# Scientific News

**-NEW APPLIED MECHANICS STUDY RESULTS REPORTED FROM D. HASANYAN ET AL**
/JULY 22/Science Letter/
According to a study from Yerevan, Armenia, "The problem of elastic stress and magnetic field concentration near the vertex of a compound wedge is modeled and investigated. The wedge is made of two isotropic dielectric soft-ferromagnetic materials and is immersed in a static magnetic field."
"The technique of eigenfunction series expansion is applied on the components of the elastic displacement field and the induced magnetic potentials near the vertex. It is shown that in this region, the magnetic susceptibility and the applied magnetic field have a strong influence on the elastic stress and magnetic field concentration," wrote D. Hasanyan and colleagues (see also Applied Mechanics). The researchers concluded: "The results are instrumental toward actively controlling the stress concentration intensity via the applied magnetic field."
Hasanyan and colleagues published the results of their research in the Journal of Applied Mechanics - Transactions of the ASME (Elastic stress and magnetic field concentration near the vertex of a soft-ferromagnetic 2D compound wedge. Journal of Applied Mechanics - Transactions of the ASME, 2008;75(4):41013).
For additional information, contact D. Hasanyan, National Academy Science Armenia, Institute Mech, Yerevan 0019, Armenia. The publisher of the Journal of Applied Mechanics - Transactions of the ASME can be contacted at: ASME-American Society Mechanical Eng, Three Park Avenue, New York, NY10016-5990, USA.

**-NUCLEAR PHYSICS; REPORTS OUTLINE NUCLEAR PHYSICS STUDY FINDINGS FROM A.S. GEVORKYAN AND COLLEAGUES**
/JULY 22/Science Letter/
According to a study from Yerevan, Armenia, "A new microirreversible 3D theory of quantum multichannel scattering in the three-body system is developed. The quantum approach is constructed on the generating trajectory tubes which allow taking into account influence of classical nonintegrability of the dynamical quantum system."
"When the volume of classical chaos in phase space is larger than the quantum cell in the corresponding quantum system, quantum chaos is generated. The probability of quantum transitions is constructed for this case," wrote A.S. Gevorkyan and colleagues (see also Nuclear Physics). The researchers concluded: "The collinear collision of the Li + (FH) -- > (LiF) + H system is used for numerical illustration of a system generating quantum (wave) chaos."
Gevorkyan and colleagues published their study in Physics of Atomic Nuclei (Regular and chaotic quantum dynamics in atom-diatom reactive collisions. Physics of Atomic Nuclei, 2008;71(5):876-883).

**-NUCLEAR PHYSICS; STUDY RESULTS FROM D.G. ASATRYAN ET AL PROVIDE NEW INSIGHTS INTO NUCLEAR PHYSICS**
/JULY 22/Science Letter/
"A new computational approach to the edge-detection problem, based on the continuous extension of discrete cosine transform (CEDCT) technique is proposed. This technique has some attractive properties, and other things being equal, it has more precise results than the usual discrete Fourier or discrete cosine transforms, especially at the intermediate points," scientists writing in the journal Physics of Atomic Nuclei report (see also Nuclear Physics).
"That is why this technique allows one to estimate numerically a finite number of a derivatives of a discrete set of multidimensional points, using

some specified properties of CEDCT. Because of using the spectrum of a given set of points, this approach is applicable to a wide area of signal- and image-processing problems. The results obtained by the proposed approach are compared with the well-known and widely used Canny algorithm," wrote D.G. Asatryan and colleagues. The researchers concluded: "Some 1D and 2D numerical examples are given."
Asatryan and colleagues published their study in Physics of Atomic Nuclei (Edge-detection algorithm based on DCT continuous extension technique. Physics of Atomic Nuclei, 2008;71(5):795-799).

**= GLASS SCIENCE; REPORTS FROM R.M. HOVHANNISYAN ET AL HIGHLIGHT RECENT RESEARCH IN GLASS SCIENCE**

/JULY 22/Science Letter/
According to recent research from Yerevan, Armenia, "An insufficient level of investigations on barium titanium borate system both in crystalline and in glassy states has stimulated the present research. The phase diagram of the ternary BaO-TiO2-B2O3, system have been constructed revealing six ternary eutectic and seven peritectic compositions in the ternary system and two new binary eutectic compositions in the BaO-B2O3 corrected system." The phase diagram in the pseudo-binary barium borate-barium titanate system is revised. The new crystalline 2BaO.TiO2.B2O3 compound is revealed at the same glass composition crystallisation. It melted incongruently at 940 degrees C with the formation of melt and barium titanate. The x-ray characteristics of 2BaO.TiO2B2O3 are reported. It has orthorhombic or tetragonal crystal symmetry and lattice constants (A): a-11.84, b-9.64, c-18.24, Z=21. The influence of various methods of melt casting on the glass forming ability in the ternary BaO-TiO2-B2O3 system is investigated. The expanded glass formation area changes from stable glass forming barium tetraborate up to binary dibarium borate and tip to barium dititanate," wrote R.M. Hovhannisyan and colleagues (see also Glass Science).
The researchers concluded: "A clear correlation between glass forming ability and eutectic areas is revealed in the investigated system."
Hovhannisyan and colleagues published their study in Physics and Chemistry of Glasses - European Journal of Glass Science and Technology Part B (Mutual influence of barium borates, titanates and borontitanates on phase diagram and glass formation in the BaO-TiO2-B2O3 system. Physics and Chemistry of Glasses – European Journal of Glass Science and Technology Part B, 2008;49(2):63-67).
For additional information, contact R.M. Hovhannisyan, Institute Materials Science Agh, 17 Charents St., Yerevan 375025, Armenia.
Publisher contact information for the Physics and Chemistry of Glasses - European Journal of Glass Science and Technology Part B is: Society Glass Technology, Unit 9, Twelve O Clock Court, 21 Attercliffe Rd., Sheffield S4 7WW, S Yorkshire, England.

