

A Journey of Self-Realization



Mr Rajaram Bojji

My father Dr. Bojji Subbannachar, a Gold Medalist of Stanley Medical College (Madras those days), for lack of resources for further education, joined Auxiliary Med Corp in 1940's , lived in some make shift hut with wife (my mother) Mrs Manjula Bai in a village , somewhere close to Yellamanchili, a small town, in Visakhapatnam Dist. Andhra Pradesh. Daily he attended patients in nearby villages riding in his bike with medical kit. My father, not a well to do man, kept praying at an ancient temple in Agraharam , a collection of Brahmin households , near Kadapa, anxiously for safety of his only son as Japan was threatening to bombard those areas! Well in such a hut as habitat, they begot a son in 1945, that too after a few miscarriages. That happened to be I, and received unstinting love and care from the parents. Never had to shed a tear in my living memory. Never heard a harsh word as a child or as a kid.

My father's services automatically got transferred to Composite Madras and later to Andhra Pradesh State Medical Services. So my education followed his postings. Elementary school in Onipenta village, somewhere close to Kadapa, later on Kandukuru, close to Nellore, followed by Vijayawada, then Yellamanchili where I finished my High School from 5th to SSLC– all government or municipal public schools.

Simple friends, generally poor background, status wise our family was better placed, studied with kerosene lanterns, upgraded to petromax light in later years. It was exciting to use old battery power table radio, with 20m stretched copper wire as antenna outside home, to tune in to Shortwave stations and listen to VOA and BBC in those days in villages! With little English knowledge and help from father, slowly started to follow these transmissions, starting from my class 4 , which did influence my thinking. Programmes on science, the world wide coverage of events redefined my own borders of world within my mind. Lots of time was left alone to handle myself to find something to do. Home generally being a little far away in most of the postings for my father, friends of school, came not too frequently and that too only in evenings. Alone, used to sit outside in verandah of reasonably spacious old bungalow attached to hospital, watched birds and ants! Yes ants fascinated me. So much so that, when I found they had to crawl over a portion of stone paved areas around my house, I used to cut a few rubber balls in to pieces to place them as shelter against hot burning sun, and their tiny “feet” would get shade to crawl. In a manner of speaking ants remained my close friends and amazed me the way communicate and build up their living habitats and care for each other. So tiny but such a grit to stand up to world with giants like me, I used to think.

Hindu editorials, my dad told me, good for my English and the practice of reading kept up my touch with the language even though I was in Telugu medium schools throughout. High School gave me opportunity of social service through Scouts & Guides organisation as well as Auxiliary cadet Corps.

My parents encouraged. Without any stress of studies, I found myself getting first rank and always wondered why the more deserving hard working friends are not getting that number one tag. I used to think they are better actually than me. I used to tell them the same. But in friendly manner they used to laugh it off. Those were truly wonderful days! One problem with me was I could not study too much, after getting a gist of text book, used to find easier to write whatever I felt like in my own way. My friends used to practically reproduce the text books! That used to surprise me.

Days were truly beautiful. School fun. Algebra took my interest and used to finish the text book in first quarter, and to clear doubt I used to go to maths teacher's home and disturb the good lady to clear my doubt, portion being much ahead of the class. Never had tuition, but what a wonderful loving teachers they were! Every single game I played - Hockey, Football, Cricket, Badminton - I enjoyed, suffered injuries, went back again to play; enjoyed the free kid's life fully!

For Pre-University Course moved out of home to Loyola College, Vijayawada. I stood first in School winning some medals at High School, but by that time my father moved on transfer to Jaggayyapet, near Vijayawada. I never bothered to collect medals. For some odd reason, thought to myself, let them remain with the Social Studies teacher who collected them in my absence. Used to think the honour if any belongs to the teachers, not me.

Loyola studies for one year, now totally in English medium proved to be different experience and a challenge. Actually when taking admission, the Principal Fr. Gordon, a very gentle graceful tall man in robes, summoned me and my father to his office. Our application read that I had opted for Biological Sciences. No doubt I had excellent qualifying marks both for maths/physics stream as well as for biological science stream. Those days the choice has to be made. My mother and dad wanted me to be a doctor, like father. Well, I used to be so scared of even touching a cockroach, (true even today) , I was not sure, it was a great idea. But then, listened to mom because they never asked or forced me to do anything in life. Father Gordon told my father looking at the marks in maths in my SSLC certificate, with algebra as main, the boy should actually take Maths, Physics, Chemistry and Logic. He told us I would be much better off as an engineer, naturally. My father looked at me. I was happy within, but then said, if dad agrees, I would change option to become an engineer. But what to tell mother on return home? My father smiled, told me not to worry, agreed for the change, thus, my fate line changed to become engineer instead of a doctor! How sensitive my father had been-- a mere look at my face he could read me and did not lose one instant to change what we had decided after days of struggle and debate at home.

