

# INTERNATIONAL FINE PARTICLES RESEARCH INSTITUTE

**IFPRI: Bringing Industry and  
Academia Together to  
Advance Particle Technology**



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Willie Hendrickson, President

# Why Is Particle Science and Technology Important?

- Ubiquitous throughout all industrial manufacturing
- Small changes in particle related processes and properties can have huge effects on productivity and profitability
- Critical lack of focus



# IFPRI History

Started in 1979 by:

- 5 Academicians

- Professor Bob Pfeffer  
City College of New York
- Professor Kurt Leschonski  
University of Clausthal
- Professor Koichi Iinoya  
Kyoto University
- Professor Brian Scarlett  
University of Loughborough
- Professor Frank Tiller  
University of Houston

- 12 International Companies

- DuPont
- Standard Oil Of Indiana
- Bethlehem Steel
- Exxon
- British Nuclear Fuels
- Alcoa
- Unilever
- Eastman Kodak
- US Steel
- P&G
- 3M
- ICI



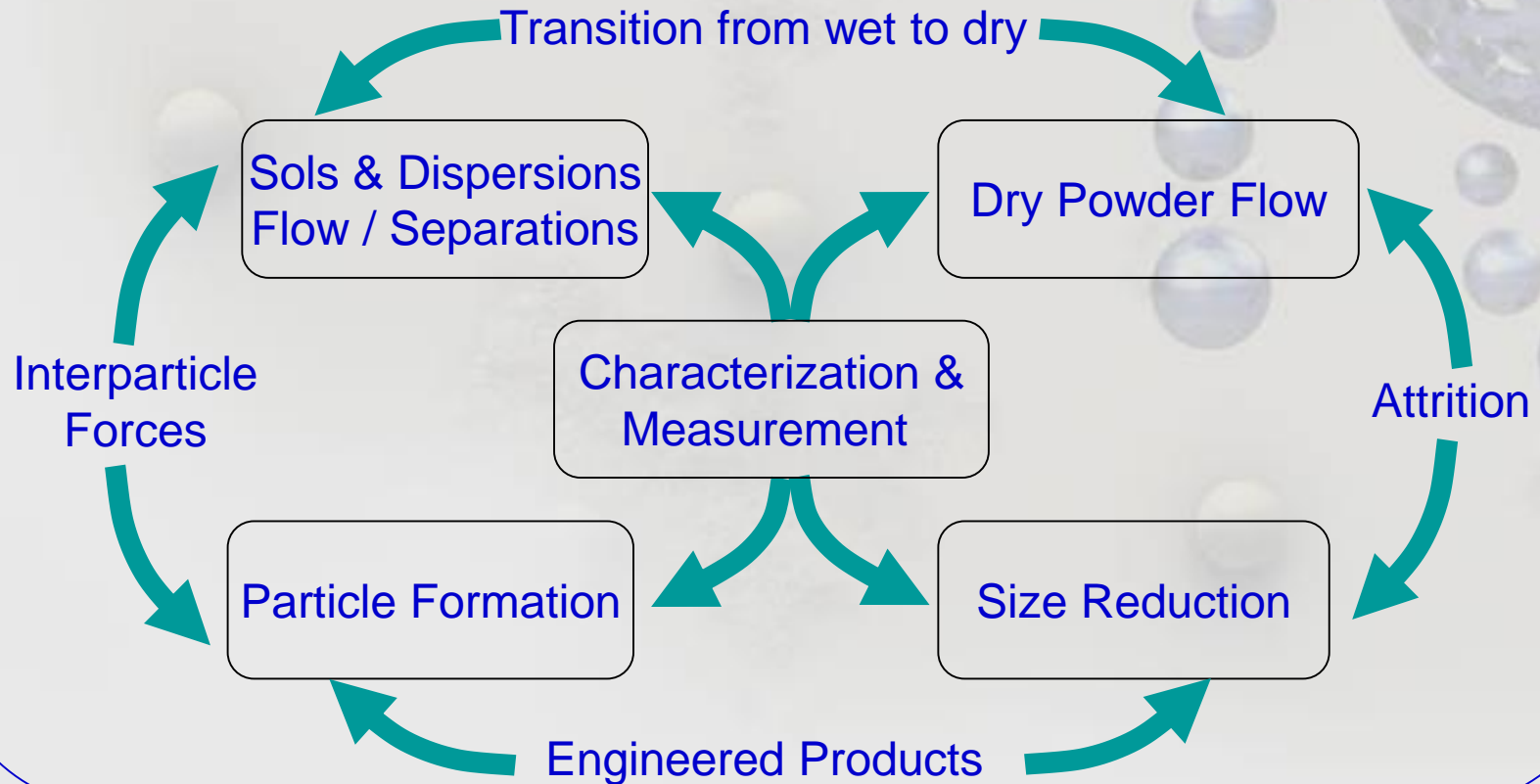
# Original Observations and Mission of IFPRI

