preparedness for the challenges in Biology related fields in the 21st century. However, training in developing those skills is not typically available to students until graduate school. In this courses-imbedded research project, students were exposed to a semester long series of realistic problems related to acceleration, force, torque and energy. Students are required to self-develop activities for formulating protocols of collecting data, analyzing, and making conclusions about these problems. The purpose to use this new method of student laboratory engagement is to train students in being able to be creative, critical, and trouble shoot simple problems during experimentation. Additionally, technical writing is emphasized as this is important for students to be successful as graduates in biology major in today's world. Throughout the semester students learn how to present scientific results. Instructors organize the discussion on the validation of experimental plan, grade reports and provide detailed one-on-one feedback to students. At the end of semester students are required to write a comprehensive report summarizing all their experimental procedures, data collection approaches, and presentation of results. Students' performance are assessed by carefully developed rubrics based on accepted standards used in conducting scientific research and reporting, a point-based scale is used to track student's skills of critical thinking, quantitative data analysis, and their technical communication. Additionally, students' feedback through pre-and post-survey questions is assessed to determine effective of this new lab format in their learning process.

1101-Pos Board B856

Exciting Minds to Make them Shine: An Undergraduate Hands-On Training Program in Biophysics

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The limited application of luminescence spectroscopy in directly monitoring foods and pharmaceuticals can be attributed to two causes: a) most useful fluorophores are either toxic, expensive, have limited availability or selective solubility, and b) detailed photophysical characterization of edible fluorophores is limited.

We have attempted to fill this void with an educational program that involves student-led research by undergraduates. This hands-on training program focuses on photophysically characterizing and cataloging generally-recognized-as-safe (GRAS) chromophores normally present in or routinely added to foods. This program creates a database of edible fluorescent and/or phosphorescent probes while also identifying potential applications of the probes as intrinsic sensors of quality and safety in foods and pharmaceuticals. These objectives require a full integration and understanding of biophysical concepts from formation of excited electronic states and transfer of excitation energy within biophysical systems to the effect of physical state of biological materials on photophysical responses.

Within this program ~15 compounds have been tested and characterized in the last few years by a team of >15 undergraduates working individually and collaboratively. The involvement of such a large pool of undergraduate students enables the testing of a broad set of potential chromophores while also providing training in biophysical research methods and techniques to a group of potential scientists. This project additionally promotes mentoring skills among the collaborating graduate students and senior undergraduates. The results of this project have been used to inform and successfully obtain federal grant funding. We believe this program serves as a useful platform for introducing biophysics research to undergraduates. The strategies that have been developed during its implementation can be extrapolated to teach biophysical concepts in other areas.

1102-Pos Board B857

Biophysics in Order: An Interdisciplinary Approach to Undergraduate Student Engagement in Research

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There is a growing recognition among university educators that early exposure to research facilitates student engagement, reinforces learned material, and provides critical training that is otherwise not provided in a traditional class setting. Unfortunately, by the nature of graduate education, undergraduates are rarely afforded opportunities to formally interact with university researchers. The ORDER (On Recent Discoveries by Emory Researchers) program is taught by graduate students and postdoctoral researchers under the guidance of faculty and aims to provide an interdisciplinary, research-based course to undergraduate freshmen and upperclassmen. During the freshmen seminar course, students propose a research question and actively conduct experiments to address their hypotheses. The capstone of the course is a research report and formal presentation of their results, specifically intended for a broad audience. The course was adapted for upperclassmen to focus on students creating and presenting a research proposal which they can use to guide the transition after their baccalaureate education.

Here, we discuss the integration of a single-molecule biophysics module into the ORDER curriculum taught in the 2012-2013 academic year at Emory University. ''iSearch: Illuminating Identity'' was a course designed by teacher-scholars from disciplines ranging from Neuroscience and Physics to Psychology and Spanish. Each teacher-scholar exposed undergraduate students to his/her specific research pursuits and mentored undergraduate students through the research process. The undergraduate students came from a broad assortment of academic programs offered at the university. Further, we present the layout of the course, the active methods used to engage students, the lessons learned from collaboratively teaching a research-based course, and the educational benefits for the teacher-scholars. In particular, we detail the single-molecule biophysics module and present pre- and post-survey results from students probing their interest and understanding of the biophysics research field.

1103-Pos Board B858

An Integrated, Instrument Intensive Project-Based Biochemistry Laboratory for Enhanced Student Learning and Research

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We have designed and implemented a two-semester instrument-intensive experimental biochemistry course. In the early part of the course, student training is focused on experimental design, calibration curves, and statistical analysis. Students study biologically significant small molecules using HPLC, UV-Vis Spectroscopy, and electrochemical biosensors. In the last half of the first semester, experiments grow in complexity and students become more independent as they use multiple spectroscopic techniques to study lipid membrane dynamics, protein structure, and enzyme activity. In the second semester, students study the impact of structure on protein function, use qPCR to quantitate relative gene expression in plants, and study the dynamics of tRNA structure upon ligand binding using fluorescence, absorbance, and electrophoresis. Throughout the course, students are trained in both formal and informal scientific writing. The culmination of both semesters is a student-designed inquiry-based independent project. We will describe the structure of the course, how learning outcomes are addressed, and report on initial student responses to this integrative instrument-based biochemistry experience. *The authors gratefully acknowledge the NSF (DUE award # 1044737) for support of this project.*

1104-Pos Board B859

Sustained Crystallography Skills through Multimedia-Supported Active Learning

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Structure solution skills in x-ray crystallography are critical capabilities for students and postdoctoral trainees in biophysics, biochemistry and structural biology. While many institutions have incorporated classes on theoretical crystallography into their curricula, practical structure solution skills are rarely imparted through coursework.

We thus developed an enabling, hands-on crystallography sub-curriculum, which can be added to existing biophysics curricula that focus on the theoretical foundations. Taking place in an encouraging, collaborative learning environment, our educational intervention sets out to provide learners from diverse backgrounds with sustainable skills to tackle real-world, protein structure solution problems independently.

Our curriculum is designed in a multimedia-enhanced, blended classroom format: Reading resources as well as short, narrated and pre-recorded slide presentations provide course participants ahead of class with the necessary background to work on problem sets during face-to-face sessions. Part of an evolving case study, the problem sets contain real-world diffraction datasets in various degrees of difficulty. Throughout the curriculum, learners are sequentially guided through all essential structure solution steps, from remote diffraction data collection and processing, various structure solution strategies, to structure quality evaluation. By the end of the curriculum, every student shares their experiences in an audio-supported slide-presentation over the web, while classmates provide feedback.

We evaluate learners' confidence, academic performance and sustained skill level through a multi-facetted set of assessments, including quizzes, problem