

Kick-off session: "Biotechnology
for a sustainable bioeconomy"



MEmbrane Modulation for BiopRocess enhANcEment

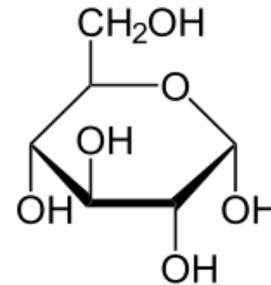
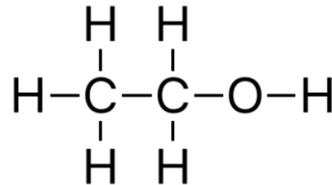
MEmBrane

Dr Alan Goddard

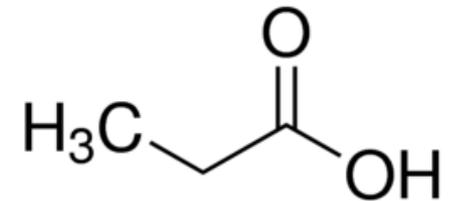


“MeMBrane will create optimized high-yield microbial cell factories that perform effectively in commercial biotechnological processes in a profitable and sustainable way. To achieve this, significant advances in the understanding of how yeast and bacteria tune their cell membranes under different process stresses will be applied to design genetically and metabolically modified strains.”

- Lallemand, Spain:
 - Mr José María Heras



- Pakmaya, Turkey:
 - Dr Mustafa Turker



- Aston University, UK:

- *Dr Alan Goddard, Dr Alice Rothnie, Prof. Roslyn Bill, Prof. Corinne Spickett, Prof. Andrew Pitt*

- Expertise in membrane proteins, lipidomics, biophysics and strain engineering



- University of York, UK:

- *Dr. Gavin Thomas, Dr Vicky Springthorpe*

- Expertise in membrane proteins and –omics integration



- Forschungszentrum Jülich, Germany:

- *Dr Stephan Noack, Dr Jan Marienhagen*

- Expertise in high-throughput screening



- Consejo Superior de Investigaciones Científicas (CSIC), Spain:
 - *Prof. Amparo M. Querol, Dr José Guillamón, Dr Eladio Barrio*
 - Expertise in proteomics, transcriptomics and yeast engineering / evolution
- University of Groningen, Netherlands:
 - *Prof. Siewert-Jan Marrink*
 - Expertise in membrane lipid and protein *in silico* modelling



- Remembrane, Italy:
 - Expertise in *in vitro* lipid supplementation to boost specific bioprocesses.
- Nova-Institute, Germany:
 - Expertise in feedstock supply, techno-economic and environmental evaluation, market research, dissemination, project management and policy for a sustainable bio-based economy.
- Total project budget: €2.4 million
- Project start: 30th April 2018

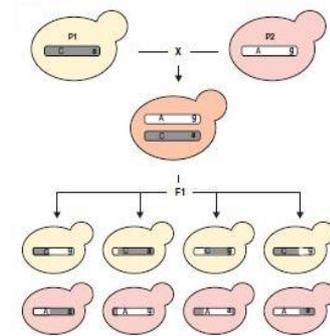
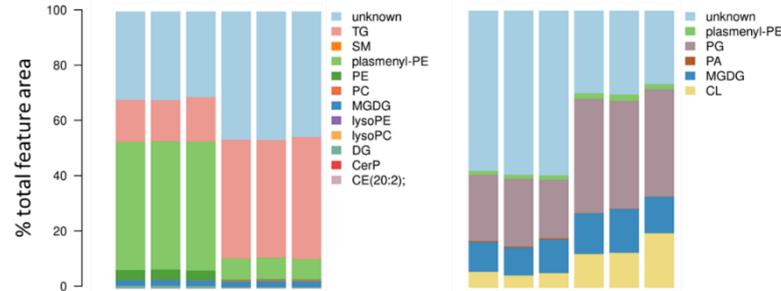
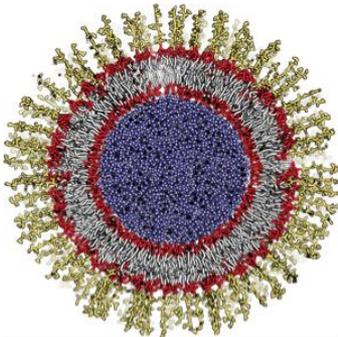


