# The Convergent Innovation Webinar Series

Food Program: Inventing "One-World" Food Solutions for Sustainable Development and Affordable Healthcare

## Simulating Senses @ TCS: A confluence of Physics based modelling, Data Science and IT

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**February 7, 2019**
09:30 am EST
(1.5 hrs in length)

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*Chair & Moderator: Laurette Dubé (Scientific Director of MCCHE)*


## ABSTRACT

We perceive and react to the environment around us using 5 basic senses – sight, smell, sound, taste and touch. These senses are an inherent part of our daily lives and work seamlessly to give us a comprehensive sense of our surroundings. The underlying mechanisms governing them are extremely complex and have been an active area of research since long time, however with no or very little digital intervention. In recent time, development of advanced computers, availability of large volumes of sensory data, robust and scalable physics based models as well as efficient algorithms have opened up new research direction of creation of digital replicas of sensory functions. At TCS, we are pursuing research in the domain of touch, taste and smell and vision. We have built a digital model of human skin using multiscale modelling framework which mimics the barrier function of real skin. The model can be used for the design, development and testing of pharma and personal care products as well as research work in transdermal delivery of drugs e.g. insulin delivery via skin. The digital model can supplement in-vivo/in-vitro tests carried out for testing of both pharma and personal care products. We are also working on building data based models to predict properties of flavouring agents. The goal is to understand how various chemicals interact with each other to create new flavours. The correlation of molecular complexity and structure of a flavouring compound with its properties is established using various machine learning techniques. The models thus developed are used to screen/design improved favouring agents. The compound is further validated with in-silico tongue model mimicking the perception of taste. TCS is also working on developing an IoT and Cloud enabled framework for real time monitoring of food quality as it traverses from farm to consumer. The attempt is to build models to predict the shelf-life of the food based on online sensory data as well as offline laboratory analysis. Additionally, we are working on building models to link the chemical structure of a compound with smell. The encoding of chemical nature into smell shall lead to development of digital signatures of smell as perceived by us. *In the webinar, I shall present the results obtained thus far while moving towards the realization of the above goals.*


## ABOUT THE SERIES

The **Convergent Innovation Webinar Series** will feature cutting edge science, technology and innovation in agriculture, food and health domains as well as in the behavioural, commercial, social and complexity sciences. These, combined with traditions from around the world, will altogether articulate an interdisciplinary research and action strategy to transform agricultural products like pulses from undifferentiated commodities into higher-margin whole and value-added food products that support sustainable development and affordable healthcare. Progressively, programs in the CI-Food webinar series will be developed for other agricultural products with high CI potential, e.g., dairy, fruits, vegetables, and others.

## Global Pulse Innovation Platform:

An Ecosystem to Transform Traditional and Modern World through Food

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