Loyola hostel life was memorable. Compulsory study hours, compulsory sleep, timely lunches and dinners, timed too. Either you finish food within allotted 15 minutes or lose your plantain leaf and get out of the mess. At the end of the year without my knowing I was announced to have won the Best Conduct Prize by the tough sounding & looking but actually kindhearted Warden Father Miranda! Received Tagore's Gitanjali on stage, to loud applause of a thousand students and faculty in 1960. I never knew they advised my parents to come for the function. How can I describe the joy of that moment! I owe quite a lot to the dear fathers in Loyola who in one year moulded me substantially. That also was my first year away from my parents in my life. Kind of traumatic but life changing.

With PUC marks one enters University those days. With double centum in maths and pretty high standing in other subjects, practically received invites from Universities without tensions. The sea shore of Visakhapatnam made me choose Andhra University. Since my father also was in his first

postings in war times worked there, enthusiastically I concurred.

The University life started with stay in those circular shaped round hostels, may be a unique feature! But Loyola Hostel too was oval shaped closed shape, and so a sense of continuity for me.

After the usual rather toughening welcome games of seniors we settled down, with a resolve we won't do such things as seniors. And we didn't too, breaking a tradition. We welcomed juniors in a more civil and loving manner, I believe. The period marked activity in literary circles as Literary Secretary, usual Hostel Secretary, then General Secretary of Students' Union followed finally by being President in final year. The NCC, their camps gave ample opportunities to be trained in fire arms too! Cleaning of guns, polishing shoes to perfection was fun in its way. By choice, though merit wise eligible to take any branch, I became a Civil Engineer, a strong desire of parents to see me in Andhra Pradesh working as Superintending Engineer in PWD! In the University days, I became a good player of Tennis and table tennis. I was a stage performer of music with Banjo, and sparring partner in Chess for the University.

Without much effort, I was bestowed First Rank in University with Distinction in 1966, which landed open invitation from IIT Kharagpur to join M.Tech programme in Structural Engineering.

That was the time of dilemma for me. Like everyone else I too filed papers for admission to US universities, and Univ of Maryland (I recollect, but could be another one), offered admission to MS programme with promise of Assistant-ship too.

A strong sense of nationalism I used to advocate as student leader, forced my student body to forego rice in hostel mess during Chinese war, to conserve rice, a staple diet, replaced with rotis, saved money foregoing usual long distance study tour donating the funds for jawan welfare. Well, when education of the same level as in US is available in our country, why go abroad? With that thought, I parted with my friends who left for US without assistant-ship, but I went to IIT Kharagpur, foregoing my assistant-ship. My friends did call me a little crazy, as usual.

University taught the usual subjects as per syllabus, but I was fortunate those days with availability large number of Russian (translated in to English) and US Aid material on scientific matters at substantially subsidized cost. Took tremendous pleasure in reading understanding Tensor calculus, advanced physical sciences, space exploits and principles covering the space travel and emerging computers. Truly a rewarding period!

IIT Kharagpur opened up a totally different work culture and study atmosphere, so different from that of University. The Professors, lecture notes more as pointers and much to be gleaned from the extensive Library, that too from latest current Journals publishing papers of the most recent advances in each field, brought me to the frontiers of knowledge, where my mind can fly. The easy relationships, the eager expectations of discovering today something different and new is what appealed to me. I was never a man who could be strait jacketed even in High School Curriculum. Used to write my own things, discussing and debating. Many of my friends used to say lucky, some crazy teachers seem to have evaluated allowing me to get even higher rank. So IIT was a fresh breeze for me, to my liking. Shell structure, advanced theory of elasticity, philosophical approach of von Mises, tickled my brains. Kani's work attracted me. My own forays in to true ultimate strength assessment for concrete by detecting different stages of cracking using ultrasonic waves, formed thesis to finally earn my Master's

degree and went on to become a Research Scholar. I wanted to take a PhD and then seek positions abroad for further research. But having married young, the girl I loved, in my second year of master's programme, found it tough to balance life with stipend I received as Research Scholar. Finances being what they were, forced me to write UPSC exam seeking to join the Indian Railway Service of Engineers, in 1970.

