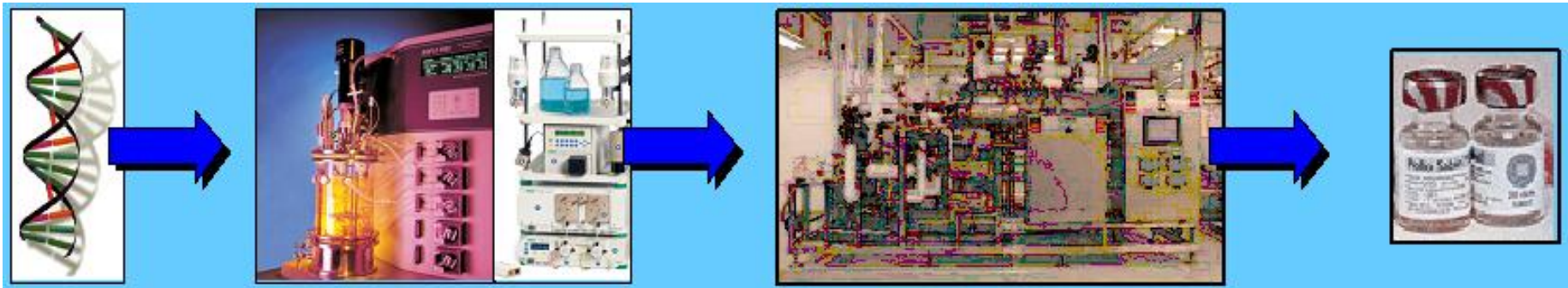


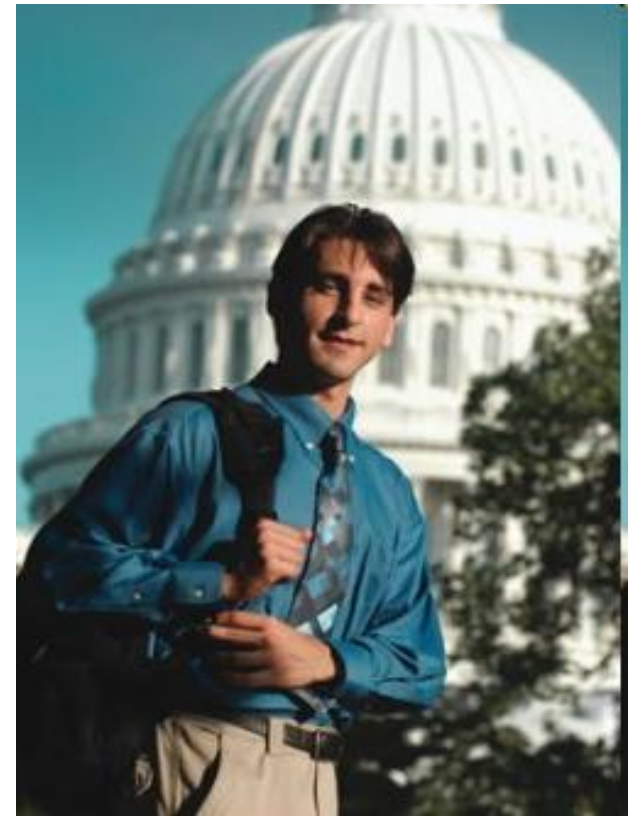
CHEMICAL ENGINEERING



***BRANCH SELECTION SEPTEMBER
2009***

Objectives of this Presentation

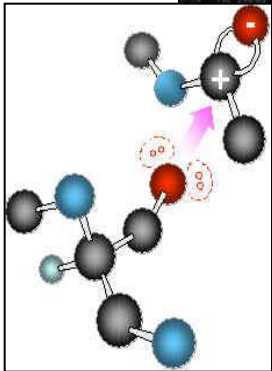
- **To introduce chemical engineering**
- **To explain what chemical engineers do**
- **To explain the Monash Chemical Engineering Program**
- **To introduce the Monash Chemical Engineering Department and student body**





What is Chemical Engineering?

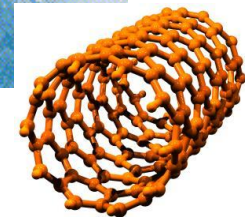
Raw Materials



Processes



Products



What Industries do Chemical Engineers Work in?

