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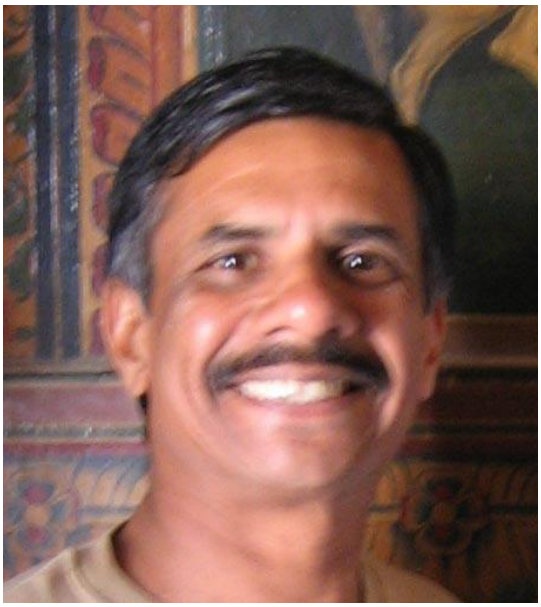
Interview with Prof. R Balasubramaniam

Professor Ramamurthy Balasubramaniam (Bala for short) is an IT-BHU alumnus (Metallurgy 1984). In 1990 he obtained the degree of Doctor of Philosophy in Materials Engineering from Rensselaer Polytechnic Institute. He is a Professor in the Department of Materials and Metallurgical Engineering (MME) at IIT Kanpur, where he has served since 1990. He has followed the footpath of Prof. T R Anantharaman to examine the famous Iron Pillar in New Delhi for its hidden mysteries, and other original research pursuits.

Apart from receiving the University Gold Medal for academic performance and Ghandhy Gold Medal from Metallurgy Department of IT-BHU for overall all-round performance, he has received many awards, including the Young Scientist Award in 1993 from the Indian National Science Academy (INSA), Alexander von Humbodt Fellowship from German Government (1996), MRSI Medal from the Materials Research Society of India (1999) and Metallurgist of the Year from the Indian Institute of Metals (1999). He is a well published author with more than 230 referred papers in journals. H is also author of nine books. He is on the editorial boards of several reputed international journals. His work on the famous Delhi Iron Pillar has earned him national and international repute.

He is the Convener of METALL 2007 (International Conference on Metals and Alloys), which is being organized at IIT Kanpur between 07 and 10 December 2007 in honor of Professor Anantharaman's eightieth birthday.

For Chronicle, Yogesh K. Upadhyaya talks with Prof. Balasubramaniam to learn more about his career and about METALLO 2007.



For bio-data of Prof.Balasubramaniam, please click http://home.iitk.ac.in/~bala/

Q-1: Prof. Bala, please tell us about yourself.

I am from Salem in Tamil Nadu. I was born and brought up there. I did my schooling in Salem till my 11th standard (1978). I consistently topped in all my classes in school; I was also very active in student politics and sports. I was captain of my School Cricket Team in my final year and also was part of the Salem District School Cricket Team that won the P.R. Thevar Inter-District School Tournament in Tamil Nadu for that year. After my schooling at Salem, I went to Madras (that was the name of Chennai during that time) to complete my PUC (Pre University Certificate in 1979) from Agarchand Manmull Jain College at Meenambakkam in Madras. Then I gave JEE exam, which I admit frankly was done with hardly any serious preparation. In fact, I still remember the adventure of talking the JEE exam. I was at Madras and had to return to Salem to give my exam the next day. I was busy with my friend Reddy from Nellore watching two movies the day before and I had to rush to the station to catch the last train to Salem, which was Yercaud Express.

I just made it to the train as it was moving out of the platform. As I only had an unreserved ticket (and the ticket collectors on trains in South India are quite strict), I had to travel in the unreserved compartment with people all around me. I quite enjoyed the trip, making friends with a jawan who was coming back home for his holidays. By the time got home, I was so tired that I told my parents that I am just not going to take the exam as I had to sleep, having not slept the whole night the previous night. However, my dear mother loving persuaded me to at least go and sit for the exam, which I did. After two days of exams (JEE in those days was conducted for two days and there was a separate paper on English!), I simply came home and threw my JEE card on the attic. Later, I was visiting my uncle at Mysore when I received a call from Salem saying what was my AIR (All India Rank) number. I did not know and I asked why. The reply was that there was only one person who got through from Salem and people wanted to know who the person was and it appeared that the name was mine. Then I told my mother and father to search the attic for my card, which they did and found out that I got through with a AIR of 1542. This was the way that destiny made me go to Banaras Hindu University. I am ever thankful for this turn of events and would not have wished it otherwise.

