

**Food Science Graduate  
Seminar Series  
Spring 2020**

Tuesdays from 4:10 – 5:00 PM  
Stocking Hall  
Cornell University

**Seminar Committee Members:**

**Dr. Rui Hai Liu, Committee Chair**



**Sarah Kozak-Weaver, PhD Student**



**Ali Tahir Sire, PhD Student**



**Yitong Li, PhD Student**



**Weiyang Zhao, PhD Student**



**Lucy Ni, MPS Student**



**Erin Atkins, Graduate Program Coordinator**

**Cathy Lee, Program Assistant**

**Tuesdays from 4:10 – 5:00 PM in 146 Stocking Hall (the PepsiCo Auditorium)**  
*7-week course, session 2*

**Seminar Chair: Dr. Rui Hai Liu**

Date	Speaker	Seminar Title
Apr 7	<b>Raymond Glahn</b> , PhD Associate Professor, Department of Food Science & Division of Nutrition, Cornell University	“Advances in Fe Nutrition from the Common Bean That Redefine Bean Fe Biofortification and Yield Opportunities for Food Science”
Apr 14	<b>Bruno Xavier</b> , PhD Senior Extension Associate, Cornell AgriTech Food Science, Cornell University	“Exploring the Role of Processing Authorities Over the Years and How the CFVC Can Help the Food Industry Respond to Rapidly Changing Regulatory Requirements, Food Safety Hazards and Advancing Technologies”
Apr 21	<b>Xingen Lei</b> , PhD Professor, Department of Animal Science, Cornell University	“How to Meet the Global Animal-Sourced Proteins in 2050”
April 28	<b>Prabhu Pingali</b> , PhD Director, Tata-Cornell Institute for Agriculture and Nutrition	“AgriFood Systems Towards 2050: Challenges, Opportunities & Innovations”
May 5	<b>Sarita Raengpradub Wheeler</b> , PhD Director of Microbiology R&D, Mérieux NutriSciences	“The Business of Research”

## Raymond Glahn



Dr. Glahn attended the Pennsylvania State University, earning a BS in biology in 1983. Following his undergraduate education, he worked for a year as a research technician at the Bethesda Naval Hospital (Intensive Care Unit), Bethesda, Maryland. In this role he participated in a broad range of endocrine research related to combat medicine, assisting in human, canine, rodent and primate studies. In the fall of 1984 he returned to Penn State to pursue graduate studies in Physiology as a member of the Poultry Science department (MS, 1986; Ph.D. 1989). As a graduate research assistant, he conducted research in the field of comparative physiology, specializing in renal function, renal mycotoxicology, nutritional physiology and virology. In graduate school he published 9 papers as first author and co-authored 3 more.

Upon receiving his doctorate, he joined the Department of Poultry and Animal Science, at the University of Arkansas, Fayetteville, Arkansas as a Postdoctoral Research Associate. In this position he conducted research regarding hepatic and renal perfusion in response to toxins, using various animal models such as swine, rodent, poultry and domestic rabbits. Subsequently, he held a position as an NIH Research Fellow in Nephrology at the Mayo Clinic and Foundation (Nephrology Research Unit), Rochester, Minnesota focusing on phosphate balance of humans undergoing dialysis therapy.

Dr. Glahn came to the US Plant Soil and Nutrition Laboratory (currently known as the Robert Holley Center for Agriculture and Health) in Ithaca, NY in 1993, and thus has over 27 years of service in USDA-ARS. He currently has over 165 peer-reviewed publications, 143 of which have been published as an USDA-ARS scientist.

Dr. Glahn's research program focuses on the bioavailability of trace minerals, specifically iron (Fe) and zinc (Zn). His expertise is on the factors and practices that influence the intestinal absorption of these micronutrients. He utilizes a physiological approach, employing in vitro techniques (ie. cell culture) and an animal model (poultry) to determine factors, interactions and food components that affect the ability of the intestine to absorb these minerals. These models are now well-established and validated relative to human nutritional trials. As such, they are employed to develop and monitor the nutritional quality of Fe and Zn in staple food crops, evaluate food products for nutritional quality of these minerals, and assess the nutritional quality of diets and meal plans of populations at risk for Fe and Zn deficiency.

In addition to his role as a Research Physiologist, Dr. Glahn is the Research Leader of Plant, Soil and Nutrition Research Unit at the Robert Holley Center. Dr. Glahn is appointed as a Courtesy Associate Professor in both the Department of Food Science and the Division of Nutrition at Cornell University.

