

# **UMC Workshop on Computational Materials Education**

## ***An Update***

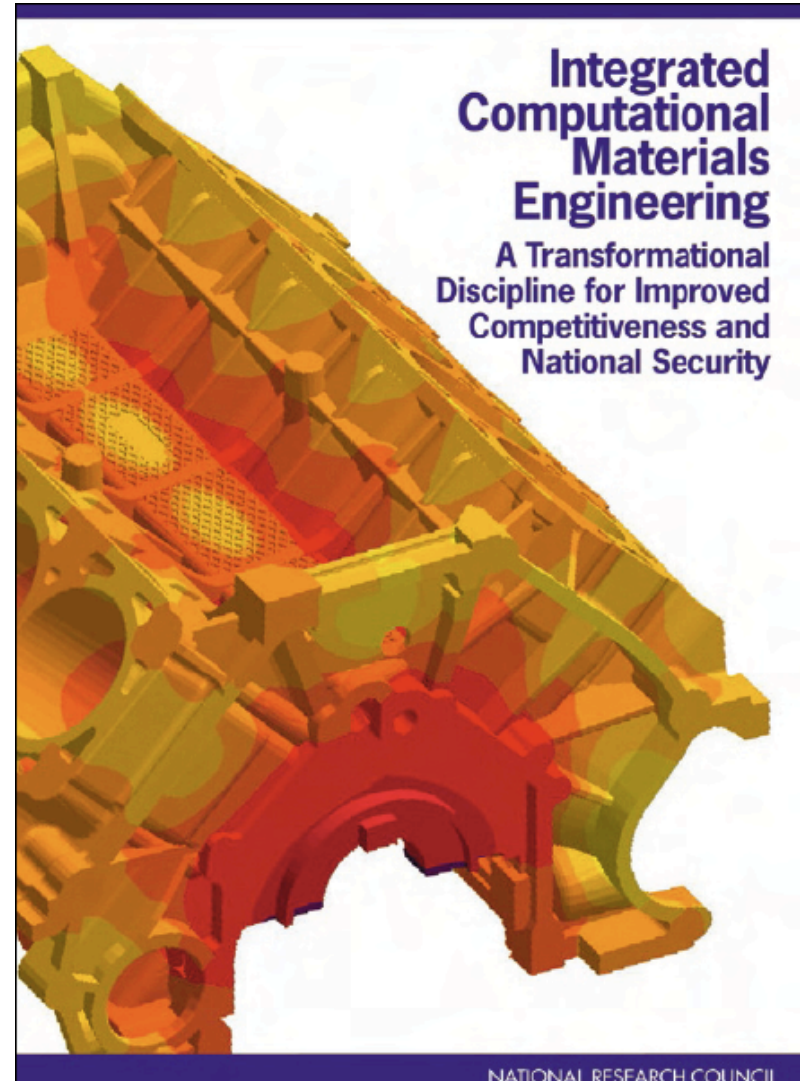
***UMC Meeting  
Boston, Dec 2009***

*Richard LeSar  
Iowa State University*

# Integrated Computational Materials Engineering

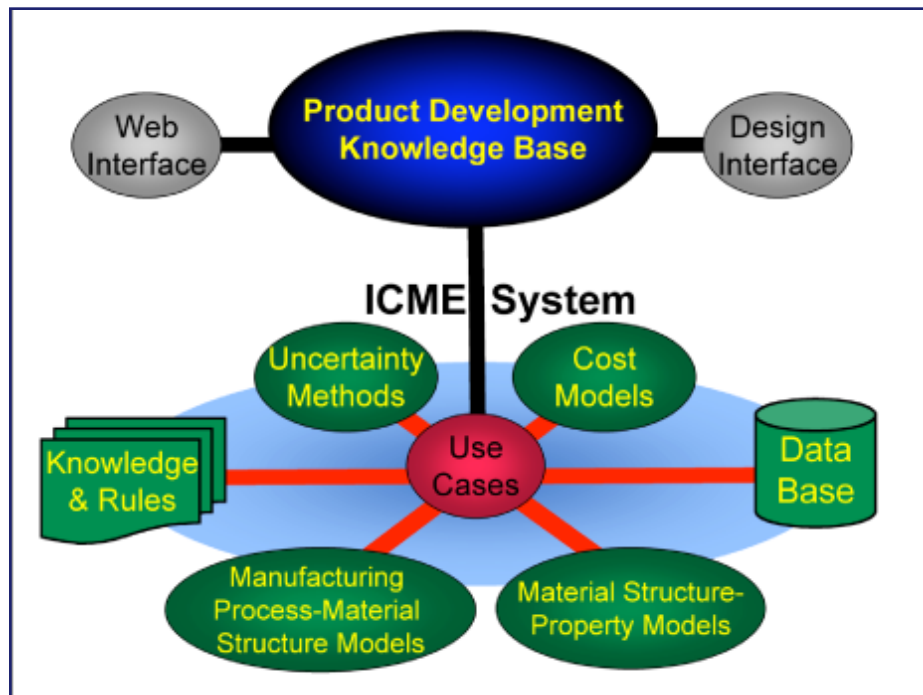
National Research Council  
study sponsored by  
Departments of Defense  
and Energy

*Report published 2008*



# What is ICME?

Integrated Computational Materials Engineering (ICME) is the integration of materials information, captured in computational tools, with engineering product performance analysis and manufacturing-process simulation.



