

WP18: Deuteration

NMI3 General Assembly

Courtyard Marriott Rome Airport Hotel

8-9th November 2011



Trevor Forsyth



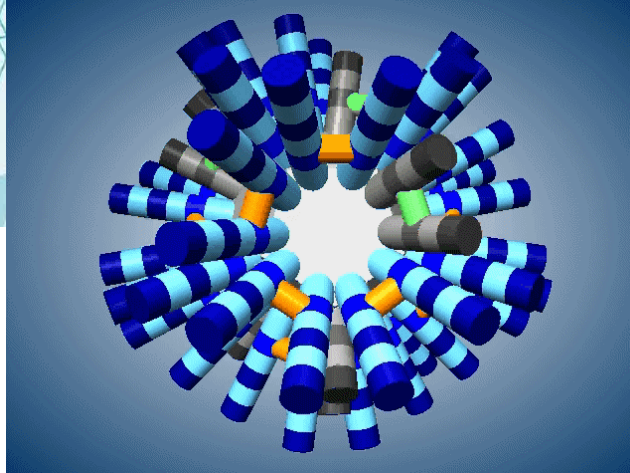
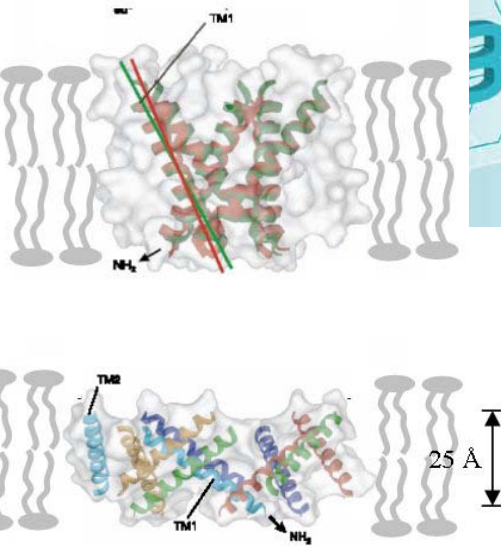
WP18 - goals

Method development for biological neutron scattering.

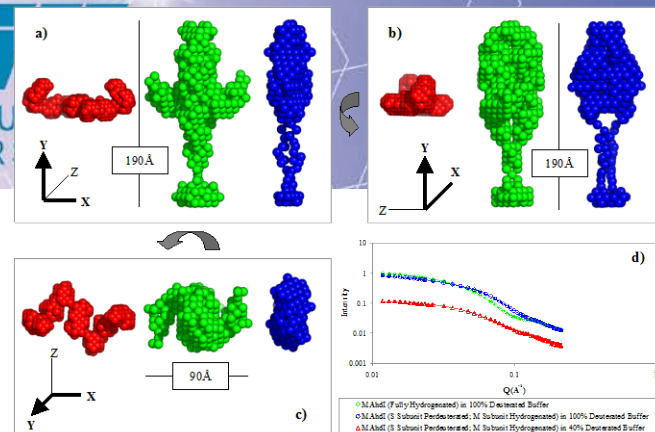
- new types of labelling strategies that ultimately feed into the user programmes of biological neutron science
- Many of the approaches that are now used routinely for deuteration were developed as part of NMI3/FP6.
- Some of the approaches being developed in FP7 are now deployed widely

WP18 - underlying themes

- **Generating a decisive impact** on European capability for biological neutron scattering
- **Widening accessibility** of neutron scattering for biology
- **Promoting better interactions between facilities** for biological work. Avoiding duplication of effort.
- Promoting **interdisciplinarity**. Key complementary techniques are X-ray scattering, NMR, electron microscopy
- Deuteration JRA deliverables have a **permanent, sustained impact** that will outlive the JRA itself.

