Editorial

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How is scientific research done? Better people than I, have desisted from writing on this. Nevertheless, I venture into this terrain which is known to produce cold feet among certain extra-terrestrials. Lest it be taken for pompousness, I hasten to add that I am only addressing students who have a very confused notion (or no notion at all) of research in science. The aim is to point out that although there is no single algorithm, there are a large number of dicta that are followed.

The great mathematician and physicist Hermann Weyl once wrote, *"Nowadays many mathematical books do not seem to be written by living men who not only know, but doubt and ask and guess, who see details in their true perspective – light surrounded by darkness - who, endowed with a limited memory, in the twilight of questioning, discovery, and resignation, weave a connected pattern, imperfect but growing, and coloured by infinite gradations of significance."* This comment may well fit a description of how scientific research grows little by little. Each step brings forth some clarity into a previously silhouetted form but also adds some silhouettes of its own. It may surprise some students to know that many important researches – at least in the theoretical sciences – add (seemingly *merely*) to our understanding of what is already *'known'*. Often, scientists adopt the law of Occam's razor which is the dictum that if there are a number of possible explanations for a certain event, one takes the simplest one. Another aspect of scientific research is that one takes for granted the world opened to us by previous stalwarts. What appears entirely natural and inevitable to the present generation could have been a confused state of understanding to the previous one. Continuing in this vein, it is not surprising that even the meanings of fundamental notions to a previous generation may be very different from what they are to the present one. The history of science teaches us that, often the boldest predictions of 100 years ago are found by us to be too timid! Another interesting dictum is attributed to Jacobi; he is said to have inculcated this

It seems incredible but it is true that many mathematical theories of the 19th century owe their very existence to the systematic use of complex variables.

Poincaré says that his ancients understood by a physical law, an unchangeable internal harmony whereas during his time (100 years ago now), it is a constant relation between the phenomenon of today and that of tomorrow. To his generation it is, thus, a differential equation!

upon his students – *"one must always seek a converse."* Jacobi precisely did this to arrive at his fundamental theory of elliptic functions. Yet another aspect of scientific research is that of abstract thinking. Time and again, it has been observed that even the most abstract of deep ideas developed for a purpose without any, a priori, motivation of *applying* it elsewhere, gets applied in formerly unenvisaged ways.

This issue features the eminent chemist, T R Seshadri. His position in the world of chemistry can be witnessed from the encomiums paid by Sir Robert Robinson, which is recalled in the Article-in-a-Box. A part of Professor Seshadri's prolific contributions (more than 700 research papers) dealing with the chemistry of natural products is discussed in lively detail by N R Krishnaswamy who was one of his students. Excerpts from Professor Seshadri's 1967 talk in the Indian Science Congress have been reproduced in the Classics item. Here is an outline of the other contents of this issue. In very lucid and easy style, R Srinivasan and Andal Narayanan explain the background which goes into the seminal works of Abrikosov, Ginzburg and Legett in superconductivity which won for these three jointly, the Nobel Prize in Physics for 2003. S N Ganguli tells us that amazingly some seventy billion neutrinos produced by a nuclear fusion reaction in the sun, enter every square centimetre of our body every second. If that is frightening enough, S Hari Prasad's article on cholesterol informs us that excavated Egyptian mummies indicate the prevalence of chronic heart disease even in those times. A S Madhu and Aditya Nori do an encore on decoding codes on graphs. Finally, there is an enlightening write-up by S Ganesh on what happens to the human body when it is struck by lightning; the results do not seem to depend on whether that human has been telling the truth or not! It is heartening to have students contribute; there are some articles by them in this issue. However, it is now time to bell the cat; lately a sizeable number of submissions are found to have been downloaded through the Internet. Amusingly, often the article reads very well but the covering letter gives it away ! Thank God, covering letters cannot be downloaded from the World Wide Web !

Catherine the Great invited the famous French philosopher Denis Diderot who attempted to convert her subjects to atheism. She asked Leonhard Euler to quiet him somehow. Euler is said to have remarked, *"Sir, $(a+b^n)/n = x$, hence God exists; reply!"* Diderot, who had no idea what Euler was talking about, is said to have returned to France soon after.