## **Advances in Fe Nutrition from The Common Bean That Redefine Bean Fe Biofortification and Yield Opportunities for Food Science**

For the past 15 years, biofortification, an alternative strategy to food fortification that utilizes plant breeding and agronomic techniques to improve the content of micronutrients in staple food crops has been employed to alleviate these leading nutritional deficiencies worldwide. Iron, zinc and pro-vitamin A have been the primary micronutrients targeted by this approach. The common bean (*Phaseolus vulgaris*) has been formally targeted for biofortification for more than 15 years as beans are widely consumed, and relatively high in Fe content. However, recent studies indicate that the primary biofortification approach of breeding for high Fe concentration (ie. 85-90  $\mu\text{g/g}$ ) may not be sustainable as Fe content is profoundly influenced by environment and genotype by environment interaction. Recent reports also indicate that the basic assumptions of this approach are not met as the average bean Fe concentration of non-biofortified varieties in markets such as east Africa is approximately 70  $\mu\text{g/g}$ , significantly higher than the assumed average of 50-55  $\mu\text{g/g}$  and essentially identical to most varieties that have been released as biofortified. Moreover, research shows that high Fe bean varieties are also known to have higher levels of polyphenolics and phytate that can lower fractional Fe bioavailability and negate the nutritional benefit.

Advances in knowledge of factors that influence Fe bioavailability from beans indicate that an alternative approach to simply breeding for high Fe is needed. “Biodelivery” may be the best term to describe this alternative approach to Fe nutrition from staple food crops as it focuses on factors that enhance Fe bioavailability. For beans, factors such as processing to disrupt the cotyledon cell wall releasing intracellular Fe, influence of other components in the diet or meal, and traits such as fast cooking, and the slow darkening and non-darkening gene that yield seed coat polyphenolic profiles that enhance Fe uptake are part of the biodelivery strategy relevant to the common bean.

Along with advances in knowledge of bean Fe nutrition come opportunities for food scientists. For example, a recently patented milling process for beans yields a versatile flour that can have multiple purposes for food products such as pasta, breads and desserts. Newly developed bean varieties that cook faster and resist darkening during storage are now available, yielding economic benefit for farmers and possibilities for food products. This presentation will summarize the history and evidence that supports this shift in approach, and highlight a path forward that redefines Fe nutrition from beans and identifies opportunities for innovative and more nutritious food products.

**Bruno Xavier**

Dr. Bruno Xavier, PhD '08 serves as a senior extension associate and processing authority for Cornell's Food Venture Center, where he helps to bring more than 2000 products to market each year by offering training in food processing and safety to food manufacturers and regulators and product and safety validations services to food companies in New York and from throughout the United States. Dr. Xavier also provides comprehensive technical expertise to Center of Excellence clients regarding food and beverage ingredients, production, safety, regulatory requirements and product development. Prior to joining the Food Venture Center staff, Bruno served as a post-doctoral associate for Cornell

University's Milk Quality Improvement Program and as a professor of biotechnology and industrial microbiology at Brazil's Federal University of São João del-Rei.

**Exploring the Role of Processing Authorities Over the Years and How the CFVC Can Help the Food Industry Respond to Rapidly Changing Regulatory Requirements, Food Safety Hazards and Advancing Technologies**

The role of Processing authorities is only briefly mentioned on the US Code of Federal Regulations. Originally, Food Safety Professionals in the food sector were focused on determining the minimal thermal processing conditions for shelf stable, low acid and acidified foods. Currently, Processing Authority work includes determining manufacturing conditions for non-thermally treated products, assessing environmental monitoring and microbial testing needs, reviewing Food Safety Plans among others. The Cornell Food Venture Center has played a major and increasing role, notably in NY State, helping hundreds of food manufacturers, as well as regulatory agencies, to determine the proper controls and monitoring activities necessary to ensure safety of food products. Recent changes in the food sector and regulatory guidelines bring new challenges to the food industry, and the CFVC is working to respond by creating a platform that gives small food entrepreneurs access to food safety determinations in real time. This platform also aims to connect participants (including consultants, service providers and suppliers) with relevant food safety information, training opportunities, as well as updates that may only affect specific products or manufacturing processes. The development of the CFVC Food Safety Platform will open opportunities for MPS students that are interested in data analysis, mathematical modeling and the diverse aspects of applied food safety principles and regulation. In this talk we will discuss the progress that has been made on this endeavor and hopefully seed collaborations with existing programs with similar or synergistic goals.

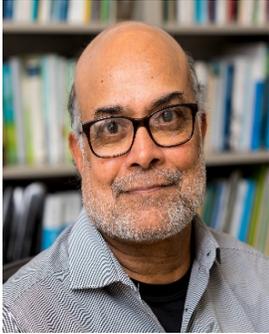
**Xingen Lei**

Xingen Lei is a Professor of Molecular Nutrition at Cornell University. He received his Ph.D. from Michigan State University and a postdoctoral training at University Missouri. Lei pioneered the application of gene-knockout models to study nutritional genomics of selenium, and revealed dual roles of selenium in oxidative stress and in diabetes. Lei's creative research developed a new generation of bacterial phytases that are used worldwide by the feed industry. Lei is exploring the nutritional, health, and environmental values of defatted microalgae from the biofuel production as a new generation of food and feed protein. Lei is an international leader of the HarvestPlus program for the global fight against micronutrient deficiencies in humans and brought the program to China. Lei has served on panels for NIH and USDA, many other scientific committees, and Editorial Boards for a number of scientific journals including Journal of Nutrition (Associate Editor) and Annual Review of Animal Biosciences. He has received a number of national and international awards including the Mead Johnson Award and Milton Sunde Award from the American Society for Nutrition and 2017 FASS-AFIA New Frontiers in Animal Nutrition Award and Gary L. Cromwell Award in Mineral Research. He is currently serving as the President of TEMA (International Society of Trace Elements in Man and Animals.)