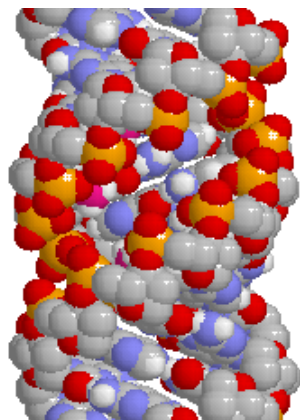


Pyruvate Dehydrogenase Complex
(Glasgow), *J. Mol. Biol.* (2010),
Biochem. J. (2011)

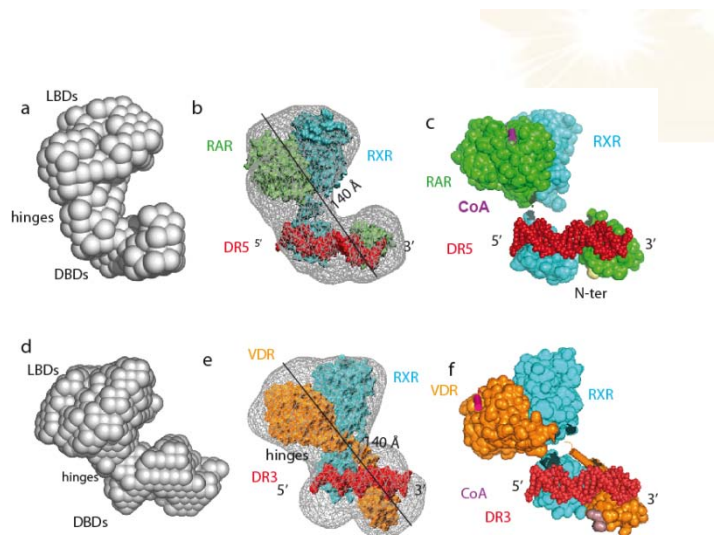


Restriction-modification systems
(Portsmouth), *J. Mol. Biol.* (2008,
2009)

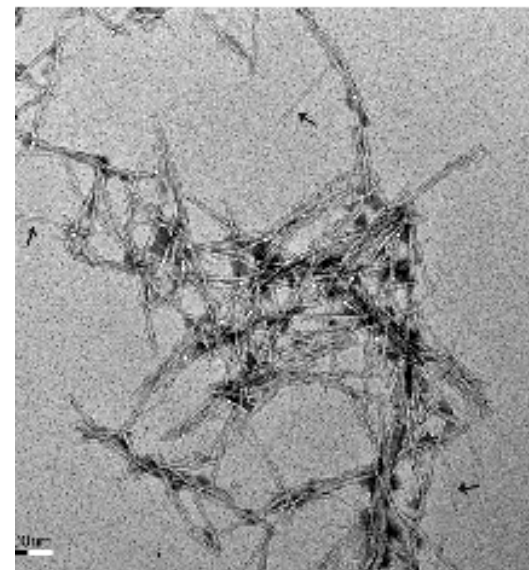
Mechanosensitive channel - NMR and
neutron reflectometry
(Karlsruhe/Oxford/ISIS/ILL). *Biophys. J.*
(2011)



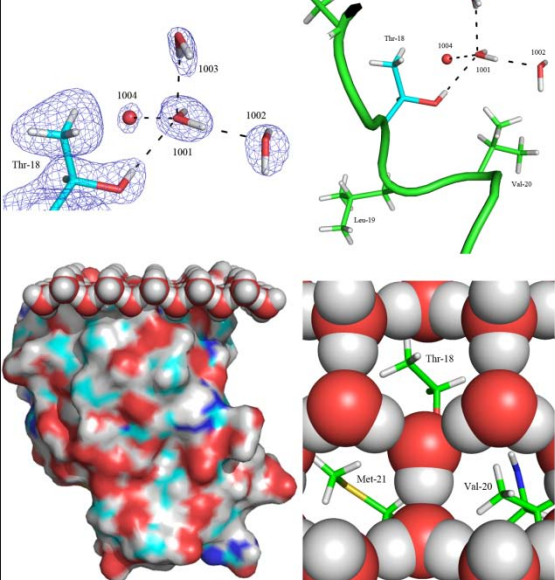
DNA Crowding (Leiden), *Phys Rev.*
(2010)



