

Baylor Undergraduate Lecture Series  
in  
**Mathematics**  
Twelfth Annual Lectures



**Professor Douglas Arnold**  
McKnight Presidential Professor of Mathematics  
University of Minnesota

**Public Lecture**  
**Computational Mathematics Simulating The World**  
Thursday, December 5, 2019 4:00 pm  
Baylor Sciences Building D110

In the late 20th century science underwent a revolution as computational science emerged as the third mode of scientific exploration alongside experiment and theory. Computer simulation of physical reality has played an equally transformative role in virtually all areas of technology, affecting many aspects of modern life. We now depend on simulation to design, predict, and optimize natural and engineered systems of all sorts, ranging from mechanical to chemical to electronic, and at scales ranging from atomic to terrestrial to cosmological. Mathematical algorithms have been crucial to these advances, even more so than advances in computer technology. In this talk we will encounter some of the mathematical ideas that have emerged and the ongoing challenges facing computational mathematics in simulating the world.

**Colloquium Lecture:**  
**Finite Element Exterior Calculus**  
Friday, December 6, 2019 4:00 pm  
Marrs McLean Science Building MMSCI 301

Finite element exterior calculus, or FEEC, is a prime example of a structure-preserving discretization method, in which key mathematical structures of the continuous problem are exactly captured at the discrete level. In the case of FEEC these structures arise from differential complexes and their cohomology, and FEEC applies geometry, topology, and analysis in order to design and analyze stable and accurate numerical methods for the differential equations related to the complexes. We will present an accessible overview of FEEC and some of its applications.