

From the Editor's Desk

Having started in 1914, publishing the *Journal of the Indian Institute of Science* is among the earliest activities of the Institute. This demonstrates the significance the founding members of the Institute attached to publication of the research output of the Institute faculty members and students. Over the years, the Journal has undergone several changes. With the centenary celebration of the Institute fast approaching, the Editorial Committee of the Journal decided to have a refreshing departure from its present scope of publishing contributed articles. Keeping in mind the changing technical advancement in the publication of scientific Journals, and with the objective of making the scope and content of our Journal different from those of other Journals, it was felt that the *Journal of the Indian Institute of Science* should publish only *Review Articles* which will be of interest to a wide cross section of researchers. Though such articles are largely of Invited nature, even good quality contributed review articles will be published. All submissions will go through the usual peer review process and accepted papers will be published in special issues dedicated to specific themes, wherever possible. Through such a change in focus, it is hoped that the Journal will have a character altogether different from those of other Journals and will serve the interests of both young and experienced researchers. We are certain that the Journal issues will be of great archival value. Through this issue guest-edited by our distinguished colleague Prof G. K. Ananthasuresh, we launch the Journal with the revised scope.

Hope to receive continued support and encouragement from the readers.

L. M. Patnaik
Editor

Editorial

The captivating charm of miniaturisation is persistent and contagious. It grows from the childhood days of reading about Gulliver's travels to adulthood when we learn that the laws of basic sciences do permit miniaturisation. The latter fact has been amply enunciated in the celebrated lectures of Richard Feynman, the Nobel laureate physicist who wondered in 1950s and after why miniaturization had not occurred yet. Now, the interest in small devices and systems has proved to be contagious: almost all disciplines of engineering have embraced the micro and nano scale technologies by taking a cue from the revolutionary success of microelectronics and reaching down to materials engineering at the nano scale. The sciences—physics, chemistry and biology—have been dealing with the aspects of small entities long before the micro and nano technologies came into focus in the last two decades. And, mathematics is not left behind because modeling is of great importance when we study small things, especially in the biological domain. All these disciplines are coming together in the micro/nano investigations because of the unavoidable coupling among different energy domains in which these systems operate. Science and technology comfortably co-exist in this regime and they are benefiting each other.

The multidisciplinary research in the nano and micro science and technology are currently growing at an exponential rate. A pertinent question has already been posed: what remains long after micro and nano terminologies cease to be the buzz words? One answer is that their influence would be pervasive in our daily life just as that of microelectronics has been. From an academic viewpoint, it would not probably be an exaggeration to say that not only the research but also the education curricula would sustain and assimilate this pervasive influence. The articles in this issue of multi-disciplinary reviews journal stand in support of this optimistic view of the future of science and technology of the small. They cover different aspects from quantum dots to nano electronics to micromachined sensors and include such fundamental issues as friction and dissipation in monolayers; kinetics, transport and mechanics of fluids squeezed into narrow

volumes; and computational methods of molecular dynamics simulations. The authors of these articles, being experts and active researchers in their topics, have put together authoritative accounts of the state of the art.

The order of the articles in this issue, although is of no technical importance, is dictated by the size they deal with because the focus of this issue is characterized by the size itself. We move from quantum dots to a packaged sensor. Professor S. B. Krupanidhi starts us off with quantum dots by describing what they are, how they can be made, and how they are useful for nanoelectronics. This is followed by Professor Sanjay K. Biswas's overview of mechanisms of friction and dissipation in organic monolayers of silanes on aluminium and silicon and fatty acids on steel. The research in the micro and nano domains would not be progressing at the rapid rate that we see today without the support from the modeling and simulation. Professor Ganapathy Ayappa and his co-researchers fill this need in this issue by giving an overview of molecular dynamics simulations. Professor Navakanta Bhat's article on strategies, opportunities and challenges in nanoelectronics in moving towards the goal of a gate length of 5 nm in future transistors, takes us to the next level in size and closer to the application domain. Professor Rudra Pratap and his co-researchers present the effects of squeezed fluid film which play an important role in the operation of micromachined sensors and actuators. Professor Suman Chakraborty's article on DNA hybridization underscores the strong connection between the technologies of the small and the biological world. We, finally reach the size of a packaged micromachined device in Professor K.N. Bhat's comprehensive article on pressure sensors.

The thorough treatment of the fundamentals involved in the nano and micro topics covered in this issue makes it clear that it is not enough to 'think small'; one also has to 'think deep'. An unavoidable impediment to studying a multidisciplinary subject is the jargon of the alien field. To help ease this, the articles include a brief description or definitions of some terms in the margins of the pages so that they would not affect the flow but they are there for a quick reference. The extensive bibliography and the tutorial nature of these articles make them equally useful to the experienced and the novice researchers in these fields. I hope the readers would concur with me.

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