

FOOD

The art and science of chocolate

Marguerite du Plessis | Posted: Jul 18th, 2012

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Photos curtesy of Purdy's chocolates



Marguerite du Plessis

Marguerite du Plessis is a biologist working in pharmaceutical research. She is also an outdoor enthusiast.

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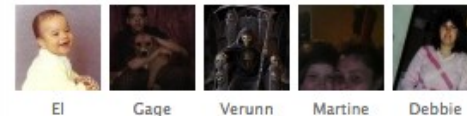
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The study of life is a key focus of the sciences, so if life is like a box of chocolates, there must be a great deal of science behind our favourite sweet indulgence.

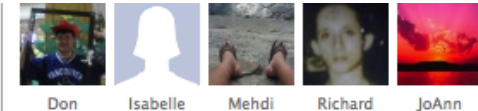
Molecular gastronomy -- the application of our knowledge of physics and chemistry to cooking -- seeks to understand the processes involved in transforming ingredients into the best tasting, most nutritious food possible. Slowly, this knowledge is penetrating the age-old, secretive techniques cherished by chocolatiers the world over.

Take for example Vancouver's *Wild Sweets*, which produces chocolates on a micro-batch basis in their own laboratory. They also utilize a production technique known as *bean-to-bar*, where nearly all of the variables are overseen by the chocolatier. "With bean-to-bar we control our chocolates," said Dominique Duby, Director at *Wild Sweets*. "We control the pH, colour, and viscosity."

Duby and his partner Cindy share the goal of improving chocolate making procedures by building on the art and traditions passed down by experienced chocolatiers, while incorporating what has been learned in the laboratory.

One question on their minds, for example, has been whether you really needed an expensive machine to make the best emulsion. Along with students from UBC's Food, Nutrition, and Health department they investigated five different methods for creating a ganache emulsion. "We have had an interest in science for quite a long time, and we had been employing students for a number of years in our business," said Dominique Duby. The students tested the emulsion based on stability and the amount of air oxidation, and as it turned out a relatively cheap method, an emulsion planter, produced great results.

The lab, however, is not the only place where chocolate inspiration happens. "Our recent Mayan chocolate line was inspired by a trip to Mexico," said Gary Mitchel, Head Chocolatier for Vancouver based *Purdy's Chocolates*, "but my inspirations comes from everywhere, even my own



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kitchen.”

Sitting in his test kitchen, Mitchel goes over some of his more inspired creations; Himalayan Pink Salt Caramel, sweet Georgia browns, brown butter maple Caramel, a special creation for Dwali with Mango and coriander, and chocolate dotted with red Hawaiian salt. Getting to these creations takes more than inspiration; there is a science behind it.

The most important ingredient needed by a chocolate lab is of course coco, which can only be grown in equatorial regions. There are essentially three types of coco beans “Trinitario, forestaro, and criollo; criollo is the premium bean,” noted Mitchel, “but the tree is prone to disease so it is actually forestaro which is used most often.”

The different beans have different flavours, and much like vineyards the soil the coco trees grows in plays a part. Peruvian coco has a hint of banana because soil still holds remnants of the preceding banana plantation, while coco from Madagascar has a hint of spice for the same reason. In order to get to the good stuff, coco pods are cut open and the scooped out beans are fermented. This fermentation is the first part that can alter the flavour of coco. The beans are then dried and roasted. At this point what is left is a thin shell surrounding coco nibs - that's the good stuff - which are pure chocolate. Crushed to a paste, nibs are reduced to 50% butter and 50% coco mass. This mixture is then separated and remixed to obtain the desired coco cake to butter combination. The ideal combination is determined by the recipe for which the coco is intended.

Purdy's purchases batches of dark and milk chocolate from Belgium and U.S. The various sources of are blended together similar to the way wine is blended from various grapes. “There are four different chocolates that go into our milk chocolates; milk, dark and white chocolates all blended together,” explained Mitchel “and our milk chocolate has always been a unique blend. One of the things that makes it unique is the addition of a Belgian white chocolate and what makes that unique is the milk crumb, which they actually caramelize.”

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When it comes to chocolate delicacies, technique becomes even more important. "Truffles should use a chocolate with less butter because you are already adding whipping cream which is fatty, more butter and the mixture won't emulsify" explained Mitchel. The resulting product is then conched, a part of making the chocolate silky smooth and also removing some of the acidity by continuously beating the molten chocolate inside a metal drum. Finally, the chocolate is tempered, the process of heating and cooling chocolate to create the ideal type of crystals uniformly throughout the batch. Tempering allows crystals to fit together better and as a result chocolate has a better snap and batter shine.

While dark chocolate is mostly coco mass, varying degrees of coco butter will play a role in the quality of the end product and for that matter in its nutritional value. "Dark chocolate is your best bet but it has to be at least 70 % pure cocoa or higher to get the benefits of the antioxidants out of it," related Ali J. Chernoff, a registered dietitian and founder of [Nutrition at its Best](#). "Antioxidants are nutrients in certain foods that help prevent or repair damage done, just like the same one's in fruits and vegetables," she added. "They may also enhance the immune system which can lead to a lower risk of cancer and infection. Milk chocolate, however, has little nutritional value."

White chocolate, which is made from coco butter, is equally devoid of antioxidants. "The problem is that people think I am going to eat lots of chocolate bars and get lots of antioxidants, but at the end of the day they have eaten a lot of butter and sugar which clearly is not good. " said Chernoff. "Yes, have dark chocolate in moderation, as a bonus to a balanced meal with plenty of fruits and vegetables."

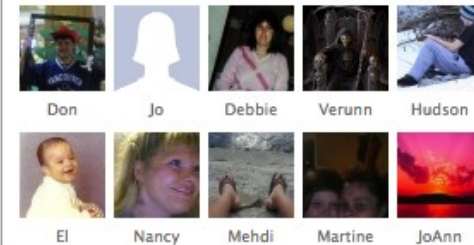
With these more nutritious aspects in mind, Purdy's developed a few products in recent years focusing on these health benefits. A favourite is the antioxidant rich Goji bar, containing 70% dark chocolate, nibs, and goji berries. Also in the range is 88% dark chocolate, which makes use of the Purdy's classic dark chocolate recipe, unchanged since Richard Carmon Purdy opened his first chocolate shop in 1907 on Robson Street in



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When chocolatiers hit the lab and start experimenting, some very interesting and exotic results can emerge. "My newest niche is cheese and chocolate" noted Gary Mitchell as he holds out a truffle. "This one has three cheeses and three chocolates: camembert goat cheese, and blue cheese."

Even more on the gastronomically adventurous side is *Wild Sweets' Harvest collection*. They cooked red cabbage with apple and cinnamon, and if you didn't know better you would say it is a fruit jelly. Without telling consumers what they are tasting Cindy and Dominique Duby have been able to introduce tasty new treats to individuals that might be averse to cabbage, but having convinced themselves it is a fruit like raspberry they enjoy the treat unrestricted. "Our culinary memory can be a difficulty when trying a new food approach" noted Cindy, "but with an accurate tasting", a blind testing if you will, "vegetable collections are expanding."

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