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BOOK REVIEW

La Vintage Métallurgie: 60 years of Marriage of Science to Industry, Institutional Publication of CSIR National Metallurgical Laboratory (NML), Jamshedpur 831007. Diamond Jubilee (1950 - 2010) Publication in 2011; 413Pages; ISBN: 97881-87053-70-8.

Reviewed by: Arun Kumar Biswas, Flat 2A 'Kamalini' 69A Townshend Road, Kolkata 700 026

The Chairman of the NML Research Council (Dr. Hemant Nerurkar of TATA Steel Ltd.), has introduced the publication under review: "This Coffee Table Book is a chronological compilation of the Sixty years journey '1950- 2010' in its pursuit of sustaining 'the marriage of Science with Industry', as envisioned by Pandit Jawaharlal Nehru while inaugurating NML on 26th November, 1950. The history of NML has been scripted by countless number of unsung heroes."

The 'unsung heroes' have been ably led by Dr. SrinivasanSrikanth, the present Director of NML and Dr. Rakesh Kumar, one of my beloved ex-students. The duo have taken charge of the 'Concepts, Research and Co-ordination regarding this volume.'

Since I have become a part of the NML narrative, I seriously doubt whether I can attain full objectivity in my review. However, when the Editor, IJHS wrote to me that: "the present Director, NML was interested to have a short review of the book by you, and I hope you are the best person of the job", I couldn't turn down the requests from the two eminent persons.

This 'Coffee- Table Book' is indeed a giant dimension, massive (about 4.5kg!) structured with delightful 'concepts, archival support, photography, sketches, illustrations, art-work' and what not, reminding one of a lovely architecture on steel. There are thirty chapters in this chronological NML story with titles, admirably technico- poetic and philosophic in nature, and accompanying explanatory notes. We provide below a few selected samples as a gist of the long story.

'Mettle in Metal' (Chapter 2, pp. 11-16): Our ancestors had mastered the art of tempering metals for more than 2500 years. It is said: A man is like steel; if you lose 'temper', you lose everything.

'Defining the structure, defining the shape' (1942-46, Chap.5): The structure of NML has to be 'body-centred as well as face-centred.'

Low shaft furnace, high ambitions (p.83): A steely resolve — nickel-free stainless steel (p.91). On the saga of MBPP, Mineral Beneficiation Pilot Plants, at NML (pp. 110-113). J.R.D. Tata's visit on 10 January 1963 and his written comment: "The MBPP is a valuable tool which can help TISCO" (p.119). Prof. H.J. Bhabha's visit (p.130). Only photographs, nothing else? More on him at the end.

'Autothermal Process' (1966-85) (Chap. 15, pp. 137-151): It is a process that requires little or no additional energy input after the initiation stage. This is the story of NML 'which operated well without a regular Director'. Did it operate well?

'Uphill Diffusion' after the period of vacuum (chap. 16, pp. 151-187): The era of Prof. V.A. Altekar (1969-85). I have been quoted in p. 157 regarding this era. 'Pile-up of Dislocations: the problematic years (1980-84).' Overall activities and achievements declined significantly during these last few years of Professor Altekar's Directorship. "In the early eighties, NML was living in its past. The energy level was missing ……. There were no computers. Most of the employees were against setting up of computers in the laboratories, because it would affect employment opportunities" (pp. 207-208).

'Overcoming Stacking Faults, The Path to Recovery, The Military Transformation'.(Chap.19-21, pp.219-263). The Abid Hussain Committee, set up for thereview of CSIR, submitted its report in 1985. It was 'scathing in its criticism of CSIR, termed as Lame Duck'. It presented 'an all-round gloomy picture, aging personnel, lack of dynamism, lack of relevance in research projects, poor interaction with society and industry'.

Professor Shilowbhadra Banerjee, the new Director (1985-1992) brought about by his dynamism, an epic change in the NML scenario. Through his 'ceaseless pursuit of discipline, he brought NML back to its pristine glory'.

During this period, India was forging ahead in the world in the areas of vital raw material resources. Two vital projects may be cited in this connection; in both, Indian institute of Technology, Kanpur and later NML played vital roles. From the very low grade tungsten ore (0.1% wolframite) of Degana, Rajasthan, concentrate of 65% tungsten oxide (WO_3) could be produced leading to anti-tank ammunition. This work at NML and DRDC was possible on account of the basic and pioneering work initiated at IIT Kanpur during the 1965 war with Pakistan.

The other national project was related to exploring polymetallic sea nodule at the ocean water depths of 4-6km. containing precious metals such as Cu, Ni, Co and Mn. India got 'investor status' from the UN and mining rights over 1.5 million square kilometer in the Indian

Ocean. While substantial work was done in several institutions including NML, the pioneering fundamental work on sea nodules specially electron microscopic, spectroscopic, quantitative mineragraphic work had been done at IIT Kanpur by Dr.Rakesh Kumar for his doctoral thesis.

It is a matter of great happiness that two of my ex-students: Dr.Rakesh Kumar and Prof. Surya Pratap Mehrotra, Director NML (2002-2009) were the chief organizers of INCOME 2008, the first International Conference on Mechano –Chemistry and Mechanical Alloying, ever held in Asia, hosted at NML during 01-04 December 2008 (vide pp. 370-371).

It had been also an unique privilege and personal friendship of the earlier Directors of the NML and also the recent three: Late Prof. Patcha Ramachandra Rao (1992-2002)(Vide Chaps 22-24). Prof. S.P. Mehrotra (2003-2009) (vide Chaps 25-26) and the current Director Dr. SrinivasanSrikanth (2010 -) (vide Chaps 27-30).