**Emphasis on  
"I" and "E"**

# The Vision

Computationally-driven materials development will be a core activity of materials professionals in the upcoming decades, uniting materials science with materials engineering and integrating materials more holistically and computationally with product development.

# Changing the Role of the Materials Engineer

- A materials engineer on an Integrated Product Development Team (IPDT) is generally used to provide a certified material whose properties match those needed in the design: materials selection not materials design
- Development of new materials is slow and cumbersome so materials are generally not optimized to enable more advanced designs
- ICME offers the chance to optimize materials design and properties along with product design

# Selected Conclusions

- For ICME to succeed, it must be embraced as a discipline by the materials science and engineering community
- Industrial acceptance of ICME is hindered by the scarcity of materials engineers trained to use them.

# Recommendations

Nine recommendations for specific actions by the following organizations for the development, support and national co-ordination of ICME

**DOD, DOE, OSTP, NIST, NSF, University Materials Council (UMC), Industry, Professional Materials Societies**

# Recommendation for the UMC

*“The committee considers that the UMC is in a unique position to influence curricula and change the culture of MSE academic institutions and that it could take an active role in promoting ICME and the curricular changes that support improvements in the computational ability of the students who graduate from their departments.”*



# UMC response

- At the June 2009 UMC meeting in Arlington, VA, we voted to sponsor a workshop
  - how best to teach computational materials within the undergraduate and graduate curricula
- I was asked to chair that meeting
- Organizing committee
  - Peter Voorhees, Northwestern University
  - Susan Sinnott, University of Florida
  - Alejandro Strachan, Purdue University

# UMC workshop

Computational Materials Education

Dates: 23-24 June 2010

Location: Northwestern University

Desired outcome:

a concrete set of suggestions for better incorporation of computational materials in the MSE curriculum

The discussion will be organized around a series of questions.

- What role should computational materials engineering play in our undergraduate and graduate materials curriculum?
- How should computational materials engineering education be integrated into the curriculum?
- What is the status of computational materials engineering education in our curriculum today?
- What are best practices today?
- What resources are currently available?
- Can we develop curriculum aids (instructional materials, code packages, etc.) that could be widely disseminated in the community?
- How can we begin to ally ourselves with our industrial partners to enhance computational materials engineering education?

# Agenda (proposed)

*Tuesday 23 June 2010*

Introduction: Peter Davies

- Briefing on the ICME report: Tresa Pollock (UCSB) (or R. LeSar if needed)
- Status of computational modeling in materials education: Katsuyo Thornton (Michigan) (also brings in the TMS perspective)
- Industrial perspective: John Allison (Ford)
- Available educational resources: Michele Manual, (University of Florida) (runs UF capstone design course and is knowledgeable about integrating computational tools into education).
- Available computational resources: Alejandro Strachan (Purdue)

Vignettes from successful examples:

- Greg Olson, Northwestern
- Mark Lundstrom (Purdue) Not an MSE example but he could describe the efforts of NCN/nanoHUB and what has been learned regarding online simulation in the classroom.
- Others?

# Agenda (proposed)

*Tuesday 23 June 2010 (continued)*

Roundtable to discuss the questions:

- What role should computational materials engineering play in our undergraduate and graduate materials curriculum?
- How should computational materials engineering education be integrated into the curriculum?

Create working groups charged with recommending findings and solutions. The goal is a set of recommendations, and path to implementation, for the community by the end of the workshop.

- We will provide teams with detailed guidelines regarding expected outcomes and how to present them in the report.

Tuesday evening: dinner plus team assignment

# Agenda (proposed)

*Wednesday 24 June 2010*

Working group reports

Roundtable to discuss the questions:

- Can we develop curriculum aids (instructional materials, code packages, etc.) that could be widely disseminated in the community?
- How can we begin to ally ourselves with our industrial partners to enhance computational materials engineering education?

Identification of follow up issues and assignment of teams

- We will provide teams with detailed guidelines regarding expected outcomes and how to present them in the report.

Adjourn

**Questions or suggestions?**