Leveraging Non-Competitive Collaborations for a Competitive Advantage

Role and Impact of the ACS GCI Industrial Roundtables

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Objectives

- Define the ACS GCI Industrial Roundtables
- Summarize impacts
- Demonstrate influence beyond boundaries
- Identify lessons learned
- Explore broader application of the format

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Co-opetition enables greening of the supply chain

- Companies in the same market work collaboratively;
- they explore new ideas to advance scientific knowledge and research new products;
- they simultaneously compete for market-share;
- and exploit the new knowledge in different ways.

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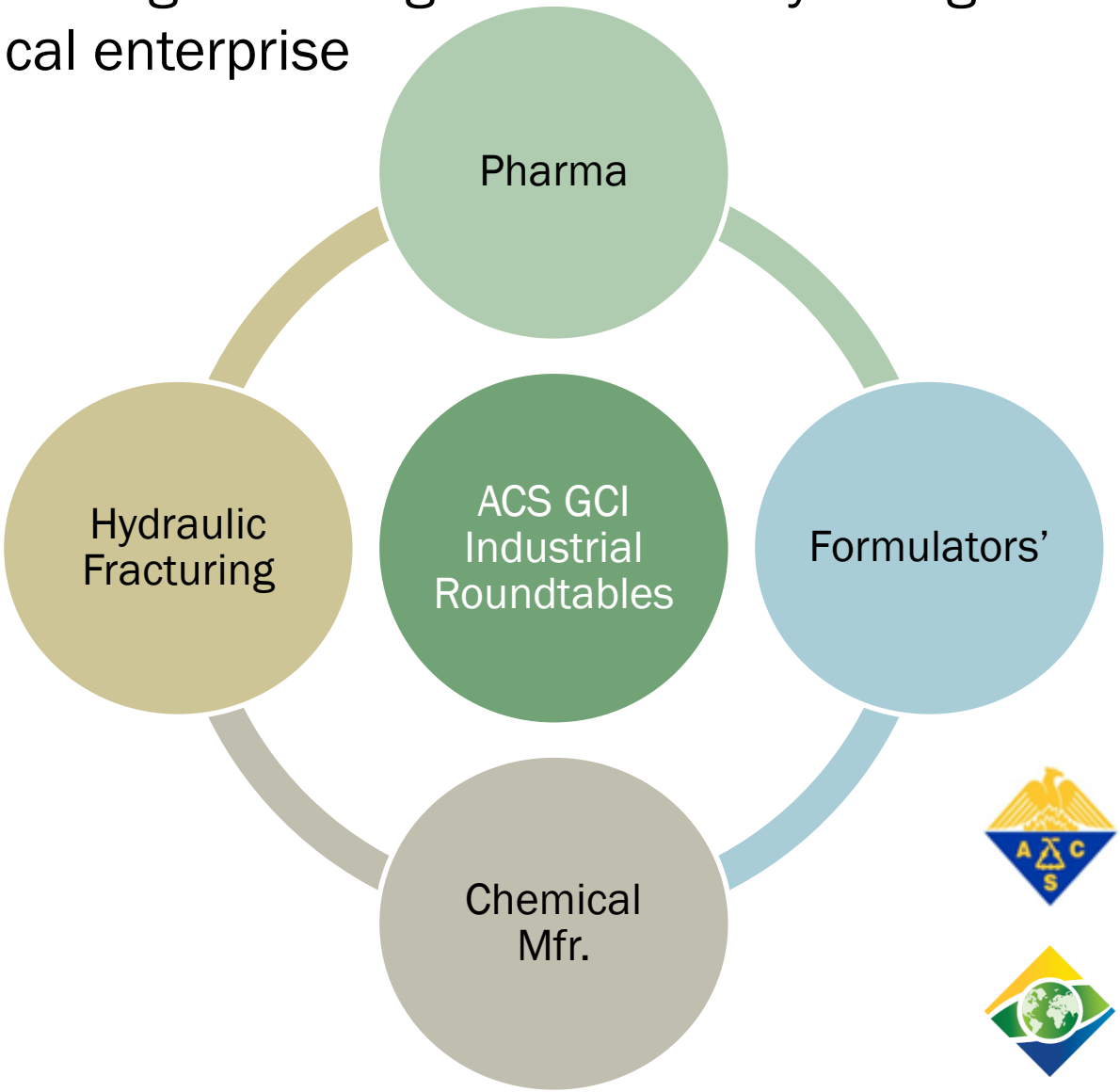
ACS GCI Industrial Roundtables:

