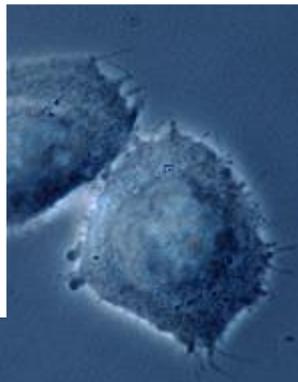
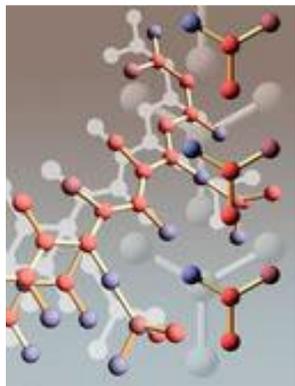
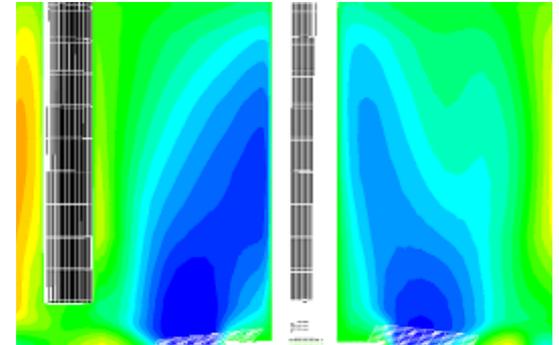


# UCD Chemical & Bioprocess Engineering



...bringing science to life

# UCD Chemical & Bioprocess Engineering



**‘Make your mind up’ time.....**

**Dr Ioscani Jimenez Del Val**  
[ioscani.jimenezdelval@ucd.ie](mailto:ioscani.jimenezdelval@ucd.ie)

# UCD Chemical & Bioprocess Engineering

- **Ireland's oldest & largest Chemical Engineering School**
  - 70<sup>th</sup> Anniversary in 2026!
- **BE Chemical & Bioprocess Engineering**
  - 4-year programme
  - accredited at Master level by IChemE
  - 35-45 graduates per annum
  - 1400+ graduates to date
- **MEngSc in Biopharma Engineering**
  - Full- & part-time
  - 100+ graduates since 2007
- **MEngSc in Chemical Engineering**
  - non-EU students



**Dr Jessica Whelan**  
Head of School



**Graduating Class & Staff, 2018**

# Chemical & Bioprocess Engineering Research

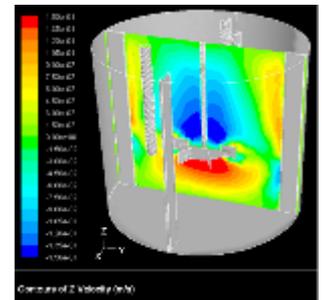
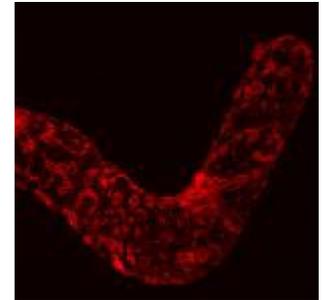
- **Research Strengths**

- Bioprocess Engineering & Multiphase Systems
- Materials Design
- Computational Nanotechnology
- Energy Conversion Systems Engineering
- Pharmaceutical Process Engineering



- **Teaching & Research Personnel**

- **14.5** full-time Academic Staff
- 4 Adjunct Professors
- 10+ Research Fellows
- 20+ PhD students
- 6 Technical Staff

