

## **India's Longest Rail Tunnel**

The first kilometre of the 11-km Banihal rail tunnel that will link Kashmir to rest of India has just been completed, promising to conquer the magnificent Pir Panjal Range of Himalayas, which has caused the Valley to miss a railway link for 154 years.

The tunnel from Laole (Banihal) to Qazigund on the Udhampur-Srinager line is going to be Indian Railways' largest, and the second largest in Asia after the recently completed, 20-km Wushaoling tunnel in Gansu, northwest China. The longest operational rail tunnel in India is the 6.5 km Karbude on the Konkan railways.

For nearly three years now, a team of about 500 has been working under the mountains round the clock and aims to finish the tunnel by December 2009. Early 2010 should see 40 trains ply on the tracks to and from the Valley.

At the work site near Qazigund, a 56-metre deep shaft leads to a 36-metre passage opening into the 1km of the tunnel already complete from the Srinagar end. Work is being simultaneously undertaken from the South Portal-Jammu end, where another kilometre will be completed soon.

Down the shaft cut through the mighty rocks, dazzling lights and roaring machines give the first glimpse of the effort that has gone into making the 9.5 meter horse-shoe tunnel. Designed by an Austrian team, which supervises the work every week, the tunnel is being dug according to the "New Austrian tunnelling technique", first used in India for the Delhi Metro.

The engineering effort is phenomenal even in this age as the rocks offer maximum resistance to even the world's most high-tech machines. The earth at the site is made of limestone, clay and quartzite. "Quartzite is the most difficult to cut through," said P Purkayastha, DGM, civil, for Ircon, the firm also constructing the Qazigund-Baramulla track in the Valley.

Though the Rs. 45 million excavator and breaker imported from South Korea has been breaking rocks for three years now, the work is moving at 2.5 to 3 meters a day. But for the people working there, it is a battle won every day. "We have bought a new machine worth Rs. 180 million which will require no explosives," said Harpal Singh, Project Manager, Hindustan Construction Co., the contractors for Ircon.

The engineers make holes to drain the water seeping in after excavation, but for the workers, it is like working in a shower for hours. Amid all this, an average of 2.5 tonnes of rocks and earth – muck, in local jargon – come out of the tunnel daily. "The rocks piled up will be as high as the pyramids in Egypt," said Purkayastha. Though the

beautiful terrain outside the construction site is captivating for the workers too, for most of them the tunnel is the hardest task they have ever undertaken, especially in the state.

A R More, a construction engineer and veteran of many railway tunnels across the country, including Delhi Metro's, agrees: "This tunnel will be the hardest job ever in the history of Railways, and the most challenging as well."

*Source : Indian Express, Jan. 28, 2007*

## **Tala Hydroelectric Project, Bhutan**

It is an engineering miracle and educative project with the following features.

- A Concrete Gravity Dam 92m high & 130m long at top located at Wangkha about 3 km Downstream of Chukha Power House.
- Three underground Desilting Chambers of 250m x 13.9m x 18.5m size for removal of suspended sediments of 0.2 mm size & above.
- Headrace Tunnel of 6.8m diameter and 23 km length.
- Surge Shaft 15/12 m diameter and 184m in height.
- Two Pressure Shafts of 4m diameter, 1.1 km long each trifurcating into Penstocks of 2.3m diameter.
- Machine Hall Cavern of 206m x 20.4m x 45.5m to house 6 Pelton Turbo Generators of 170 MW capacity each (1020 MW)
- Transformer Hall Cavern 190m x 16m x 26.5 m to accommodate 19, 70 MVA 13.8/400 kV Transformers.
- Tail Race Tunnel of 7.75 m diameter and 3.1 km length.
- Two Double Circuit 400 kV Transmission Lines from Tala Power House to Indo-Bhutan border of 140 km circuit length.
- A 400 kV/220 kV, 200 MVA capacity Interconnecting Sub-Station at Malbase, Bhutan.
- Construction on fast track between 1998 to 2007 due to good management conditions.

