thus it is incorrect to interpret that bananas will be able to produce significant inhibition in clinical situations. Rao *et al.* have not shown data on blood pressure pattern of normotensive or hypertensive rat models. The effect of 2 bananas on the blood pressure of normotensive volunteers mentioned in the article is an example of very poor clinical pharmacological reporting. Neither the time course of blood pressure lowering nor its correlation with serum ACE in those volunteers is described. Recently, an 'International Update on Hypertension' was held, where a lot of emphasis was laid on proper blood pressure recording. This paper in the *Current Science* emphasizes the fact that cardiovascular research in this country needs support and that there is a need to establish a center of excellence in cardiovascular sciences so that best from both allopathic and alternative system of medicine could be extracted.

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Response:

The central role of renin angiotensin system in blood pressure regulation is well established[1]. Though the causes for essential hypertension are not clear, ACE inhibitors have been used in the treatment of all types of hypertension – high, normal, moderate to severe including essential hypertension and their other beneficial effects have been proved[2–4]. Of course there are other lines of treatment for hypertension. To the best of our knowledge, cadmium is not present in bananas[5,6]. Dialysis effects suggested that banana ACE inhibitors may not be small metal ions[7]. 5-HT is indeed present in banana pulp (20 μg/g)[5,6] but any relation between ACE and 5-HT needs to be established.

Captopril is one of the several competitive inhibitors of ACE design based on active site model. These competitive inhibitors show near complete inhibition of ACE at a much higher concentration compared to IC_{50} values[8]. For example, IC_{50} of captopril for sheep serum ACE was 15.85 nM but 99% of ACE inhibition occurred only at a concentration close to 1 μM (ref. 8). Captopril concentration used in banana ACE inhibition assay was around 4 μM when adjusted to sheep serum ACE assay[8]. Further, substrate concentration used in banana ACE inhibition was two times higher compared to substrate concentration used in sheep serum ACE assay[7]. Hence, high captopril concentration (4 μM) was used to get 99% of ACE inhibition. Since the presence of ACE inhibitors in bananas was unknown at the initial stage of work only approximate captopril concentration was used. Further, there was no intension at that time to do or to calculate effective dose of bananas required to lower blood pressure in humans. Unless the molecular weight of ACE inhibitory principle is established, IC_{50} value for banana ACE inhibitors is impossible to calculate. Decrease in serum ACE activity (10%) in volunteers after consumption of bananas for a week suggests *in vivo* inhibition of ACE[9].

Studies made so far suggest that consumption of bananas can be beneficial to antihypertensive individuals because serum ACE activity as well as systolic blood pressure decreased (10%) in cold stress induced hypertension individuals after consumption of bananas for a week[9]. Many aspects of antihypertensive action of bananas require further intensive studies. Collaboration from interested scientists is most welcome. Since hypertension and other cardiac diseases like CHD affect more than 15% of the population, there is need to have a centre of excellence in cardiovascular diseases.

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NEWS

DAE–Solid State Physics Symposium 1998 – A report

The annual Solid State Physics Symposium (SSPS), sponsored by Board of Research for Nuclear Science, Department of Atomic Energy (DAE) was held this year in Kurukshetra University, Kurukshetra.

There were 304 papers scheduled to be presented. These included 22 invited talks. A seminar on nano-phase materials and two tutorial sessions, on Experimental Techniques, Data Processing and Scientific Visualization were scheduled. Out of the 257 contributed papers, 18 were chosen for oral presentation and the rest were posters. Fifteen theses were selected for presentation (oral + poster) out of which 10 were presented.

The scientific session started with a talk by Priya Vashishta (Louisiana State University, USA). He highlighted the current status of the molecular dynamics simulation (MDS) on parallel computers using multi-million atoms. Important device materials like silicon nitride and silicon carbide have been studied combining first-principle calculations and multi-million atom MDS to determine the stress distribution in a 54 nm pixel on a 0.1 μm silicon substrate.

The talk by Anil Kumar (Indian Institute of Science, Bangalore) dealt with 3-D Ising critical behaviour in aqueous solutions. He mentioned that the critical behaviour in complex fluids does not conform to the 3-D Ising type; instead a mean-field approach provides a better description. It was concluded that the breakdown of the anticipated 3-D Ising behaviour is mainly due to the structuring induced by the electrolytes.

R. Mukhopadhyay (Condensed Matter Physics Division (CMPD), BARC) talked on classical and quantum dynamics of the methyl side-groups attached to the main polymer chain as studied by the neutron scattering technique. Neutron scattering being very sensitive to the protons is the best suited probe to study the dynamics in glassy polymers. He showed the first experimental evidence of quantum rotational tunneling in polymers. He also demonstrated how the methyl group dynamics can be consistently described by a distribution of barriers for random hopping in the classical regime and by a distribution of the tunneling frequencies in the quantum regime, both having the same physical origin: disorder inherent to the amorphous state of the polymer.