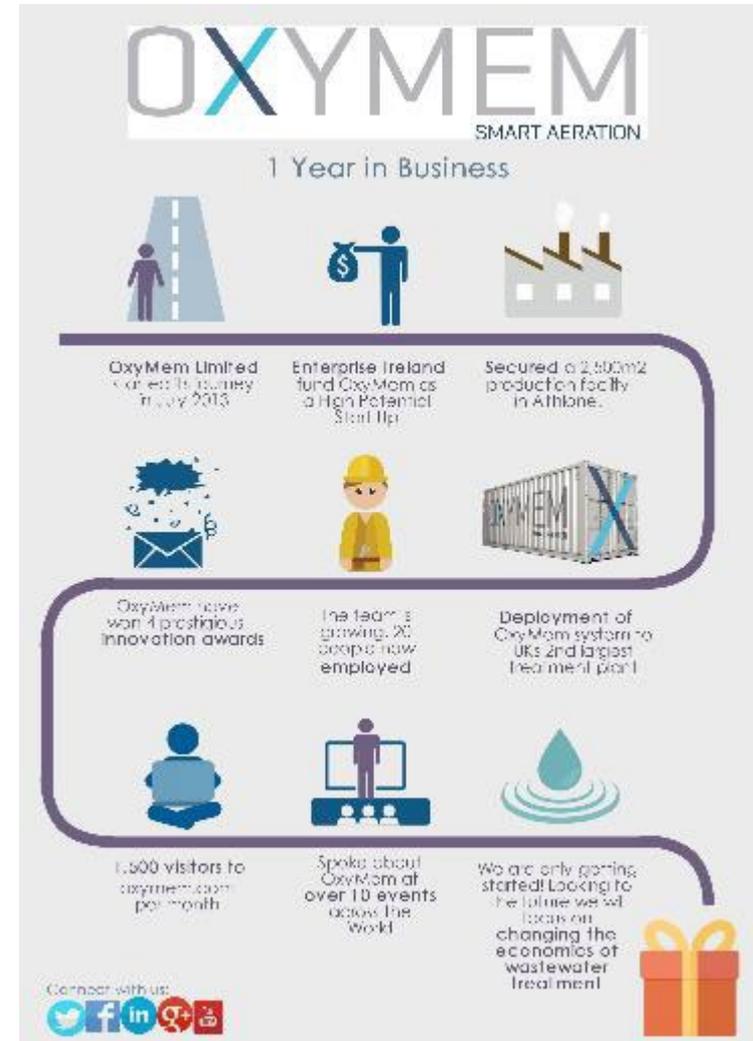


# OxyMem

- Campus company, est. 2013
- Founders: **Prof Eoin Casey & Dr Eoin Syron**
- Solves energy-intensive wastewater treatment with smart aeration



THE IRISH TIMES InterTradeIreland  
**INNOVATION**  
OVERALL AWARDS WINNER 2014  
INNOVATION OF THE YEAR  
**OXYMEM**



# APC: partners in pharmaceutical engineering

- Campus company, est. 2011
- Founders: **Prof Brian Glennon & Dr Mark Barrett**
- Purpose-built Cherrywood facilities, 2016
- >100 full-time employees
- Largest Irish employer of PhD-qualified Chemical Engineers
- Works with pharma/biopharma manufacturers to develop chemical/biological processes to produce medicines



[L-R]  
Dr. Mark Barrett CEO  
Prof. Brian Glennon CTO



# Chemical & Bioprocess Engineering Education

- **Preparation for life-long learning**
  - scientific, mathematical & engineering competencies
  - engineering problem-solving skills
  - effective teamwork & professional awareness
- **Strong industrial links**
  - Adjunct Professors
    - ▣ **Dr. David O'Reilly**, formerly CEO Chevron
    - ▣ **Brendan O'Callaghan**, VP Biologics, Sanofi
    - ▣ **Dr. Mark Barrett**, CEO APC
    - ▣ **Prof. Mike Bulter**, former CSO, NIBRT
  - Industrial Internships (>85%)
- **Excellence in Teaching & Learning**
  - Awards/Funding: ExxonMobil, National Forum, NAIRTL, UCD



# UCD Chemical & Bioprocess Engineering

## BE degree in Chemical & Bioprocess Engineering

- 4-year (8 semester) degree programme
- typically 35-45 graduates
- professionally, internationally accredited:
  - IChemE (Master level)



## • Chemical & Bioprocess Engineering?

- One curriculum for Stages 2, 3, 4

## • Internships?

- Optional, non-credit bearing
- Typically, Summer at end of Year 3; increasing employer & student interest in longer Internships
- Support from School in applying for positions



# UCD Chemical & Bioprocess Engineering

## ME degree in Chemical & Bioprocess Engineering

- 5-year Integrated Master's degree programme
- With extended (8-12 month) Internship from Jan of Stage 4

## BE or ME?

- Same Stage 2 & Stage 3 programmes for BE & ME
- BE/ME Decision: At end of Stage 3\*

## Accredited? YES!

- **BE:** accredited by IChemE to Master level
- **ME:** accredited by IChemE to Master level, accredited by Engineers Ireland to Master level

## Chartership!

\* Current GPA for admission to ME  $\geq 2.8$ , based on 70% Stage 3 GPA + 30% Stage 2 GPA

# ChemE: BE & ME Programme Structures

Year 1 Engineering (Omnibus)



Year 2 Chemical & Bioprocess Engineering



Year 3 Chemical & Bioprocess Engineering

BE Pathway



Year 4



BE DEGREE  
Level 8

ME Pathway



Year 4



Year 5



ME DEGREE  
Level 9

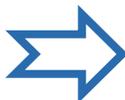
← Which discipline for ME?