When I went for counseling to IIT Madras, the only entry that I made was “VMT” which stood for “Varanasi Metallurgy.” I choose Metallurgy at Varanasi as my only choice during JEE Counseling because it was clear that I will get something in BHU for sure (apart from subjects that did not interest me like Naval Architecture, pure sciences, etc in an IIT). I filled this as the only choice based on the feedback received from other people and also the person from BHU on the counseling day (I remember it was Professor K.A. Padmanabhan who had come to IIT Madras for counseling purpose from BHU, who also happed to be from the Metallurgy Department of IT-BHU, and later a good guide and friend, and also Director at IIT Kanpur). I got VMT. Although I had opportunities to pursue other branches of engineering at Guindy

Engineering College and REC, Tiruchirapalli (I had secured very high marks in the PUC exam which was the basis for admission in the state along with an interview), I decided to go to Banaras to do metallurgy as I heard very good things about the Department there. My father accompanied me when we first set foot in BHU early morning on an August in 1979 after an arduous two day train journey from Madras. That was the way I came into BHU.

Just to remind readers that for people like me coming from a relatively far away place like Salem in Tamil Nadu, reaching BHU and getting back home was a great adventure. Remember that I had to first take a train from Salem to Madras, stay overnight and then early next morning catch the Ganga-Kaveri Express from Madras Beach station. Then two days of train journey, especially with the last lap from Allahabad to Varanasi being one of constant stops due to incessant chain-pulling by the locals to get down at their home doorstep. It was then we reached BHU. We really enjoyed the trips to and from BHU because there used to generally be a crowd of students and the trips were memorable as we used to play music and sing songs on the way to pass time. In the same manner, I want the readers to also note that it was very difficult especially when BHU closed *sine-die*. I had seen 4 *sine-dies* during my five year stay at BHU and it was quite another adventure to clear out of the campus within 24 hours and catch the train back home, without reservations or money sometimes. It was quite easy for the local students to reach Ballia or Allahabad, but think of students like me who had to trudge all the way back to Salem with no reservations or money. Once, I remember the entire gang traveling first to Calcutta and then on to Madras and by the time we reached Madras Central, we were all looking like urchins! Then again there was another day's journey to Salem for me.

I really can understand how my parents must have felt because I am a parent now. There was no telephone service like we see now and certainly no instant-fix like mobile phones. Making a phone call was a tedious process as one had to book a "trunk call" and wait for several hours at the telephone exchange in BHU before you got connected to the number. It was difficult but it was real fun. Therefore, when we reached BHU, we promptly wrote a card to home to say we reached safely and my mother still recalls that she used to feel fire in her belly till the time the card reached her (which was almost ten days once we had left the house). Still, with all this, my parents were so supportive of my education and it is due to them that I owe all that I am now. They gave me the freedom to choose and become what I am today and it is clear that they deserve all the credit for what I am today. Without them, I would have been nothing and a nobody.

There were several adventures in our trips to BHU and back. Once I remember the AC chair car of Kovai Express not being available and the people in the AC Chair Car were allotted a normal second class sitting coach. In my rush from Varanasi to catch this connecting train from Madras Central to Salem, I got into this compartment, which incidentally had my name, which I checked quickly on the platform. The compartment was also second class and therefore things were fine before the train started. Just before departure, a healthy person with a lady beside asked me quite politely to clear the seat I was sitting on because it was his seat. I told him that it was mine and

told him that the reservation list had my name on it "Balasubramaniam". He then reminded me that his name was also the same and it began with the initials "S.P." and that his sister was traveling with him (S.P. Shailaja). He saw that I had a guitar with me (remember we used to travel playing music and singing) and it was an interesting experience with SPB on that day.

