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Best Practices & Open Innovation: Collaboration Between Universities & Industry

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4th National Workshop on R&D in Food Processing Sector
FoodWorld India 2012


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Systems Approach Food Research

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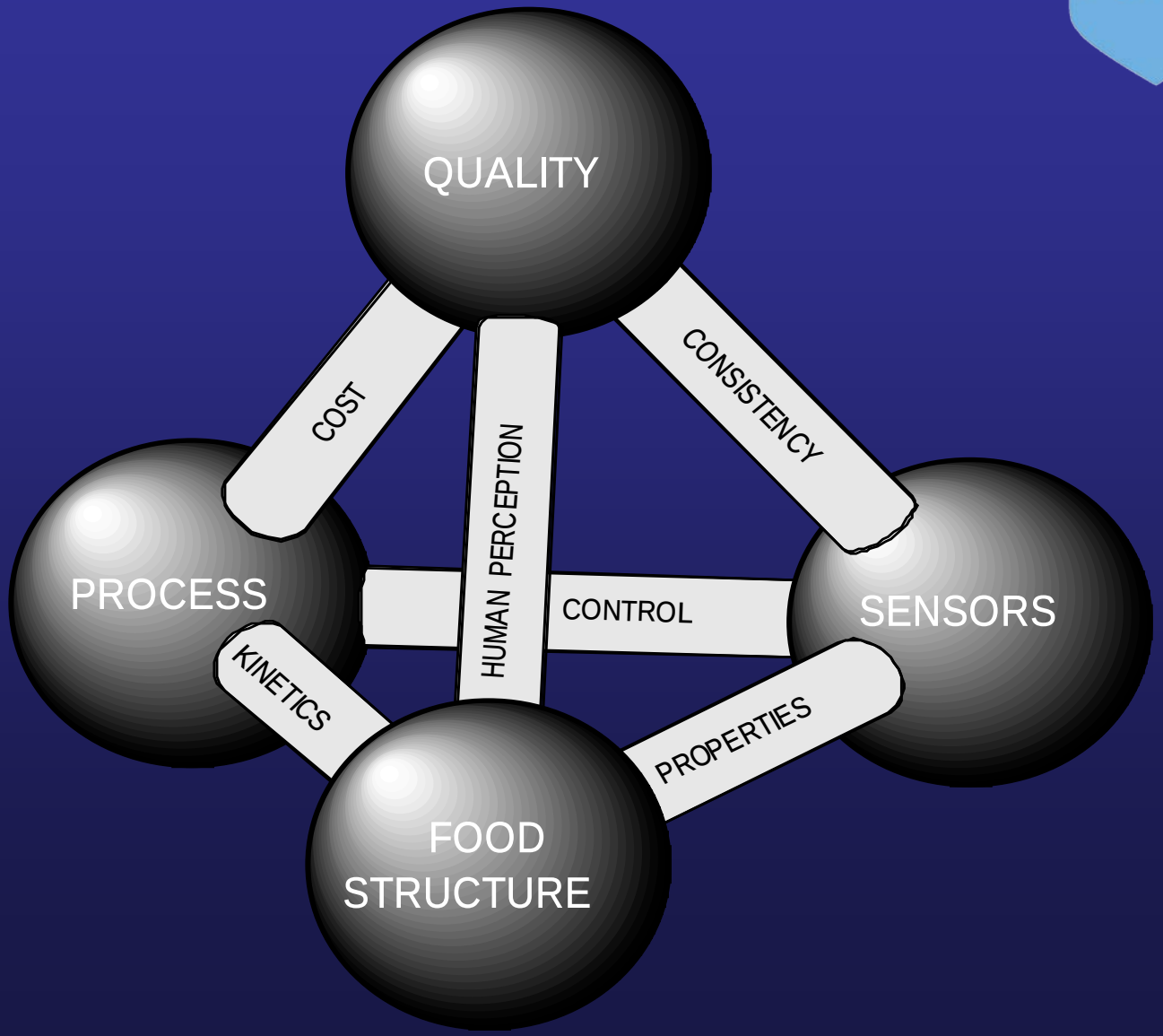
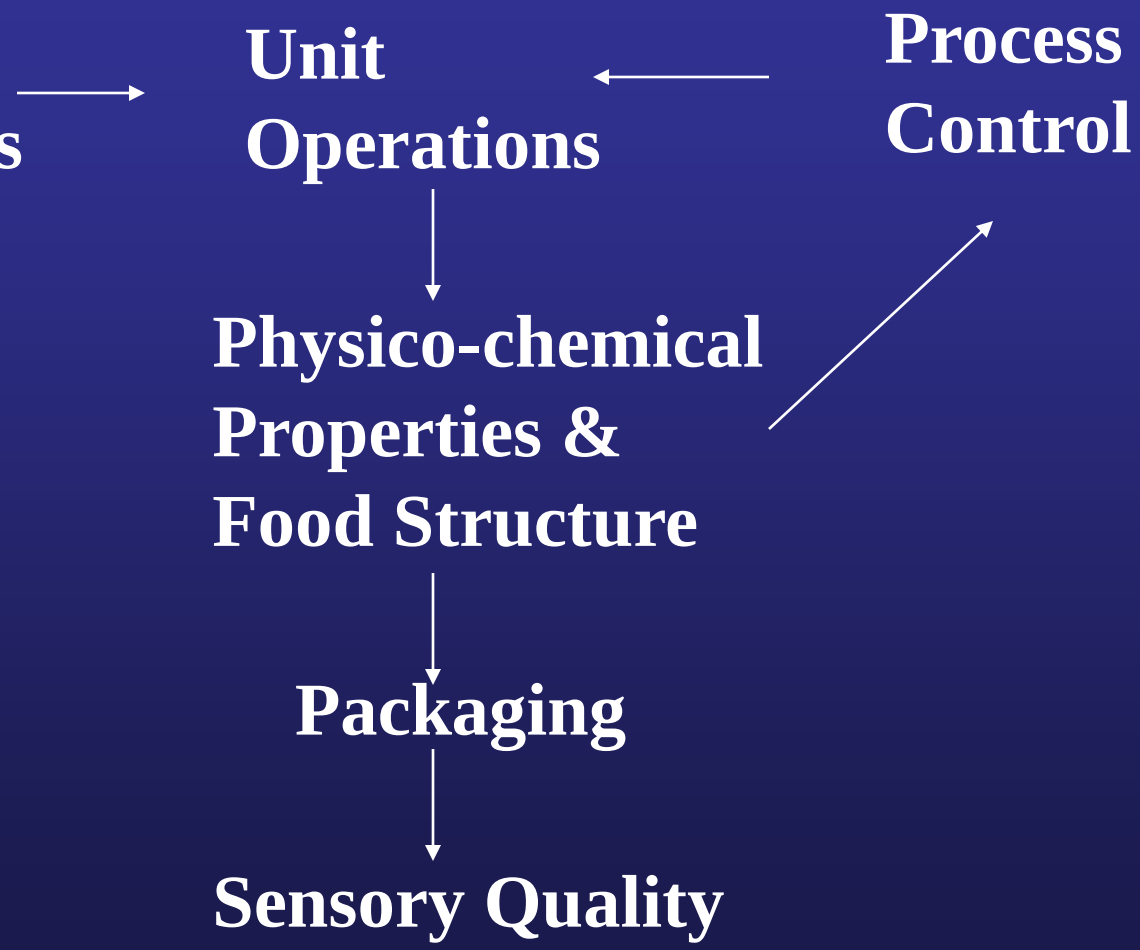


Food Material Science Approach



Industry-Univeristy-Government Partnerships

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SWAMY ANANTHESWARAN

Partnerships Provide Synergy

Current strategies for growth within the food industry include introduction of new products, leveraging brand strengths, acquisitions, and international expansion. The food industry is becoming technologically more sophisticated, necessitated partly by shorter-time-to-market new products. This requires retooling of the R&D operation within the food industry, and one approach might be strategic industry–university–government partnerships.

