

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)  
Interactive Presentations (IP)

Author: Mrs. Allison Rae Hannigan  
United States, AstroAllie5@gmail.com

Ms. Valerie Anne Casasanto  
NASA Goddard/University of Maryland, Baltimore County (UMBC), United States,  
Valerie.A.Casasanto@nasa.gov

## FOOD SCIENCE: "SPACE CHOCOLATE"

**Abstract**

Food science in space has mostly been limited to formulating recipes on Earth for eating of food in space. Simple math shows that the 'consumer' market for space-based comestibles can be counted on fingers. A more market-driven approach would have us consider edibles developed in the unique environment of space for the eating on Earth. Such a logical approach is still constrained, however, by many practicalities, not least of which is a currently prohibitively high cost to produce foodstuffs that could possibly be sold to terrestrial markets. Although on-orbit manufacturing platforms of any type are still a long way into the future, a development path for one item in particular is envisaged here: "Space Chocolate." The first step begins with testing basic principles of polymorphous crystallization, melting and solidification. The proposed initial experiment will use a parabolic flight, and progress to sub-orbital flights. The hardware selected has been flight-qualified by BioSpace Experiments, Inc., and would be temperature controlled to allow for melting and solidification. Volumes involved will be measured in the microliters range; therefore no edible end-product is expected yet. These first steps, testing the melting points and crystallization of chocolate with varying concentrations of milk fat for optimal results, will inform future development of larger samples of space-made chocolates. Also, any serious attempt to produce an end product for consumption will require development of production equipment optimized for the conditions of space. Finally, for any substantial volume of chocolate to be produced, a capability beyond that offered by the ISS will need to be available. Therefore, current trends in space platforms dictate a very long lead-time before these products can be available to market. For now, then, concept development will be confined to basic research levels. One ray of hope is that the field of food science specifically known as "molecular gastronomy" is growing in popularity, and many other concepts can be developed for creation in space. Perhaps this one field could contribute to an increased demand for access to space, offering hope of an expedited path to genuine space manufacturing platforms. Attempts will be made by the authors to secure funding and form a collaborative team this year; however actual flying time on either a suborbital launch or parabolic flight will likely occur next year. Results of this experiment will be written up into a follow-on paper to be submitted to IAC-18.