So much so for experiences! Now let me recollect some thoughts on BHU.

I was quite happy to do metallurgy at BHU because I liked the idea of working with metals and the excitement involved in such a study. Plus everybody kept reminding me that I was at THE best department for metallurgy in India at that time in India, thanks largely to Professor Anantharaman, who had built the research reputation of the Metallurgical Engineering Department at BHU through sheer hard work and dedication. At the end of the first year at IT-BHU, I again had an opportunity to change my branch as I had high scores in the first year, but I decided to stick to metallurgy. There were several in my class, who moved to other "attractive" departments like Electrical Engineering and Mechanical Engineering. I felt that it is better to always to go on new paths, than treat the usual path taken by most people at that time (i.e. choose mechanical or electrical engineering). I think I am happy that I decided to remain a metallurgist. It is wonderful and the subject is great.

I had a very eventful five years at BHU. I took part in several activities – music and sports, mainly. I was quite popular in BHU as a whole as a drummer and I remember having performed all over the campus and also in the city several times. I made very good friends from the other departments and faculties in BHU due to music and I still cherish the memories. I still have music friends in Banaras who I bump into when I go to Banaras even now. Plus, we had a faculty in our Department who used to play very good music (Professor N. Prasad) and it was a great experience playing music with all the people in BHU. We had a western music group which had Paul Anthony Mohan Sundaram (now Professor at University of Peurto Rico in San Juan) as the lead singer (Paul, what a voice!), Sriram as the rhythm guitarist (who I heard is now in Chicago), Arun Mani on the bass (now in Madras and who needs all over love and support because of the personal difficulties he is going through now), me on the drums (all from the same year and batch of Metallurgy 1984) and "Poodi" from the mechanical engineering department one year junior who played lead guitar in the group. I do not recollect whether we went by any name, but certainly that was the time of HOT ROCK band of Bobby Bringi and gang (one year senior to us 1983 batch) and PEBBLES band of Mathew Ooman / Krishnakumar and gang (one year junior to us 1985 batch).

We had many music shows and we really enjoyed playing in several festivals around India. I clearly remember playing to a packed audience at IIT Kanpur Culfest (that was the name of the cultural festival at IIT Kanpur during those days and now it has been changed to Antaragni) in 1979-80 session and at IIT Madras during their festive Mardi Gras in a later year. We really kicked a storm at the OAT (Open Air Auditorium) at IIT Madras when we played a sequence of songs from Pink Floyd's WALL. Those were the days of fun and the festivals were enjoyable

because there was more of music and drama and practically no “fashion shows” or “Miss XX or Mister XX shows” which are so popular nowadays with the younger junta, as I notice in the festivals. Well, times move on and I guess this is due to the influence of television on the youth because they see more of fashion and “nachna” and therefore this is more important in their scheme of things.

I also was very active in ITCA (Institute of Technology Cultural Association) and served as Music Secretary under Murali Mohan. Later in my final year, I was the General Secretary (the main person responsible for the show, sounds communist terminology now to me!) of Kashi Yatra held in 1984. We had a fairly good show and a large number of teams took part in Kashi Yatra 1984. It was tough organizing the event as I had practically no ways to rope in the money required and it was all the hard work of our entire team (in fact the entire student body at that time) that we raised a good amount of money to run the show. It was then that I decided that management was not my cup of tea and it was academics that I loved doing the most and that is what I will do all my life. No management – no controlling – no bossing around – no hassles!

On a philosophical note, let me add here that it is clear you can be a leader without titles. There is a clear distinction between a “leader” and a “head”. While a “HEAD” can head things and direct things to move smoothly and without controversy, it is the “LEADER” that sets new directions and paths, several times fighting the way through uncharted territory and uncharitable people. BHU teaches us to be leaders and not heads!

Coming back to music, I started playing the guitar during my stay in BHU (my first guitar chords C-F-G7 was taught by Pintu – Kankan Bhattacharya) and continued it seriously during my PhD days at RPI. I concentrated on classical guitar and used to practice almost three hours daily in the evenings after tiring work in the laboratory during the day. I think that I am quite proficient on the guitar and most people (from my time in BHU) will not connect me with guitar but rather the drums. I remember being one of the three winners of the Student Talent Competition at RPI for two years for playing my classical guitar (open to all the UG/PG/PHD students at RPI), which entitled the three of us to perform for three days in the Student Activity Centre at RPI in a place called “Mothers” that was the place that some country singer used to perform every week for three days (Friday, Saturday and Sunday).