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● Project objectives

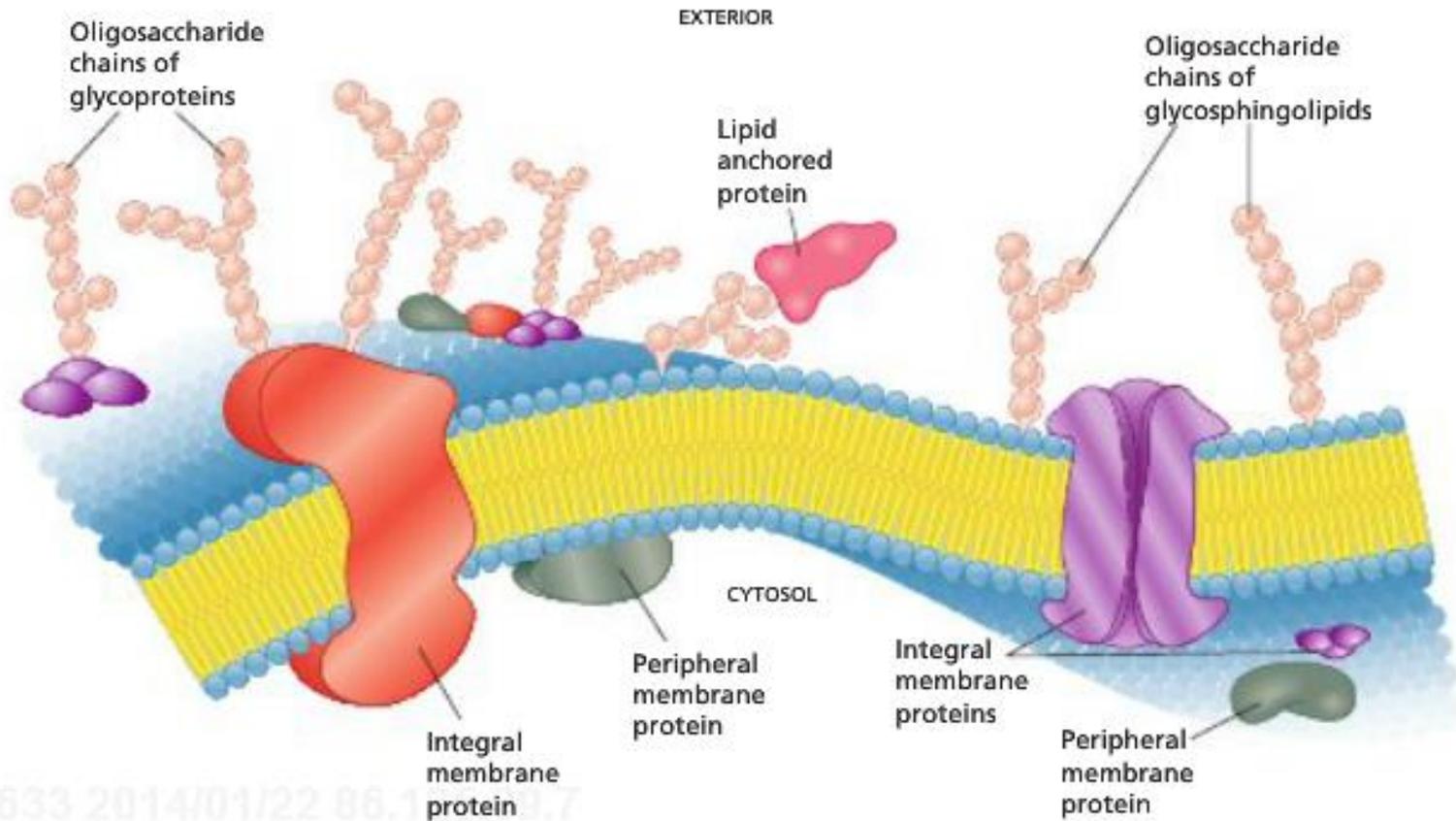
- Develop strong collaborations between leading academic research groups and industry to commercialise bioprocesses
- Overcome toxicity challenges in existing bioprocesses by engineering cellular membrane composition
- Achieve more sustainable, competitive and eco-efficient fermentative processes
- Achieve improved yield per mass unit biomass-input compared to current processes allowing validation of TRL 5