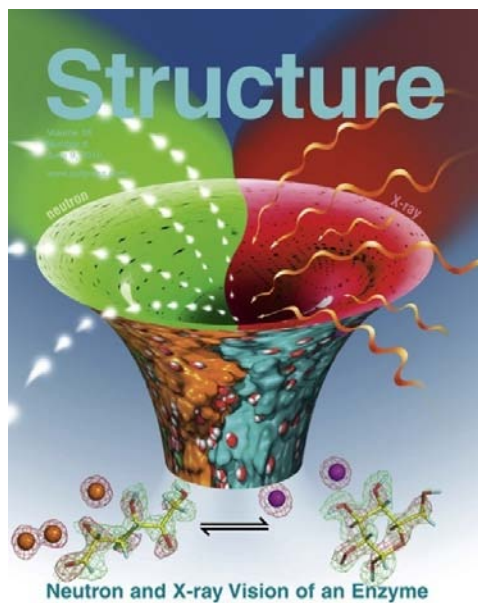
Nuclear receptor heterodimers
(Strasbourg), *Nature Structural &
Molecular Biology* (2011)



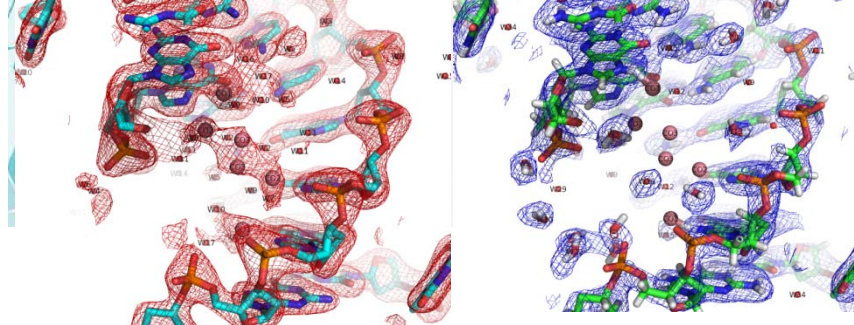
Amyloid (Lund, Sweden)



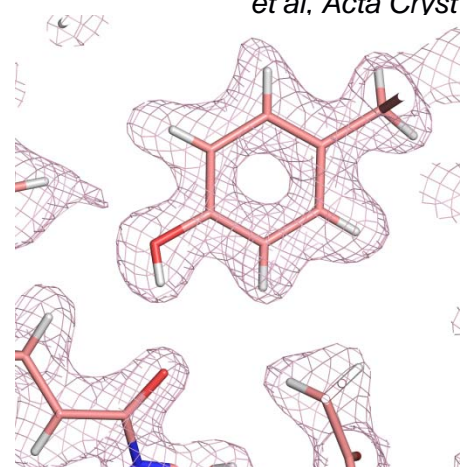
Type III Anti freeze protein (IGBMC)
J. Mol. Rec. (2011)



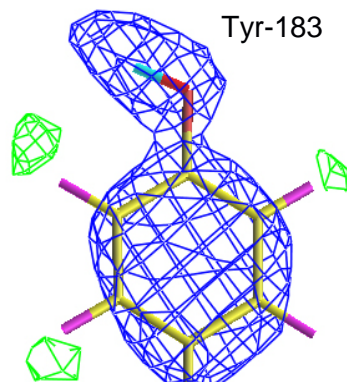
Xylose Isomerase *Structure* (2010)



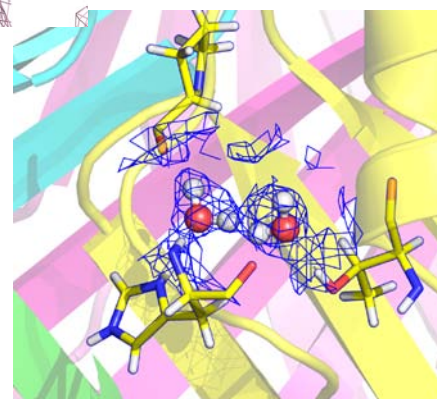
A-DNA in d(AGGGGCCCT)₂ *Lea*
et al, Acta Cryst D (2011)



