Guest Editorial

The progress of human civilisation is always related to the advancement in the development of novel devices and machines, which in turn are assemblies of components and are constructed to achieve a specific function or a set of functions. Each component of the assembly performs a simple act and the assembly as a whole performs a more complex and useful function characteristic of that particular device/machine. A few typical functions that are performed are related to signal transfer, information processing, energy conversion or a chemical fuel and a wide range of mechanical aspects. The components capable of mimicking the role of switches, memories, sensors, actuators, etc., are desired for practical applications. The approach ultimately leads to construction of electronic and mechanical systems.

Sensors among all the components have drawn special attention from the researchers and technologists due to their wide range of applications in both civil and defence. Sensors are employed in a variety of configurations in the area of mechanical, chemical, electrical, electronics, biological, biomedical, robotics, etc. There has been a phenomenal growth in sensors in the last two decades and it has made unprecedented impact in all walks of life–domestic, biomedical, agriculture, defence, etc. The emergence of smart and intelligent sensors has further enhanced their utility manifold and has transformed the present-day scenario altogether.

The importance of science and technology of sensors is obvious from the number of journals being published and the conferences/seminars/workshops being organised all over the world devoted entirely to this field. Billions of dollars are being provided to R&D centres for activities in this area. In India also, a large number of premier institutes and R&D centres have taken up challenges in this field for making novel developments meeting the user requirements. The number of conferences/seminars on sensors organised in India is increasing every year.

The miniaturisation, micro-miniaturisation and nanotechnology have given further impetus to sensors science and technology. However, it may be mentioned that the size of the components or devices depends upon their use.

Several DRDO establishments are actively engaged in research in this area. Development work in device and material is in progress at laboratories like Solid State Physical Laboratory, Delhi; Naval Materials Research Laboratory, Ambernath; Defence Laboratory, Jodhpur; Defence Research & Development Establishment, Gwalior; Armaments Research & Development Establishment, Pune and sensor-based system activities are being carried out by many system laboratories of DRDO. Besides this, a number of projects are sponsored by DRDO to national laboratories and academic institutions like IITs, IISc and universities. DRDO has chalked out a programme with provision of adequate funds to promote sensor-related work during the 11th five-year plan. The activities under this pertain both to basic research and hardware development. Material science, electronics, mechanical science, modelling, designing and fabrication techniques are the areas where the emphasis is being laid. System development and performance evaluation are the ultimate goals for specific applications for

employing indigenously developed and produced sensors in missile and warfare programmes besides environmental monitoring, fire sensing, detection of explosives, navigation, structural health monitoring, and agriculture.

The present issue of *Defence Science Journal* is a very modest attempt to include research and review papers in this area which are of direct interest to DRDO. Contributions are both from DRDO laboratories and other R&D/academic institutions in India and also from abroad. It is hoped that the contents of this issue will provide the readers a flavour of the activities being persued in the field of sensors. The papers fall into categories such as materials, device design and fabrication, modeling and performance evaluation in system configuration. It may be mentioned that a special issue of *Defence Science Journal* on Nano Materials: Science and Technology will be published in the near future which will be covering the nano sensors too.

Lastly, expressing gratefulness to authors, referees, and DESIDOC colleagues for their kind cooperation is our pleasant duty.

Guest Editors

Dr Pran Kishan obtained his PhD (Physics) from the University of Delhi. He was superannuated from Solid State Physics Laboratory (SSPL), Delhi, in 2000 as Officiating Director, Scientist G. His main areas of research included materials science and related devices. He developed microwave ferrites and phase shifters for phased array radar which are now in production. He has more than 60 research papers, review articles, and chapters in books to his credit. He is the recipient of *NRDC Import Substitution Award,* three *DRDO Technology Awards, MRSI Medal, IRSI-IETE Award*, etc. Presently, he is Vice Chairman, Delhi Branch of the Institute of Defence Scientists & Technologists.

Dr Chandra Prakash obtained his PhD on ferrite materials from the University of Delhi in 1986. He joined DRDO in 1985 as Scientist B at SSPL, Delhi. Presently he is Scientist F, Additional Director, Directorate of Extramural Research & Intellectual Property Rights (ER & IPR) at DRDO HQrs, since October 2006. Prior to this, he was Head, Electroceramics Group, SSPL. He made significant contributions in the field of electroceramic materials (ferrites, dielectrics, piezoelectrics, pyroelectrics, etc.) and devices. He was co-recipient of *DRDO Technology Awards* for 1988, 1995, and 2002. He was on deputation for one year to Materials Research Laboratory, PennState University during 1994-95. He has published/presented more than 170 papers in reputed journals and conference proceedings.