• **Industry.** Traditionally, R&D in industry is mostly applied and geared toward short-term needs related to product development, manufacturing, and shelf-life issues. Industry is very capable of conducting basic research, but because of the inherent fast pace and a market-driven organizational structure, basic research is mostly left up to the universities.

• **University.** The university R&D process is driven by the discovery process and the educational mission of the university. The research thus conducted in the context of graduate education is slow but needs to be tied to the needs of industry. Universities in general are powerhouses of information merely waiting to be tapped into. A shortage of traditional funding opportunities has made universities more receptive to collaborating with industry and even conducting proprietary research.

> Through industry–university–government partnerships, we can find synergy between the respective missions and link basic and applied research.

Safety and Technology (NCFST) at Illinois Institute of Technology, and the Center for Advanced Food Technology (CAFT) at Rutgers University. The U.S. Dept. of Agriculture's National Research Initiative (USDA-NRI) program has been encouraging collaborative and integrated basic research proposals between universities and industry, and is setting aside up to 20% of the total funding for such proposals. This is a great beginning, and more of the federal funding programs ought to mandate such joint endeavors.

My experience of an academic working with industry has been very rewarding. When the opportunity came to take a sabbatical, I chose to work within the R&D group of a major food company. By the end of my sabbatical, I understood better the needs of industry, and this helped me to become a better teacher. Since then, I have continued to work with the food industry in a consulting capacity. My professional colleagues within the industry and I have jointly advised graduate students on basic research topics fit enough for publication yet very relevant to the business needs of the food industry.

There are many opportunities for the food industry to get involved in an active manner with academia. Food industry scientists can serve as a member of the university/department advisory board, a visiting professor, a guest lecturer, or an external member of a thesis research

University

- Discovery drives R&D
  - Basic research
  - Powerhouses of information (Silos?)
  - Beyond publication, where is the relevance?
- Education
  - “Freely” disseminate knowledge
- Slow pace
  - Perpetual literature review
  - Analysis until paralysis
- Has man/woman pwer for basic research

University

- **Shortage of external funding opportunities**
  - **Increasingly more receptive to collaborating with industry**
  - **Proprietary research**

Industry

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- Innovation drives the industry
  - Applied research
- Meet the needs of consumers & shareholders
- Industrial scientists are more strategy-driven
  - Applied research
  - Prerequisite: Basic research
- Fast pace
  - Needed by yesterday
- Has state-of-art equipment waiting to be used
- Good with the “D” in R&D?

Government

- Government labs conducts basic/applied research
  - Mission similar to university
- Has ear-marked funds available
  - Catalyst for the partnership
- Needs to show impact factor
  - Basic research morphing into applied problem solving
- The deal maker?

Industry-University-Government Partnerships

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- **University/Industry**
  - **Different ends of the same continuum**
  - **Synergy between the respective missions**
- **Linkage between basic & applied research**
  - **Proactive problem solving within the industry**

Industry-University-Government Partnerships

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- Adds relevance to the research mission of the university
- External funding opportunities for university
- Students benefit from internship opportunities at industry
- A pool of well-trained scientists for industry
- Implement life-long learning at industry

Challenges

- Cultural organizational challenges (PSU-Geisinger)
- Comfort levels to take risk are different
- Recognize that the mission and the short-term goals are different
- Respect for everyones' role in the partnership & trust between the partners
- Open communication

Challenges

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- University needs to understand the research needs of the industry
  - Industry needs basic research
  - Industry does indeed conduct basic research, but does not publish
- Intellectual property issues

