

Original Article

Birth of a Neurogastronomy Nation: The Inaugural Symposium of the International Society of Neurogastronomy

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Abstract

A review of the neuroscientific, clinical medicine, culinary, and food technology and agriculture presentations and demonstrations that were featured at the inaugural symposium of the International Society of Neurogastronomy, held at the University of Kentucky on November 7, 2015.

Key words: clinical medicine, culinary, neurogastronomy, neuroscience

In 2006, Gordon Shepherd wrote in a paper to *Nature*: “It is possible to imagine a future ‘neurogastronomy’, combining the biochemistry of food preparation, the molecular biology of the olfactory receptors, and the knowledge of odour images and the brain flavour system reviewed here. Such a synthesis could have the potential to improve our understanding of the human experience of eating and ways to shape it towards more flavourful and healthier diets” (Shepherd 2006). And thus the term “neurogastronomy” was coined. In 2012 Dan Han, chief of the University of Kentucky’s neuropsychology services clinical section and Associate Professor of Neurology, was attending a conference in Montreal and due to a botched dinner reservation at the famed restaurant “Joe Beef,” was able to meet the chef-owner, Fred Morin. Together over wine and conversation the idea to bring chefs and scientists together to study neurogastronomy germinated. On November 7, 2015 this synthesis was officially born at the University of Kentucky with the inaugural symposium of the International Society of Neurogastronomy (ISN).

The symposium featured 13 speakers and 6 food technology and agriculture demonstrations. The talks comprised the 3 pillars of neurogastronomy: culinary arts, clinical practice, and bench neuroscience. The keynote speaker was none other than Gordon Shepherd who expounded on how flavor is created by the brain. Highlights of his presentation included the overlap between food and drug addiction and the brain’s reward system; a review of the evolutionary significance of human oral anatomy and the invention of cooking; and humans’ uniquely acute capacity to perceive flavors

through retronasal olfaction. Shepherd also elegantly explained how the brain is at the center of neurogastronomy and the complex and dynamic bidirectional relationship between eating and neuroscience, noting for example, how eating engages nearly the entire brain and that our brain is shaped from gestation onwards by what we eat. He also synthesized the themes of this historic symposium by pointing out the paradox of how flavor images in the brain both make us susceptible to illusions of unpalatability, such as in the case of chemotherapy patients, while at the same time their link to the reward system makes us susceptible to overeating. Shepherd concluded his lecture with a call for new initiatives, and underscored the importance of uniting basic research with nutrition and public policy so that the field of neurogastronomy can most effectively advance.

Neuroscience presentations

Tim McClintock, Professor of Physiology at the University of Kentucky and one of the founders of ISN, discussed the future of flavor development and emerging technologies, such as “the Kentucky assay,” that will enable the identification of the specific olfactory receptors involved in detecting any given odorant, and which will then make reverse engineering odorant formulations scientifically possible. McClintock stressed the importance of this breakthrough for flavor formulations which can have specific nutritional benefits, and likened the significance of this new frontier to how the

pharmaceutical industry was able to develop drugs for specific treatments once the receptors involved in their (mal)function were identified.

Bret Smith, also a Professor of Physiology at the University of Kentucky, explained the gut-brainstem-liver-glucose regulatory circuit and its involvement in how the brain processes food and the motivation to eat. To demonstrate how this knowledge can be applied to disease he presented research from his laboratory which has been able to reverse glucose intolerance in animal models of diabetes. He also reported on a new device (patent pending) that can be placed on the vagus nerve to counteract Type 2 diabetes in humans. Smith concluded that a central challenge to the budding field of neurogastronomy is to find ways in which food can be made hedonically appealing without circumventing the homeostatic mechanisms that maintain a balanced metabolism.

The acclaimed sensory psychologist, Charles Spence from the University of Oxford discussed the significance of emotion, memory, and context in human food perception. He summarized his laboratory's vast research on cross-modal correspondences and explained how the relationships between hearing, vision, and texture that we have learned through our experiences with the environment can change and influence the perception of food. For instance, if toffee is eaten while listening to high pitched tinkling notes it tastes sweeter than average, and when it is paired with hearing low bass tones it tastes more bitter. Most importantly, he discussed the significance of these relationships where food consumption is a challenge to health such as in hospital settings and for cancer patients. One significant example is that the color red is a universal signal for attention and danger and has been shown to inhibit food consumption, yet red trays are often used in hospitals to bring food to undernourished patients. His lecture made clear that the findings from neurogastronomy research must be and can be integrated into public policy to institute changes that improve human health and well-being.

Clinical presentations

The principal founder of ISN, neuropsychologist Dan Han from the University of Kentucky, discussed the need for a paradigm shift to bring olfaction into focus in both medicine and public awareness. He drew attention to the parallels between how monoculture is bad for agriculture and monotonous diets are bad for human nutrition to make the point that nutrient variety is critical for health. His presentation accentuated the mission of ISN and the need to stimulate intellectual thought, debate and networking between colleagues across disciplines to address clinical deficits, proliferate new approaches, and apply the craft and science of neurogastronomy so that the needed changes can be made to improve human quality of life.

Sid Kapoor, a neurologist at the University of Kentucky College of Medicine and a founding member of ISN, began his presentation by illuminating the connection between food, medicine and health explaining that the origin of *Rx* is the Latin word "recipe" meaning "to take." Kapoor then went on to present fascinating research on the promise of nutritional medicine, specifically in terms of his work on the "ketogenic diet" for the treatment of epilepsy. He described different methods by which this treatment can be applied under various circumstances, and case studies illustrating the efficacy of this nutritional therapy for treating epilepsy where all other procedures have failed.