← Study Abroad?

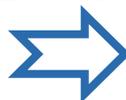
← BE/ME? [GPA  $\geq$  2.80]

**ME Internship**  
6-8 month: Jan–Aug  
or  
12 month: Jan-Dec  
[w/ in-company project]

**Optional: Minor in Biochemical Engineering**  
for BE or ME: Years 3-4



Where to next?



# Stage 2

## Semester 1

- CHEN20020 Chemical & Bioprocess Engineering Measurement
- CHEN20030 Chemical Engineering Thermodynamics & Kinetics
- CHEN20050 Bioprocess Engineering Principles
- CHEN20080 Chemical & Bioprocess Engineering Laboratory 1 (10 credits)
- MATH20290 Multivariable Calculus for Engineers

## Semester 2

- CHEM20060 Organic Chemistry for Engineers
- CHEM20070 Inorganic and Physical Chemistry for Engineers
- CHEN20060 Transport Phenomena
- CHEN20070 Computers in Chemical & Bioprocess Engineering
- CHEN20090 Biotechnology Principles
- Elective
- Elective

# Stage 2 Laboratory/Project Work

## CHEN20080 Chemical & Bioprocess Engineering Laboratory 1

- Engineering & Chemistry experiments
- Computing Sessions
- Group project
  - Problem-based learning, e.g.
  - Design, Construction & Evaluation of a Heat Exchanger
  - 'Heart-Lung Machine'



## CHEN20050 Bioprocess Engineering Principles

- Group-based poster presentation

## CHEN20070 Computers in Chemical & Bioprocess Engineering

- EXCEL, Matlab, Visio

### Winning team PBL HXCR Project

(L-R) Matthew Perron, Phillip Roche,  
Meabh Doyle, James Robinson

# Student Scholarships: Stage 2

## Pat McAdam Scholarship in Chemical & Bioprocess Engineering



**Martin McAdam**

UCD BE (ChemE) 1982

**CEO Aquamarine Power Ltd**



GREEN ENERGY OUT OF THE BLUE

- Established in memory of Pat McAdam, at the request of Mr Martin McAdam, to celebrate and honour the life and work of his late wife, Pat, a much-loved teacher.
- €4,000.00
- to cover Summer Research Internship, Colorado School of Mines

# Student Travel Bursaries



**Mark Carthy**

UCD BE (ChemE) 1982

**Managing Partner  
Orion Healthcare  
Equity Partners**



## **Mark Carthy Travel Award in Chemical & Bioprocess Engineering**

- €1000 bursary
- To support travel for personal and/or professional development purposes

## **Martin McAdam Travel Bursary in Chemical & Bioprocess Engineering**

- €1000 bursary
- To support travel for personal and/or professional development purposes

# Student Scholarship: Stage 3

## Abbvie Achievement Award in Chemical & Bioprocess Engineering Practice



- €1000 bursary
- Awarded to the Stage 3 student receiving the highest accumulated grade in
  - Chemical & Bioprocess Engineering Laboratory 2
  - Chemical & Bioprocess Engineering Design
  - Unit Operations in Chemical & Bioprocess Engineering

# Stage 3

## Semester 1

- ACM30030 Multivariable Calculus for Engineers II
- CHEN30010 Chemical & Bioprocess Reaction Engineering
- CHEN30020 Unit Operations
- CHEN30030 Chemical & Bioprocess Engineering Thermodynamics
- CHEN30040 Commercial Pharmaceutical & Bioprocessing Technology
- Elective

## Semester 2

- CHEN30130 Heat Transfer and Fluid Mechanics
- CHEN30200 Chemical & Bioprocess Engineering Design (10 credits)
- CHEN30210 Chemical & Bioprocess Engineering Laboratory 2 (10 credits)
- MEEN30140 Professional Engineering (Finance)