Nowadays, I only play drums when I am play in front of a crowd, but at home when things are quite, I prefer playing the classical guitar. I am now playing the guitar for almost 27 years and I am quite proficient at it. I hope to record my compositions in an album sometime. I think I have sufficient good, new and original compositions for making a CD. However, getting time for actually doing this (i.e. getting musicians to record, arrange the studio and the associated funding) is a problem for me due to lack of time, but if anybody in the IT-BHU community can help (especially if the person is in the recording business), I will be happy to hear from them.

Coming back to BHU and the way I went to the US for PhD, I recollect the following. In my final year, I applied to different universities. Although I was offered admission with partial assistance from University of California at Berkeley and full scholarships from other universities, there were some last minute hitches and I decided on RPI.

I wanted to work in the area of solidification with Prof. Glicksman when I went to RPI but found out that he was on sabbatical. Therefore I took up the offer of Professor Duquette to do work on corrosion and I am happy that I decided to do corrosion. I quite enjoy this subject and it is also very important for industry.

I was active in music even at RPI and we even had a Indian music group (called RPI Melodies) that traveled to other universities to give full length concerts. We had a large gang and in fact a wide range of orchestral instruments. Plus we were gifted with good singers (Ena and Manoj – WOW). I remember AJ (Ajay Diwakaran) on rhythm guitar, Nitash Balsara and Sudakar on the lead guitar, "Poing" Rahul Shah on the sax, and several others. I used to play almost all the instruments and pitched in whenever required at what ever instrument that needed a player. Usually I was the bass guitarist (matches well with my classical guitar style of playing – plucking the strings). I made some very good friends when I was there in RPI and several were great people who stood by me through thick and thin. AJ, in particular, for the wonderful *pullow* that he used to cook in a jiffy and feed with affection! Where do we get such gems nowadays? AJ was (and still is to me) *navaratna* all rolled into one.

After my PhD, I did not want to take up a job there in the US and I was very clear that I wanted to teach back in India. I applied to BHU but they could only offer me a Research Associate position, which was not a teaching position. On the advice of Prof Suryanarayana, who was visiting the US that time, I decided not to come back with a research position. He rightly advised me to take up a position, how every low, but in the teaching stream (i.e. lecturer). Then IIT Madras and IIT Kanpur offered me faculty positions. I first checked out IIT Madras but found that the place was controlled more by the clerical staff (I do not know the situation now). IIT Kanpur had the fire and zing when I first stepped in (just the enthusiasm of the faculty here in inviting me and making me feel at home was incredible) and I immediately decided that this was the place to be. And I have been here ever since July 1990.

IIT Kanpur is really special to me and it is a very important place that I owe my appreciation. Remember that whatever research and development that I have done for the past 17 years, practically my entire original research work, we supported and aided by IIT Kanpur. Without IIT Kanpur, I would have been difficult to do anything worthwhile. The academic environment here is dynamic and the people, both faculty and staff, great! They let you do what you want, interfere the least and are happy to note that you are doing well. Plus, the teaching here in IIT Kanpur is really great and it is a pleasure to face the IIT Kanpur students both in class and outside. They really charge you up with their ideas and easily, they are a great source of inspiration.

Most of my colleagues here in IIT Kanpur are also very good at what they do and IIT Kanpur is the unrecognized gem of India, when it even comes to research. For teaching, of course, there is no one to even come near to us as you can see the number of text books authored by IIT Kanpur faculty far outweighs the number from any teaching institution in India. However, what is not known is the research out put from IIT Kanpur has been very significant and it has been path breaking in several manner. We do not get the light on us like a few other places, but still if one looks at the situation from outside (especially I have heard people from Europe, Japan and US comment), IIT Kanpur easily leads the pack in innovation, originality and impact of research. Remember that we are not that heavily funded like few other institutions in India and we manage to work with what ever we have. I remember one of the research heads of General Motors visiting my lab and after seeing the pathetic condition it was in (at that time, but since improving thanks to the generous consideration of IIT Kanpur's Dean of Research and Development Professor Srivastava – ITBHU Alumnus from EE-, Deputy Director Professor Kripa Shankar – ITBHU Alumnus from ME- and, most notably, the Director Professor Sanjay Dhande, a great workhorse himself) commenting that "Bala, looks like here is a laboratory where ideas are working rather than equipment."

