



Energy Expertise

// Bio-derived fuels

Main expertise areas

- Social, economic and policy dimensions of biofuels.
- Community responses to biofuels, including attitudes to GM in biofuels.
- Algae - developing, enhancing and introducing marine-based bio-derived fuels.
- Governance of biofuels and structures shaping adoption of biofuels
- Transnational ethics and intellectual property issues
- Enhancing yields of bio-derived fuels through molecular biology and biochemistry.

Background

Through taking up carbon dioxide and converting it to biomass that may be used as a fuel, plants and algae have been investigated as a source of carbon neutral energy for many years. Critically, bio-derived fuels offer a short-to-medium term route to a road transport fuel which many other renewable energies cannot provide without significant changes to existing transport infrastructure.

Bio-derived fuels covers a range of technologies, either where biological material is readily converted to an energy source, or living organisms produce a fuel source. Bio-derived fuels may be gaseous (biogas such as methane, or biohydrogen), liquid (bioethanol and bio-derived butanol as petrol replacements; bio-derived diesel and green diesel for diesel replacements), or even solid (fast growing and coppiced trees, algae biomass, etc.).

Research team

Professor Phil Dyer – Synthesis of bio-derived fuels and chemicals

Professor Chris Greenwell - Microalgal production, macroalgae, biofuel forming reactions at mineral catalysts

Dr John Bothwell - Macroalgae, growth and evolution of brown seaweeds, Biofuels

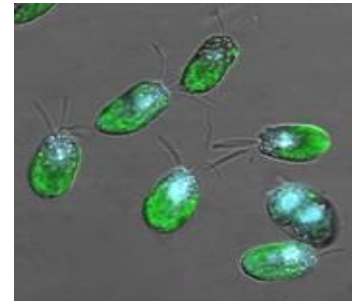
Professor Keith Lindsey - Developmental biology of plants, molecular control mechanisms in embryogenesis and root development

Dr Jun Jie Wu - Developing techno-economic models and energy footprints of microalgae biorefineries



Recent projects

- **MacroBioCrude:** The EPSRC-funded £1.6M project explored the gasification of preserved macroalgae and ensiling seaweeds to convert wet seaweed into a more energy-dense fuel source (PIs Phil Dyer, Chris Greenwell).
- **Macroalgae Biogas for the Isle of Man** assesses the growth of microalgae in four key sea zone areas around the IoM coastline and undertake technological feasibility studies to address public acceptability and stakeholder perceptions of using this to generate biogas for the local domestic gas market.
- **Heather as energy** Potential use of heather, *Calluna vulgaris*, as a bioenergy crop (PI Prof Fred Worrall).
- **SuBBSea:** This BBSRC-funded project is pioneering selective non-GM breeding studies to improve the composition of seaweed feedstocks. We're also developing new microbial platforms to manipulate and process seaweed biomass for fermentation and anaerobic digestion.
- **Energetic Algae:** The EU-funded project links with European partners to look at the environmental and societal issues that surround seaweed cultivation in NW Europe.
- **Crop improvement for better yields:** synthetic biology methods for improving oil yields, and changing carbohydrate structure for improved energy crops.



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