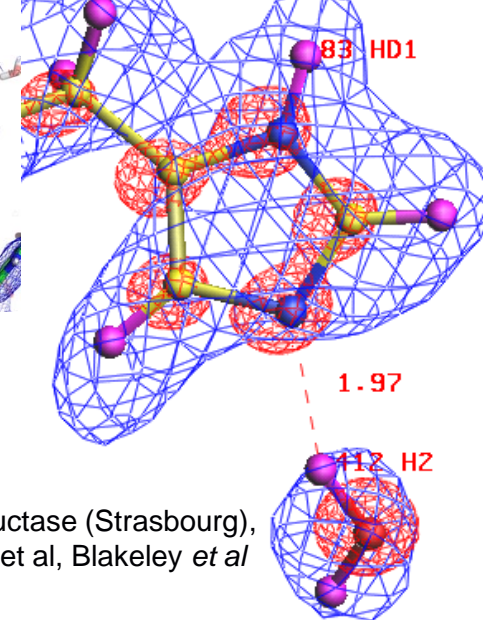
Rubredoxin *Cuypers et al*



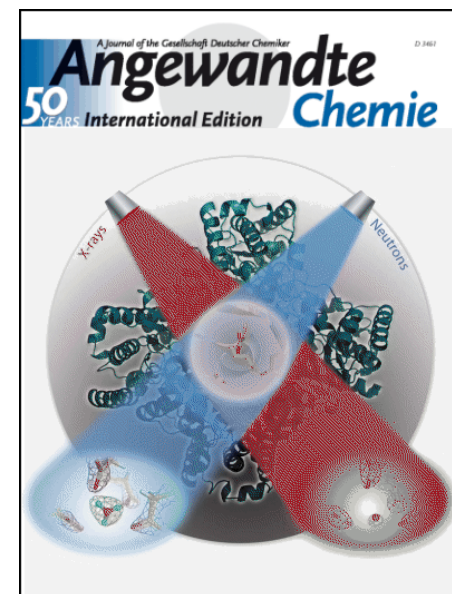
Thaumatin *Teixeira et al,*
Acta Cryst D (2010)



