Carnegie Mellon's kitchen chemistry makes science palatable

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Molecular gastronomy or molecular cuisine, the culinary movement that uses chemistry, is heating up kitchens worldwide. Carnegie Mellon University Chemist Subha Das is bringing the same techniques found in the world's leading restaurants, and seen on the popular television show Top Chef, to the classroom to teach students about the principles of chemistry.

Das will discuss "kitchen chemistry" during the Food Chemistry in the Liberal Arts Curriculum session at the 239th Meeting of the American Chemical Society today.

"What is food, but chemicals?" asked Das, an assistant professor in the Department of Chemistry. "Food provides the context that makes chemistry and biochemistry accessible to students while teaching them the fundamentals of the scientific process. "

For years chefs have been trying to alter the taste, texture and appearance of their food. Recently, they have begun to use techniques and equipment typically found in scientific laboratories to enhance their cooking. After seeing such concepts in restaurants, books and television shows, Das realized that there was a unique opportunity to use the science of these novel food preparations to engage students. He developed "The Kitchen Chemistry Sessions," taught at Carnegie Mellon.

The seven-week mini course is offered in two "flavors:" one for science

majors looking to apply their coursework to the kitchen and the other for non-science majors and first-year students. Students attend a lecture in which they learn about chemical and biochemical concepts surrounding the major types of molecules found in food: water, fats and oils, carbohydrates, proteins, and flavor and aroma molecules. They then take these concepts to a kitchen laboratory to apply what they learned.

For example, students learn how to make a chocolate mousse with only water or a flavored liquid and a chocolate bar, taking advantage of the emulsifier lecithin found in the chocolate bar. They learn to make fruit juice and yogurt "caviar" using the polysaccharide alginate, and they learn about transglutaminase, a "meat glue" that can bind two proteins together.

Students apply their knowledge through assignments that ask them to identify ingredients in common grocery store items and explain what chemical purpose those ingredients serve. Their final project is to prepare a meal using the concepts taught in the class.

"At the end of the course, I was amazed to see how much each student had learned and how they were able to apply the concepts. Architecture students were able to give detailed explanations of chemical processes, like oxidation states. All of the students were able to identify functional groups and suggest their effect in a transformation — something that is normally only taught in organic chemistry," Das said.

Provided by Carnegie Mellon University