Models of Partnerships

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- European Model
  - 1/3 Industry, 1/3 University, 1/3 Government
  - Very effective & successful
- Collaborative research
  - Co-advisors
  - Funding requirement
    - Make industrial sponsorship mandatory for grant funding (DMI)
- Industrial advisory board at university
- Consortia
  - IIT
  - CFM

Models of Partnerships

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- **Consultancy/Sabbaticals**
  - **University**
  - **Industry**
  - **Government**

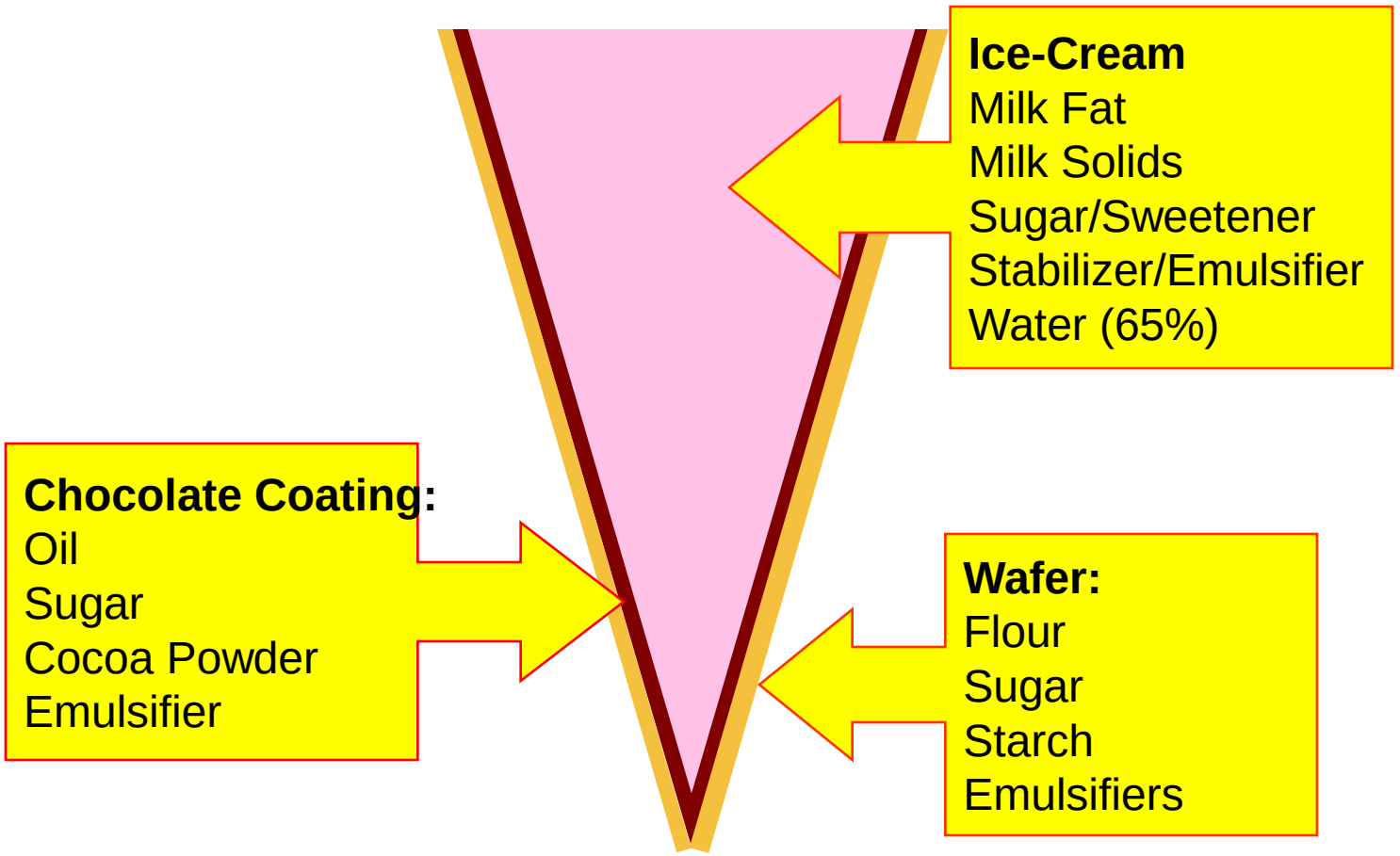
Industrial Consulting at Penn State

- Faculty on 9-month appointment
- One day a week consulting privilege during the academic year