- Lack of fundamental particle science understanding
- Lack of forum for intercompany discussion
- Poor connectivity between universities and industry
- Provide venue for particle technology discussion
- Develop strategic plan for particle science
- R&D focus on precompetitive industry concerns



# IFPRI Technical Program

Dynamic - responds to Member Company needs  
Managed within 5 Subject Areas which have strong interactions and weak boundaries



# IFPRI 2014-2015 Programs (Part I)

Type	Technical Area	Project Description	Research Associate	Institute	Renewal Date	End Date
Full Proposals	Characterization	Effect of Electrostatics on Particle Packing	A. Castellanos	U. Seville	2016	2019
	Formation	Creating Tunable Agglomerates via 3D Printing	K. Hapgood	Monash U.	2017	2020
		Powder Structure Control	R. Kohlus	U. Hohen-heim	2014	2017
		Relating Compaction Performance and Behavior to Process Conditions	A. Zavaliangos	Drexel U.	2015	2018
		Spray Drying at High Temperatures	D. Williams	Imperial College	2016	2019
	Wet Systems	Long-Term Stability of Colloidal Gels	W. Poon	U. Edinburgh	2017	2020
	Size Reduction	Development of Grindability Tests	J. Ooi	U. Edinburgh	2015	2018
	Dry Systems	Die Filling of Aerated Powders	C. Wu	U. Surrey	2016	2020
		Quantitative Prediction of Segregation at Process Scale	C. McCarthy	U. Pittsburg	2017	2020
		Flowability Assessment of Weakly Consolidated Powders	C.Hare and A. Hassenpour	U. Leeds	2017	2020
Reviews	Wet Systems	Deliquoring of Solvent Wet Cakes	TBD	TBD	NA	2015
	Formation	State of the Art on Drying Technologies	E. Tsotsas	U. Madeburg	NA	2015
	Size Reduction	Innovative Non-Mechanical Milling	L. Tavares	Federal U. Rio de Janeiro	NA	2015



# IFPRI 2014-2015 Programs (Part II)

Type	Technical Area	Project Description	Research Associate	Institute	Renewal Date	End Date
Work Shop	Formation	Crystallization	NA	NA		2015
	Education	Particle Technology	NA	NA		2015
Briefs	Wet Systems	Molecular Self Assembly	TBD	TBD	2018	2021
	Dry Systems	Powder Rheology	TBD	TBD	2018	2021
	Dry Systems	Physical and Chemical Characterization of Powder Surfaces	TBD	TBD	2018	2021



# IFPRI Industrial Membership

- **FINE CHEMICAL**

- Syngenta
- Corbion
- Novozymes

- **PHARMACEUTICAL**

- Merck
- Eli Lilly
- AbbVie

- **CONSUMER GOODS**

- Procter & Gamble
- Unilever

- **ASSOCIATE MEMBERS**

- PSE
- Hosokawa (Europe)
- AVEKA, Inc.
- Freeman Technologies
- Paul O. Abbe
- Horiba

- **GENERAL CHEMICALS**

- DuPont
- DSM

- **STEEL**

- Nippon Steel

- **SPEC. CHEMICALS**

- Corning
- Johnson Matthey
- UOP
- Almatris
- Evonik

- **POTENTIAL NEW MEMBERS**

- Sandvik
- Imerys
- Mondelez
- Air Products
- Chiesi Pharma
- Givaudan
- Innopharma Labs





# IFPRI Deliverables

- Annual general meeting
- Winter business meeting
- 8-10 annual research reports
- Over 600 commissioned reports and reviews
- 2-3 reviews
- Workshops
- Intensive technical interaction