**- NUCLEAR PHYSICS; DATA ON NUCLEAR PHYSICS REPORTED BY RESEARCHERS AT YEREVAN STATE UNIVERSITY**

/JULY 22/Science Letter/
"We develop a variational many-body approach within a second quantized formulation for a few-electron system in a parabolic two-dimensional quantum dot (QD). By way of application, the nature of the ground state of a two-electron system in a parabolic QD in a broad range of magnetic fields is theoretically investigated," researchers in Yerevan, Armenia report (see also Nuclear Physics).
"Various phase transitions on the basis of the resulting analytical expressions for energy of the system have been investigated: First, the well-known transition from a maximum density droplet to a Wigner phase in a magnetic field is obtained, provided that the QD is in conditions of weak confinement. Furthermore, in the case of relatively strong QD confinement and weak magnetic fields, a rotationally symmetric spin-singlet state is

the ground state of the system. However, in a strong magnetic field and for the same QD confinement, a broken-symmetry spin-singlet state appears to be energetically favored over the symmetric spin-singlet state," wrote A.A. Avetisyan and colleagues, Yerevan State University.
The researchers concluded: "A first investigation of such a broken-symmetry spin-singlet phase in a QD in a magnetic field is shown to be an important application of the proposed technique."
Avetisyan and colleagues published their study in Physics of Atomic Nuclei (Phase transitions in a few-electron quantum dot in a magnetic field: Wigner phases and broken-symmetry spin-singlet states. Physics of Atomic Nuclei, 2008;71(5):800-806).
For additional information, contact A.A. Avetisyan, Yerevan State University, Dept. of Physics, Yerevan 375049, Armenia.

**- PHARMACEUTICAL RESEARCH; RESEARCHERS AT YEREVAN STATE UNIVERSITY RELEASE NEW DATA ON PHARMACEUTICAL RESEARCH**

/JULY 22/Drug Law Weekly/
According to recent research published in the International Journal of Pharmaceutics, "The effect of dimethyl sulfoxide (DMSO) and its nearest homologue diethyl sulfoxide (DESO) as a polar cosolvents on the binding of vitamin E to water+ DMSO (DESO) containing reversed micelles of sodium bis(2-ethylhexyl) sulf6succinate (AOT) has been investigated by a spectrophotometric method."
"The results suggest that compare with water without organic cosolvent-containing reversed micelles in this case an increase of binding constant of vitamin E in reversed micelles takes place," wrote S.A. Markarian and colleagues, Yerevan State University (see also Pharmaceutical Research).
The researchers concluded: "The results obtained shown that with the addition of DMSO and DESO it will be possible to monitoring a penetration of vitamin E into micellar core."
Markarian and colleagues published their study in International Journal of Pharmaceutics (The spectrophotometric study of the binding of vitamin E to water plus dimethyl sulfoxide and water plus diethyl sulfoxide containing reversed micelles. International Journal of Pharmaceutics, 2008;353(1-2):52-55).

**- LASER PHYSICS: STUDY RESULTS FROM A. SARGSYAN ET AL PROVIDE NEW INSIGHTS INTO LASER PHYSICS**

/JULY 29/Science Letter/
According to recent research published in the journal Laser Physics, "It is demonstrated that the velocity-selective optical pumping/saturation resonances of the reduced absorption in a Rb vapor nanocell with thickness L = lambda, 2 lambda, and 3 lambda (resonant wavelength lambda = 780 nm) allow for the complete elimination of crossover (CO) resonances. We observe well-pronounced resonances corresponding to the F-g = 3 & rarr; F (e) = 2, 3, and 4 hyperfine transitions of the Rb-85 D-2 line with line widths close to the natural width."
"A small CO resonance located midway between F-g = 3 & rarr; F-e = 3 and F-g = 3 & rarr; F-e = 4 transitions appears only for L>= 4 lambda. The D-2 line (lambda = 852 nm) in a Cs nanocell exhibits a similar behavior," wrote A. Sargsyan and colleagues (see also Laser Physics).
The researchers concluded: "From the amplitude ratio of the CO and VSOP resonances, it is possible to determine the thickness of the column of alkali vapor in the range of 1-1000 mu m. The absence of the CO resonances for nanocells with L similar to lambda is attractive for the frequency reference application and for studying the transitions between the Zeeman sublevels in external magnetic fields."
Sargsyan and colleagues published their study in Laser Physics (Saturated absorption spectroscopy: Elimination of crossover resonances with the use of a nanocell. Laser Physics, 2008;18(6):749-755).
For additional information, contact A. Sargsyan, National Academy Science Armenia, Institute Physics Research, Ashtarak 0203, Armenia.