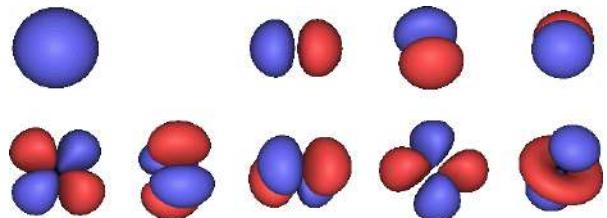
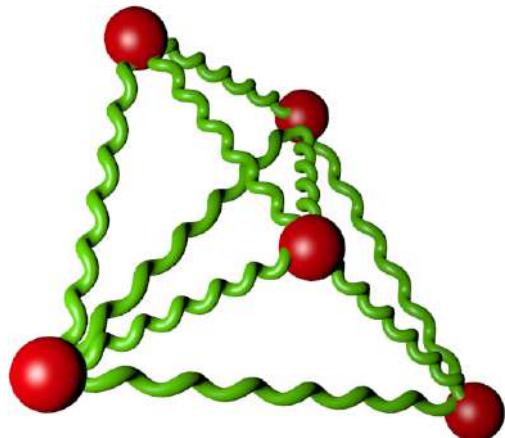
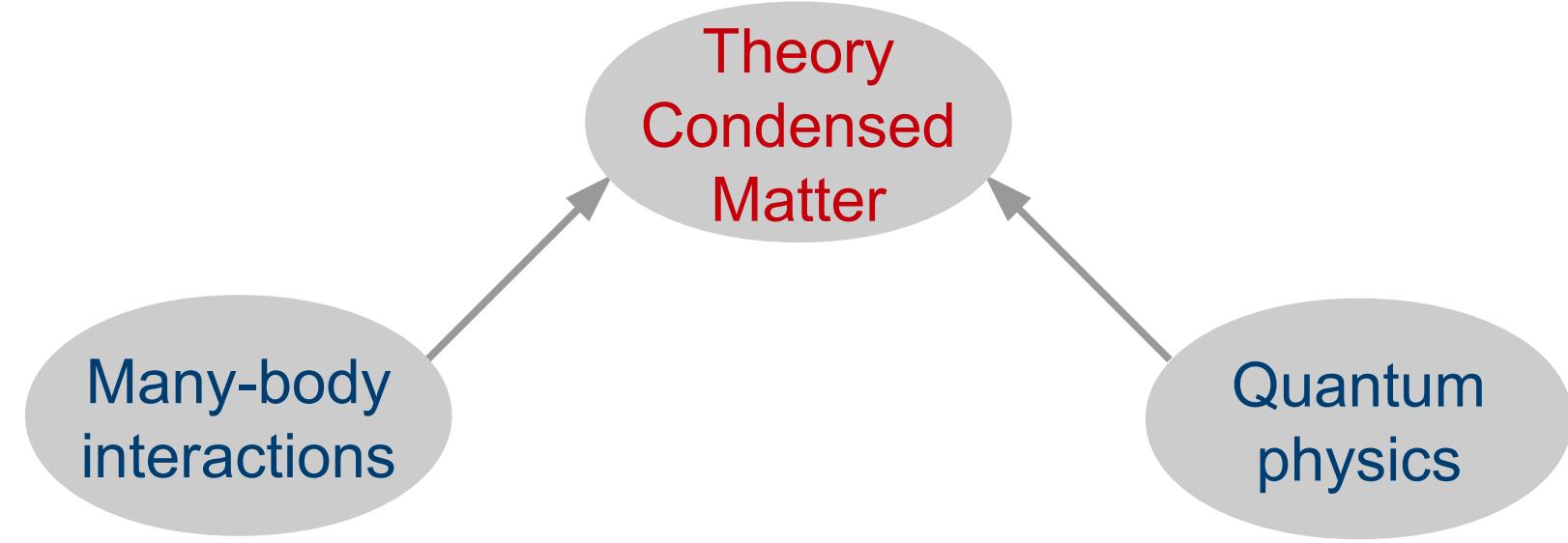