- Scientific approach
 - Synthetic biology, Systems biology, Bioinformatic tools



- Project topic area
 - Sustainable production and conversion of different types of feedstocks and bioresources into added value products
 - Sustainable industrial processes

Lipids and Membranes

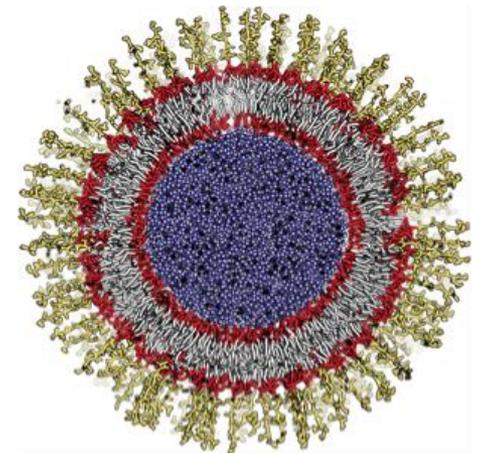
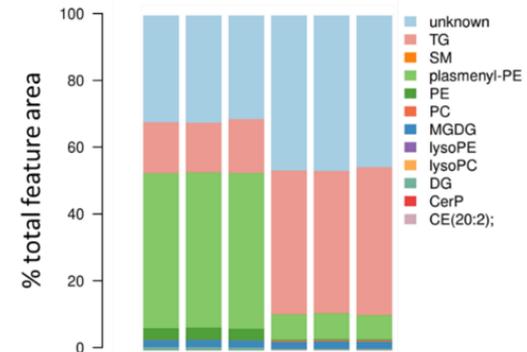


WP1: -omics technologies

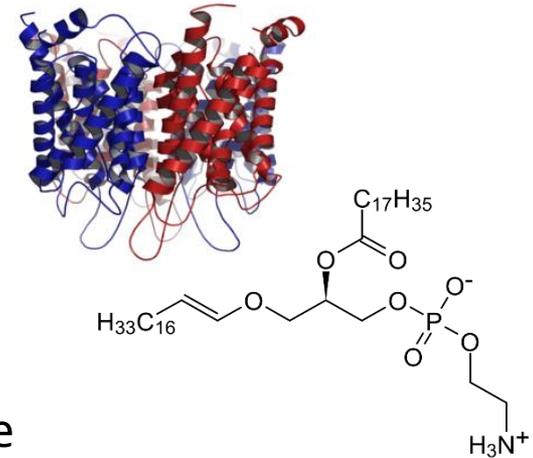
- Isolate strains with high or low resistance
- Quantitative lipidomics, transcriptomics, proteomics
- Integration of datasets using whole-genome metabolic models

WP2: *in vitro* and *in silico* analysis

- Allows rapid screening of membrane compositions
- Use model bilayers to determine desirable lipid compositions
- Produce, isolate and characterise membrane proteins of interest
- Use parallel molecular dynamics approaches to understand these processes in detail



