中科院特聘外籍研究员聘任仪式暨过程工程所 SKIPER 学院名师讲堂

演讲嘉宾：Christodoulos A. Floudas 教授

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演讲主持：所长助理 肖炘研究员

演讲地点：中科院过程所过程大厦 312 会议室

演讲语言：英语

嘉宾简介：

Christodoulos A. Floudas 教授长期致力于全局优化的理论、方法及其在过程系统工程、计算化学和分子生物学等领域的应用，并做出杰出贡献，属世界知名学者，于今年 2 月当选为美国工程院院士。他曾于 2010 年 5 月 12 日访问我所并做有关杂合能源新系统创新设计的学术报告且反响热烈。本月他将作为我院特聘外籍研究员到所工作，期间将于 12 日和 13 日分别就全局优化和杂合能源新系统的最新进展再做两次学术报告。报告题目、简介、时间、地点附后。欢迎大家参加。

更多信息参见：http://titan.princeton.edu。

报告 1

报告时间：2011 年 4 月 12 日（周二），上午 10:20 - 11:40

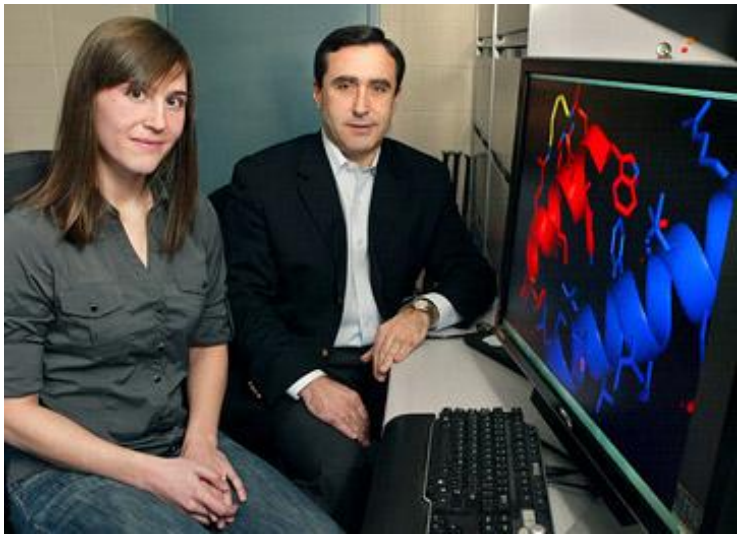
报告内容：

Towards Large Scale Deterministic Global Optimization

Abstract

In this presentation, we will provide an overview of the research progress in global optimization. The focus will be on important contributions during the last five years, and will provide a perspective for future research opportunities. The overview will cover the areas of (a) twice continuously differentiable constrained nonlinear optimization, and (b) mixed-integer nonlinear optimization models. Subsequently, we will present our recent fundamental advances in (i) convex envelope results for multi-linear functions, (ii) a piecewise quadratic convex underestimator for twice continuously differentiable functions, (iii) piecewise linear relaxations of bilinear functions, (iv) large scale extended pooling problems, and (v) large scale generalized pooling problems. Computational studies on medium and large scale global optimization applications will illustrate the potential of these advances.

Application Example



Global Optimization has wide applications from molecule to system, from material to policy and from static to dynamic almost in all aspects of science and engineering. Prof. Floudas (right) and his Ph.D student Meghan Bellows-Peterson have innovated a new way based on global optimization to take some of the guesswork out of discovering new drugs. Using the technique, they have identified several potential drugs for fighting HIV. The image reported as headline news on Princeton University home page shows a graphic of their drug candidate (red) attached to HIV (blue). (Photo by Frank Wojciechowski)

For detail:

http://www.princeton.edu/main/news/archive/S29/66/70K88/index.xml?section-top stories

报告 2

报告时间：2011 年 4 月 13 日（周三）, 上午 10:30 - 11:40

报告内容：

Hybrid Biomass, Coal, and Natural Gas to Liquids (CBGTL) Systems: Design, Simulation, and Supply Chain Optimization

Abstract

Heavy dependence on petroleum and high greenhouse gas (GHG) emissions from the production, distribution, and consumption of hydrocarbon fuels pose serious challenges for the United States (US) transportation sector. Depletion of domestic petroleum sources combined with a volatile global oil market prompt the need to discover alternative fuel-producing technologies that utilize domestically abundant sources. The primary aim in the discovery of hybrid energy processes is to combine coal, biomass, and natural gas to meet the United States transportation fuel demand.

The first part of this presentation will outline the needs and introduce novel coal, biomass, and natural gas to liquids (CBGTL) hybrid energy process alternatives which employ the reverse water-gas-shift reaction along with a non-carbon based source of hydrogen, and attain a near 100% conversion. Mathematical models for biomass and coal gasification are developed to model the nonequilibrium effluent conditions using a stoichiometry-based method. Steady-state process simulation results coupled with heat and power integration, and economic analysis determine the break-even price of crude oil (BEOP) and suggest that the CBGTL process is competitive with petroleum-based processes.

The second part will present a novel framework for the optimal energy supply chain of CBGTL processes. A mathematical model will be introduced that minimizes the total network cost while simultaneously evaluates the environmental performance through a life cycle analysis of each individual plant. The optimal network topology provides information on (i) the optimal plant locations throughout the country, (ii) the locations of feedstock sources, (iii) the interconnectivity between the feedstock source locations, CBGTL plants locations, and the demand locations, (iv) the modes of transportation used in each connection, and (v) the flow rate amounts of each feedstock and product type.