Workshop Summary

New Directions and Opportunities – Creating the Future

CCR/NSF Discipline Wide Curriculum Workshops

The Path Forward

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Drivers for Change

- The integrative and synthesis skills of our students are poorly developed
- Attributes are not well taught
- Our traditional industry has shifted
  - The nature of jobs for US chemical engineers in the future will be different
- Biology represents a new frontier for us as a discipline
  - Not just an application
- Our close connection with basic science makes our graduates very versatile
  - We have failed to articulate this clearly to our stakeholders
  - We have failed to imbed this in our curriculum
- Separation of research and education
- Our student base is at risk
  - Perception of what we do is important to capturing the best and the brightest

Integration of the Curriculum: New Core Organizing Principles

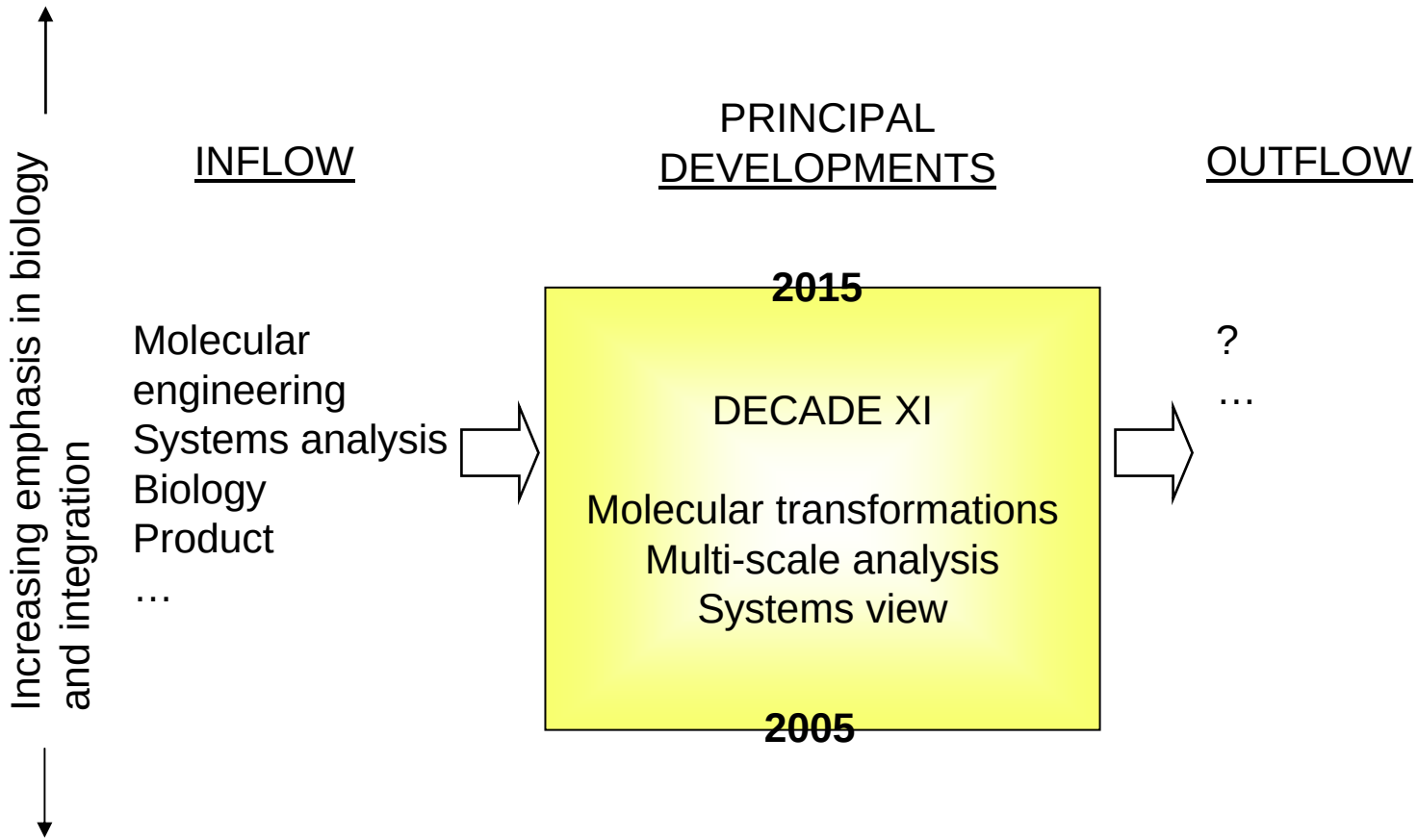
- Molecular Scale Transformations
  - chemical & biological
  - physical: phase change, adsorption, etc
- Multi-Scale Descriptions
  - from sub-molecular through “super-macro”
  - for physical, chemical and biological processes
- Systems Analysis & Synthesis
  - at all scales
  - tools to address dynamics, complexity, uncertainty, external factors

Old core does not integrate molecular concepts

Old core covers only macro to continuum, physical and chemical

Old core primarily tied to large scale chemical processes

The Frontier



2015

- The future is open – there is currently NO content in decade XI
- How do we chose to fill it?
  - Roll forward the engineering science paradigm
    - This is reductionist … no synthesis
    - Poor integration
    - Skills and attributes taught poorly or not at all
    - Schizophrenic faculty
    - A completely full curriculum
  - What new problems could our students solve and address with molecular engineering skills?
    - Is this a future worth pursuing?

Summary

- Excellent interaction and input from group
  - Good list of questions
  - Lots of output from breakout groups

Summary

- Key Points
  - Multitude of delivery vehicles are possible
  - We need to involve today's students in this discussion
  - Need for knowledge updates for faculty as well as practitioners
  - Integration is important across curriculum and into sciences
  - Form DACHE (design-integration-synthesis projects)
  - Parse material into nuggets
  - Many ideas on teaching methods/techniques for modules
  - Potentially 25-50 different industries that chemical engineers go to

Summary

- NSF program that requires industry involvement for funding curriculum development
- Partner at high level with industry – VP level
- Make business case and formal invitation to involve industry
- Academic units will be primary driver; need to get our institutions involved
- Involve industry throughout module development
- Professional society clearing house to link faculty with industry expertise
- How to keep curriculum of 2015 up-to-date.
- CCR/AIChE should think about an ongoing review method to ensure that the process continues

Summary

- Need to think globally in education
- Modules need to capture student interest
  - Energy module – how do we meet our energy needs without irreversibly damaging the environment
  - Think short, mid, and long-term
  - What fuels would we use in each time frame
    - Way to get students excited.
- Generate interaction among different universities worldwide that are using a module in a given term
- Modules can be spread throughout the curriculum to ensure the organizing principles are covered.