ESTABLISHED INDUSTRIES

Tradition of strong graduate recruitment



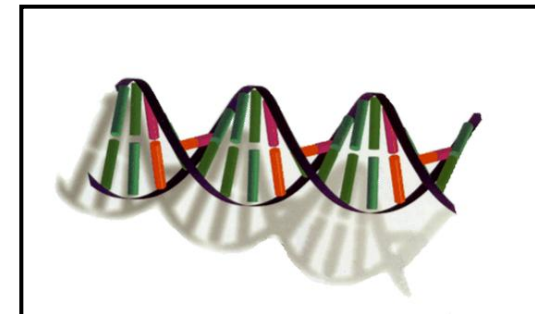
ALTERNATIVE

Other industries looking for the edge



NEW: Biofuels / Biotech / Nanotech / R&D

Exciting, developing areas pushing the boundaries



Established Industries

- **Beer, Beverages and Food:** *Fosters, Carlton United Breweries, Unilever Foods,*
- **Energy:** *Esso Australia, Shell, Santos Oil ,BP and Gas (Both out in the field and in refineries)*
- **Minerals Processing and Mining:** *BHP Billiton, Rio Tinto, Coal, Gold*
- **Chemical:** *Orica (e.g. fertilizers), Qenos*
- **Environment and Water:** *GHD,*
- **Government, Construction**
- **Engineering Consultancies:** *SKM, Kvaerner, Uhde-Shedden*



bhpbilliton

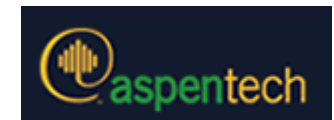
The Qenos logo, featuring the word "Qenos" in a white serif font on a dark teal rectangular background.

CLIENTS | PEOPLE | PERFORMANCE



Alternative Industries

- **Management Consulting:** *BCG, Bain, KPMG*
- **Finance:** *ANZ, Commonwealth Bank, NAB, etc*
- **Sales:** *BOC Gases, Chemicals, Pall (filtration)*
- **Patent attorney:** *Griffith Hack*
- **Software, simulation:** *Aspen Tech*



“New” Industries for Chemical Engineers

- **Biotech, Bioprocessing, Pharmaceuticals:** *Merck, Genetech, etc*
- **Biofuels (Ethanol, biodiesel):** *Coskata, Solazyme*
- **Hydrogen energy (fuel cells):** *Ballard*
- **Nanotechnology:** *Biomimetics, Cap-XX, Raymor*
- **Climate Change:** *Consulting Companies*
- **R&D:** *Sustainable energy, clean water, etc.*



What kinds of jobs?

- **Process engineer**
 - Design and operate major chemical facilities
 - Engage in plant expansions, improvements
 - Reduce energy usage
 - Improve environmental impact
 - Produce models of the plant to help understand the operation
 - troubleshooting





What kind of jobs?

- **Project Engineer**
 - In charge of managing a project eg. construction of a new LNG train
 - Installation and commissioning of a new renewable energy plant using biofuels
 - Manage all the aspects of a project: design, construction, environmental impact etc

What kind of jobs?

- **Research Engineer**
 - Invent new technologies eg. renewable energy
 - Develop new products or more efficient unit operations
 - Work closely with plant and process engineers to evaluate impact of new processes/products



Challenges facing the chemical engineer in the work place in the 21st century

- **Smart products**
 - Less environmental impact
 - Responds intelligently to environment
- **May require new technologies of**
 - Biotechnology
 - Nanotechnology
 - Sustainable Engineering

Challenges facing the chemical engineer in the work place in the 21st century

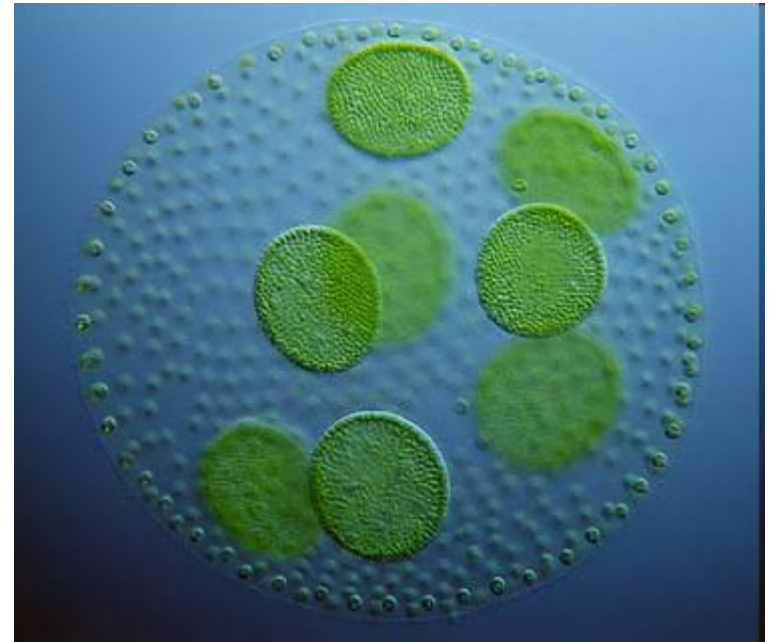
- **Renewable Energy**
 - Fuel cells
 - Advanced solar processes
 - Wind, etc
 - Hydrogen fuel
 - Biodiesel from biomass