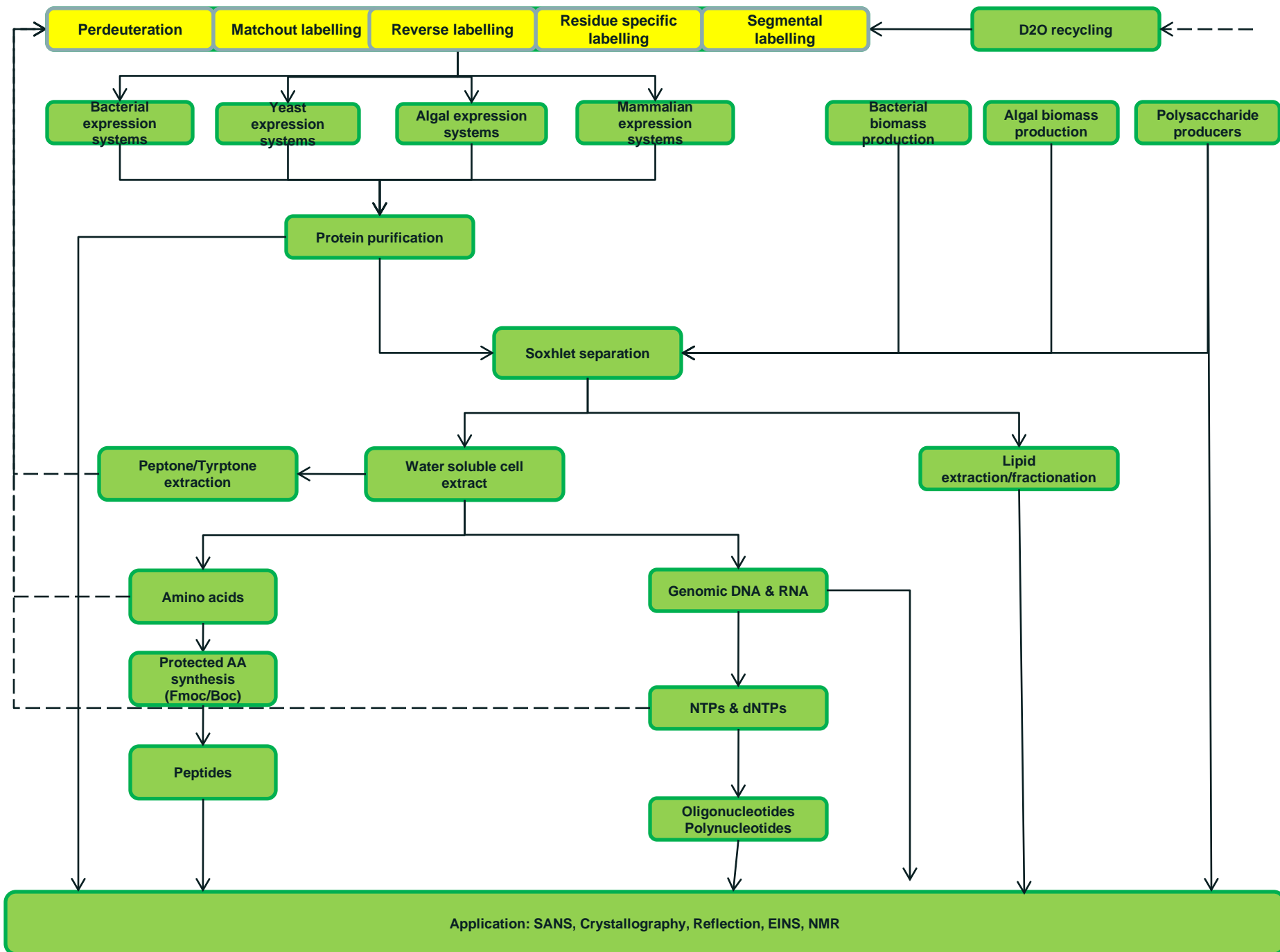
Transthyretin *Haupt et al*

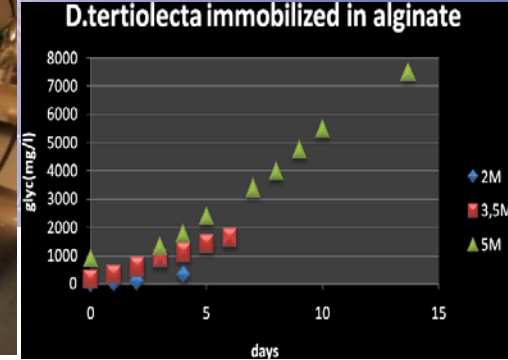
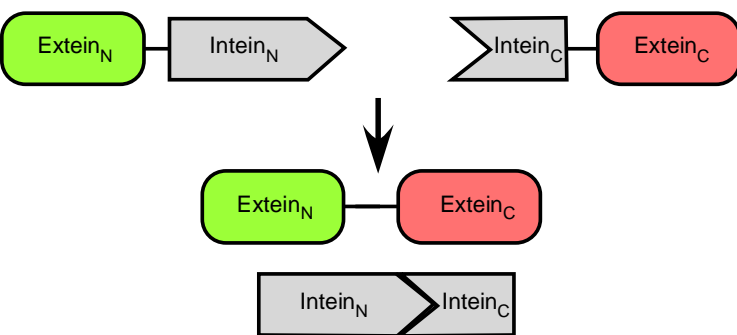


