

## **Roddam Narasimha**

JNCASR & Member - ICTS International Advisory Board

Good morning to all of you, and warm greetings on this great day for ICTS.

It is a great day for more than one reason. During its short history, Spenta and ICTS have conducted a variety of scientific programmes – from workshops to special lectures; they have hired some excellent young new faculty for the Centre; and they have made a new campus for themselves. I have seen with admiration the plans that Spenta has drawn up for the campus: it is shortly going to be a very attractive campus, and will certainly be an exciting one as well if you go by the kind of programmes being run and the philosophy that inspired the Centre. ICTS is in the first place multi- and inter-disciplinary but, with the inclusion of earth sciences and computer science as well, the choice of subjects of research for the Centre goes beyond the mathematics, physics and biology that have formed the core of basic science for long. I confess to a bias for those relatively rare entries, but I must say that India badly needs a high-level initiative there; by bringing these subjects under one roof, ICTS has taken an extraordinary initiative. The triad of earth sciences, computers and mathematics (with ideas from physics and biology) is a powerful combination that is essential for achieving progress in earth sciences, because of the complexity of the subject: the problems are scientifically challenging, and nationally and globally important. And the greatest advances in these subjects are actually happening at the borders between these disciplines. There is as of today no Indian general circulation model, in spite of the extraordinary importance of the monsoons to our economy. ICTS has taken a path-breaking initiative by putting people from the ‘triad’ under one roof.

Let me say a few words about why the behaviour of the atmosphere and the oceans is so hard to predict. The simple fundamental reason is that they are in a state of turbulent motion most of the time. And, as Feynman said, turbulence is the last or greatest unsolved problem in classical physics. Von Neumann pointed out some 60-70 years ago that turbulence was the first clear-cut instance of the failure of statistical mechanics. Both of these statements remain true to this day. I have been recently reading Arnab Rai Choudhuri's book on The Third Cycle (as he calls it). I don't know if he is in the audience here, but the book is a fascinating account of solar cycles. And I was amused to find that the place where the solar physicists get stuck in predicting solar cycles is exactly the same as where the engineers get stuck in predicting flow in a pipe. So one can legitimately say that if you can predict the next turbulent flash in pipe flow, you will not be far from being able to predict what happens in the next solar cycle.

With the influx of some fresh faces into the fundamental sciences, I am sure that in coming years India will have a new Centre for making progress in problems that involve the globe as a whole – like climate change, the monsoons and a variety of other issues regarding the oceans as well.

I think the combination of programs, research and outreach that ICTS has adopted is unique. I think it has an exciting future, and am privileged to be part of it. I thank Spenta for seeking my association with the Centre, and wish to congratulate him for all the thinking and effort he has put into building it up. So the legacy of Homi Bhabha is still strong and alive! I also want to congratulate TIFR and DAE for the support they have provided and, following what David Gross has already said, the Governments of India and Karnataka as well.