

耶鲁大学产业生态学的研究及 课程设计

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清华大学环境学院

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耶鲁大学概览



图片来源: Yale University

森林与环境学院 FES



图片来源: Yale University

2015 年森林与环境学院(FES) 概况

- 280 硕士研究生
- 75 博士研究生
- 50+ 教师(Faculty members),以及各类访问学者
- 每年120余门可选课程
- 50% of coursework can be taken at other Yale University Schools & departments
- 12 environmental research centers and programs
- 30+ student interest groups
- 14 Joint or Dual Degree programs within Yale University, Tsinghua University, Pace Law School and Vermont Law School

产业生态学中心所在地
Center for Industrial Ecology (CIE)



访学期间的办公室



Yale University

Center for Industrial Ecology

YALE SCHOOL OF FORESTRY & ENVIRONMENTAL STUDIES



Graduate Studies

Exploring the relationship
between industrial
development and
environmental quality



Yale University's School of Forestry & Environmental Studies' Center for Industrial Ecology was established in September 1998 to provide an organizational focus for research in industrial ecology.

来源:<http://cie.research.yale.edu/about/people-cie>

People in CIE (产业生态学中心)

来源:<http://cie.research.yale.edu/about/people-cie>



Thomas E. Graedel



Edgar Hertwich



Marian Chertow



Reid Lifset



Arnulf Grubler



Barbara Reck



Ayman Elshkaki



Yale University Center for Industrial Ecology

教师（Faculty）的主要研究兴趣

- 产业生态学理论基础Theoretical basis of industrial ecology
- 物质循环the cycles of materials
- 城市生态化发展, eco-industrial urban development
- 产业共生, industrial symbiosis
- 产品及生产者相关的政策研究product and producer policy issues.
- 气候变化climate mitigation
- 生命周期评价life cycle assessment
- 可持续生产与消费sustainable consumption and production
- 贸易与环境trade and environment
- 风险评价risk analysis

Industrial Environmental Management Program

产业环境管理项目

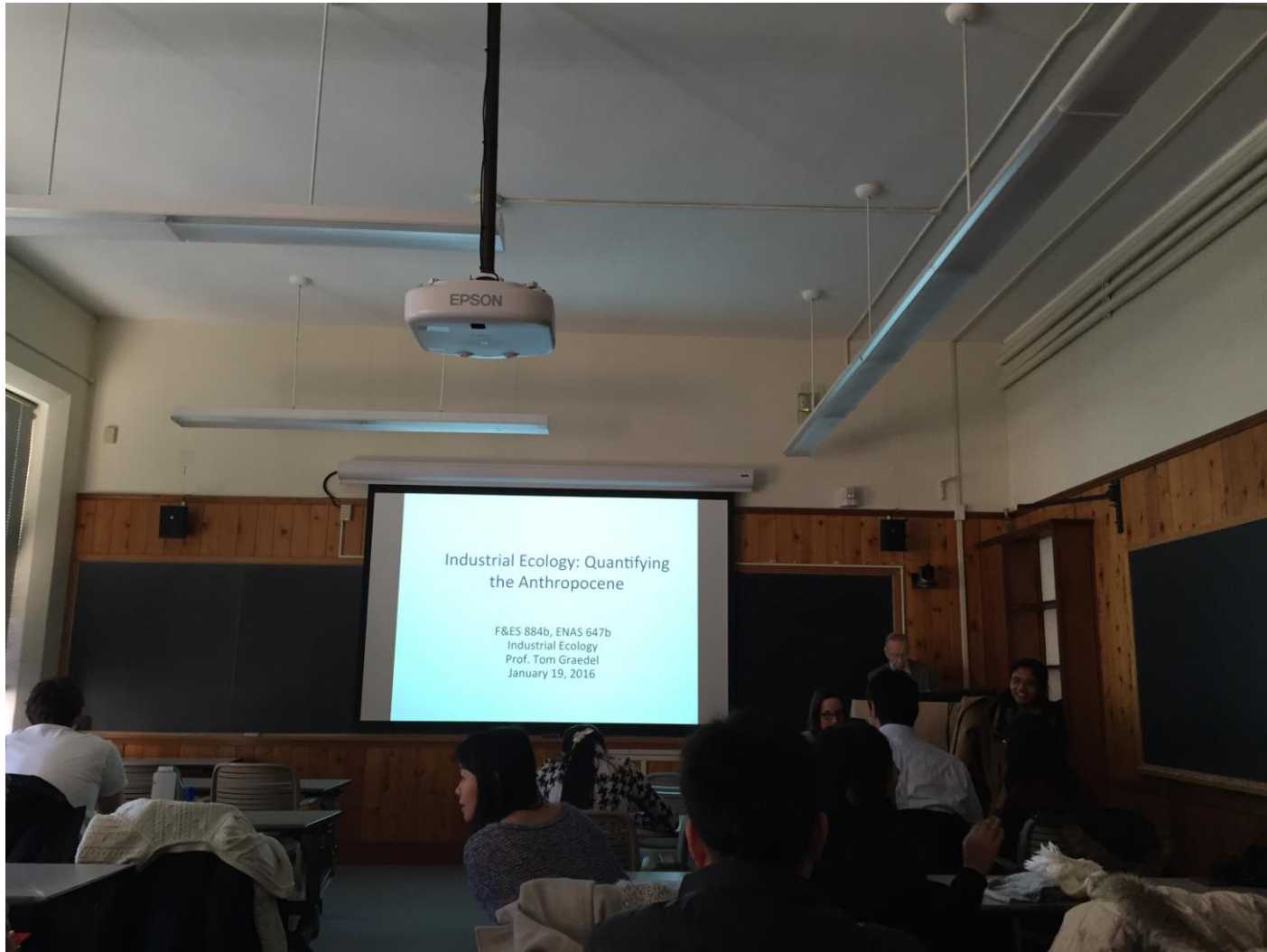
- The **Industrial Environmental Management graduate academic program** trains environmental and business leaders to understand the relationship between economic development and environmental quality and then to apply this knowledge to optimize resources use in products, processes and services.
- **The intellectual core of the IEM program is industrial ecology**, an emerging field that allows us to study and implement the twin goals of economic development and environmental quality.