# Stage 3 Laboratory/Project Work

## CHEN30210 Chemical & Bioprocess Engineering Laboratory 2

- Pair-based experimental work
- Laboratory/pilot-scale equipment
- Distillation, evaporation, drying....
- Complements CHEN30020 Unit Ops

## CHEN30200 Chemical & Bioprocess Engineering Design

- Process & equipment design
- Factors to consider: purpose, chemical design, material, equipment, safety, environmental, cost



# Stage 3 – Industrial Internships

- Stage 3 students encouraged to secure Summer Internships
- No academic credit awarded
- Assisted by School
  - Stage 2 Mock Interviews (2019: Abbvie)
  - Professional preparation:
    - **CHEN30040 Commercial Pharmaceutical & Bioprocessing Technology** (In-programme elective )
- Companies recruiting for Summer 2022 or year-long 2022-23

**Abbvie**

**BMS**

**FDT**

**Jacobs**

**Pfizer**

**Roche**

**APC**

**DPS**

**GSK**

**MSD**

**Phillips 66**

**Biomarin**

**Eli Lilly**

**Helsinn**

**Mylan**

**PM Group**

# Year Abroad?

- **Managed by UCD International Office**
  - Open to students from all Engineering disciplines
- **Recent ChemE Erasmus exchanges...**
  - University of Edinburgh, UK
  - Technical University of Berlin (TU Berlin) in Germany
- **Recent, ChemE Non-EU University Exchanges**
  - University of California, Santa Barbara
  - University of Connecticut
  - Georgia Tech
  - Queen's University Ontario
  - NUS, Singapore
  - **For 2023-2024:** 6 ChemE students

# Stage 4 (BE & ME) & Stage 5 (ME)

## STAGE 4 - Semester 1 – BE & ME

- CHEN40150 Adv. Separation Processes
- CHEN40160 Adv. Heat Transfer & Fluid Mechanics
- CHEN40210 Adv. Experimental Design
- CHEN40620 Adv. Process Design
- Option

## STAGE 4 - Semester 2 – BE

- CHEN40010 Environ. Eng.
- CHEN40200 Research Project
- CHEN40560 Process Control
- Option

**BE Degree**

## STAGE 4 - Semester 2 ME

- Internship

## STAGE 5 - ME

**Summer Sem.**

Internship (cont.)

**Semester 1**

Research Project

**Semester 2**

Core & Option modules

**ME Degree**

# Research Project

- Individually, or in pairs (different credits for BE & ME)
  - Laboratory-based or PC-based; some industrially-linked
  - Closely linked to School research activities
- 
- Effect of oxygen level on the ex vivo generation of fully mature human red blood cells
  - Assessment of mixing in an aerated stirred tank reactor
  - Nanoparticles for fuel cells
  - Mixing and mass transfer in external loop airlift reactor
  - Thermal conductivity of methane hydrate from equilibrium MD simulation
  - Residence time distributions in continuous stirred tank and plug flow reactors
  - Investigation of Ionic Liquids systems under zero and e/m field conditions
  - Application of probiotic bacteria (*Lactobaccillus casei*) for production of biosurfactants
  - Scale up and economic analysis of a novel bioplastic production process
  - Integrating DynoChem into the ChemE curriculum

# Life after graduation.....?

- BE degree
- Accredited by IChemE at Master level



2018 BE Chemical & Bioprocess Engineering

# Life after graduation.....?

- **What are the current Stage 4 students planning?**

## **Offers accepted:**

APC, BMS, DPS, MSD, Jacobs, Pfizer (Cork), Pfizer (Grange Castle), Eli Lilly, PM Group

## **Actively recruiting:**

Diageo, GlanBia, GSK, Irish Cement, Kingspan, PwC

Fully-funded PhD programmes in UCD

## **Other options:**

Funded PhD programmes in other high-ranking Universities

Post-graduate courses in Biopharmaceutical Engineering, Energy, Process Control, Teaching, Pharmacy, Maths, Business...

# Additional Information...

- **Chemical & Bioprocess Engineering Videos & Blog**  
<http://www.ucd.ie/chembioeng/study/prospectivestudents/>
- **IChemE 'Why Not Chem Eng?'**  
<http://www.whynotchemeng.com>
- **Talk to our staff and students!**



# Lauren Callaghan

ME Chemical & Bioprocess Engineering 2024

## **Graduate Profile**

Goal – Convince you that Chem. Eng. could be the choice for you!



