of material phenomena is also governed by inter-dependence. All phenomena, from the planet we inhabit to the oceans, clouds, forests and flowers that surround us, arise in dependence upon subtle patterns of energy. Without proper interaction, they dissolve and decay.

Human beings are not like machine-made objects. If we were merely mechanical entities, then machines themselves could alleviate all of our sufferings and fulfill our needs. However, since we are not solely material creatures, it is a mistake to place all our hopes for happiness on external development alone. Instead, we should consider our origins and nature to discover what we require.....

I believe that no one is born free from the need for love. And this demonstrates that – although some modern schools of thought seek to do so – human beings cannot be defined as solely physical. No material object, however beautiful or valuable, can make us feel loved, because our deeper identity and true character lie in the subjective nature of the mind.

*- Nobel Laureate Dalai Lama,
Source: Excerpts of the Article Published in
The Times of India, June 16, 2002*

Volcanic Rock for Hangover Cure

A UK firm is about to market a new cure for hangover based on lava-formed stone imported from Turkey and Australia. “We were researching this for cancer patients to help with the side effects of treatment, but we have found it works really well for hangovers”, Dr. Kenneth Maul, of Global Health Products, said.

The volcanic dust, or zeolite, acts as a natural detoxifying agent and has already been used internationally for purifying water, treating animal feed and attending victims in Bulgaria of the Chernobyl nuclear disaster.

Source: The Times of India, July 20, 2002

Bharat Ratna Dr. APJ Abdul Kalam's Prescription for Managers

- Economic strength is powered by competitiveness.
- Competitiveness is powered by knowledge power.
- Knowledge power is powered by technology.
- Technology is powered by resource investment.
- Resource investments are powered by the revenues.
- Revenues are powered by volume and repeated sales.
- Volume and repeated sales are powered by the customer loyalty.
- Customer loyalty is powered by the quality and value of products.
- Quality and value of products are powered by employee productivity.
- Employee productivity is powered by employee loyalty.
- Employee loyalty is powered by employee satisfaction.
- Employee satisfaction is powered by working environment.
- Working environment is powered by management and stewardship.
- Management and stewardship is powered by the invisible leadership.
- Invisible leadership is exercising the vision to change the traditional role from commander to coach, manager to mentor, director to delegator and from who demands respect to one who facilitates self-respect.
- Vision ignites particularly the young mind. The ignited soul is the most powerful resource on the earth, above the earth and under the earth. It is essential to keep the lamp of knowledge burning to achieve the vision – a developed India.
- Failures are stepping-stones to success.
- In the knowledge era, successful people will always take on travelled roads rather than the beaten path. Take the untravelled road that would be the right path for your life.

*Source: The Times of India,
July 25, 2002*

PIONEERS

This issue of the Journal is dedicated to the following pioneers who have been constant source of inspiration.

Let us not look back in anger or forward in fear, but around us in awareness.

- James Thurber

Genius begins great works; labour alone finishes them.

- Joseph Joubert

Nothing ever becomes real till it is experienced. Even a proverb is no proverb to you till your life has illustrated it.

- John Keats

The final test of leader is that he leaves behind him other men the conviction and the will to carry on.

- Walter Lippman

The force of arms is powerless when matched against the force of love or the soul.

- Mahatma Gandhi

Success consists of a series of little daily efforts.

- Mami McCulloch

To insure good health: eat lightly, breath deeply, live moderately, cultivate cheerfulness and maintain an interest in life.

- W. Louden

We cannot all do great things. But we can do small things with great love. It is not how much we do, but how much love we put in the doing.

- Mother Teresa

It is one of the strange ironies of this strange life that those who work the hardest, who subject themselves to the strictest discipline, who give up certain pleasurable things in order to achieve a goal, are the happiest people.

- Brutus Hamilton

Nearly all men can stand adversity, but if you want to test a man's character, give him power.

- Abraham Lincoln

BLISSFUL THOUGHTS

The best way to pray to God is to love His creations.

- *Mother Teresa*

The supreme happiness in life is the conviction that we are loved.

- *Victor Hugo*

After the verb "to love", the verb "to help" is the most beautiful verb in the world.

- *Bertha Von Suttner*

At sunrise, open and raise your heart like a blossoming flower, and at sunset, bend your head and in silence complete the worship of the day.

- *Rabindra Nath Tagore*

An ounce of practice is better than tons of theory. See God in all beings and love them as your ownself.

- *Swami Shivanand*

Men do not mirror themselves in running water – they mirror themselves in still water. Only what is still can still the stillness of other things.

- *Chuang Tzu*

He who wants a rose, must respect the thorn.

- *Proverb*

Footprints

One night a man had a dream. He dreamed he was walking along the beach with the Lord. Across the sky flashed scenes from his life. For each scene, he noticed two sets of footprints in the sand: one belonging to him and the other to the lord.

When the last scene of his life flashed before him, he looked back at the footprints in the sand. He noticed that many times along the path of his life there was only one set of footprints. He also noticed that it happened at the very lowest and saddest time of his life.

This really bothered him and he questioned the Lord about it. "Lord, You said that once I decided to follow you, You'd walk with me all the way. But I have noticed that during the most troublesome times in my life, there is only one set of footprints. I don't understand why when I needed You most You would leave me".

The lord replied, "My son, My precious child, I love you and would never leave you. During your times of trial and suffering, when you see only one set of footprints, it was then that I carried you."

Source: The Divine Life Society, Rishikesh, Uttaranchal, India