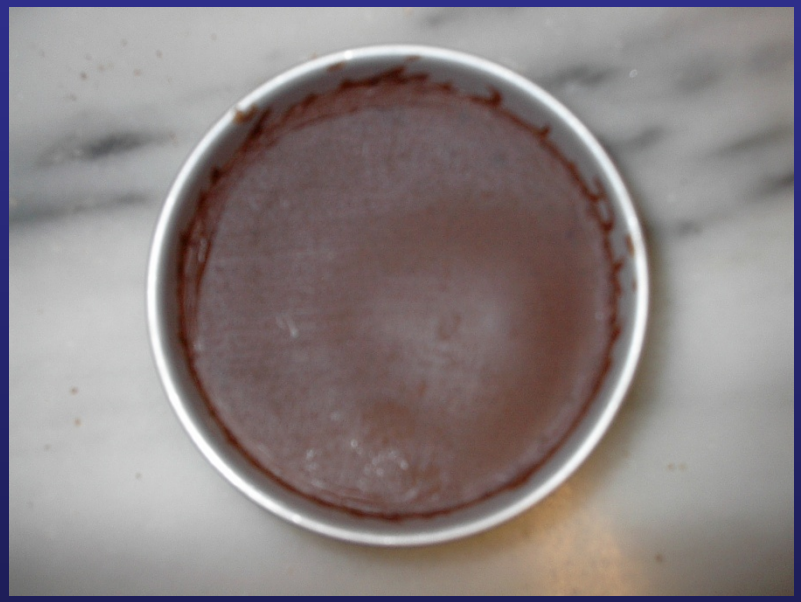
Case Studies

- Cargill
- Frito Lay
- Heinz
- Hershey
- Nestle

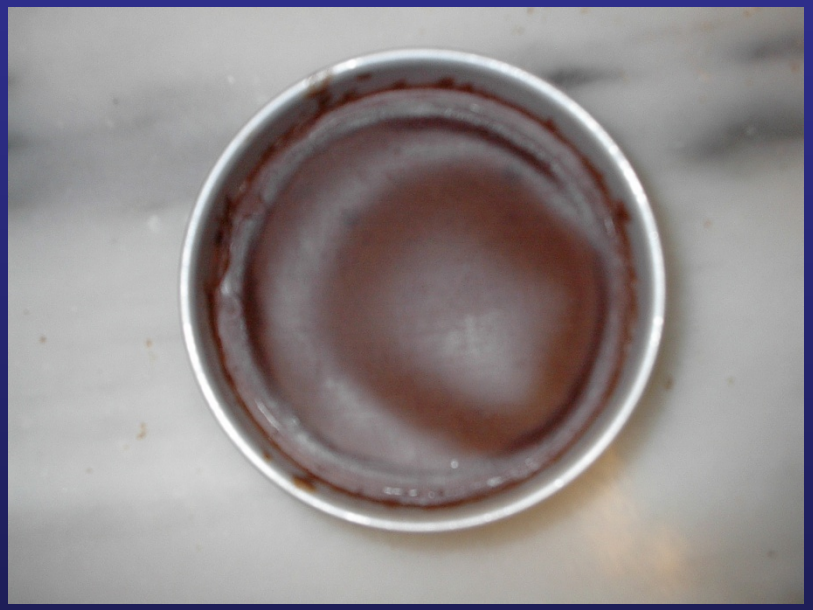
Moisture migration in an Ice-Cream Cone



Effect of Relative Humidity



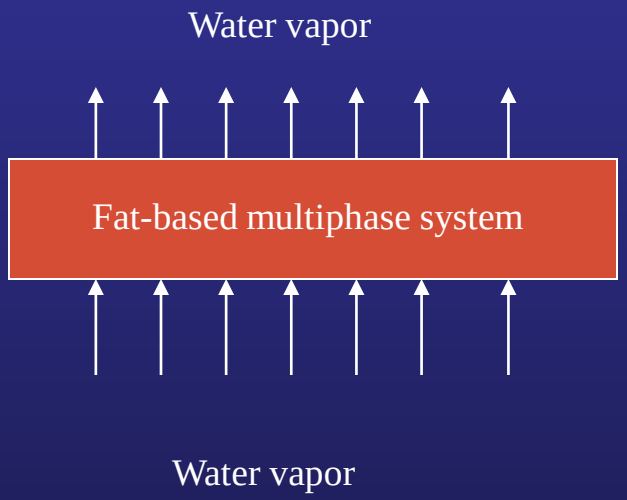
Humidity range 75 % – 33%



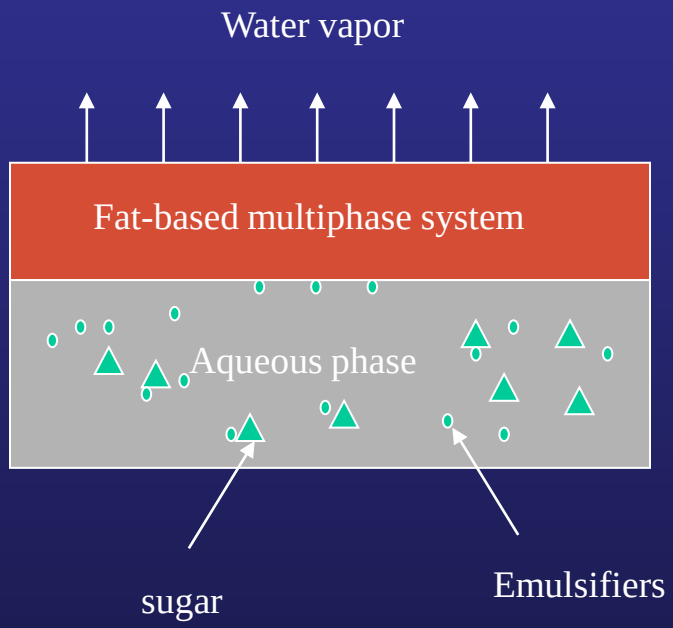
Humidity range 75 % – 54%

Moisture Migration in Confectionery

Vapor-induced



Liquid-induced



Product-atmosphere (packaging) interaction

Product-product interaction

Hershey-Penn State Projects Completed

- Measurement of yield stress in chocolate using the vane method (B. Baker)
- Thermal & mechanical determination of glass transition temperature in saccharide mixture (B. Kiefer)
- Moisture migration through fat-based multiphase systems (Q.Yuan)
- Oil migration in model confectionery systems (T. Motwani)

Hershey-Penn State Projects Completed

- **Characterization of heat resistant milk chocolates (C. Dicolla)**
- **Mechanisms of development of heat resistant chocolate (Ongoing - J. Laughter)**

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Measurement of Yield Stress in Chocolate using the Vane Method

Brian S. Baker

Masters Degree Candidate

Department Food Science
Pennsylvania State University

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Thermal and Mechanical Determinations of Glass Transition Temperature (Tg) in Saccharide Mixtures

Bruce A. Kiefer
Masters Degree
Department of Food Science
Pennsylvania State University

April 20, 2004

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Moisture Migration Through Fat-Based Multi-Phase Systems

Qingbin Yuan
Ph.D. Candidate
Department of Food Science
The Pennsylvania State University

