

*ACCMS Working Group Meeting on Clusters & Nanomaterials
7-9 September, 2006, IMR Sendai*

Inaugural Address

Distinguished colleagues, participants, dignitaries coming from abroad, students, friends, ladies and gentlemen. Let me welcome you all to this ACCMS Working Group Meeting on Clusters and Nanomaterials. I am standing here on behalf of Prof. Yoshiyuki Kawazoe the Chairman of the organizing committee of this meeting, who unfortunately could not be present in this inaugural session due to some urgent meeting that he has to attend in Tokyo. I feel truly honored and privileged getting this opportunity to welcome you all to the beautiful city of Sendai and to this Institute of Materials Research of Tohoku University. IMR has legitimately earned its place as a world renowned centre for materials research, and as you all know 'Nature' magazine has recently declared it as the No. 1 COE in Materials Research (vide Nature 10th August Issue entitled 'Japan's other research hub')

Why nanomaterials ? Well, if we categorize 19th Century as Automation Age, 20th Century as the Atomic or Electronic Age, then 21st Century will be the Nano-age. I think it is superfluous to emphasize the importance of nanomaterials today. The research on nanomaterials is *Technology driven* as well as *Curiosity driven*. When Feynman in his famous 1959 lecture entitled "*There is plenty of room at the bottom*" threw the challenge of making a nanomotor, I am sure it was curiosity-driven and even a fortune-teller at that time could not have predicted that this will mark the beginning of what is known today as *Nanoscience and Nanotechnology*. Of course, if you carefully observe the history of science, you will see many such examples. Dirac introduced "spin" as an internal degree of freedom of electrons and today a century after his birth, we are experiencing a tumultuous growth of Spin-electronics. Based on the so-called "*qbits*", the quantum computers is coming from myth to reality ! Similarly Bose-condensation conjectured in the early part of 20th century is today emerging as an exciting branch of single molecule spectroscopy. There are many such examples, where one can see what started as the so-called "*blue-sky*" research ultimately ended up as some of the most important technological revolutions.

Materials scientists are lucky because there is no dearth of problems ! So many new materials and structures have been discovered during the last 2 or 3 decades that it is sufficient to keep us busy experimentally and theoretically. Some of these discoveries are driven by science and some by technology ---

some are "evolutionary" in nature while some are truly "revolutionary". In this nano-age, many of these problems are taking new dimension by going to nano-size, be it via the "top-down" approach or the "bottom-up" approach. And now scientists have started realizing that this "nano" is nothing new in Nature and we are only trying to mimic what Nature already has in its "R&D Lab" that is 2 billion years old ! The ultimate example of nano-technology is "life" itself !

What is the role of Computational Materials Science ? Advent of high-performance computers is contributing enormously to the growth of "materials simulation". Length scales accessible to experiments have been decreasing consistently, thanks to the advent of highly sophisticated tools such as STM, AFM etc. Simultaneously, the length scales achievable for electronic and atomistic simulations are increasing, thanks to the advent of smart algorithms coupled with enhanced computer power from MFlop to GFlop to TFlop. Thus it is possible today for the experiment and computer simulation to meet at a point from the two sides of a 'tunnel'. The remarkable array of simulation techniques covering the entire range from nano-meter to macroscopic length scales have originated from our basic understanding of classical, quantum and statistical mechanics.

So the theme of our Working Group Meeting "Clusters and Nanomaterials" is highly appropriate and in consonance with the objective of our ACCMS. As many of you are already aware, the Asian Consortium for Computational Materials Science was initiated here in Sendai in the year 2000 during the International Workshop on "Materials Design by Computer Simulation at Atom and Electron Level", under the leadership of Prof. Y. Kawazoe, Prof. B.L. Gu and myself as executive members. We already had three very successful conferences in Bangalore (2001), Novosibirsk (2004) and Beijing (2005), and the proceedings have been published. The decision to start working group meetings on specific subjects was taken during ACCMS3 at Beijing. The idea behind such subgroups is to germinate new ideas and collaborations in the emerging areas. I sincerely hope that this meeting is going to act as breeding ground for new ideas, new collaborations, new materials, new phenomena and ultimate new physics !

Let me once again, on my own behalf and on behalf of the organizing committee of this Working Group Meeting, extend a warm welcome to all of you and wish you a very pleasant stay in Sendai.

(G.P. Das)