ENGINEERING SCIENCES & APPLIED MATH--FEATURED SPEAKER

Optimal Form and Function

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Networks are ubiquitous in biological and engineered systems: The vasculature of plants and animals transports nutrients, power grids supply consumers with electrical energy, mechanical networks are a basic building block for modern metamaterials. To provide the most efficient functionality both in terms of evolutionary fitness and engineering demands, optimality plays a crucial role in natural and human-made network design. Using specific examples I show how the mathematics of optimality can be used as a guiding principle to answer basic questions about how natural and artificial networks can operate efficiently and robustly, the connection between biological development and function, the fundamental limits that functional networks are subject to, and how to use these insights to develop new design principles for networked materials.