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Characterization of Phase Transitions in Vanadium Deuterides

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distribution of free charge on one-dimensional, finite conductors. In particular, a system of two such conductors possessing equal but opposite charge can be used to model the cross section of a parallel plate capacitor. The free charge distribution on the plates has been studied as a function of plate separation. Using the procedure of Merrill¹, the electric field between and around the edges of the plates has been mapped out and compared to that produced by a uniform charge distribution.

¹J.R. Merrill, Am. J. Phys. **39**, 791 (1971).

C3 Energy Policy Development: A Systems Dynamics Approach. * THOMAS B. COBB and DOUGLAS P. SAINTIGNON, Bowling Green State Univ.--A system dynamics simulation procedure first described by Kane, (1) has been applied to the problem of energy policy development and impact analysis for several communities in northwest Ohio. The simulation procedure, which describes the dynamical development of a system of social variables, is compared with the Lagrangian procedure for solving physical problems, and a computer procedure suitable for analyzing and presenting the results is described. Proposed policies are treated as constraints on a pre-defined system of interacting social variables whose evolution over time is followed and displayed graphically. Initial values and an expected range for each social variable are estimated and defined in terms of current social conditions. The system evolution over time is followed both with and without policy intervention, and the resulting "trajectories" for the social variables are then compared to gain insight into the potential impact of the proposed policies.

*Supported in part by the U.S. Office of Education through Grant #6007804980.

(1) J. Kane, Techn. Forecasting and Social Change **4**, 129 (1972).

C4 A Classroom Energy Demonstration. JOSEPH PRIEST and GEORGE PIERCE, Miami University, Oxford, OH. Illustrating physics principles is an important aspect of teaching energy concepts. Demonstrations involving students in a classroom setting can be especially effective. An automobile alternator coupled to a bicycle pumped by a student allows the participant to sense work being done when electric energy is generated. Using the same apparatus in a laboratory setting students can verify the dependence of output voltage on alternator rotational speed. The quantitative relationship shows the student how the generator principle is used in a tachometer. Construction of the apparatus, experimental results, and student reactions are presented.

C5 Effective Mass in Sports. DAVID F. GRIFFING, Miami University.--When an athlete uses a bat, club or racket to strike a ball the colliding objects may not constitute an isolated system. The athlete may influence the impact. To account for this possible influence it is useful to introduce an effective mass for the athlete - striker system. This effective mass may be larger or smaller than the striker mass. Illustrations from baseball, tennis and golf will be discussed.

Optical Bistability at a Nonlinear Interface with Surface Plasmons. * GARY WYSIN, Univ. of Toledo--It has recently been demonstrated¹ that near grazing incidence at the boundary between a linear glass medium and a nonlinear (Kerr effect) medium the reflection coefficient exhibits hysteresis of 20% as a function of incident optical intensity. We theoretically examine bistable operation in reflection with simultaneous excitation of the surface plasmon mode in a prism,

metal film, nonlinear medium geometry (Kretschmann configuration). Near the angle of incidence for surface plasmon excitation we find the onset of bistable operation may occur for an incident power an order of magnitude below that required previously. Furthermore, the change in reflectivity as the incident power is reduced below threshold can be a factor of ten. Hysteresis curves for a silver film with CS₂ at angles of incidence near the surface plasmon angle and for visible and near infrared wavelengths will be displayed.

*Submitted by H. J. Simon

¹P.W. Smith et al, Phys. Lett. **35**, 846 (1979).

C7 Characterization of Phase Transitions in Vanadium Deuterides. R. L. TOBER and G. BAMBAKIDIS, Wright State University. * -- Resistivity and differential scanning calorimetry were used to locate transition points on the V D_x phase diagram for x in the range 0.5 to 0.8 and for temperatures ranging from 100 K to 300 K. From the resistivity data, the character of the $\gamma \leftrightarrow \delta$ transition near 150 K at the stoichiometric composition V₄D₃ was determined. The $\gamma \leftrightarrow \delta$ transition temperature at this composition was also found from X-ray diffraction measurements of the lattice parameters of the orthorhombic vanadium lattice.

*Supported by the U.S. Department of Energy through the Research Participation Program of Monsanto Research Corporation-Mound Facility, under contract No. DE-AC04-76-DP00053.

C8 Constraints on Lepton Numbers in Big Bang Nucleosynthesis. R.G. Tabak, Youngstown State University.--Predictions of the abundances of light elements produced in the Big Bang using the Standard Model of the Universe agree quite well with observation. This appears to indicate that the Universe is open. However, recent discoveries of both a theoretical and observational nature demonstrate that the mass density of the Universe may be greater than previously expected. This would require modification of the Standard Model, one of the most plausible being the addition of neutrino degeneracy. Using the constraints that $\Omega_0 \sim 1$ and that the age of the Universe is between $10 - 20 \times 10^9$ yrs., I have obtained the following ranges of values for the electron and muon numbers, respectively: $-4.4 \times 10^{-2} \lesssim L_e \lesssim 0.439$ and $6.6 \lesssim |L_\mu| \lesssim 170$. This enables one to predict that $6.7 \times 10^{-6} \lesssim \text{He}/\text{H} \lesssim 1.5 \times 10^{-5}$ and $6 \times 10^{-11} \lesssim \text{Li}/\text{H} \lesssim 2 \times 10^{-9}$. These values agree with the observed abundances of these elements.

* Submitted by Stephen Hanzely

C9 Note on the P-state Charmed Mesons - Especially the Charmed 1⁺-mesons. J. S. RNO, U OF CINCINNATI, and S. ONEDA, U OF MARYLAND.--The mass spectrum and hadronic decays of the P-state charmed mesons are investigated. A particular attention is paid to the existence of a large mixing between the two charmed P-wave 1⁺-mesons, called R and R', similar to the one observed in the Q-meson system. A simple quadratic mass formula $R^2 - A_1^2 = R'^2 - B^2$ or $R^2 - Q_1^2(1280) = R'^2 - Q_2^2(1400)$ is obtained. Two distinct mass spectra of the R and R', together with their distinct decay characteristics, are found possible. The theoretical framework used is a purely algebraic one which extracts information from the various asymptotic realizations of chiral SU(4) x SU(4) charge algebra.