## Why I picked Chem. Eng.?



Enjoyed the problem solving from Process Principles option

Didn't really enjoy mechanics or civil modules

Seemed to offer a lot of diverse opportunities

# Why I stuck with Chem. Eng.?



Industrial  
Opportunities /  
Internships

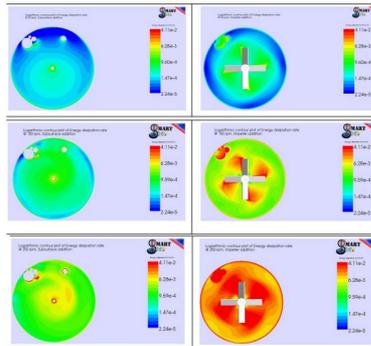
Support from  
friends

Felt engaged by  
the coursework



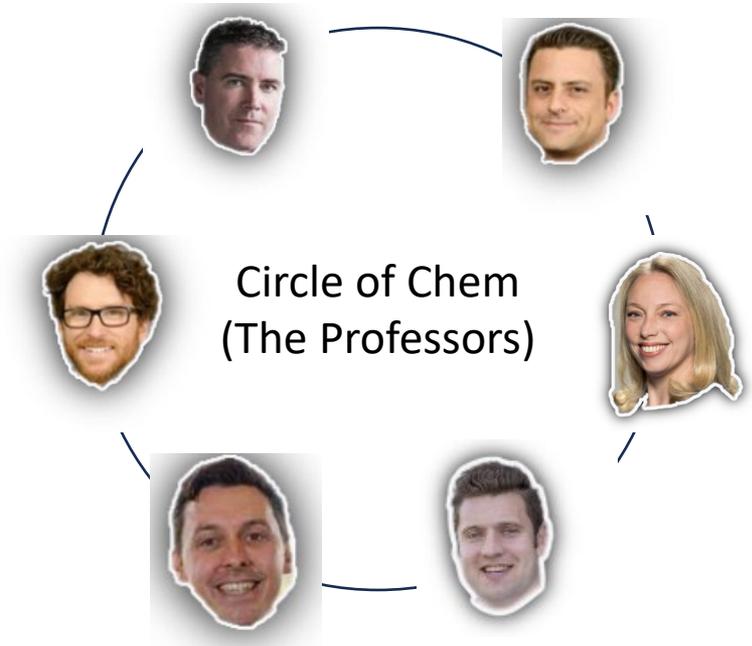
## Favourite Modules:

- Computing / Systems
- Transport phenomena
- Final year project



## Community:

- Older years, lecturers, tutors, grads, classmates, technical staff
- Student staff committee
- EDI Committee



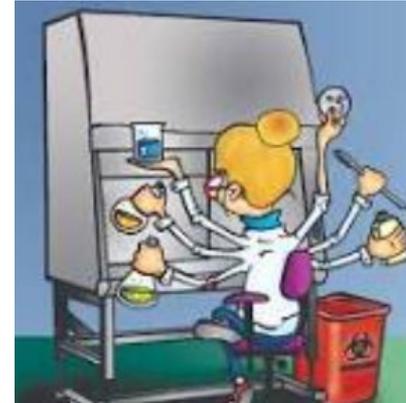
# Pathway Flexibility

## Biochemical Minor:

- Additional accreditation going forwards
- Defined set of modules in the cell therapies/ biotechnology

## Masters or Bachelors:

- Can leave after 3 years (BSc), 4 years (BE), or 5 years (ME)
- 8 month – 1 year industry experience with masters



# Get the most from your time!

- Bursaries & Travel Awards
- Study Abroad
- Frank Morton International Sports Day
- ChemEngSoc Pub Quizzes
- Industrial Site Tours



# Opportunities Galore:



Pharmaceuticals



Food and Beverage



Heavy Industry



Energy



Process Design/  
Consultation



Further Study



Other Industries





# Current Role and Future



- Just finished a yearlong internship with APC
- Back to UCD for the final semester of my Master's
  
- Returning to APC in September.
- Focus on the modelling of chemical systems.
- Really supportive and accepting work culture.

# Parting Tips:

- You earned your place in Engineering and whatever stream you pick; you can do amazing things.
- Never be afraid to ask for help.
- Don't pick Chem. Eng. If the only reason is that you like chemistry.
  - Only do 3 specific chemistry modules.
- Try not to get too focussed on good grades, enjoy the experience!

Any Questions at all

[laurcal217@gmail.com](mailto:laurcal217@gmail.com)