# SCALING OF FRACTURE STRENGTH IN DISORDERED QUASI-BRITTLE MATERIALS[1]

**Phani Kumar V.V. Nukala**[a] and **Srdan Simunovic**[b]

[a]Computer Science and Mathematics Division
Oak Ridge National Laboratory
Oak Ridge, TN 37831-6359
nukalapk@ornl.gov

[b]Computer Science and Mathematics Division
Oak Ridge National Laboratory
Oak Ridge, TN 37831-6359
simunovics@ornl.gov

For materials with *broadly distributed* microscopic heterogneities, the fracture strength distribution corresponding to the peak load of the material response does not follow the commonly used Weibull and (modified) Gumbel distributions. Instead, a *lognormal* distribution represents the fracture strength of the macroscopic system more adequately than the conventional Weibull and (modified) Gumbel distributions. Lognormal distribution arises naturally as a consequence of multiplicative breaking process, in which large number of random distributions that represent the individual conditional probabilities of breaking of bonds leading up to the peak load, are multiplied to give the failure probability of the lattice system. Numerical simulations based on two-dimensional triangular and diamond lattice topologies with increasing system sizes substantiate that a *lognormal* distribution represents an excellent fit for the fracture strength distribution at the peak load. The second significant result of the present study is that, in materials with broadly distributed microscopic heterogeneities, the mean fracture strength of the lattice system behaves as $\mu_f = \frac{\mu_f^\star}{(LogL)^\psi} + \frac{c}{L}$, and scales as $\mu_f \approx \frac{1}{(LogL)^\psi}$ as the lattice system size, $L$, approaches infinity. This result is in agreement with the finite size scaling laws derived using the renormalization group (RG) methodology as the system approaches critical behavior.

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