Aldose reductase (Strasbourg),
Hazemann et al, Blakeley et al

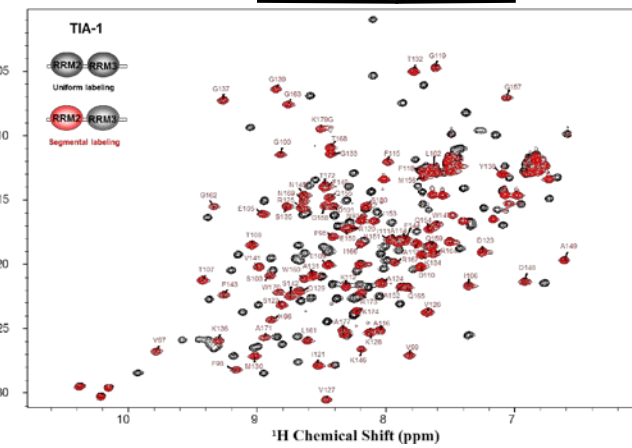


Hydronium ions in XI *Angewandte*
Chemie (2011)

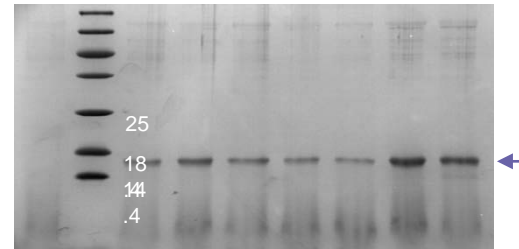
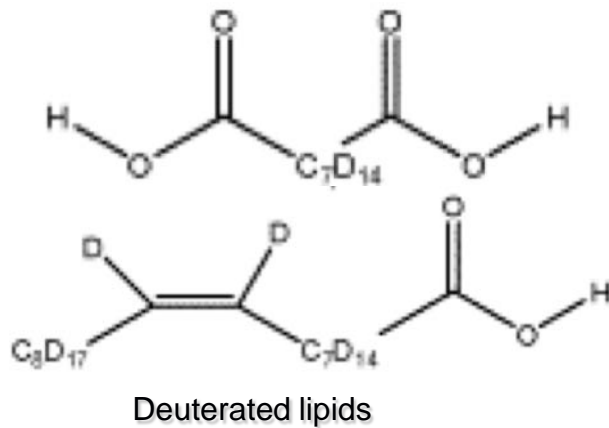




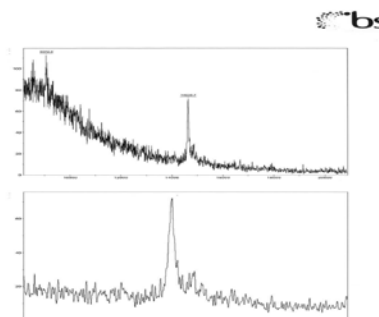
Deuterated glycerol from algal cells.



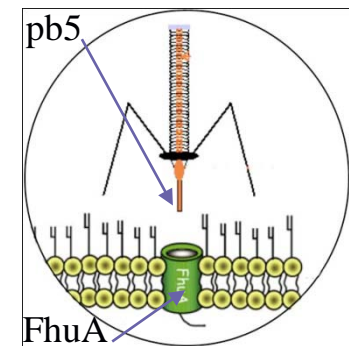
Segmental labelling for SANS and NMR
(NMR tests completes, SANS work
planned at FRM-II)