K. P. N. Murthy (Material Science Division (MSD), IGCAR) spoke on aging scaling, often found in slowly relaxing nonequilibrium systems. He attempted to describe the process using directed random walk models with site dependent transition probabilities. The aging was confirmed by calculating exactly the autocorrelation and its scaling with the ratio of the times. The talk by A. V. Rao (Physics Department, Shivaji University, Kolhapur) was on the technology of a novel material highly porous (99% air and 1% solid) silica aerogel as prepared by sol–gel technique. It has very low bulk density of <20 mg/cm^3 but has visible transparency of 90% which makes this an important material that finds application in low mass liner for the generation of high intense soft X-rays, Cerenkov radiation detectors and as a host for many confinement requirements.

The tutorial session on Scientific Visualization dealt with two presentations: H. K. Kaura on Virtual Reality and P. S. Dhekne on Scientific Visualization, both from Computer Division, BARC.

In the evening talk, R. Chidambaram highlighted the importance of solid state physics for conducting nuclear tests of desired yields.

Vince McKoy (Caltech, US) discussed the progress in exploiting large parallel computers to generate electron collision cross-sections for gases of interest to the semiconductor industry. He gave an overview of the methods employed in these calculations and its computational demands and discussed the strategies used to parallelize the computer intensive steps. Parongama Sen (Surendranath College, Calcutta) reviewed the present status on coexisting spanning clusters in percolation. She discussed the different properties of such clusters and highlighted the existing problems in the spanning clusters in ordinary and directed percolations.

The seminar on nanophase materials was a topic of current interest for its numerous applications in the field of nonlinear optical devices, metallurgy and catalysis. A. K. Arora (MSD, IGCAR) who coordinated the seminar discussed various methods of synthesis and characterization of nanoparticles. S. Ramasamy (Physics Department, Madras University) described the synthesis of magnetic nanostructured materials using ultra high vacuum chamber which gives high purity grain boundary structure and results in various magnetic properties. S. Mahamuni (Physics Department, Pune University) discussed the optical properties of the quantum dots using solid state theories based on the delocalized electrons and holes within the confined volume. Her talk brought out the fact that enhanced nonlinear optical properties are the consequence of state filling effects as well as bleaching of the exciton absorption by the presence of surface trapped electron hole pair. She also discussed size and shape-dependent properties with reference to II-VI semiconductor dots.

S. C. Gadkari (Technical Physics & Prototypic Engineering Division, (TPPED) BARC) reviewed the solid state sensors used for gas sensing applications, in general and particularly emphasized the devices based on metal-oxide semiconductor thin films. He indicated future trends in the field of development of gas sensor array to realize the 'electronic nose' using neural network.

N. D. Sharma (Kurukshetra University) gave an overview on surface modifications on ion implanted materials with specific examples of 304 stainless steel, nimonic-90 alloy and aluminium implanted with 130 keV nitrogen, boron and argon ions at different doses. The possible increase of near-surface hardness was attributed to the formation of nitride and boride precipitates and dislocation pinning.

The talk by Prasenjit Sen (School of Physical Sciences, Jawaharlal Nehru University, New Delhi) on dissipative structure formation in heavy ion irradiation, provided evidence of realizing such phenomena in metals. He showed that these are formed as rearrangements in microstructures filled with stationary imperfections like dislocations and grain boundaries. He identified processes leading to such rearrangements.

Matti Lindroos (Tampere University, Finland) reviewed the electronic structure and fermiology of complex materials. He presented the results of first principles computations of the photointensity in high T_c material Bi2212. Substantial matrix element effects and remarkable anisotropy of the CuO_2 plane band intensities were observed in the experimental spectra.

A presentation by R. P. Dahiya (IIT, Delhi) on surface nitriding of steel components in expanding plasma highlighted the industrial applications of such studies.

R. Ramakumar (Low Temperature Physics Division, Saha Institute of Nuclear Physics, Calcutta) discussed the nature of quasi one- and two-dimensional organic superconductors. He described the model developed to understand superconductivity in TTF[M(dmit)$_2$]$_2$ (where M is Ni, Pd or Pt). These materials have an electronic structure in which both highest and lowest unoccupied molecular orbitals derived bands cross the Fermi level and helped superconductivity.