A different world altogether I entered. Training classes, field training at various levels, the codes of practice, technical inputs very special to railway, hands on real life experience too included in the two years of probation, took me all over India, followed by tests to certify me fit to take a working position. Perhaps one of the best programmes to go through, provided you are serious and do really go through, taking the opportunity. As an officer there was always scope for taking things easy, which actually some seniors used to suggest. But I enjoyed working with gangmen in harsh sun, going through use of the tools myself, feeling at ease with them. The rides on steam locomotives with drivers, the inspection methodology all add up to tremendous confidence by the time, 1972, I was posted as Asst. Engineer Shahabad, near Wadi, in Gulbarga Dist. Karnataka.

A huge impressive bungalow of old style with garden and a saloon too added to my status with almost a thousand working those days with lots of temporary gangs on rolls. The 24/7 work schedule, hardly allowed me to savour the privileges! Gheraos, unionized labour test one's leadership qualities. Missing sleep riding locomotives boarding past midnight and getting off at 2am at some far away station was normal. Daytime push trolley over the entire stretch at walking speeds, every month kept a hectic work schedule. But the relaxation for me was to be the change I want to be for the system. SO following my dictum that a solution can have any amount of complexity, but for working it should be simple, invented a few gadgets for the largely illiterate gangmen to make curve realignment simple. A lady's hairpin with a locally cut GI sheet triangle with 6in x 2 in sides, providing 1:3 ratio, used with a 20m string as tools allowed the gangmen to do realignment of railway curves all by themselves. The principle was simple. The versine at mid chord is 3 times the versine at half chord for a perfect circular curve. The hairpin used as ref marker for versine at mid chord holding 6in side perpendicular to rail, then the device held vertically at quarter point of the chord string, . If it was matching with hairpin location, nothing to be done. Else slew applied by gangmen at mid point to move the chord to match. This progressively goes from one end to another and then a reverse pass given to correct for accumulated errors on variable curved transitions. The quality of work done recorded by taking routine versine measurements is broadly the method. The job otherwise involved laborious measurements of versines, over several kilometers, and then send them to Hqrs CE office, for working out on a computing device the slews required to correct, and on filed fix reference points and then slew under supervision of an Inspector. Called it a Standard Curve rectifier, which got a National level award at a conference organised in Delhi. First year of service this was produced. Then over next two years, a new washable apron which can be executed without sanction of any work by Hqrs, being too economical, packing tube for measured shovel packing steel trough sleepers of those days, were created. All these works recognised, peer reviewed and honored by publications in the railways. I used to enjoy the feeling that we do things which no one produced earlier in the world, and we were the first. This doing something different kept high motivation and excitement within staff, making every day exciting.

The normal heavy work load of managing personnel files, the inspections, 24/7 routine on tracks, contracts, execution of works were being managed to the best satisfaction of superiors. In addition these more exciting things were done making the job a joy!

We worked together and eliminated the practice of manual scavenging in railway colony, involving 250 toilets. Govt was not sanctioning the budget. So we organised, the scrap tar drums, two of them forming septic tank, buried underground, used cement pans locally cast and called entire work as drainage repairs and finished off all the 250 units in 3 months. Staff felt elated. Simple but touches lives. I had to face some administrative grumblings but unions stood by me. Well I had more than normal fill of brushes with administrative machinery normally working to a rote. Change begets it.

Three years over, promoted and posted as Divisional Engineer Sholapur. From then on within short span moved to Secunderabad, then to Research Designs and Standards Organisation, Lucknow, because by that time already had a few papers in our technical journals and some awards at All India level. Posted to research Directorate in track wing, in 1976 remained there, as Joint Director/Research till 1987.

Perhaps, this suited me the best.

The first task was to find a method of manufacture for the mass imported elastic clip called Pandrol clip, as RDSO was trying to indigenize its production. A complex spatial curved one was defying the die making process in those days. That is the time I within 2 months could envisage a new concept die constant, by plotting the variable spring constant with rotation of clip, optimizing the correct orientation of the main spatial curve. This was used to correct the die and the first Indian clips manufactured within three months with our own technique. The reward is that Pandrol company heads visited my labs, to understand under permission from Railway Board, of course, then copied, to produce a new variation which they promptly patented! Our Government has little respect for Indian intellectual property I realized.

