Issues in cyber-based combustion education

An emerging cyber-infrastructure presents combustion education with ...

... **opportunities**

- Wide dissemination of pedagogical tools and resources
- Prompt integration of a breadth of research results into teaching strategies

... the chance and obligation to address certain **challenges**

- Negative and ill-informed perception among the populace
- Negative and ill-informed perception among policymakers
- Possibility of eventual marginalization of the academic community

Issues in cyber-based combustion education

Opportunities

- Wide dissemination of pedagogical tools and resources
  - Web-accessible libraries and databases, and web-based modeling tools
  - Remote, interactive lecturing; remote dissertation committee participation
- Prompt integration of research results into teaching strategies
  - Seminar webcasts (real-time and/or archived)
  - Short publishing lead times; self-publication of results
- Caveats (not unique to education)
  - Need for prompt definitions of standards
  - Difficulty of preserving authorship and ownership of ideas and digital materials
  - Quality control in self-publishing (cf Wikipedia)

Issues in cyber-based combustion education

Challenges

Negative and ill-informed perception among the populace

- Perception that combustion is not 'high technology'
  - Public swayed by PR (cf hybrid vehicles ... basic technology dates back to early submarines)
  - Difficult to draw students to the study of combustion
  - Perception fueled by / reinforces combustion research demographic (e.g. absence of diversity)
- Association of combustion with pollution and environmental degradation
  - Advocacy groups and activity are hostile to combustion
  - No appreciation of potential combustion improvements

Issues in cyber-based combustion education

Challenges

Negative and ill-informed perception among the populace

- Role of a combustion cyber-infrastructure
  - Community needs to address the absence of a natural advocacy constituency outside of the field
  - Community needs to embrace 'superficial' technology advances in presentation, pedagogy
  - Long-term: need to increase public understanding of energy cycle, public ability to assess relative merits of technology critically
  - Useful to incorporate thermal sciences more into secondary school curricula, e.g. via creation of accessible pedagogical materials (demonstrations, course modules etc.)

Issues in cyber-based combustion education

Challenges

Negative and ill-informed perception among policymakers

- Policymakers swayed by advocacy
  - Advocacy attaches to inspirational and well-presented ideas
  - Incremental changes much less resonant than wholesale shifts
  - Revitalized interest in established fields requires new applications or context
- Suggestions for the combustion community
  - Less 'provincial' view of combustion research; emphasizing applications instead of methodology
  - Professional representation before policymakers
  - Involvement in K-12 reform driven by broader engineering community
  - Coherent, optimistic vision

Issues in cyber-based combustion education

Challenges

Possibility of eventual marginalization of academic combustion

- Obsolescence driven by different manifestations of funding realities
  - Diminished research interest: nuclear engineering
  - Proprietary industrial dominance: petroleum engineering
  - Redefinition of interesting problems / applications: chemical engineering
- Role of cyber-infrastructure
  - Facilitates higher levels of collaboration, for efficient allocation of limited resources (e.g. financial, computational)
  - Allows practical exploration of new, computationally-intensive applications; potentially transfers some financial burden to industry
  - Increases agility of research efforts by promoting sharing of results, speeding dissemination and limiting redundant efforts