

# Workshop on Exploiting Advanced Manufacturing Capabilities: Topology Optimization in Design



**November 19, 2019**

National Academy of Sciences Building, Room 125  
2101 Constitution Ave., N.W., Washington, D.C 20418

8:00 Breakfast available in the Cafeteria

8:30 Welcome, Objectives, Introductions all around – CHAIR **Haydn Wadley**

8:45 Keynote Speaker **Ole Sigmund**, DTU Technical University of Denmark

**Introduction by: Dianne Chong**

## **Topic 1: Topology Optimization and Advanced Manufacturing Technologies**

**Introductions by: Bill King Q&A by: Katherine Faber**

*Topology optimization focuses on the function of a material or structure, but the manufacture of the material or structure is rarely considered as part of the optimization. In practice, this results in designs that are theoretically optimal but that could never be realized. This topic considers how topology optimization can incorporate manufacturability along with functional design. We ask: What new methods are required to simultaneously optimize a design and its manufacture; What new manufacturing technologies are enabled by doing so; and What are the step change improvements that can be created in the underlying manufacturing technologies?*

9:35 Speaker **James Guest**, Johns Hopkins University

10:05 Break

10:25 Speaker **Chris Spadaccini**, Lawrence Livermore National Laboratory

10:55 Speaker **Matt Begley**, UC Santa Barbara

11:25 Lunch

**12:25 Panel Discussion on *The Emerging Synergy between Topology Optimization, Manufacturing, and Materials***

**Introductions by: Katherine Faber Q&A by: Bill King**

Panelists: **Claus Pedersen**, Dassault Systèmes Simulia Corp

Panelists: **Mark Shaw**, GE

Panelists: **Francesco Iorio**, Augmenta AI

## **Topic 2: Topology Optimization and Multi-Physics**

**Introductions by: Carlos Levi Q&A by: Angus Kingon**

*Most topology optimizers consider a single physical domain, for example stress-strain analysis for structural design, or electromagnetic analysis for photonic crystal design. This topic considers challenges and opportunities that combine multiple physical processes. For example: How might we create an optimal design for both mechanical properties along with fluid-structure interactions; or how might we create an optimal design for a chemically reacting flow in the presence of a distributed catalyst? The session will discuss the methods required for multi-functional topology optimization and the software intelligence required to search these design spaces.*

1:45 Speaker **Graeme Milton**, University of Utah,

2:15 Speaker **Ryan Watkins**, NASA Jet Propulsion Laboratory (JPL)

2:45 Break

3:00 Speaker **Reinhard Radermacher**, University of Maryland

**3:30 Panel Discussion on Topology Optimization and Multi-Materials**

**Introductions by: Angus Kingon Q&A by: Carlos Levi**

Panelists: **Kimberly Saviers**, United Technologies Research Center (UTRC)

Panelists: **Alicia Kim**, University of California San Diego

Panelists: **Rebecca Dylla-Spears**, Lawrence Livermore National Laboratory

4:50 Wrap up and final comments

5:00 Adjourn meeting day 1

**November 20, 2019**

National Academy of Sciences Building, Room 125  
2101 Constitution Ave., N.W., Washington, D.C 20418

**8:00 Breakfast in the Cafeteria**

**8:30 Welcome, plans for today – CHAIR Haydn Wadley**

**Introduction by: Ned Thomas**

**8:45 Keynote Speaker Joe DeSimone, Carbon**

**Topic 3: Topology Optimization of Soft Materials and Deformable Structures**

**Introductions by: Frank Zok Q&A by: Ned Thomas**

*Soft and compliant structures could unlock new applications in medicine and bioengineering, wearable structures and devices, and human-machine interfaces. While topology optimization for rigid materials and structures is quite mature, there are a lack of tools and methods for topology optimization of soft or compliant structures, and structures that undergo large deformations as part of their intended function. This topic considers: What are the fundamental challenges for topology optimization of soft structures and how might these be overcome; and for what applications and domains would there transformational new opportunities.*

**9:35 Speaker Brett Compton, University of Tennessee, Knoxville**

**10:05 Break**

**10:25 Speaker Mark O'Masta, HRL Laboratories**

**10:55 Speaker Xiaoyu (Rayne) Zheng, Virginia Tech**

**11:25 Lunch**

**12:25 Panel Discussion on Emerging Materials and Efforts**

**Introductions by: Ned Thomas Q&A by: Frank Zok**

**Panelists: Hardik Kabaria, Carbon**

**Panelists: TBD, TBD**

**Panelists: Ole Sigmund, DTU Technical University of Denmark**

**1:45 Wrap up discussion for the full workshop, Haydn**

**2:30 Adjourn meeting**