Anyway, stoically, worked further and making the lab technicians my co-partners in spirit, we recommissioned our own furnace scrapped years earlier, and we produced a brand new clip much economical and better performing, which as RD3 got international patents including USA. The reward I could give my staff was to make them co-patentees! Govt was luke warm. But we enjoyed the journey. Then I realised, the reward is not to be looked for from the government. We will make life more interesting and rewarding by our own work and fight the system, by getting patents to prove we are doing innovations. Thus followed further innovations from the laboratory and patents. Yes, under pressure Govt did conduct field trials etc but had a way of favouring foreign origin items only. There are many ways for blocking intelligently implementation. But this did not affect our spirit. What did not happen in RDSO record happened in my time with the same staff and lack of resources. Those dilapidated sheds certainly made a shining example to all others in RDSO. We refused to be unhappy--enjoyed the forays to frontiers of knowledge.

This is the period of high productivity with 300 plus research test reports filed and I personally getting international recognition because of my papers on New Theory of Rail Wheel Interaction, Simple Theory of Track Vehicle Interaction and two more original papers. It was gratifying that in Europe students worked on the basis of my papers for their PhD and sent me thanking communications. But of course not a mention within peer groups nor a debate!!

Fulfillment is that I could do what I wanted to do. Rest whether, the system benefited or not depended on many other factors, beyond my control. I learnt to accept success norm as my work should remain of world class, recognised by third party international bodies and peer reviewed at world level. Local

biases notwithstanding, I succeeded by my norm. Since I did not look for any returns, by donating all intellectual property to government, fortunately did not face any disappointments. I knew that I as a man of organised services, should be mere manager type and not supposed to add research inputs of such serious degree. So remained an odd man in.

I had an opportunity to go to Jordan in 1983 or 84 as consultant to investigate the cracking of aluminum freight stock made by French for Aqaba Railway Corporation- a three month assignment. With simple accelerometer, analog one, and one assistant landed there. Manually laboriously we worked frequency responses and found the cause was ill designed suspension. This report of analysis got accepted by World Bank which granted relief to the Aqaba Railway Corporation. Work finished, earlier than the allotted time we came back, foregoing the remaining daily allowances in foreign country...It is great that my assistant too followed me without demur!

At the same time I was in Jordan, I had to make a trip to Vienna to assist on field trials for one of my inventions, microprocessor based Rational Analysis for track Maintenance (RAMTRAK), which aims to correct long wave defects in tracks for very High Speed (> 250 kmph). It was my first trip to Europe and I was amazed at the respect I received there and the privileges granted for my stay as their guest. As one accustomed to be mostly ignored or treated indifferently, this was unforgettable experience. And realisation why we Indians are technologically a resounding failure, while Europe puts on pedestal technology and innovation. I was a nuisance back home, but here it was different. Came back with a firm resolve we should make some structural changes in RDSO.

This experience forced me to pen the Restructuring the RDSO report for changing the attitude of the RDSO from being a system of being just a doormat for blindly stamping whatever executives wanted to import, without own effort of building original knowledge base. Well, it took lot of effort but it was adopted by the progressive Minister at that time, and RDSO reform was affected with budget grants for setting up new labs, relaxed norms for international conferences. But the fear that finally the relaxed norms will be used by the mighty to make ego trips out of the country but really not help the country always lingered, as mentioned wryly, by Minister himself, while agreeing to my report. Rank-wise I was too junior to deal with him. But he was gracious. Then I did not stay to see the results. I had to move on.

But the period of 7 years spent in Research Directorate gave unique rewarding experience of hands on working on real-time systems of microprocessors, measuring wheels, Track recording cum Research vehicle, and finally resulted in my own conclusion that instead of power spectral density, one can as well simplify using appropriate chord measured versines as in-out data and the standard deviation defined as standard definition for track geometry assessment. Similarly, working opportunity for Planning Group for Railways at Planning Commission level and assisting the likes of Mr Menezes, Dr Jagjit Singh inspired me to develop computer simulation models for complex railway operations and assessing effectiveness of alternate options for improving railway performance and safety. Every department of railways I covered for what should be the future path to be adopted for railways. The knowledge gained and contributions from my thinking getting accepted at such high level tremendously boosted my sense of fulfillment.

Landing in Lusaka for a stint of three years with Zambia Railways in 1987 with my wife opened up a starkly different kind of experience. We had a two hour drive to reach a motel called masiye to stay along with our team for a few weeks before regular accommodations were organised. We Indians are

great as a team working abroad. Practically our ladies took over the hotel kitchen and trained the cooks to prepare a few Indian dishes!! Well, some fun.