Chef Leah Sarris from Tulane University in New Orleans developed the first interdisciplinary program between culinary science,

nutrition, and medicine and her curriculum is currently used in 16 medical schools across the country. Her talk focused on the epidemics of obesity and diabetes in North America and stressed the very serious issues that they present to child health. Sarris called for collaborative research to create tastier food that is also healthier, and pointed out how parent's attitudes toward food influences food acceptance among their children. Most importantly, she outlined how a sea change needs to take place in our approach toward food education, marketing, healthcare, and public policy so that people learn how to cook and prepare food and understand the importance of food to nutrition and health.

Culinary presentations

Talks given by luminary chefs in the culinary panel were by turns enlightening, moving, and entertaining. All of the chefs emphasized that an open dialogue between food creators and food consumers is critical to developing an understanding of the consumer's flavor palate so that maximum benefits, both hedonically and nutritionally, can be obtained from a meal.

Chef and co-founder of ISN, Fred Morin, from the internationally renowned restaurant "Joe Beef" in Montreal discussed what makes people try new foods, individual differences in each of our "gastronomical canvases," and that a common language is needed so that chefs, neuroscientists, and diners can communicate the food experience. He also discussed the importance of "terroir," expanding the use of this French term about regional effects on the tastes of wines to encompass food culture, local ingredients, and the context of the dining experience. Morin's talk focused on the pleasure that can be derived from gastronomy and he concluded his presentation with a hopeful example of how food and wine are being used in a Quebec hospice to improve resident's quality of life.

Bob Perry, a chef at the University of Kentucky who conducts food system research, gave a presentation on his special expertise in hog breeds. Perry began his presentation with the memorable statement that "one has to eat pigs to save them"—signifying that in order to foster humane farming a greater appreciation of pig meat is needed. He then went on to discuss the differences in a range of hog breeds for the quality and yield of their meat—explaining for example, that the "Ossabaw" has superb flavor but a poor yield, while the "Tamworth" is the quintessential bacon pig because of its high meat to fat ratio. To bring his examples home, Perry's presentation was followed by a prosciutto tasting demonstration.

Jehangir Mehta, chef-owner of "Graffiti" and "Me and You" in New York City, considered the importance of the conversation between the chef and the diner to achieve maximum satisfaction and pleasure from food, and raised issues of how physical intimacy and attention to table settings can change the experience of eating. His talk further emphasized the importance of food and health and how food can be used as medicine—giving the example of how a special diet enabled his wife to maintain her vigor through severe chemotherapy and aided her recovery from cancer. Mehta also stressed the importance of food and emotion with examples from the Ayurvedic tradition, such as that bitter taste decreases sadness and pain, whereas sweet helps the body combat fear.

Ed Lee, a distinguished chef-owner of several restaurants in Kentucky, also focused on the use of food as medicine and how it helped his wife overcome cancer. His presentation highlighted the unfortunate disconnect between food taste and nutritional quality, particularly in hospital settings, and how this can hinder recovery. He concluded that there was a serious need for hospitals to develop

personalized meal plans so that individuals can experience greater hedonic pleasure from eating, which in itself can facilitate the recovery process, and that meal plans—each having unique therapeutic benefits—should be developed to specifically address different medical conditions. Lee also discussed the medicinal origins of flavor principles in different ethnic fare explaining that the reason spices such as ginseng, garlic, rosemary, oregano, and turmeric are present in so many cuisines is because of their fundamental curative qualities.

Quita Michel, a celebrated Kentucky chef gave a passionate, personal, and persuasive presentation on how the inability to eat hastened her mother's death from cancer. Her talk addressed the unique and relativistic relationship between food and person, and discussed how the emotional trauma brought on by a terminal diagnosis not only depresses the desire to eat but also the body's physiological ability to metabolize food. Addressing possibilities for remediation, Michel reviewed how placebo effects can extend to food and that if patients are convinced that a food is healing it will help with their recovery. The core message of her presentation was that the research findings from neurogastronomy need to be applied to develop sensory transformations of food and tableware that can facilitate eating among end-stage cancer patients so that the quality and length of their lives' can be improved.

A buffet of sensory and food technology demonstrations were made available throughout the day. One demonstration illustrated color-flavor confusion with 3 aspics that were presented in unexpected colors, such as a green, chicken flavored cube. "Sonic Seasonings" demonstrated how music can alter taste perception with 2 cookies differing only in the color of their frostings that one ate while listening to either heavy metal or soul music. Another demonstration asked the participant to consider how salt versus sugar

changes the perception of bitter taste in grapefruit slices and tonic water, and an advanced version of the jelly bean demonstration on retronasal olfaction where food texture and color were additionally manipulated was also present. Most delicious was Bob Perry's demonstration of how brine curing differentially changes the taste of pork depending upon the breed of pig.

This symposium deftly brought expert chefs, neuroscientists and clinicians together to discuss the problems that are central to eating in today's world—disease and undernourishment and disease and obesity. Although these problems may seem to address opposing issues they are fundamentally united by the fact that an understanding of how the brain, our physiology, and individual differences in the experience of food pleasure are intricately involved in food consumption is critical to any solution that can provide lasting and meaningful changes to human diet, health, and well-being.

The mission of the ISN is "to advance neurogastronomy as a craft, science and health profession to enhance quality of human life and to generate and disseminate knowledge of brain-behavior relationships in the context of gastronomy." This goal was achieved with gusto at the inaugural symposium of the International Society of Neurogastronomy. It was a privilege to be present at the beginning of what I am certain will be an extremely influential society—one whose mandates and discoveries will transform the future of research and practice in neuroscience, the chemical senses, public policy, culinary arts, and most importantly, human health and happiness.

Reference

- Shepherd GM. 2006. Smell images and the flavour system in the human brain. *Nature*. 444:316–321.