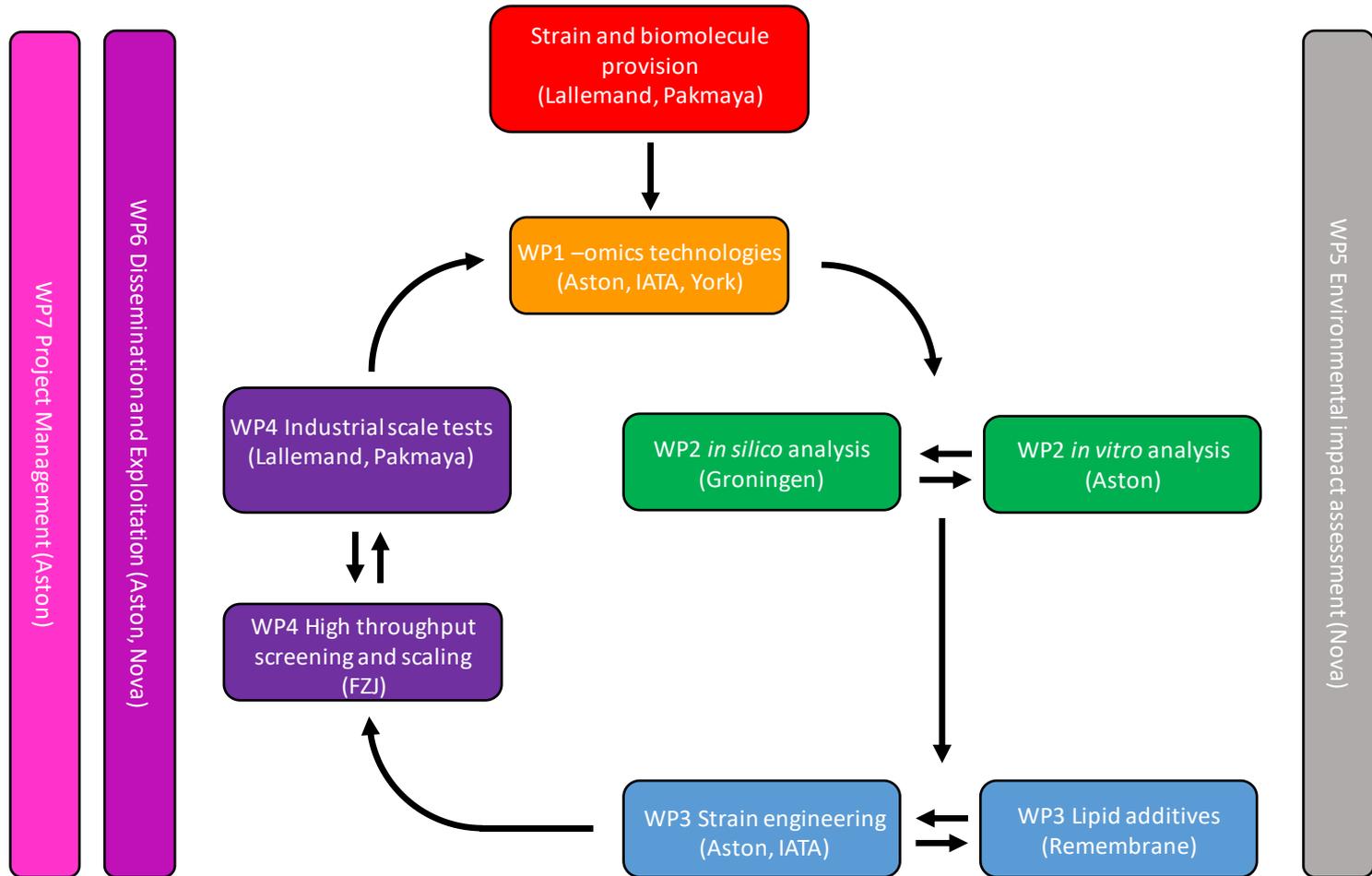
- WP₃: Membrane Engineering
 - Synthetic biology and rational genetic improvement
 - Additive-mediated approaches
 - Non-recombinant strategies
- WP₄: High throughput screening and industrial scale tests
 - High throughput screening in the lab
 - Small-scale laboratory testing of best strains
 - Scale up into industrial environments
- WPs 1-4 are iterative.