The Project commissioning could have been achieved in lesser time frame but there was delay due to the most unprecedented natural calamity of August 2000 when 1700 mm of rainfall was recorded during 01-03 Aug. 2000, viz. in just three days. Kilometer of freshly constructed roads vanished, as if they had not existed at all. In that deluge precious lives were also lost in land slides and flowing streams. A good number of skilled manpower left the worksites in panic. Restoration of the washed away access roads and replacement of equipment and damaged bridges lost in the storm took more than six months. Within a few months of resuming the Project work, nature was unkind once again and in May 2001 almost 1/3<sup>rd</sup> crown length of the Power House cavern collapsed, restoration of which took 10 months upto April 2002. Construction of Pressure Shafts posed serious problems as five large cavities were formed due to rock falls into the already constructed shafts resulting in multiple blockages. Removal of the blockages and treatment of cavities took another 12 months. Rock mechanics studies

have been carried out. The observed large displacements in right and left walls of machine hall cavern are 13 cm and 23 cm respectively. Yet the cavern appears to be stable.

Under the afforestation plans more than 725,000 saplings were planted at various locations, of which more than 500,000 have survived and have grown fast.

### **After Tala**

The best known natural resource of Bhutan is water flowing down the steep slopes of its rivers with an estimated hydro power potential of 30,000 MW. The most dependable market for this commodity across its border is India where the installed capacity of 130,000 MW is short by 22,000 MW of hydro-power for an ideal 40:60 of hydro: thermal mix of the power system.

Without referring to any documents on hydropower planning it would be worthwhile to propose erasing this deficit in next ten years and also add full 40% share of hydro power in the power development taking place during the same period. Assuming a growth rate of about 8-10% in power development in India, the hydro power addition in next ten years would be about 50,000 MW. For Bhutan even to achieve an ambitious target of developing 5,000 MW of hydropower in the next decade would result in meeting only about 7% of India's requirement, assuming that entire additional power generated by Bhutan would be surplus. The RGoB & the GOI have already signed a protocol for developing hydro-power in Bhutan, jointly. In the meanwhile, the DPR of Punatsangchu Hydroelectric Project Stage-I prepared by M/s WAPCOS in association mainly with CWC & CEA has been accepted by the GoI after its presentation to the RGoB. Implementation of the 1095 MW Punatsangchu Project is planned to be started soon. Two more mega hydro power projects, namely Punatsangchu Stage-II and Mangdechu are presently under investigation for preparation of DPR by M/s WAPCOS and M/s NHPC, respectively. It is also understood that the two governments are keen on development of already investigated 4000 MW Sankosh Hydroelectric Project in near future.

*Source: Khazanchi, R.N. (2007). Tala – a shining example of Indo-Bhutan Cooperation, Int. Workshop on Experiences Gained in Design and Construction of Tala Hydroelectric project Bhutan, edited by Rajbal Singh and A.K. Sthapak, Org. by ISRMTT, CSMRS, THPAB, pp.1-11 (see also pp. 269-280). Cost of Proceeding: Life Members, ISRMTT – Rs. 550/-; Institutional Members, ISRMTT – Rs. 700/- and Non-Members – Rs. 1000/-.*

### **Virtual Environment to Aid Tunnel Design and Construction**

The tunnelling and mining industries will soon have a new tool that will enable engineers and geologists to 'walk through a virtual model of a tunnel or cavern before it is constructed. Researchers at Virginia Polytechnic Institute and State University are using Global Positioning System receivers in combination with geologic mapping,