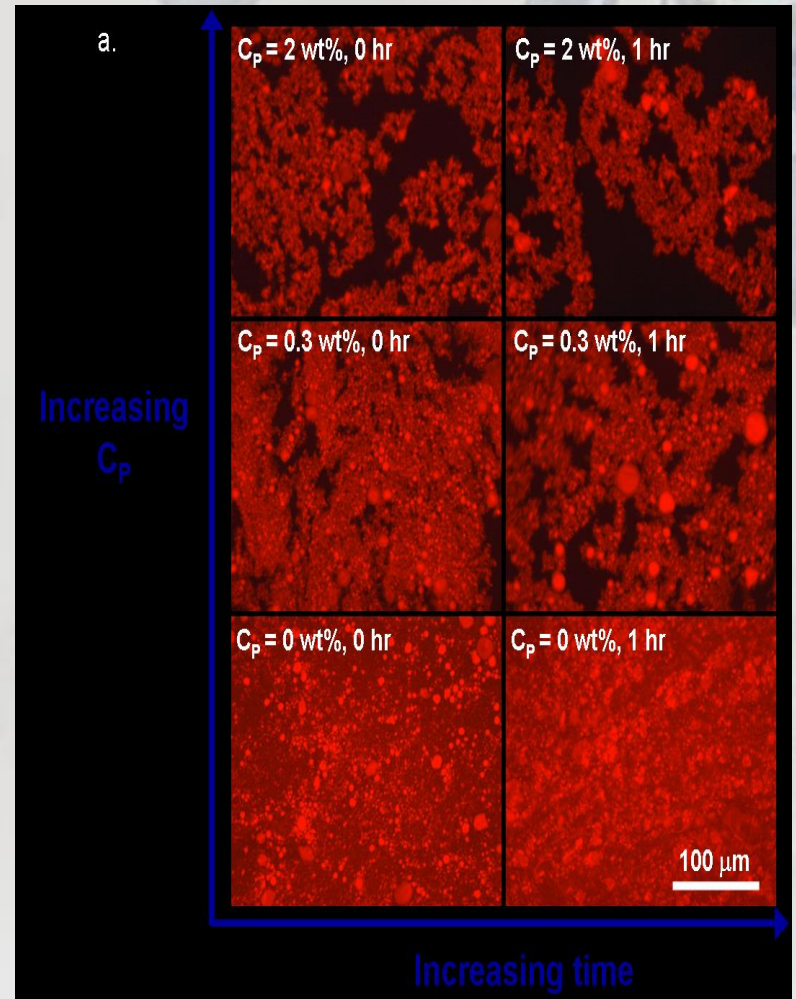
# Annual General Meeting

- Five Day Meeting
  - 2014 University of Edinburgh
  - 2015 Cornell University
  - 2016 University of Surrey (proposed)

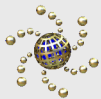


# Annual General Meeting

- Particle technology reviews
- Project overviews
- Project brief writing
- Bob Pfeffer seminar series
- Student poster session
- Proposal and brief voting
- Business meeting



E. Furst University of Delaware



# 37<sup>th</sup> Annual General Meeting

June 21-25, 2015

Statler Hotel, Cornell University  
Ithaca, NY

Hosts: Professors Marty Murtagh & Uli Wiesner



**IFPRI**

International Fine Particle  
Research Institute



**IFPRI**

# Deliverable Example

- Focused workshop on particle formation
- 2 day technical overviews, breakout sessions, consensus building
- Program proposals



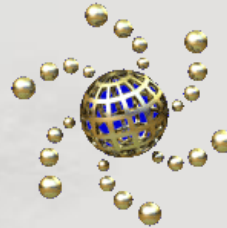
# Workshop Outcome

- Defined two areas of interest
  - Standard particle
  - Best practices
- Wrote project brief on standard particle
- Received 3 proposals
- Voted on funding Professor Karen Hapgood at Monash on 3D printing



# Predicting Crystallization Behavior Workshop

June 19<sup>th</sup> – 20<sup>th</sup>, 2015  
Ithaca, NY, USA



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Workshop Chairs: Dr. Neil George and Professor James Litster

***Plenary speakers:***

Prof. Dr. Gerard Coquerel, Univ. Rouen  
Prof. Dr. Michael Doherty, Univ. Santa Barbara  
Dr. Rob Geertman, DSM  
Dr. Daniel Green, DuPont  
Dr. Paul Meenan, Pfizer  
Prof. Dr. Sarah Price, UC London  
Prof. Dr. Joop ter Horst, Univ. Strathclyde  
Prof. Dr. Elias Vlieg, Univ. Nijmegen

***Invited participants:***

Dr. Keith Chadwick, Univ. Purdue  
Dr. Denis Gebauer, Univ. Konstanz  
Prof. Dr. Kevin Roberts, Leeds Univ.  
Prof. Dr. Ronald Rousseau, Georgia Tech  
Dr. Thomas Vetter, Manchester Univ  
Prof. Dr. Ulrich Wiesner, Cornell Univ.  
Prof. Dr. Michael Zoworotko, Univ. Limerick



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# IFPRI Shear Testing Roundtable Discussion

- IFPRI Member Roundtable January 2015
  - Intent of flowability measurements
  - What devices or methods employed
  - Number of samples measured
  - Who conducts the tests
  - What problems are encountered
  - Unmet needs
  - Is this a topic for further IFPRI sponsored R&D





# General Conclusions

- Broad research portfolio serving diversified membership
- Projects provide new relevant scientific knowledge for membership
- IFPRI academic associates are world-class authorities providing a unique global network and forum in particle technology
- Full profit of IFPRI membership is based on an active participation among members and contractors
- “Consultable” forum



# INTERNATIONAL FINE PARTICLES RESEARCH INSTITUTE

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**Thank you!**