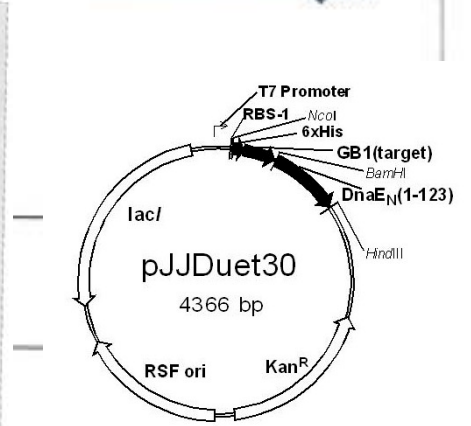
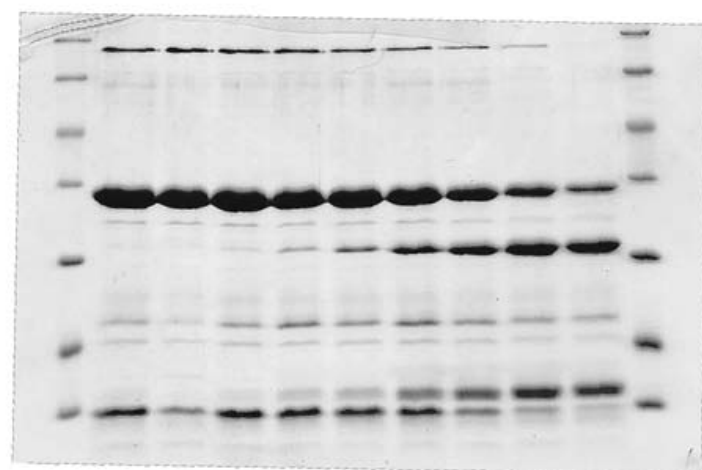
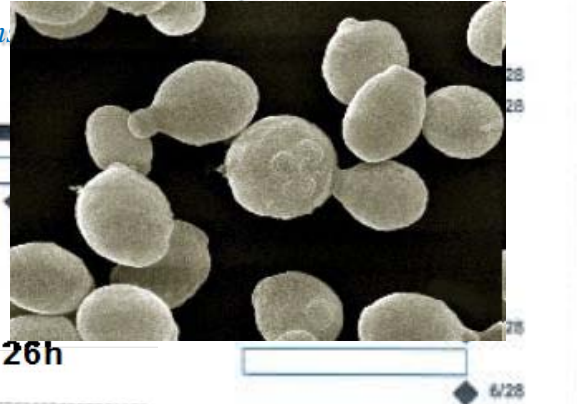
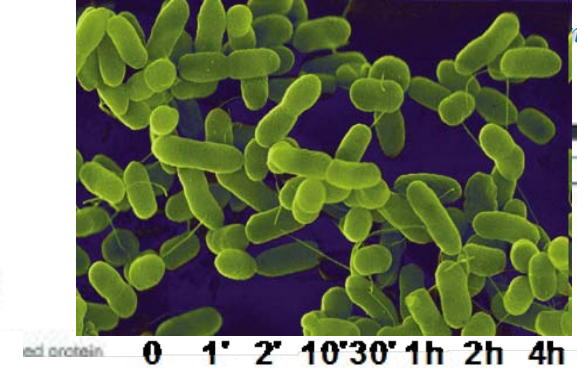