Catalyzing the integration of green chemistry & engineering in the global chemical enterprise



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ACS Chemistry for Life™

ACS Green Chemistry Institute®

ACS GCI Chemical Manufacturer's Roundtable

ACS GCI Pharmaceutical Roundtable

ACS GCI Formulators' Roundtable

The Foundation of a Roundtable

Non-Competitive

Common Challenges

Member Governed

Consensus

Defined Priorities

Value

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Benefit Category	Benefit Description / Strategic Alignment	Business Areas Realizing Benefit	Annual Benefits Value			Total
			Year 1	Year 2	Year 3	
Research Grant	Influence research agenda; Access to research in key areas; Engagement with researchers; Authorship	R&D	$150k	$150k	$150k	$450k
Lecture Tours	Research lectures to company sit				$10k	$30k
Articles Interest	Lit				45k	$135k
Solvent Selection Guide		, EHS	$30k	$30k	$30k	$90k
Reagent Selection Guide	vailable to company scientists, 0.2 FTE resource	R&D, EHS	$30k	$30k	$30k	$90k
Commercial Tool Guidance	GC becomes standard feature rather than customization in some electronic lab notebooks.	R&D, EHS	$10k	$10k	$10k	$30k
		Annual Total	$275k	$275k	$275k	**$825k**

Over a 3 year period…

Input= $75,000+

Output = $825,000+

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Impacts and Outcomes

- Inform and influence the research agenda.
  - Communicate industry needs
  - Influence funding
- Drive the use of good science in policy setting.
- Develop decision-making tools.
- Drive change through comparison.
- Influence through the supply chain.
  - Grignard reagents in greener solvents
  - Greener fragrances

PMI:
Setting Targets

All the resources are **non-proprietary**, but…

The manner in which a company chooses to internalize them may give the company a **competitive advantage**.

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How actively involved would you be?

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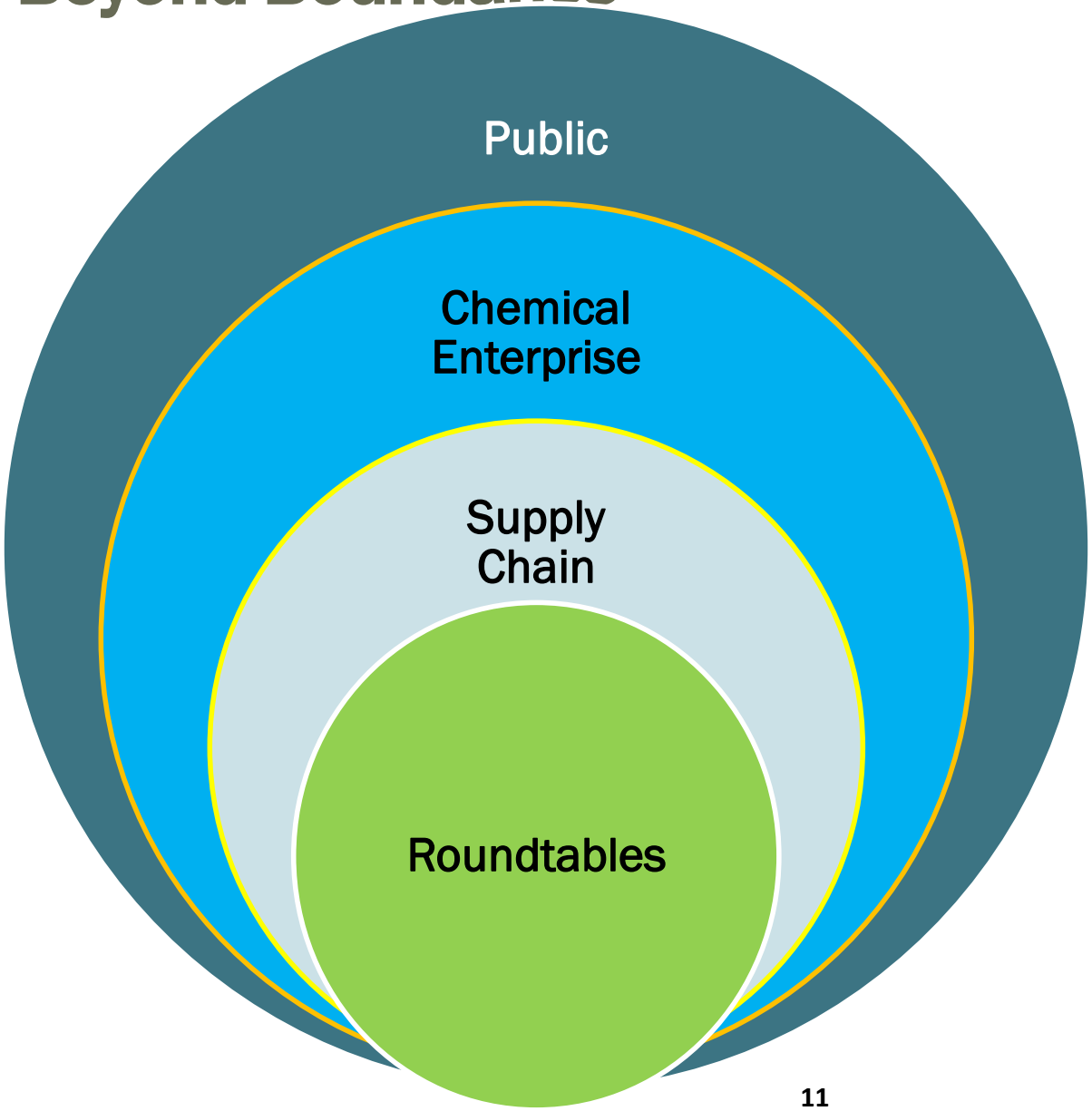
Influence Beyond Boundaries