P. S. Goyal (Inter University Consortium for DAE Facilities, Mumbai) gave a talk on anomalous thermal properties and tunnelling states in solids with a specific example of mixed salt system of ammonium and alkali iodides which show non-Debye specific heat behaviour. The results of neutron scattering and specific heat measurements on these mixed salts were presented.

S. Mazumder (CMPD, BARC) highlighted that a scaling law different from those observed in the case of binary alloys, is valid in describing the temperature-dependent phase separation behaviour of a multi-component alloy like maraging steel.

P. Ch. Sahu (MSD, IGCAR) described the laser heated diamond anvil cell technique and discussed its importance in material synthesis with illustrations from his own work in Japan.

The first tutorial session on Experimental Techniques: Characterization of materials was coordinated by S. C. Gupta (CMPD, BARC). He briefly described the various techniques like STM, AFM, and CCD-based X-ray imaging. A. Sinha (CMPD, BARC) discussed in detail his set-up of CCD-based X-ray imaging for both normal and high pressure applications. N. Venkatramani (Advanced Centre for Research in Electronics, IIT, Mumbai) showed with various illustrations the potentials of Scanning Probe Microscope as a tool to characterize materials. He mentioned that atomic scale resolution is possible in the AFM and a resolution better than SEM is possible in SPM. He stressed the fact that SPM imaging has reached a high degree of reliability and is an important technological tool, specially for storage media, profilometry and as a tribological device. G. Raghavan (MSD, IGCAR) discussed the characterization of interfacial evolution in film multilayers. He pointed out that the evolution of different phases in heat treated film multilayers involves issues related to interdiffusion and microstructure.

The tutorial session on Data Processing and Scientific Visualization (coordinated by B. K. Godwal and R. Mukhopadhyay, from CMPD, BARC) was an attempt to bring about an interaction between the physicists and the computer scientists. As the basic purpose of scientific computing is to gain an insight into the problem that is being probed, it was felt that a session based on such interaction will be useful. B. S. Jagadeesh and S. K. Bose (Computer Division, BARC) enlightened the participants through their detailed lecture-cum-demonstrations on data processing and scientific visualization.

J. Jayapandian (MSD, IGCAR) highlighted the novel design concepts in PC-based integrated data acquisition and control systems. He described various novel interfacing design techniques for automation in industries and laboratories. He stressed that such indigenous approach will save a good amount of foreign exchange.

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Guides for neutral atoms

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Atom optics involving cooling, trapping and manipulating neutral atoms is an active field of research currently[1]. The cold trapped atoms are generally held in magneto-optic traps isolated from nearby material containers under ultra-high vacuum conditions. In order to transport the atoms over some distance, several types of devices are being developed.

It is well known that light can be guided through fibre-optic strands[2] by total internal reflection and that thermal and cold neutrons can be guided through neutron-guides[3] by total external reflection. Hollow optical fibres have been proposed for guiding neutral atoms[4] by evanescent reflection.

Two investigations have recently been reported; one dealing with an experimental demonstration of guiding neutral atoms by specific magnetic configurations and another dealing with a theoretical proposal for collimating neutral particles by a magnetic mechanism.

Denschlag *et al.*[5] have demonstrated a new technique based on magnetic trapping potentials created by a thin current-carrying wire to guide and transport neutral atoms. Two variants of magnetic field/guiding configurations were investigated: (a) In the first configuration called 'Kepler' guide, a current of nearly 1 amp was passed through a wire and the magnetic field surrounding the wire acted as the trapping and guiding field. (b) In the second configuration called 'side' guide, the current-carrying wire was placed in a homogeneous biasing magnetic field normal to the wire. In this configuration the circular magnetic field around the wire gets cancelled by the biasing field at a specific distance from the wire; hence one finds a line/tube with minimum magnetic field running parallel to the wire from which magnetic field increases in all directions and this line/tube acts as the trapping and guiding field. Figure 1 *a* shows the two guides schematically.

The interaction of atoms possessing a magnetic moment $\boldsymbol{\mu}$ with a field $\mathbf{B}$ is given by $-\boldsymbol{\mu}\cdot\mathbf{B}$. If $\boldsymbol{\mu}$ is parallel to $\mathbf{B}$ and $\boldsymbol{\mu}\cdot\mathbf{B} > 0$, the atoms are in a high-field-seeking-state and they get trapped at the surface of the current carrying wire in the 'Kepler' guide. On the other hand, those atoms with $\boldsymbol{\mu}\cdot\mathbf{B} < 0$ are in a low-field-seeking-state and they get trapped to the line/tube near the current carrying wire in the 'side' guide.

In the experiments carried out by Denschlag *et al.*[5], nearly a million cold