Anil Misra is currently a Professor at the University of Kansas, Lawrence. He previously served as a faculty member at the University of Missouri-Kansas City. He received his bachelor’s degree in civil engineering from the Indian Institute of Technology, Kanpur, India in 1985, and his M.S. and Ph.D. degrees from the University of Massachusetts at Amherst in 1988 and 1991, respectively. His broad research interest span topics covering basic and applied aspects of engineering mechanics, materials engineering and geo- and bio-mechanics. His primary research has been in the micro-mechanics of granular materials. He has pioneered the method of granular micromechanics with which he seeks to develop generalized continuum model of a range of granular materials and materials with granular texture, including geomaterials, biomaterials, polymers, and architectured/metamaterials. His research into granular materials began in his graduate studies wherein his Ph.D. dissertation dealt with method to treat the effect of non-affine motions in random grain packings on their macro-scale behavior. This early work formed the foundation of his desire to develop methods that can capture the impact of micro-scale in materials of complex microstructures; structures that occur over a range of spatial scales, are too numerous to characterize and are largely inaccessible through purely experimental techniques. This research has resulted in development of several novel and alternative concepts cutting across analytical, computer simulation and experimental methods.

In an innovative experimental work performed in early 1990s, he measured grain displacements and grain spins in 2D grain packing published in

These measurements showed that displacement fluctuations in these materials organize spatially into finite sized clusters, typically, spanning a few grains. The work remained one-of-a-kind till revisited in 2012 as noted in Richefeu et al. (2012) Geotechnique Letters 2, 113–118.

In more recent works on granular materials he has engaged in micro-macro correlations termed by him as “granular micromechanics”. He has applied this approach to develop governing equations, and constitutive relationships for rocks, concrete, soils, asphalt concrete, biological materials, polymers and rock fractures including derivations of higher-order continuum mechanics theories from discrete (particulate/atomistic) descriptions. Among these works are the thermomechanical derivation of rate-dependent damage and plasticity constitutive relations.

These derivations present some interesting findings with respect to relationship of Cauchy stress and grain-pair forces in granular systems.

To address problems of interest to engineering practice, the derived constitutive relations have been applied to failure of concrete/ cementitious materials and for analysis of permanent deformations of asphalt pavements, see for example


Interesting extensions of the “granular micromechanics” homogenization is its application to the derivation of micromorphic model of granular materials which includes the effect of grain spins, discussed in publications such as


Many of his works are pioneering and among first forays into the subject matter. Worthwhile to mention along these lines is the study of failure behavior of single crystals from first principle atomistic simulation. It was which shows interesting local deformation


Although, the atomic system and granular system described above may seem distant from each other, they clearly show that for their continuum modeling similar considerations need to be applied to account for the micro-deformations (or inner motions) of a volume element or a continuum material point. As another example he introduced in an early paper contact orientation as an additional measure of roughness in contact mechanics of rough solids, an aspect which was derived in a more recent paper by considering contact of gaussian rough surfaces

In an experimental innovation Misra along with his research collaborators introduced the concept of ‘homotopic’ measurements to address the data interpretation from non-destructive high-resolution location-dependent complementary measurement of physical, chemical and mechanical properties. See publications


He has a deep interest in interdisciplinary research at the intersection of mechanics and material science motivated by the principle that the fusion of knowledge from traditionally separated disciplines will lead to creative approaches for solving problems. His ability to reach out across disciplines meaningfully is attested by his having co-authored with researchers in material physics, dental materials, polymer chemists, see for example works below that introduce new ideas or collect state-of-the-art works:


His ability to transcend basic and applied research is clear. He has collaborated with geotechnical engineers (field of his training in graduate school) to solve problem of uncertainty in the design of deep foundation, and the application of coal combustion products to soil stabilization for which he earned a partnership award from the United States Environmental Protection Agency. He has been a key component of many other successful collaborative engagements. His accomplishments can be seen at his website http://people.ku.edu/~amisra/.

For all exposed reasons the committee, entrusted by the Scientific Committee of the International Research Center MEMOCS with the responsibility of awarding the International Eugenio Beltrami Prize unanimously proposes Professor Anil Misra as recipient of the 2017 edition.