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Influencing the Curriculum

Professors Rob Maleczka & Mitch Smith, MSU

- ACS GCIPR grant & NSF GOALI Grant recipients

Professor Neil Garg, UCLA

- ACS GCIPR grant recipient; Green suzuki experiment in UCLA labs
- Published 3 papers including ACS Catalysis, J Chem Ed.

Professor Michael McBride, Yale University

Freshman Organic Chemistry II

- http://oyc.yale.edu/chemistry/chem-125b/lecture-31#ch4 (chapter 5)
- http://oyc.yale.edu/chemistry/chem-125b/lecture-33

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Lessons Learned

- Need critical mass.
- Assure multiple contacts.
- Beware of the 1 trick pony.
- Leverage external resources.
- Avoid all talk, no action.
- Provide value-added deliverables.
- Don’t let perfect hinder progress.

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Is this format applicable elsewhere?

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Acknowledgements

- ACS Green Chemistry Institute®

  www.acs.org/greenchemistry
- ACS GCI Pharmaceutical Roundtable

  www.acs.org/gcipharmaroundtable
- ACS GCI Formulators' Roundtable

  www.acs.org/gciformulators
- ACS GCI Chemical Manufacturer's Roundtable

  www.acs.org/gci_chem_mfr
- All member companies

Thank you!

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Back Up Slides

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Key Green Chemistry Research Areas

- Solvents
- Small Amines
- Chelants
- Boron Alternatives
- Fragrance Raw Materials
- Corrosion Inhibitors
- Alkanolamide Replacement
- Surfactants
- UV Filters

- Less Energy Intensive Alternatives to Separations (Distillation)

- Amide Formation
- OH Activation
- Amide Reduction
- Greener Mitsunobu Reactions
- Oxidation/Epoxidations
- C-H Activation or Aromatics
- Chiral Amine Synthesis
- Asymmetric Hydrogenation
- Green Fluorination Methods
- *N*-Centred Chemistry
- Key Ideas outside the Reaction theme
- Solventless Reactor Cleaning
- Greener alternatives to polar aprotic solvents

Legend:
Orange- **Formulators**
Blue **– Chemical Manufacturers**
Yellow **- Pharmaceutical**

Tools to Enable Greener Process Design

- Process Mass Intensity Calculator (now with LCA)
- Solvent Selection Guide
- Reagent Selection Guide
- Continuous Processing Business Cases

Step Name/Number	1	
	Value	Units
Physical Batch Size		
Assay Purity		
Assay Batch Size		
Yield		
Assay Kg product		
Product Purity		

Raw Materials	Physical Charge (kg)
Substrates	
Reagents	
Solvents	
Aqueous	

PROCESS STEP METRICS	
Mass Substrate (kg)	0
Mass Reagents (kg)	0
Mass Solvents (kg)	0
Mass Aqueous (kg)	
Step PMI	#DIV/0!
Step PMI Excluding H2O	#DIV/0!
Cumulative PMI	#DIV/0!
Cumulative PMI Excluding H2O	#DIV/0!

www.acs.org/gcipharmaroundtable

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