In this issue

Atomic and nuclear databases

'Nuclear data' describe quantitatively the physical properties of atomic nuclei and the fundamental physical relationships governing their interactions, thereby characterizing the physical processes underlying all nuclear technologies. Generation and proper use of nuclear data comprising measurement and evaluation of recommended values of accurate nuclear data belong to cutting-edge science and form an important component of basic nuclear physics. The nuclear data comprise numerical values of fundamental constants such as nuclear masses, level structure of nuclei, decay half-lives, energies of gamma rays and cross-sections for neutron and photon interactions which are the numerical constants providing quantitative description of nuclear interaction processes such as capture, scattering, fission, etc. These are the essential inputs for the physics design of nuclear systems and play an important role in nuclear medicine, astrophysics and cosmology. Thus, applications of nuclear data include energy applications (fission reactor design; nuclear fuel cycles; nuclear safety; reactor monitoring and fluence determination; waste disposal and transmutation; accelerator-driven systems; fusion device design, and plasma processing technologies) as well as non-energy applications (cancer radiotherapy; production of radioisotopes for medical and industrial applications; personnel dosimetry and radiation safety; nuclear safeguards; environmental monitoring and clean-up; materials analysis and process control; radiation damage studies; detection of concealed explosives and illegal drugs; exploration for oil and other minerals) and basic research (e.g. nuclear astrophysics) and education. The scope of nuclear data collections includes all 85 natural elements with 290 stable isotopes and more than 4000 radioactive nuclides.

The Nuclear Data Section (NDS) at the International Atomic Energy Agency (IAEA), Vienna, has been involved in the formulation and maintenance of a wide range of atomic and nuclear databases for over 40 years. Nevertheless, the nuclear data are still not well-defined after many decades of nuclear power. Much of the development work and the assembly of the dedicated numerical nuclear databases at the nuclear data centre such as the IAEA NDS, has involvement of external consultants and expertise from around the world, through well-defined IAEA Coordinated Research Projects (CRPs) and data development programmes (DDPs). Alan Nichols summarizes (**page 26**) the most recent CRPs and DDPs, and describes in some detail achievements that have been and are being made with respect to both energy and non-energy-related applications of nuclear data.

India sponsors a regional IAEA-NDS nuclear data mirror site (see http://www.nds.indcentre.org.in) for the Asian region at Mumbai. Accurate knowledge of nuclear physics as recommended and available at this website helps to improve and sustain energy security of India. BARC has initiated a programme to participate in the international classical nuclear data activities such as the compilation of Indian experimental nuclear physics data into EXFOR database of the IAEA. Recently India contributed high quality Indian experimental KAMINI criticality benchmark for validation of nuclear data and codes. India is a formally recognized contributor to the handbook of International Compilation of Evaluated Criticality Benchmarks (ICSBEP) for nuclear data and code validation purposes. The website of the ICSBEP: http://icsbep.inel.gov/ provides more details. Since the time India joined International Thermonuclear Experimental Reactor (ITER) as a partner, there has been considerable increased awareness of nuclear database for high energy neutrons (14 MeV neutron energies and beyond) distributed by the IAEA and tailored to the ITER design and its safe operation. It is therefore that the article by Alan Nichols in this issue is timely.

S. Ganesan

Real time phase detection in seismic signals

Real time phase detection of the seismic signals and subsequently the seismic moment, radiated energy, source mechanism and rupture propagation can be used to assess the occurrence of a tsunami. The Great Sumatra Earthquake (26 December 2004, *Mw* 9.3) and the resulting tsunami has generated considerable interest amongst the scientists and engineers to develop algorithms for phase detection which can be used as a part of a tsunami-warning system. In this issue, W. K. Mohanty *et al.* (**page 54**) propose an Adaptive Markov Amplitude model using a modified Least Mean Square (LMS) algorithm with an adjustable learning rate to adaptively and accurately estimate the parameters of the seismic signal model. The model-order has been determined using Multiple Signal Classification (MUSIC) algorithm that estimates the dominant frequencies of the signal. A Cumulative SUM (CUSUM) algorithm has been used to automatically detect the significant changes in the model-parameters which are indicative of the changes in phases of the seismic signal. It has been demonstrated that the phase changes are accurately indicated in the change in the parameters of the proposed model. A time-complexity study of this algorithm has also established the utility of such a method for real time phase detection.