

# Chemical Engineering Seminars – HT 2007

***Week 9: Tuesday 13 March, 4:15-5.15 pm  
Lecture Room 2, Thom Building, Engineering Science***

## New Technologies from Engineered Self-Modifying Proteins

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### **Abstract**

My laboratory seeks to apply protein engineering and genetics to develop new technologies in the areas of biosensing, drug discovery, bioseparations and bioprocessing. These goals are achieved through the development of designer proteins based on naturally occurring self-splicing proteins known as inteins. By combining rational protein engineering with a highly flexible and reversible genetic selection system, we have been able to generate inteins with novel and unique applications. In the area of bioseparations, we have combined a previously developed pH-sensitive self-cleaving intein with a variety of purification tags to produce simple and economical methods for purifying recombinant proteins at a wide range of scales. Our most recent work involves the development of self-aggregating, self-cleaving protein purification tags, which allow the efficient recovery and purification of native targets using simple mechanical means without the need for chromatography. In biosensing, we have developed an allosteric reporter protein, incorporating an intein, that can be controlled by the addition of small molecule ligands. We have used these to construct an *E. coli* hormone biosensor that is able to detect hormone-like compounds in growth media. Remarkably, this simple bacterial sensor can differentiate agonist from antagonist compounds and has been effective in detecting a wide variety of strong and weak estrogenic compounds. These include a wide variety of known drugs as well as estrogenic pollutants, home products and natural herbal remedies. Indeed, we were recently able to identify estrogenic activity in two newly constructed compounds from an untested small library, which have now been confirmed in human cell assays. Applications of our designed protein are far-reaching, and include drug discovery, biosensing, targeted drug activation, reversible knockouts for metabolic research, new genetic selection systems, and advanced cellular control strategies.

### **Bio-sketch**

**Prof. Wood** is an Assistant Professor in the Department of Chemical Engineering at Princeton University, with research interests in metabolic, protein and enzyme engineering.