Q-2: Please tell us about the material composition of Iron Pillar at New Delhi and why it is still standing without any deteoration.

I have talked at great length about this in several other places and also the entire scientific information is available in published literature. In short, the relatively high phosphorus content in the Iron Pillar helps in the formation of a protective passive film on the surface which provides the Pillar its exceptional atmospheric corrosion resistance. You can visit my homepage for a list of papers related to Iron Pillar (http://home.iitk.ac.in/~bala).

Q-3: Please explain the phenomenon of corrosion and its control to our readers.

Well, you want me to tell something that I have been teaching over the last 17 years at IIT Kanpur. I will try to make it as short as possible. Corrosion is simply the degradation (either partial or complete) of an engineering material due to electrochemical reaction with the environment. The main reason that corrosion is important is because of the huge amount of losses that the industry has to entail due to corrosion. Therefore, there is great need to control (or better still, prevent) corrosion. Large sums of money are spent in combating corrosion and that is what makes the subject very important from an industrial perspective.

There are several ways in which corrosion can be controlled and prevented. These include materials selection, modification of the environment, by electrical protection methods, protective coatings and by proper design considerations. There are so many intricacies involved in the subject that it would be difficult for me to spell out all the specifics. However, the comment that I want to make is that corrosion is an important subject and by proper use of knowledge, one can save a huge amount of money that generally is lost due to corrosion.

Q-4: What is the status of study of metallurgical engineering in Indian colleges/universities?

It is pretty bad. There are no takers for metallurgical engineering or materials engineering in India nowadays. It is quite obvious going by the number of colleges in India who offer this as a discipline. While I do not know the exact causes for such decay, it is clear that there are more opportunities for engineers doing other subjects. If India is to grow economically, it has to produce good engineering materials, and for this we need a good workforce. There is therefore a need to train more materials engineers. However I do not see that happening and maybe the people from other disciplines are filling up the traditional role covered by the metallurgical and materials engineers. I can already see that happening in nanotechnology, where people from different disciplines have put their hands in "the pie."

There is need for metallurgical engineers and materials engineers to regain their sphere of influence. The push for the same must come from Industry. However, the Indian industry is (rightly, maybe) focused on producing more and without having to reinvent the wheel. It is obvious that there appears to be no need for metallurgical and materials engineers in the Indian economy in this scenario. I do not see much hope for the future because there are no concerted efforts to promote learning in materials engineering related disciplines. There are very few new institutes that offer materials engineering as one of the disciplines. Materials engineering does not figure anywhere in the list of priority disciplines. Therefore, unless we wake up, we are going to face a serious shortage of good materials-engineers in the future and the idea of a developed India by 2020 may be a mirage more than a reality. Without engineering materials, you just cannot have a developed country. Simple as that!

Q-5: Metallo-2007 International Conference on Metals and Alloys is being organized this year at IIT-Kanpur. Please explain our readers about this seminar and the preparations behind it.

The conference has been conceived as a forum to honor Professor Anantharaman, who will be completing 80 years on 25 of November 2007. As I mentioned earlier, he was the visionary who gave direction to the Metallurgy Department at BHU (which incidentally was the first in India, begun in 1923 as a college of Mining and Metallurgy by Pandit Madan Mohan Malaviyaji, to regain India's rightful place as a leader in metallurgy, as it has always been in the past). He is an inspiring teacher and has guided several people (both in India and abroad) who are now leading stalwarts in the discipline. If I have to list the achievements of Prof. Anantharaman, I will need another interview altogether. We have complied an interesting publication (book) on Professor Anantharaman and if anybody is interested in obtaining a copy (*Professor T.R. Anantharaman: An Inspiring and Dedicated Educator* by R. Balasubramaniam, A. Upadhyaya, B. Basu and Deepika Sachdeva, Aryan Books International, New Delhi, 2007), please send an email to me (bala@iiitk.ac.in) and I will see how best I can get it across to you. The same information is also

hosted on the METALLO 2007 conference website (http://www.iitk.ac.in/infocell/announce/metallo).