digital photography, remote sensing, and tomography, as well as other technologies, to create virtual underground spaces. The project, known as AMADEUS – or Adaptive Real – Time Geological Mapping, Analysis, and Design of Underground Space – will assist engineers in the design and construction of tunnels and other underground construction projects. The system will enable tunnel designers to view rock formations and fractures as well as simulate the response of the rock mass to an excavation or to the installation of support systems, says Marte Gutierrez, M.ASCE, an Associate Professor of civil and environmental engineering at Virginia Tech and the lead researcher on the AMADEUS project. Although many of the data being used to create the virtual underground environment will still require interpretation, the researchers are looking at exposed rock fractures on the surface or at the face of an excavation and extrapolating with statistical models to determine where fractures might be located within a rock mass. Once the virtual environment is created, the engineers can walk through the model, as opposed to viewing it on a computer screen. The team is also developing immersive display systems that are portable and more economical. One is what is called a geowall and consists of two screens that display right-eye and left-eye images to create three-dimensional views when the users don special glasses for three-dimensional viewing along with a heat mounted display similar to that used in the video game industry today. The head-mounted display could be taken to an excavation and used to ‘see’ the rock mass beyond the face of the excavation, according to Gutierrez. ‘It’s like giving [the engineer] X-ray vision’, he says. ‘Being able to see fractures in three [dimensions] and seeing the depth give you the sense of being inside a rock mass’, Gutierrez says. ‘We have never had this capability before’. The researchers are testing the system by using data collected at the Kimballton Mine, Virginia and from Shimizu tunnels in Japan (Shimizu 3) to test the system. AMADEUS is also improving data collection techniques. The research team has developed a system using personal digital assistants to gather and analyze data in the field instead of relying on manual data collection and interpretation. Gutierrez hopes that the AMADEUS project will help to lower construction costs, improve worker safety, and teach students about underground construction.

*Source : Civil engineering, June 2006, Vol.76, No.6*

## **A Jurassic Park in India**

It was always known that the subcontinent is a priceless geological treasure chest. The latest confirmation comes from Gujarat where geologists have discovered gigantic plant fossils belonging to the Jurassic era, a throwback to nearly 200 million years ago. Researchers from Vadodara’s MS University stumbled on to the fossilised tree logs at Khadir island near Dholavira in Kutch, while studying dig samples near the Harappan civilisation site.

These findings bear resemblance to similar plant fossils found earlier in Jaisalmer. Once palaeobotanists determine the exact plant species these belong to and their age, scientists will be able to understand their evolutionary history and possible correlation with other

parts of western India. The latest findings add to the remarkable chain of palaeontological discoveries that have been made in India of late. As happened in 1997, when villagers discovered hundreds of fossilised dinosaur eggs in Pisdura, north-east of Bombay. In 2003, the remains of a carnivorous dino – *Rejasaurus narmadensis* – were unearthed in the Narmade river region. This was surprising since the *Rajasaurus* was supposed to roam the southern hemisphere landmasses of today's Madagascar, Africa and South America. So the big meat-eating reptile's presence in India was an obvious pointer to the shifting of the continents, as India separated from Africa, Madagascar, Australia and Antarctica, and collided with Asia.

The Dholavira fossils suggest that central India might have been one of the largest dinosaur nesting sites in the world. In other words, India could well have been the original Jurassic Park, especially since the remains of the earliest, as well as the most advanced, dinosaurs have been found here.

*Source: Hindustan Times, Jan. 10, 2007*

### **Oldest Tree is in California**

General Grant, the widest tree (at the base) and the third largest on the planet is awe-inspiring. This 268-foot high sequoia is, at its widest, 40 feet in diameter and is 1700 years old! In 1956, President Eisenhower made the tree a national shrine' - in memory of those who died for the country.

But the big daddy of them all, General Sherman, also the largest living thing on earth, is a few minutes away by car. General Sherman stands tall at 275 feet with a base diameter of 36.5 feet. And it has stood here on the Sierra-Nevada range for (hold your breath) 2200 years! That means the seed for General Sherman must have germinated some time around 193 BC!

*Source: Hindustan Times, May 20, 2007*

### **Tata buys Corus in biggest overseas Indian acquisition**

In the biggest-ever overseas takeover by an Indian company, the Tata Group on Wednesday acquired Anglo-Dutch steel major Corus.