Diffusion, Counter-Diffusion & Lipid Phase Changes During Oil Migration in Confectionery Products

Tanuj Motwani
William Hanselmann
Swamy Anantheswaran

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University Park, PA 16802
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Characterization of Heat Resistant Milk Chocolates

MS Thesis

by

Carolina Dicolla

November 20, 2008

Characterization of Heat Resistant Milk Chocolate

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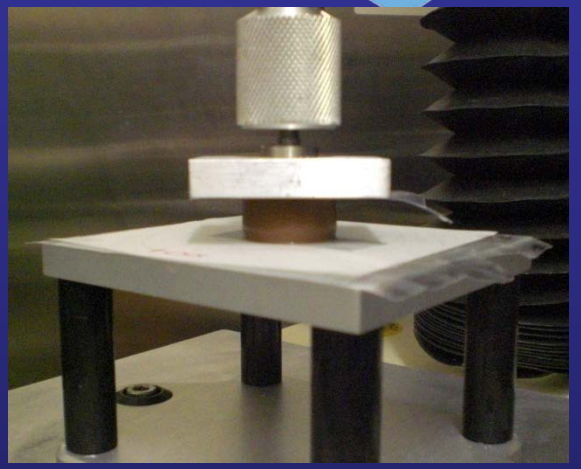

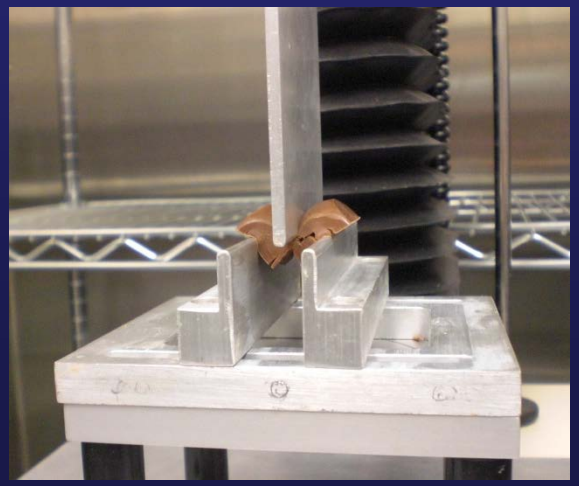

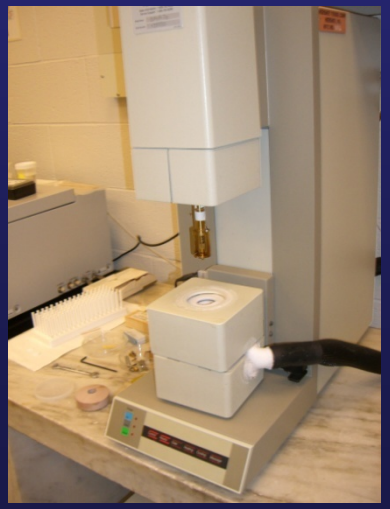

Guidelines for Partnership

- **Develop mutual trust**
- **Negotiate in best faith**
- **Let patents ownership vest with university partner**
- **Grant industrial partner(s) exclusive license**
- **Be patient & understanding**

Guidelines for Partnership

- We cannot afford not to!
- Took 3 years to get a buy-in from industry
- Need a champion at both ends
- Collaboration needs to be nurtured
- Keep separate lab books for the “R” and for the “D”

Guidelines for Partnership

- **Win-win situation for industry, university & student!**
- **Hire an industry advisor for the project**
- **Hire the right student who can wear both the academic & industry hat**
- **Update progress on projects to Dean & VP**
  - **Emphasize value addition**

Current Projects at Penn State

- **Mechanism of destruction of *Listeria* during HPP Controlled release of Nisin from biopolymer films**
- **Mechanisms of development of heat resistant chocolate**
- **Effect of roasting on polyphenols in cocoa**
- **Edible coatings to improve shelf-life of fresh mushrooms**


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THE END