

Laudatio for Christoph Ortner

John Todd Award 2016 in Numerical Analysis

Christoph Ortner has made seminal contributions to the numerical analysis of several multiscale problems in materials science. His work has introduced a mathematical structure and numerical analysis for atomistic-to-continuum and quantum-to-molecular mechanics coupling methods that has elucidated the accuracy and efficiency of currently used variants in the materials science and engineering communities and the development of more accurate and efficient schemes.

Christoph Ortner's contributions include

1. a functional analytic framework for a nonlinear error analysis of atomistic-to-continuum and quantum-to molecular mechanics coupling methods.
2. the first error estimates in two and three dimensions for the approximation of point and line defects modeled by general many-body potentials.
3. the construction and analysis of quasi-optimal blended and ghost force correction atomistic-to-continuum methods.
4. the development of definitive computational benchmark comparisons of atomistic-to-continuum and quantum-to molecular mechanics coupling methods with theoretical predictions.
5. the establishment of an error analysis of far-field boundary conditions for atomistic simulations of crystal defects.

Christoph Ortner's fruitful interactions with a variety of mathematicians and scientists, both senior and junior, have already made him one of the leaders who are setting the research agenda in the emerging field of multiscale computational mathematics.