Four months after it first triggered the acquisition process, the Tatas made the winning bid of \$12.1 billion for Corus in London, agreeing to pay 608 pence (app. Rs. 517.00) a share. It came in the ninth round of a bidding contest with Brazilian rival CSN, being overseen by UK watch-dog Takeover Panel.

The Corus's board recommended Tata Steel's revised bid of 608 pence a share to its shareholders, saying it considered the bid to be "fair and reasonable". In a regulatory

filing with the London Stock Exchange, Corus said its directors believe that the Tata offer after the auction process represented best value for shareholders. Outlining his strategy and vision in acquiring Corus, for what many said was an “exorbitant price”, Tata Group chairman Ratan Tata said the takeover cost would prove to be worthwhile, even though the group paid much higher than what it had started with.

He said the price went up when investors came in after Tata’s preliminary bid of 455 pence a share and before it was challenged by Brazil’s CSN. “But we have to pay for getting the company. As a prudent management, we had taken a view that we would not go beyond a point. We did not reach that point. Had we reached, we would have walked away,” Tata said.

He dismissed suggestions that the group had overbid for the acquisition of Corus, saying, “Overbidding or not is subjective when it comes to a judgement call.”

*Source: Hindustan Times, Feb. 1, 2007*

## **The Men and their Wealth**

By sheer numbers, Indians topped the list of richest people in Asia with 36 billionaires, of whom Forbes placed Lakshmi Mittal, Mukesh Ambani and Anil Ambani in the ultra elite global top 20.

The combined wealth of Indian billionaires, including familiar names like Azim Premji, K.P. Singh, Sunil Mittal, Shashi and Ravi Ruia, Pallonji Mistry and Adi Godrej, swelled to 191 billion dollars – equal to one-fourth of India’s GDP.

Mukesh Ambani and his brother Anil Ambani breached into the top 20 richest list with a net worth of 20.1 billion dollar and 18.2 billion dollars respectively. Forbes ranked Lakshmi Mittal, whose steel empire has earned him 32 billion dollars, the fifth richest person on the planet.

The Forbes list for 2007 said India ended Japan’s 20 year reign as home to Asia’s most number of richest people. The land of the rising sun now has 24 billionaires with a combined net worth of 64 billion dollars.

However, China and Hong Kong together account for 41 billionaires, including Hutchison Whampoa’s Li Kashing. “India’s rich are marching toward the top of our rankings and now has three in the upper echelons, second only to the US,” the Forbes’ magazine said.

As many as 14 Indians have joined the coveted club this year, raising the net worth of the country’s billionaires by around 90 billion dollars.

Wipro's Premji is ranked 21<sup>st</sup> with 17.1 billion USD in the Forbes list. Kushal Pal Singh of DLF was ranked 62 with 10 billion USD, Bharti Group Chairman Sunil Mittal and family at 49 with 9.5 billion USD, Aditya Birla Group Chairman K.M. Birla at 86 with 8 billion USD and Essar Group's Shashi and Ravi Ruia also at 86 with 8 billion dollars.

Microsoft founder Bill Gates continues to be the richest person in the world for 13<sup>th</sup> year in succession with a net worth of 56 billion dollars among a record 946 billionaires listed by the magazine.

*Source: Hindustan Times, March 10, 2007*

## **Ayurveda – the Future**

Alternative healing therapies are now as popular as allopathic treatments, if not more. Allopathic treatment, especially the medication, often has side effects. As a result, the ailing and their families look for other cures and treatments. India is probably the only country where different systems of medicines, like ayurveda, homeopathy, unani, *siddha*, and naturopathy are recognised along with allopathy.

Described as the knowledge of life, Ayurveda (a Sanskrit word: *ayur* means life and *veda* knowledge) deals with conditions beneficial to humanity and to factors conducive to happiness. It was taught in the ancient universities of Nalanda and Taxilla.