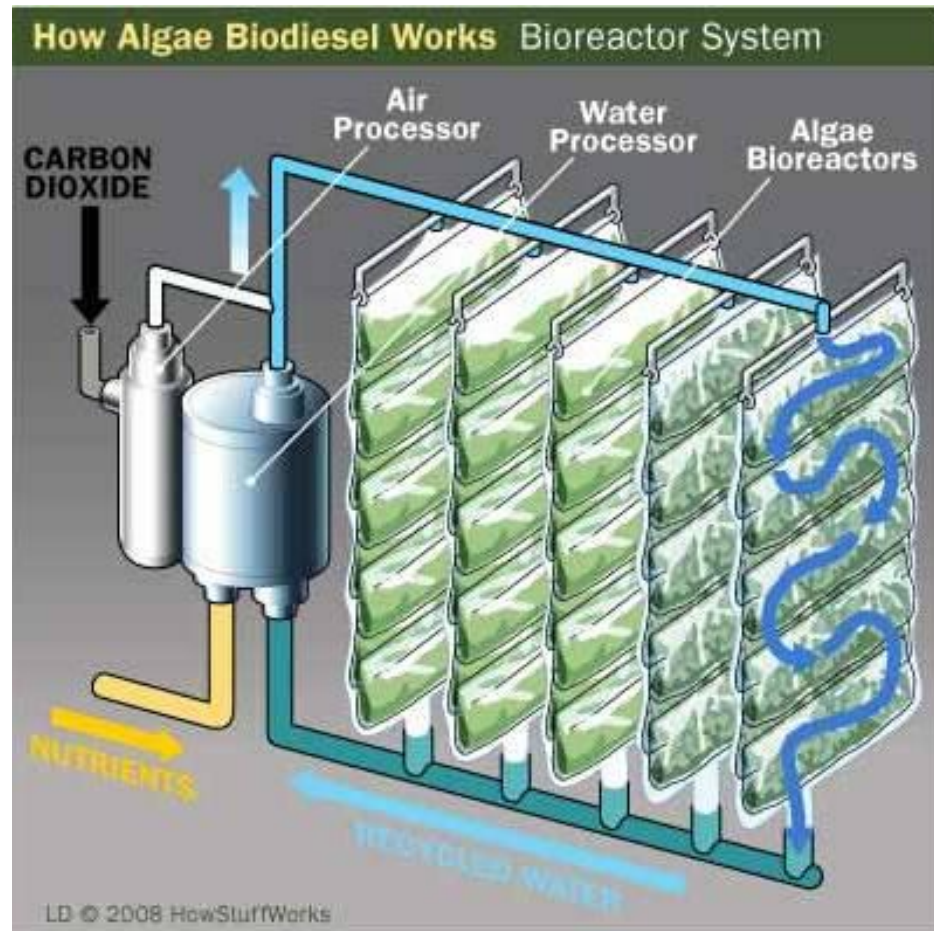
Example: Green fuel

- Algae to biodiesel
- Environmental issues
- Plants: food or fuel?





How does it work?





Monash Chemical Engineering Program

- **Common First year**
- **Level 2**
 - Core units in thermodynamics, fluid mechanics, heat and mass transfer, mass and energy dynamics
 - Core units in mathematics, chemistry, bio/nano engineering
 - Lab work illustrates principles in your units