Industrial Environmental Management

支撑产业环境管理项目的课程体系

- **Industrial Ecology**---Thomas Graedel and Marian Chertow
- **Energy Systems Analysis**---Arnulf Grubler
- **Advanced Industrial Ecology Seminar**---Marian Chertow
- **Green Engineering and Sustainable Design**---Julie Zimmerman
- **Life Cycle Assessment Practicum**---Tom Swarr
- **Corporate Environmental Management and Strategy**---Marian Chertow and Daniel Esty
- **Seminar: Interdisciplinarity in Environmental Research**---Marian Chertow, Anjali Gupta
- **Energy Technology Innovation**---Arnulf Grubler
- **Climate Change Mitigation and Industrial Ecology**---Edgar Hertwich

Industrial Ecology 《产业生态学》课程



Industrial Ecology

“Industrial ecology is the study of the flows of materials and energy in industrial and consumer activities, of the effects of these flows on the environment, and of the influences of economic, political, regulatory, and social factors on the flow, use, and transformation of resources.”

研究物质、能源在工业和消费活动中的流动及其产生的环境影响；以及经济、政策、管理、社会因素对物质、能源流动、使用，及资源转化的影响。

Source: Robert White 1994 President, US National Academy of Engineering
Courtesy of Prof. Marian Chertow and Prof. Thomas Graedel

Industrial Ecology 《产业生态学》 课程

课程目标

- To define and describe industrial ecology;
- To demonstrate the relationships among production, consumption, sustainability, and industrial ecology in diverse settings, from firms to cities to international trade flows;
- To show how industrial ecology serves as a framework for the consideration of environmental and sustainability-related aspects of science, technology, and policy;
- To define and describe tools, applications, and implications of industrial ecology.

Industrial Ecology 《产业生态学》 课程教学内容

每次课讲授主题		每次课讲授主题	
1	Industrial Ecology: Quantifying the Anthropocene	2	Biological and Industrial Ecosystems
3	Biological and Industrial Metabolisms	4	Anthropogenic Resource Cycles and National Material Accounts
5	Industrial Symbiosis Framework	6	Lost by Design
7	Product-Centered Analysis	8	Introduction to life-cycle assessment
9	Virtual Flows	10	Industrial Symbiosis in Action
11	Urban Industrial Ecology and Urban Mining	12	Social Metabolism
13	Input-Output Analysis in Industrial Ecology	14	Complexity in Industrial Ecology
15	Industrial Ecology and Food	16	Historical and Island Studies in Industrial Ecology
17	IE and Policy: Framework and Implementation	18	Industrial Ecology in Developing Countries
19	Scenarios in Industrial Ecology	20	The Status of Resources
21	Industrial Ecology and Sustainability	22	Industrial Ecology Term Projects
23	Industrial Ecology Term Projects	24	Industrial Ecology Futures

Life Cycle Assessment 《生命周期评价》课程

实践课

- In this **practicum course**, students work on real projects with industry partners in order to achieve skills and training as analysts in this field.

Corporate Environmental Management and Strategy 《企业环境管理与战略》课程



Corporate Environmental Management and Strategy 《企业环境管理与战略》课程

课程目标

- This survey course focuses on understanding how adroit environmental management and strategy can enhance business opportunities; reduce risk, including resource dependency; promote cooperation; and decrease environmental impact.

清华大学面向可持续发展的教学体系中与IE教学相关的内容

顶层设计课程

- 环境保护与可持续发展
- 生态文明十五讲

部分公共任选课程

- 清洁生产导论（面向本科生）
- 工（产）业生态学（分别面向本科生和研究生）
- 工业生态与循环经济（面向留学生）
- 生命周期评价（新开，面向研究生）

国内产业生态学教学开展情况

- 2015年4-5月，清华大学环境学院石磊教授课题组在线问卷向国内**21**所高校及科研院所开展“工业生态学教学科研情况调查”；
- **10**所大学面向本科生—博士生开设清洁生产、工（产）业生态学、循环经济相关的课程，学时**16, 18, 32, 48**不等，以**32**和**48**学时较多；
- 所调研的高校及科研院所所有**24**个左右成立了与Industrial Ecology研究有密切关系的研究机构。

- 现阶段Industrial Ecology在高校及科研院所环境学科相关的院系内尚未普遍进入主流方向，面向产业生态学的学生教学体系还未形成，
- 生态产业分委会如何有计划地设计Industrial Ecology教学体系并在推进IE教学方面发挥更多作用？