After suffering a setback in the medieval period, the ayurvedic approach to treatment was resurrected during the awakening of nationalism. Separate schools of ayurvedic education emerged, first in many of the princely states followed by the state governments of British India. In 1916, members of the Imperial Legislative Councils pressurised the government to accept and develop this ancient system of science. In 1920, Indian National Congress demanded government patronage for ayurveda and the first Health Minister's conference of free India resolved it should be developed and used for the benefit of the people. Following this, schools were established in Delhi, Varanasi, Chennai, Mumbai, West Bengal and Mysore.

Today, there are close to 461 undergraduate and 100 postgraduate ayurvedic colleges in the country, in addition to research institutions at Banaras Hindu University, Ayurveda University, Jamnagar and the National Institute of Ayurveda, Jaipur. After taking their BAMS degree, graduates can go for three year post-graduate programmes. Degrees of Doctor of Medicine in Ayurveda [MD (Ayu)] and Master in Ayurveda [MS (Ayu)] are further options. MBBS graduates from the Medical Council of India recognised institutes, who have completed one year internship training, can also pursue postgraduate courses in ayurveda. An increasing number of students are opting for ayurveda as a career because with today's stressful lifestyles, ayurveda offers a holistic approach to treatment and not only cures but also prevents many diseases.

There are 3100 Ayurvedic hospitals across India and 6,95,024 recognised medical practitioners. One of the most sought-after services is that of a medical masseur, both in India and abroad. Interestingly, there has been a sharp rise in the number of pharmaceutical companies manufacturing ayurvedic medicines offering many more career opportunities. At present, there are 9,257 drug manufacturing units.

From eight different fields of specialisation, Astanga Ayurveda, as the discipline came to be known, has further evolved in the last 50 years, and now there are 16 branches that cover specialisations including anatomy, physiology, pharmaceuticals, gynaecology, pathology and surgery.

Ayurvedic medicines not only cure diseases but also build up the immune system. Because they are made from herbs, these medicines have no side effects and work wonders even for chronic diseases.

This alternative method of medicine has a worldwide audience, with conferences and seminars in the US, Britain, Russia, Germany Hungary and South Africa playing an effective role in opening opportunities for the spread of India's ancient medical practices. The Indian government has made remarkable efforts towards the globalisation of ayurveda. Memorandums of Understanding have been signed with the Governments of Hungary, Russia amongst others, for the development of ayurveda in their countries.

Popular across the world, herbal treatment facilities beckon tourists. Medical tourism is propagated by setting up specialised units for rejuvenating ayurvedic therapies like Panchakarma, spas and yoga in tourist hotels and resorts. The ayurvedic medicines help improve the quality of life of patients suffering from chronic disorders.

*Source: Hindustan Times, June 13, 2007*

## **UN Honour for Mahatma**

Welcoming the world community's decision to give recognition to Father of the Nation Mahatma Gandhi by declaring his birth anniversary, October 2, as International Non-Violence Day, Prime Minister Manmohan Singh today said, "The universal relevance of Gandhiji's message of non-violence is more important today than ever before since nations across the world continue to grapple with the threat of conflict, violence and terrorism."

He added that this is also an occasion for all the people of India to rededicate themselves to the ideals and values of Mahatma Gandhi.

The United Nations General Assembly unanimously adopted a resolution on International Day of Non-Violence piloted by India with the co-sponsorship of 142 countries to annually observe and celebrate Mahatma Gandhi's birthday, October 2, as the International Day of Non-Violence.

Representing the Indian government at the UN General Assembly Plenary, Minister of State (External Affairs) Anand Sharma said this important decision reflected the respect that Mahatma Gandhi commanded universally and the enduring relevance of his humane philosophy. *India also pointed out that it encompassed the rejection of violence against oneself, against others, against other groups, against other societies and against nature.*

The idea of promoting such a resolution originated from the Declaration adopted at the International conference on “Peace, Non-violence and Empowerment-Gandhian Philosophy in the 21<sup>st</sup> Century” convened in New Delhi in January this year to commemorate the centenary of the Satyagraha Movement launched by Mahatma Gandhi in South Africa. Attended by 91 countries and 122 organisations besides many eminent personalities, including philosophers and Nobel laureates, the participants in that conference had decided to nurture the values espoused by Mahatma Gandhi and articulated the collective yearning for a new way forward to address the problems of hunger and dehumanising poverty, and build a just and equitable world.

