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## Ann Rundell Receives NSF CAREER Award

Professor Ann Rundell has been selected to receive a prestigious NSF CAREER Award for her work on advancing model predictive control of cell differentiation.



One goal of tissue engineering is to direct the differentiation, integration, and organization of living cells to produce biological substitutes for organs to meet the need of nearly 100,000 Americans who are waiting for organ transplants. Current efforts in tissue engineering are largely driven by experiments with very little guidance from control theory. This project develops and experimentally evaluates a control theory-based approach that will facilitate the design of protocols to predictably promote the differentiation of human promyelocytic leukemia (HL60) cells into monocytes and granulocytes. Model predictive controllers will be designed using sparse grid-based optimization methods to select practical values that are robust to model uncertainties and experimental disturbances. This potentially transformative research will be among the very first studies specifically designed to develop and experimentally validate control theory-based strategies to control cellular differentiation.

Efforts will be made to educate and inspire tomorrow's engineers to pursue careers that utilize control principles and practices to design experimental strategies to manipulate cellular processes. It is estimated that more than 500 graduate, undergraduate, and middle school students will benefit from the proposed educational activities. Mastery-oriented teaching and small group mentoring sessions are anticipated to promote student attainment of a positive self-image, sustained motivation, and life-long learning skills while the Web-modules, electronic fieldtrips, and summer camp activities will highlight the beneficial contributions of control engineers to society. This integrated research and education career plan will have implications for the control theory, systems biology, tissue engineering, and engineering education communities.

More information on Professor Rundell's research can be found at <https://engineering.purdue.edu/BME/Research/Labs/Rundell/>

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