Alluding to late Prof. Rao's era, the significant titles of the chapters in this volume are: 'Stepping into the Materials World. Everything other than spiritual is material! Discovering the five–fold symmetry. Preventing the entropy catastrophe'. Prof. Rao first discovered the existence of five–fold symmetry in quasi-crystalline Mg-Zn-Al alloys. 'The beautiful five-fold symmetry or order created by him at NML was sustained much above its melting point through his inspired leadership and perseverance.'

Professor Rao's monumental work was the wonderful multi-authored volume edited by him and N.G. Goswami: *Metallurgy in India – A Retrospective* - NML Golden Jubilee Commemoration Volume, published by NML and India International Publisher, New Delhi, 2001 The volume, worthy of preservation in all libraries of the world, has two parts. Part I entitled '*Our Metallurgical Heritage*' has nine articles, the first article penned by me: 'Minarals in Ancient and Pre-Modern India.' Part II entitled '*Metallurgy in Independent India*' has sixteen articles ending with Prof. Rao's 'Fifty Golden Years of NML.'

It is sad to reflect that the 2011 publication *La Vintage Métallurgie* of NML has done little justice to its worthy predecessor in the volume beyond a very brief mentioning in p.312. When Prof. Rao moved to BHU as the Vice Chancellor, he maintained his professional contacts and graciously contributed a very special article in the multi-authored volume: *Science in Archaeology and Archaeo-materials* (Editor: A.K. Biswas), D.K. Print world Pvt. Ltd., New Delhi, 2005.

Professor S.P. Mehrotra's Directorship era was utilized in 'Finding the right texture' and 'Arresting the inverse melting.' He successfully piloted the 200 million rupees TECA project 2004 with seven other CSIR laboratories, evaluating 'Structural Integrity of Engineering Components' in the country, using extensively NDE or Non-Destructive Testing and Evolution Facilities with IGCAR. We have already referred to the prestigious INCOME 2008 Conference piloted by him and Dr. Rakesh Kumar.

An international expert in the area of Computer Modelling of the Mineral Engineering and Metallurgical Processes, Prof. Mehrotra chaired the International Seminar on MPT Mineral Processing Technology held at Chennai in March 2006. A positive outcome of MPT 2006 was that the Indian bid for hosting the International Mineral Processing Congress (IMPC-2012) in New Delhi got the overwhelming support of the IMPC Council (vide pp. 360-361). We are awaiting this great event which is being piloted by two of my esteemed ex-students, Prof. S.P. Mehrotra and Dr. Pradip.

The Current Director of NML, Dr. Srinivasan Srikanth (2010 -) has barely started his innings, and yet added two diamond feathers in his cap: the earlier 380 pages 2010 volume '*Diamond Jubilee Souvenir*' replete with

euphoria, messages, Directors' Reports and nearly forty reminiscences (see also pp. 103-105), and then this second bulky volume of 2011 *La Vintage Métallurgie*, presently under review.

This publication is excellent, but could have been better with some measure of self-critical editorial introspection. I would submit only three distinct observations:

(1) This volume has made the pertinent reference about the sad decline of discipline, performance and overall standard at NML during the long period 1970-1985, but did not investigate its root causes. Part of the reason lay in the over-all political and intellectual scenario in the country, which affected many other Indian institutions also, at that time. The readers may consult my Review of E.C. Subbarao's *An Eye for Excellence: Fifty Innovative Years of IIT Kanpur*, Harper Collins Publishers India, 2008, which was published in the *Indian Journal of History of Science*, 44.3(2009) pp. 463-469. However, deeper reason lay in the ailment of the entire CSIR structure itself, which is being remedied only recently.

This volume under review mentioned Abid Hussain Committee's 1985 Report 'scathing in its criticism of CSIR' (p.221), but did not acknowledge Prof. H.J. Bhabha's stringent criticism of the Bhatnagar CSIR Model, made two decades earlier, just before his death. In my article published in the 2010 NML *Diamond Jubilee Souvenir* (pp. 103-105), I wrote: "Bhabha was very critical of the hurried expansion of the CSIR network at the cost of the universities and quality of scientific research …… His critical easy, delivered as a lecture on 07 January 1966 (merely 17 days before the tragic air crash over Mont Blanc) was published in *Science and Culture*, July 1966, pp. 333-342 and has been reprinted in the monograph *The Scientist in Society*, Thema, Calcutta, 2000, pp. 216-235."

(2) My aforementioned article in The NML 2010 volume was in fact a Diamond Jubliee Lecture on the Foundation Day of NML, 26 November 2010, devoted to the title 'Mineral Processing Research: Early Reminiscences and Vision Ahead.' The entire text of the lecture is awaiting publication.

Even though NML has been one of the pioneers in the field of Mineral Engineering research, the Headquarter of the Indian Institute of

Mineral Engineers (IIME), and the organizer of the forthcoming IMPC – 2012 in New Delhi, there in very little evidence in its 2011 volume under review, that NML has any plan to modernize and revamp its tradition of Mineral Engineering discipline going beyond feasibility studies towards basic research, surface chemistry, particulate technology in the sub-micron range, material engineering etc.

(3) At IIT Kanpur, which was for three decades since 1965 a global leader in Mineral Engineering and Process Metallurgy, the subjects have dwindled to trivialities. The name of the parent department has been changed from 'Metallurgy' to 'Material Science.' I have not noticed sufficient evidence in this 2011 volume under review that NML may try to restore the balance in the national scenario.

This colourful and delightful 2011 volume *La Vintage Métallurgie* may be procured to adorn the libraries of the world.