The response to the conference has been good. We have now a good program of good speakers and very good contributed papers that will be presented in the conference. We hope to have three days of intense academic discussion and debate during the conference. We invite all people to try and make it to the event. Even if one cannot be there in person, at least to visit the website as we shall be constantly uploading the PDF of all the talks presented at METALLO 2007 at the website and hopefully have photographs of the events as they unfold.

Q-6: Please tell us about your days at IT-BHU and at Rensselaer Polytechnic Institute.

I have already touched upon several of these aspects in my earlier replies. As I had mentioned, I had a good time during my college days both at BHU and at RPI. I believe very much in enjoying life in full and be good while doing so. I have tired and am still striving to do this all my life.

Q-7: Please tell us about your personal life.

I am married to Gaitri Saini, a PhD in particle physics from IIT Kanpur. She has devoted her time to look after the house and to bring up our two children, Gowri (13 years and in class IX studying in Kendriya Vidyalaya of IIT Kanpur) and Gargi (8 years and in class IV studying in Campus School in IIT Kanpur).

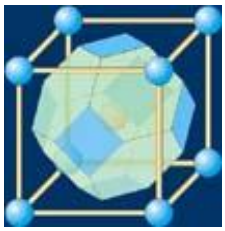
My mother is staying now in Salem. I have two brothers, both younger to me. The first one is in a senior position with Satyam Computers in Hyderabad and the second is a Professor (and Associate Dean) at a famous and reputed US university. Both are very good at their work and are famous in their fields for their major achievements.

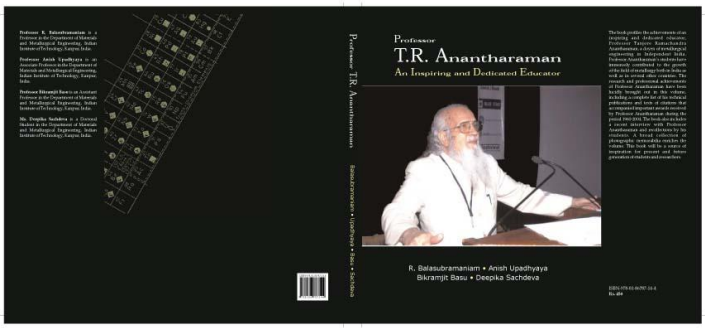
Q-8: Thank you very much, Sir. It was nice talking to you.

You may contact Prof. R. Balasubramaniam at: bala@iitk.ac.in

Links:

1) http://www.iitk.ac.in/infocell/announce/metallo/





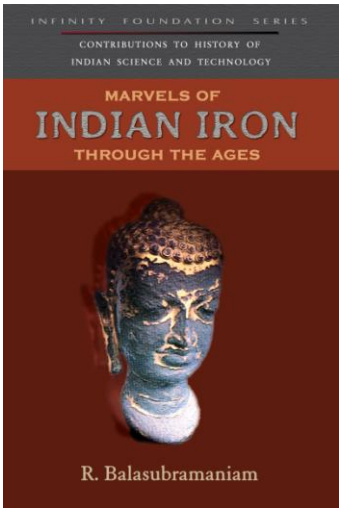
2) **Professor T.R. Anantharaman:**

An Inspiring and Dedicated Educator

R. Balasubramaniam, Anish Upadhyaya, Bikramjit Basu and Deepika Sachdeva

Aryan Books International, New Delhi, 2007.

Hardbound, ISBN 81-86787-14-3



3) **Marvels of Indian Iron through Ages**
R. Balasubramaniam
Rupa and Co, New Delhi, 2007.
Hardbound, ISBN 978-81-291-1184-5.