**How to Meet the Global Animal-Sourced Protein Needs in 2050**

Animal-sourced foods provide the global population with 18% of total calorie and 25% of total protein intakes. While the world consumption of meats and milk has already doubled during the past 50 years, a 173% increase of meat and milk production in 2050 over that in 2010 is projected. This estimate is largely derived from the anticipated expansion of world population and the continued improvement of living standards in developing countries, but is challenged by recent promotion of healthy diets for sustainable food systems. Therefore, this presentation will attempt to provide a balanced review of animal-sourced protein intakes on human health, relative use efficiencies of land, fresh water, and edible nutrients, environmental pollutions of nitrogen and phosphorus, and greenhouse gas emission. Strategic solutions including technologic innovations will be explored for providing the 10 billion people with adequate, health-promoting animal-sourced protein.

## Prabhu Pingali



Prabhu Pingali is a Professor in the Charles H. Dyson School of Applied Economics and Management at Cornell University, with a joint appointment in the Division of Nutritional Sciences, and the Founding Director of the Tata-Cornell Institute for Agriculture and Nutrition (TCI). Prior to joining Cornell, he was the Deputy Director, Agricultural Development Division of the Bill & Melinda Gates Foundation, from 2008–May 2013. He was director of the UN Food and Agriculture Organization’s Agriculture and Development Economics Division from 2002–2007. In addition, he worked with the CGIAR for 15 years from 1987–2002, first with IRRI in the Philippines and then with CIMMYT in Mexico. Pingali is a member in the U.S. National Academy of Sciences and an AAEA Fellow. He has over three decades of experience working with some of the leading international agricultural development organizations as a research economist, development practitioner and senior manager. Pingali has written 13 books and over 120 refereed journal articles and book chapters on food policy.

### **AgriFood Systems Towards 2050: Challenges, Opportunities & Innovations**

Global food systems are facing a perfect storm of threats and challenges as we look towards 2050. These include: urbanization & growth in middle class populations leading to rapid diet changes with the consequent rise in obesity and non-communicable diseases; global environmental challenges, including climate change & the increased incidence of extreme weather events; globalization, trade integration and the declining competitiveness of agriculture in developing countries. These global threats and challenges also offer opportunities for future food and agricultural systems to positively contribute to rural prosperity, improved nutrition, and environmental sustainability, including enhanced management of climate threats. This talk presents an overview of the global trends and an assessment of technological breakthroughs and disruptive innovations that could lead us to a more sustainable future food systems. The overarching question that this talk addresses is how agricultural research and policy ought to be re-oriented to confront current & forthcoming global challenges.

**Sarita Raengpradub Wheeler**

Dr. Sarita Raengpradub Wheeler is Director of Microbiology R&D with Mérieux NutriSciences. She received her B.S. in Biology from the University of Illinois at Urbana-Champaign and her Ph.D. in Food Science from Cornell University with emphasis on molecular microbiology and food safety. She now directs the Corporate Microbiology R&D department, focusing on new technologies and innovation, and coordinates Global Biology research activities for Mérieux NutriSciences. She previously led the Silliker Food Science Center's Microbial ID group that focuses on DNA sequencing and microbial subtyping. In addition, she has led the technical implementation of Next Generation Sequencing capabilities and the Foodborne Virus and GMO laboratories at the Silliker Solution Center, Mérieux NutriSciences' flagship laboratory in North America. Dr. Wheeler is a professional member of the International Association for Food Protection (IAFP), American Society for Microbiology and AOAC International and is on the Executive Committee of the AOAC Pacific Southwest Section.

**The Business of Research**

Mérieux NutriSciences is a global solutions provider for the food industry, delivering analysis and consultancy services for companies, all along their value chain, from product design to manufacturing and distribution. With more than 100 accredited laboratories offering testing solutions, Mérieux NutriSciences must evaluate market trends and stay on top of dynamic customer needs, in order to drive our internal research, development, and industrialization activities to maintain our global competitiveness. This seminar will address research from a commercial laboratory perspective and how it must be able to quickly address emerging needs and coordinate with operational and commercial activities, but also recognizing that the demands and the pace can be quite different from academic research. Examples from various food industry-related topics will be shared, from GMO to foodborne viruses and parasites to newer technologies like next generation sequencing.