*Source: Indian Express, June 17, 2007*

## **Tips for Research Students**

Think about these and adapt them to your needs.

1. *Don't panic too often.*
2. Only write on one side of paper.
3. Be nice to librarians (especially in inter-library loan).
4. *Remember that your supervisor is a busy person; if he or she isn't, change your supervisor.*
5. Find out how you work best.
6. Read your degree regulations.
7. Always have a couple of areas you can work on at any time.
8. Read a few dissertations or theses in your area.
9. Budget for typing and binding.
10. Plan ahead.
11. Don't think that photocopying is the same as reading.
12. Put your external examiner's book on the bibliography.
13. Get a good typist or use a good word-processing package.
14. Don't think it will be absolutely perfect
15. *....read your supervisor's thesis.*
16. Remember that ideas change – what you wrote at the outset may need changing.
17. *Write the Introduction last.*
18. Put typing conventions on cards for your typist.
19. Don't be afraid to point to your strengths and to the weaknesses of others.
20. Keep full bibliographical details.
21. Have someone comment on your written style at an early stage.

22. Set yourself short-term goals.
23. ....and if you aren't meeting them, work out why.
24. Allow plenty of time for writing up.
25. Step back from time to time.
26. With each piece of work ask if it is worth doing.
27. Don't begrudge some time spent reading very widely.
28. Find out early on about : length; presentation conventions; submission dates.
29. Talk to people about it.
30. Don't begrudge time spent thinking.
31. Only write on every other line.
32. Think of it as a meal ticket.
33. Keep writing.
34. Don't think that reading just one more book will solve all your problems.
35. ....and don't use that as an excuse for not starting writing.
36. Criticize, evaluate, analyse; don't just describe.
37. Find a typist who has done your sort of work before.
38. Use your research to make contacts.
39. Use quotations selectively.
40. Use a card index for references, ideas, etc.
41. Don't be afraid to be imaginative.
42. Make sure your bibliography is comprehensive.
43. Label your diagrams, graphs, and tables properly.
44. If you set something aside for a while, make some notes about your ideas for its continuation.
45. Organise an efficient filing system.

*Source : Brown and Atkins (1988), Effective Teaching  
in Higher Education, Methuen*

## **Humour**

### ***Wanted a new car***

A friend had an old car which required frequent repairs. The mechanics of the auto workshop got fed up of repairing the jalopy. One morning when he took his car to the workshop, the senior mechanic checked the engine thoroughly and said, "I'm afraid you have more of a problem than I anticipated. Your battery needs a new car."

## ***Pioneers***

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

- Try not to become a man of success but rather to become a man of value.

**- Albert Einstein**

- The greatest gift you can give another is the purity of your attention.

**- Richard Moss**

- Democracy is a device that ensures we shall be governed no better than we deserve.

**- George Bernard Shaw**

- Discovery consists of seeing what everybody has seen and thinking what nobody has thought.

**- Albert Szent-Gyorgyi**

- We need men who can dream of things that never were.

**- John F. Kennedy**

- The wisest men follow their own direction.

**- Euripides**

- If you are in a bad situation, don't worry, it will change. If you are in a good situation, don't worry, it will change.

**- John A. Simone**

- To my mind, engineers have to be problem-solvers (not just identifiers of problems), and a prime requirement is for them to have knowledge and judgement to approximate a previously unseen, a typical, seemingly intractable problem into a situation that can be solved with an appropriate degree of accuracy.

**- Bob Sarsby**

*Source: Environmental Geotechnics, Thomas Telford Ltd., 2000, p.584*