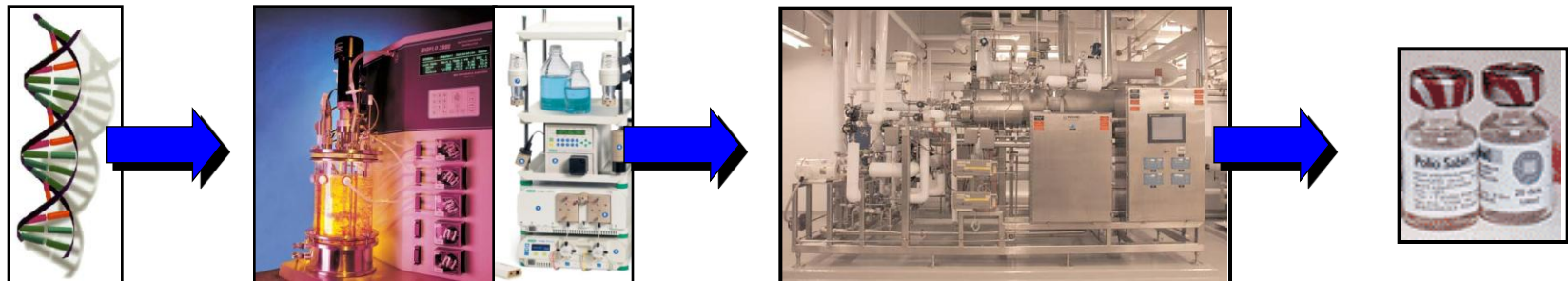
Monash Chemical Engineering Program

- **Level 3**

- Core units in chemical thermodynamics, sustainable engineering, transport phenomena, process control, process engineering, separation processes, reaction engineering
- Elective unit #1 in one of 3 streams
 - > Biotechnology
 - > Nanotechnology
 - > Sustainable processes

Biotechnology Minor

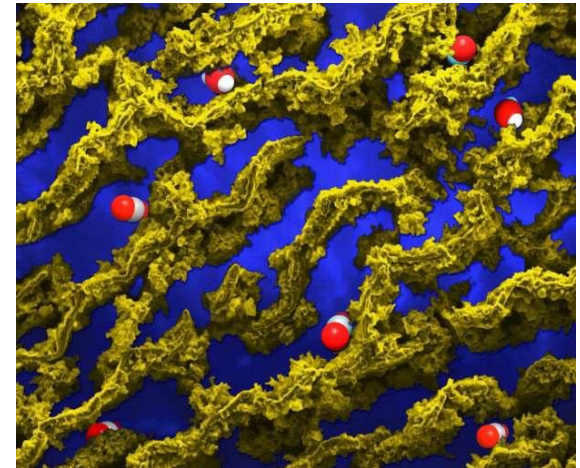
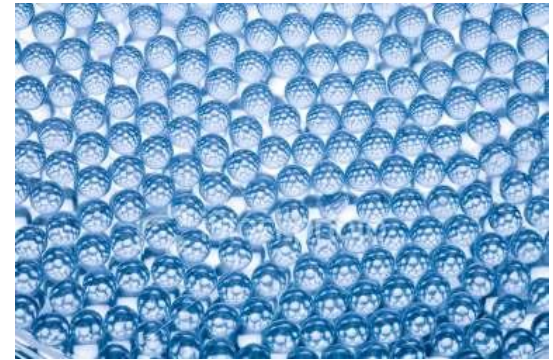
- structure of proteins, carbohydrates and lipids; the importance of enzymes and their interactions with substrates and inhibitors;
- Designing process to make recombinant proteins, peptides, vaccines, enzymes
- immobilized cultures, bioreactors, scaling, process selection





Nanotechnology Minor

- concepts of nanotechnology and nanofabrication, self assembly of amphiphilic molecules in nanofabrication
- zero-dimensional nanoparticles, one-dimensional nanostructures, two-dimensional thin films, nanoporous materials and nanocomposites.
- Biomimicry, biosensors, drug and gene delivery and for advanced scaffolds used in tissue engineering



Sustainable Processes

- **Environmental Impact Assessment**
- **Life cycle analysis**
- **systematic approaches to waste minimisation in process and utility systems**
- **heat integration, water integration and recycling of process streams**

Monash Chemical Engineering Program

- **Level 4**

- Core units in engineering management, particle technology
- Elective unit #2,3 in your minor stream
- Major Plant Design (12cp)
- Major Research Project (12cp)
- Option of industrial placement for 1 semester: dependent on grades and availability

Chemical Engineering Department

- **Ranked in top 3 in Australia**
 - 19 academic staff, many are world experts in their fields
- **~ 350 undergraduate students, 70 PhD students, 20 research fellows**
- **Outstanding administrative support staff**

Additional Support

- **Lunch time seminars**
- **Student Prospectus: - Posted to Chemical Engineering companies**
- **Academic Course Advisors: Specifically allocated to provide advise on the progression of your degree.**
- **A very supportive and approachable student organisation – SMUCE: Society of Monash University Chemical Engineers**



CHEMICAL ENGINEERING



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