Structural Engineering Seminar Series

CEE 595 S

Nonlinear Mechanics of Accretion

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Abstract:

We formulate a geometric nonlinear theory of the mechanics of accretion (surface growth). In this theory the natural configuration (material manifold) of an accreting body is represented by a time-dependent Riemannian manifold with a time-independent metric that at each point depends on the state of deformation at that point at its time of attachment to the body, and on the way the new material is added to the body. We discuss the incompatibilities and residual stresses induced by accretion. Balance laws are discussed and the initial-boundary value problem of accretion is formulated. The particular cases where the growth surface is either fixed or traction-free are studied and some analytical results are provided. We numerically solve several accretion problems and calculate the residual stresses in nonlinear elastic bodies induced from accretion. The coupling of accretion mechanics and thermoelasticity is also discussed.

Bio:

Dr. Arash Yavari is a Professor in the School of Civil and Environmental Engineering with a courtesy appointment in the George W. Woodruff School of Mechanical Engineering. He has a B.S. in Civil Engineering from Sharif University of Technology, Iran, an M.S. in Mechanical Engineering from the George Washington University, and a Ph.D. in Mechanical Engineering (minor in Mathematics) from the California Institute of Technology. His research focuses on geometric mechanics, nonlinear elasticity and anelasticity, and computational solid mechanics. He has been funded by the Army Research Office (ARO), Air Force Office of Scientific Research (AFOSR), the National Science Foundation (NSF), and King Abdullah University of Science and Technology (KAUST). He is a Fellow of the Society of Engineering Science (SES), and the recipient of the 2010 AFOSR Young Investigator Program Award.

Monday, September 30th, 2019   4:00 – 5:00 p.m.

1310 Yeh Student Center