Once settled, as the design Engineer my duties covered anything and everything connected with cerebral work in regard to civil engineering starting from simplest residential home construction along with electrical wiring plans to track health monitoring and replacing programmes, not leaving out procurement activity preparing needed documentation and tender proceedings for Directors' approvals. But the entire work load was not too taxing really, used to take only 15 to 20% of working time.

So difficult to remain idle compared to 14 hour work a day I was used to in RDSO. But the spare time became an opportunity to seek my dream to create a new railway system which has all the advantages of coned wheel with single flange on rail, providing high speed transportation, but risk of derailment or capsizing killing people be totally eliminated.

Started to work from basics and building up a system radically different from known system. To prevent the bogie with wheel sets escaping the guiding tracks, enclosed the same in a restraining box , but the coach taken out suspended from the traveling bogie overhead. Though similar to a overhead crane, it is modified to have high speeds by using the same railway bogie sets with coned wheel sets and single flange, behaviour and physics same as conventional ones, but with the coach containing the people, traveling below the tracks not above the tracks!

In Bologna University, as part of their 900 years of completion celebrations, this technical paper was presented in International Conference and it was a memorable experience, in 1989.

But on return to India, in 2004 as MD Konkan Railway could really try the concept out! Lucky that with industry support I could put up a full scale prototype within 3 months, costing Rs 7cr and that put Railway Ministry to shame for refusing me earlier the funds.

So got sanction of Rs 50 Cr and tested the live system over standard 1.5 km track to international standards. BARC scientists too chipped in. It actually speaks volumes for prowess of our scientists and engineers that with 90 days such momentous work was done! International technical bodies like American Society of Civil Engineers, and even channels like National geographic and Discovery channels covered this new Metro system, Skybus. Prime Minister Malaysia offered to grant Rs 2000 cr to build first 14 km route for Hyderabad. But Govt of India for won reasons did not allow. Now the tests track is proposed to be sold as scrap, 9 years after I retired!

Story of technology not denied from abroad, so we deny our own technology.

On return from Zambia in 1990, posted as Chief Engineer , Goa and had running hot debates for fixing the railway alignment in highly aware Goa! Technology I could use from remote sensing satellites , to prove that railway does not hurt environment. That work became a technical paper in International Journal, London on remote sensing issues , along with scientist from IIT Mumbai.

Finally political pressures resulted in appointment of Justice Ozha commission who upheld the work done by us.

Then moved on as Board member of Konkan Railway in charge of the Project, later became MD in 1997. The construction experience , challenges faced , and resistance of higher authorities and seniors to geo-technical science is some thing unbelievable. Administrators rely on outdated own experience rather than advancement in engineering and technology.

In Konkan Railway, I followed my own norm that technology should be used to serve people. New innovations resulted in like Anti-collision Device, the Skybus metro, maintenance free tracks, self stabilising tracks to mention a few.

The ACD , anti-collision device , looking simple, but has very many features of artificial intelligence built in to handle uncertain data and information gaps, but still assure safety. For the typical railway signal engineer, who is conditioned on go no go kind of thinking it was too difficult to absorb. But the innovation met all the demands made by them of even implausible situations. That was confounding. But this development forced French Consulate to come all the way to dissuade us from pursuing, because it adversely affects their industry. That is the difference between us and western countries. But we received Parliament approval after due tests, and implemented over 2000 km. But lobbies still worked, and on my retirement, the RDSO started another project renaming and saying improvement and sort of blocked wider implementation. Technology gets easily defeated by administrative actions!

But innovative Roll on Roll off service, for trucks bridging the distance from Mangalore to Mumbai, almost 600km, by rail, saving fuel and decongesting the NH17, still continues successfully earning hundreds of crores over the last decade and half. Similarly the wide area networked IT based railway operation and management ,which I took pains to build from scratch , handling even real time decision making to run trains apart from the standard ticketing, accounting and three levels of decision making capacity with built in knowledge base to train station masters too through on line refresher courses has proved itself to be sturdy , reliable, delivering over last 15 years 24/7 service, with no breakdown, truly is something India can be proud of.

I am fortunate to have achieved many a dream in India. On retirement, I moved to US as resident to stay with children. The association with Empowered Board for delivery of ITER, for India, is a rewarding experience over 5 years. Then, continued research for using gravity as alternate perennial source of energy for mankind. The paper Gravity Powered Road, Rail, Water and Runway transport systems got peer approval in international conference APM2011 Paris in 2011. I feel happy it has become part of proceedings of ASCE.

Currently I am working to put up experimental Gravity Power House to generate energy from sea waves, and transport systems using gravity power towers. We can stop using fossil fuels on the planet practically if we succeed here.

That is my dream.