## UNDERGRADUATES PURSUING RESEARCH IN SCIENCE AND ENGINEERING (UPRISE)

## PHARMACEUTICAL SCIENCES WINKLE COLLEGE OF PHARMACY

## SUMMER RESEARCH OPPORTUNITIES FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: 03/01/2018

PROJECT TITLE: Topical Delivery of an Anti-aging Cosmetic Agent

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## Project Description

Leave-on cosmetic products such as creams and lotions often deliver benefits beyond skin moisturization and smoothness. Skin lightening, reduced appearance of age spots and reduced appearance of wrinkles are frequent targets of such products, which are often termed  $\hat{a}\in\mathbb{C}$ cosmeceuticals $\hat{a}\in$ . Success in the marketplace depends, in part, upon how efficiently the skin benefit agent is formulated, as some agents can be very expensive and also hard to deliver.

This project will focus on the delivery of a lipophilic (oil-loving) skin benefit agent from a cream formulation constructed as an oil-in-water emulsion. For efficient delivery, the formulation must be designed so that the benefit agent is soluble, but not too soluble, in the oil phase. Furthermore, other excipients should be chosen to maximize skin permeability while causing minimal irritation or dryness. The summer project will focus on the solubility aspect of this problem, using tools such as regular solution theory and both Hildebrand and Hanson solubility parameters to optimize the design of the oil phase.

The student investigator will learn basic principles of emulsion formulation and performance. In addition to the solubility measurements, she will calculate solubility parameters and apply regular solution theory to interpret the results, extending this analysis to more advanced engineering methods including NRT, UNIFAC/UNIQUAC and CosmoTherm if necessary. She will apply this analysis to interpret human skin penetration data generated by others working on the project. The student will leave with a sense for the teamwork and diverse set of scientific methods required to make advances in the consumer products area.