

Science and cooking combine at gastronomic physics lab in Italy

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Liquid-nitrogen ice cream: UK delegates Jason Wye and Dave Richardson prepare a supercool dessert at Physics on Stage.

One evening of Physics on Stage included a dinner at the ESTEC restaurant where the menu had been invented by a chef with a passion for research and a physicist with a passion for cooking.

For two years I've been working with Ettore Bocchia, executive chef at the Grand Hotel Villa Serbelloni. We experiment with novel cooking techniques and create original recipes based on physics. As the physicist, I study and conceive new ways of cooking and new ideas for foods, while the chef gives the dishes an inviting form.

Villa Serbelloni has become the first gastronomic physics lab in Italy and the largest in the world. Scientific instruments, graphic charts and computers have all

become a key part of the kitchen.

The knowledge of physics is the starting point to inventing, and each new dish becomes an opportunity to explore the complex physics and chemical properties of each ingredient.

For now this project lies in the field of *haute cuisine*, but the relationship between this research of 'high molecular cooking' and cooking as we know it could be compared to Formula 1 and the car: sooner or later the real innovations will be available to all.

Part of the menu for the Physics on Stage dinner is given below.

Davide Cassi, *associated professor of matter physics, Parma University*

Menu

Lecithin gnocchi

Soya lecithin acts to highlight the gastronomic characteristics of this dish. If we add lecithin to a mixture of water and flour we obtain a smooth and resistant dough without the taste of egg. The special amphiphilic nature of the molecule enables it to dissolve easily in water and fat, creating the incredible properties for this gnocchi that marries perfectly with a light fish sauce.

Absolute turbot

In a new and very simple cooking method, we 'fry' the fish in hot sugar solution, rather than oil, at a temperature of 190 °C. This liquid conducts heats and retains the flavours better than oil does. The turbot is wrapped in a leaf of leek with thyme and a rind of orange, then placed in the sugar. This kind of flash cooking maintains the characteristics of the fish with the delicate perfume of thyme and orange. The leek leaves that isolate the fish from the sugar produce wonderful flavours due to the Maillard reaction. They are later used to make a sauce.

Light 'vitel tonné'

Slow cooking at low temperatures softens meat. When cooked in water, meat will dry. We have cooked veal in oil without reaching frying temperature. The meat is light, so we created a 'tonnata' sauce using no oil or egg. The soya lecithin amalgamates easily in the same way as fat, but also dissolves in water, resulting in a very light cream with no cholesterol and thus a low calorie content.

Coffee nitrogen ice cream

To end the dinner we offer an incredibly tasty ice cream. Liquid nitrogen at $-196\text{ }^{\circ}\text{C}$ is poured directly onto the cream while stirring. Rapid freezing produces microcrystals of ice ($20\text{ }\mu\text{m}$) that are imperceptible to the palate. Only a small quantity of nitrogen is required to freeze the cream; no chemical thickeners, which reduce flavours and perfumes, are needed. The resulting delicious ice cream is soft and velvety, melting slowly in the mouth, allowing the flavours to be appreciated and leaving a light sensation of freshness.