1077-68-1657 **Patricia D. Hough*** (pdhough@sandia.gov). *Simulation-Based Optimization and Uncertainty Quantification Methods and Software at Sandia National Labs.*

Many questions arise regarding the design and performance of engineered systems. Time and resource constraints make it impossible to conduct the number of physical experiments needed to fully understand multiple designs or all possible operating conditions. Therefore, physics-based modeling and simulation are used to perform much of the required analysis. I will give a very brief introduction to how computational mathematics supports these simulation efforts and then discuss in more detail the roles of nonlinear optimization and uncertainty quantification in conducting advanced simulation-based analysis. I will describe some of the methods we have developed as well as the software framework through which they are deployed. Finally, I will give some examples of our experiences and lessons learned applying these methods to engineering problems at the lab. (Received September 20, 2011)