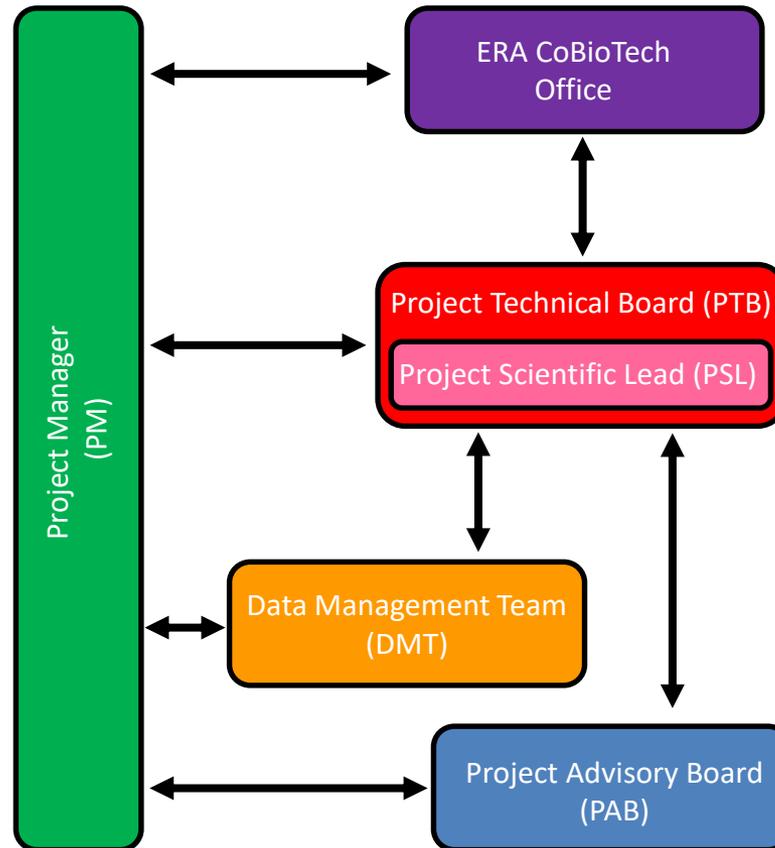


- WP5: Environmental and social impact assessment
 - Life Cycle Assessment (LCA) analysis
 - Identify potential hot spots
 - Compare products to existing counterparts
 - Cradle-to-gate approach

- WP6: Dissemination and Exploitation
 - Communication with public, research community, government and academia
 - Data management
 - IP

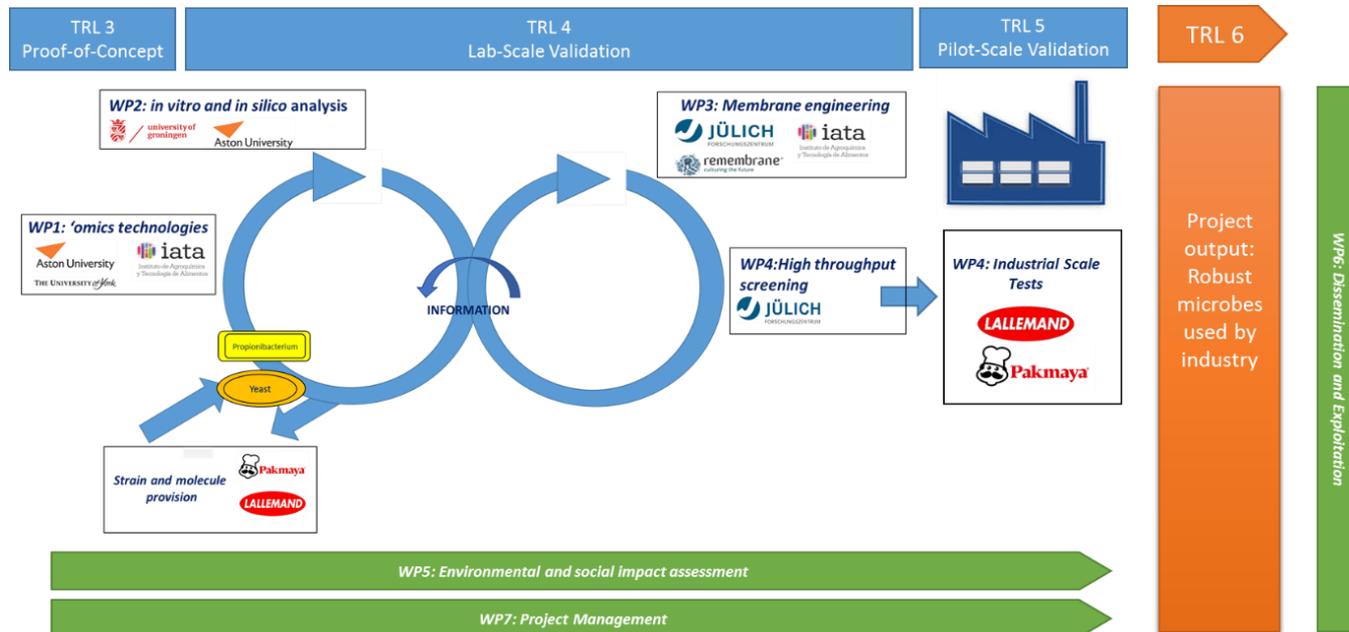
- WP7: Project Management.





- Outcomes to be achieved
 - The development of bioprocesses which are more economic and eco-efficient
 - Newly-developed strains progressed from TRL₃ to 5
 - Effective communication of MeMBrane outcomes to a range of stakeholders
- Planned implementation and exploitation of results
 - Implementation of strains at an industrial scale
 - Dissemination of approaches to allow improvements across the sector

- MEmbrane Modulation for BiopRocess enhANCement
- Two industrial biotechnology processes enhanced by progression of new strains from TRL₃ to TRL₅.



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