Optimised biomass extraction



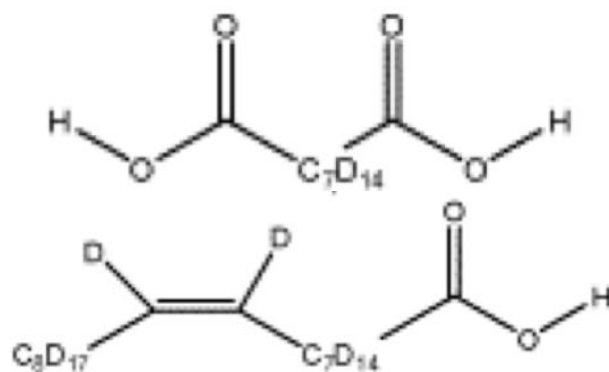
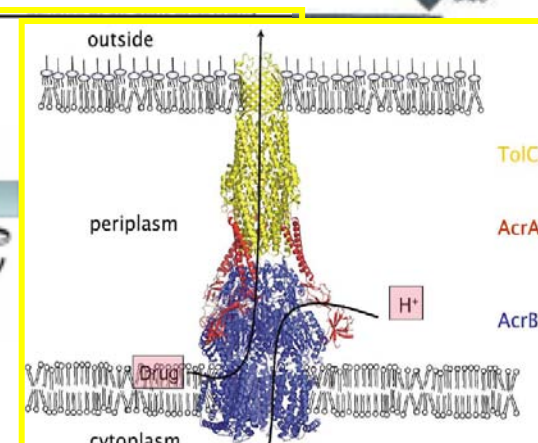
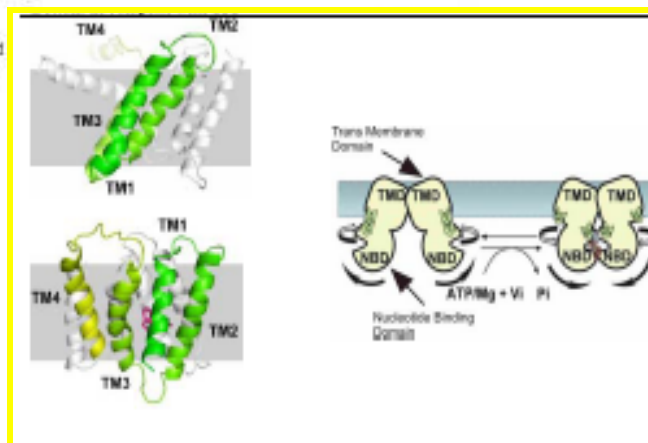
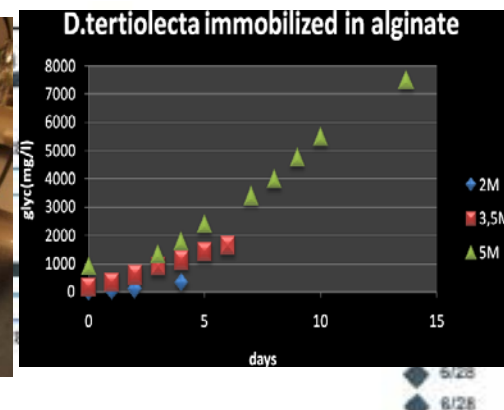
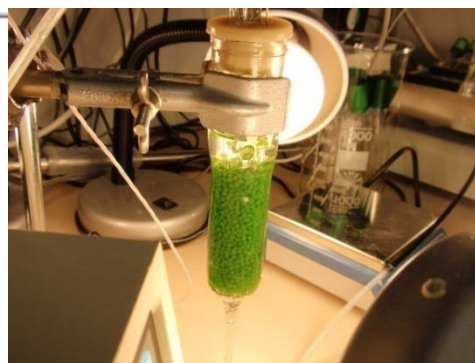
Yeast expression systems – eg
deuterated hydrophobin, HSA



Labelling of membrane
proteins - the first stage
of E.Coli infection by
phage T5.



ID	Task /Milestone /Deliverable	Task Name
85	Task 18.5	Low cost D-Glycerol production
86	Sub task 18.5.1	Growth conditions of <i>Dunaliella</i> for production of glycerol
87	D 18.5.1.1	Report about light intensity and other parameters
88	Sub task 18.5.2	Establishing of a "milking" procedure for <i>Dunaliella</i>
89	D 18.5.2.1	Report about the milking process, small amounts of glycerol
90	D18.5.3.1	Full protocols
91	Task 18.6	Deuterated membrane proteins
92	Sub task 18.6.1	Deuterated membrane proteins
93	D 18.6.1.1	Report on the optimised production of a model protein
94	D 18.6.1.2	Report on the optimisation of surfactant exchange
95	D 18.6.1.3	Full protocols for membrane protein labelling
96	Task 18.7	Deuterated lipids
97	Sub task 18.7.1	Identify target amino acids and lipids and
98	D 18.7.1.1	Report on targets and proposed routes
99	Sub task 18.7.2	Synthesis of target lipid components
100	D 18.7.2.1	Report on lipid components
101	Sub task 18.7.3	Assembly of lipids
102	D18.7.3.1	Report on assembly of lipids
103	Sub task 18.7.4	Large scale production
104	D18.7.4.1	Full protocols



NM13

open

Progress

Milestone

Summary

Project Summary

External Tasks

External Milestone

Deadline

Reflectometry

NMR
Solid state and solution

Small-angle
Solutions
Partially ordered systems

ILL

HZB

ISIS



FRM-II

ESS

Dynamics
Incoherent elastic scattering
Inelastic scattering

High-angle diffraction
Crystallography
Partially ordered systems

