

Timoshenko Medal



Zdeněk P. Bažant

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For major lifetime achievements in solid mechanics, encompassing stability of three-dimensional bodies and structures undergoing damage, fracture, size effect laws for quasibrittle failure, probabilistic mechanics, damage nonlocality, micromechanics, microplane constitutive model, and creep and hygrothermal effects in nano-porous multiphase materials

Professor Zdeněk P. Bažant was born and educated in Prague (Ph.D. 1963). He joined Northwestern University in 1969, became Professor in 1973, and served as Director of Center for Geomaterials (1981-87). He was inducted to the National Academy of Sciences, National Academy of Engineering, American Academy of Arts and Sciences, Austrian Academy of Sciences, Italian National Academy (dei Lincei), Spanish Royal Academy of Sciences, Istituto Lombardo, and Engineering Academy of Czech Republic.

Bažant was Editor of ASCE Journal of Engineering Mechanics, president of Society of Engineering Science, founding president of IA-FRANCOS and of IA-CONCREEP, and Division Director in IA-SMiRT. He is Illinois Registered Structural Engineer and Regional Editor of International Journal of Fracture; served on US National Committee on Theoretical and Applied Mechanics. Among his honors: Six honorary doctorates (CTU Prague, TU Karlsruhe, UC Boulder, Politecnico di Milano, INSA Lyon, TU Vienna); Honorary Member ASCE; SES Prager Medal; ASME Warner Medal and Nadai Medal; ASCE von Kármán Medal and Newmark Medal; American Ceramic Society Roy Award; RILEM L'Hermite Medal; Exner Medal, Austria; and other honors; and Guggenheim and other fellowships. He published six books (Scaling of Structural Strength, Inelastic Analysis, Fracture and Size Effect, Stability of Structures, Concrete at High Temperature, and Concrete Creep).

Bažant resolved decades of polemics by showing correlations among various objective stress rates and the corresponding stability criteria for three-dimensional bodies (1971); discovered and experimentally verified the size effect law for quasibrittle failures (1983), its relation to cohesive fracture characteristics (1991), its loading-rate dependence and use in identifying these characteristics from experiments, standardized by RILEM (1991); introduced nonlocality and crack-band model for mesh-insensitive predictions of softening material damage (1984) and for assessing failure probability of quasibrittle structures (1991); provided micromechanical explanation of damage nonlocality; found size-dependence of Paris law for cyclic quasibrittle fracture growth (1992); discovered softening-hardening reversal upon sudden loading rate increase (1995); conceived the microplane constitutive model (1983); developed an atomistically based finite weakest-link model for probability distribution of quasibrittle structure strength and its size dependence (2005); formulated thermodynamic criteria for stability of inelastic post-bifurcation path (1989), for frictional constitutive laws (1991) and for localization instabilities in variously shaped domains (1993); solved the three-dimensional singularity at oblique crack-edge/surface intersections (1979); invented the exponential algorithm (1971) and age-adjusted effective modulus (1972) for aging viscoelastic analysis of concrete structures (1972); elucidated via surface adsorption thermodynamics the drying-creep effect in cement gel as multiphase nano-porous material (1972); discovered and modeled new phenomena in moisture diffusion through the nano-pores of unsaturated (1972) or heated (1979) concrete; etc. Bažant's ground-breaking results found wide applications in structural analysis of fiber composites, sandwich structures, concrete structures, rocks and soils, nuclear containment safety, arctic ice movements and capacity, borehole stability, avalanche triggering, missile penetration simulations, etc.

The Timoshenko Medal was established in 1957 and is conferred in recognition of distinguished contributions to the field of applied mechanics. Instituted by the Applied Mechanics Division, it honors Stephen P. Timoshenko, world-renowned authority in the field, and it commemorates his contributions as author and teacher.