1010-93-47 **David L. Russell*** (russell@math.vt.edu), Dept. Math. 460 McBryde Hall, Virginia Tech, Blacksburg, VA 24061. *Control of Nonlinear Elastic Systems.*

Let us consider an elastic body which, in equilibrium, occupies a region $R_0 \subset R^m$, where, typically, $m = 2$ or 3. Departure from equilibrium is expressed in terms of a displacement vector $\Xi(X)$, $X \in R_0$; the elastic strains are then expressed in terms of the symmetrized Jacobian matrix $E(X) = \nabla\Xi + (\nabla\Xi)^*$ and the corresponding reactive stress is given by $-\Sigma(E)$ where the *stress operator* Σ is a linear, positive, trace-symmetric matrix operator. As such Σ has a trace-orthonormal basis of symmetric eigenmatrices P_k and positive eigenvalues λ_k. The potential energy is then $\frac{1}{2}\sum_k \lambda_k \ (\mathrm{Tr}\ P_k E)^2$.

Our purpose in this talk is to explore the use of nonlinear constitutive laws obtained from adding quartic terms $\epsilon_k \ (\mathrm{Tr}\ P_k E)^4$ to each of the quadratic terms in the elastic potential energy shown above. We indicate the effect of incorporating those terms and explore implications for both static and time-evolutionary systems. (Received August 10, 2005)