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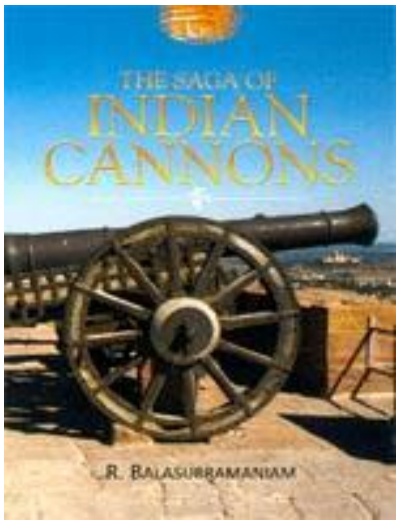
4) ***Prachin Bharatiya Dhattushastriye Ashchharya*:**
Dilli Loha Stambha (in Marathi)
(Ancient India's Metallurgical Marvel: Delhi Iron Pillar)
R. Balasubramaniam and Pravin P Deshpande
Sushama Prakashan, Pune, 2007.
Paperback, ISBN81-90612-20-4

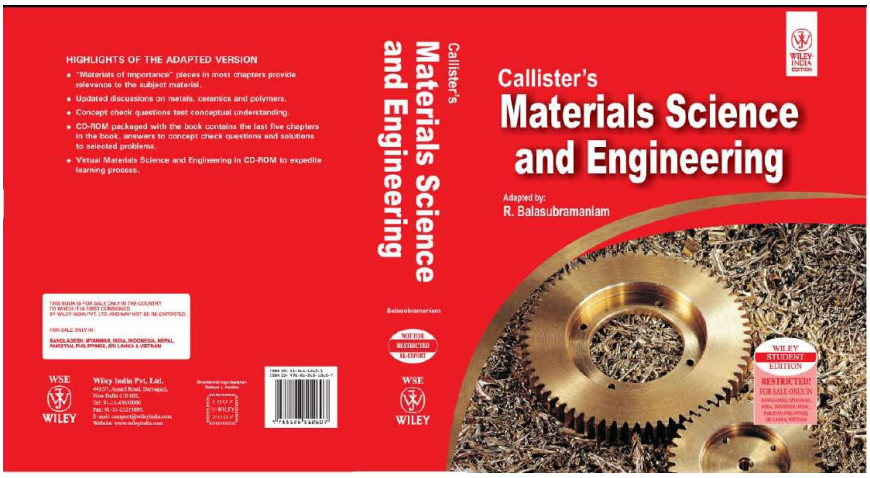


5) The Saga of Indian Cannons

R. Balasubramaniam

Aryan Books International, New Delhi, 2008

Hardcover, ISBN-97-881-730-5339-9.



6) Callister's Materials Science and Engineering

R. Balasubramaniam

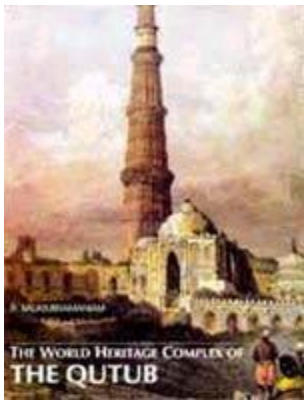
Wiley India Pvt. Ltd, New Delhi, 2007

Paperback, ISBN-81-265-1076-5.

http://books.google.com/books?id=FruHOlKlbJAC&pg=PA95&dq=material+science+book+by+R+balasubramaniam&sig=htFuQgcN400xNTEQJro8nqYJO1U#PPP1,M1

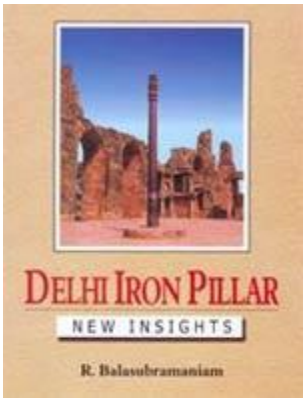
7) Story of the Delhi Iron Pillar

R. Balasubramaniam
Foundation Books, New Delhi, 2005
Paperback, ISBN-81-7596-301-8.



8) The World Heritage Complex of the Qutub

R. Balasubramaniam
Aryan Books International, New Delhi, 2005
Hardcover, ISBN-81-730-5293-X.



9) Delhi Iron Pillar: New Insights

R. Balasubramaniam

Aryan Books International, New Delhi, 2002

Hardcover, ISBN-81-730-5223-9.