Research in Theory of Condensed Matter

Gareth Conduit

TCM Group, Department of Physics

What is condensed matter physics



Research themes in TCM

Electronic structure

CASTEP and ONETEP \$33million in sales

Collective phenomena

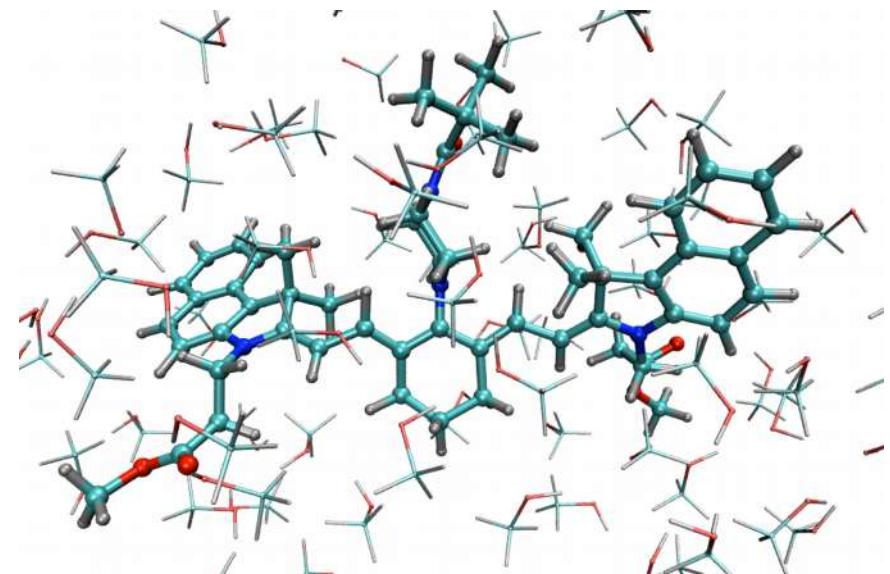
Quantum physics

Biological and soft matter

Database analysis

Fluorescent dye

Outside cancer cell

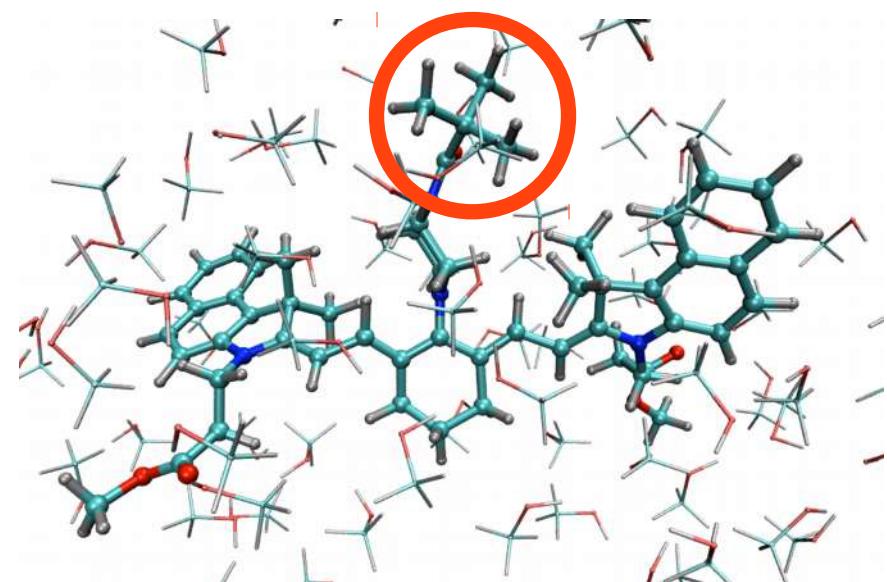


Fluorescent dye inside a cancer cell

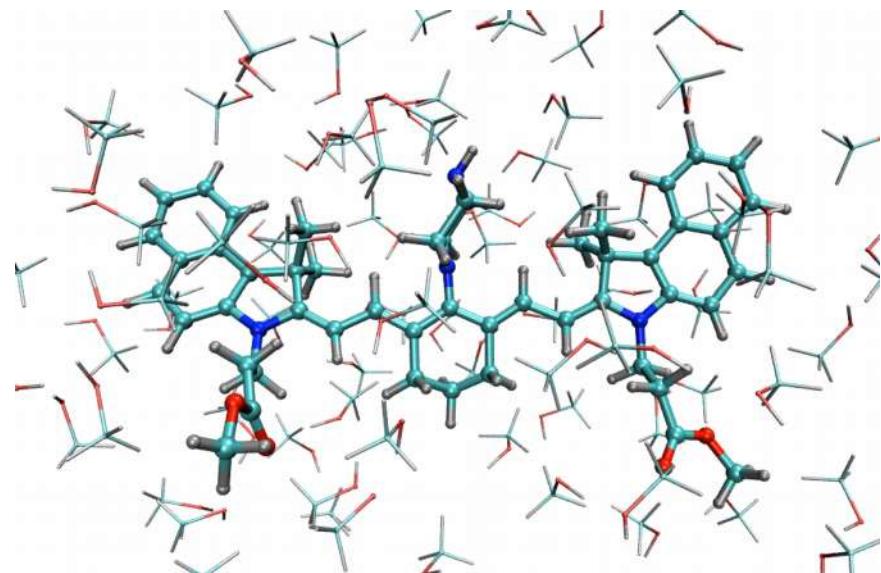
TCM
BSS&POM

Dr Cole, Dr Zuhlsdorff
Dr Bohndiek, J Weber

Outside cancer cell



Inside cancer cell

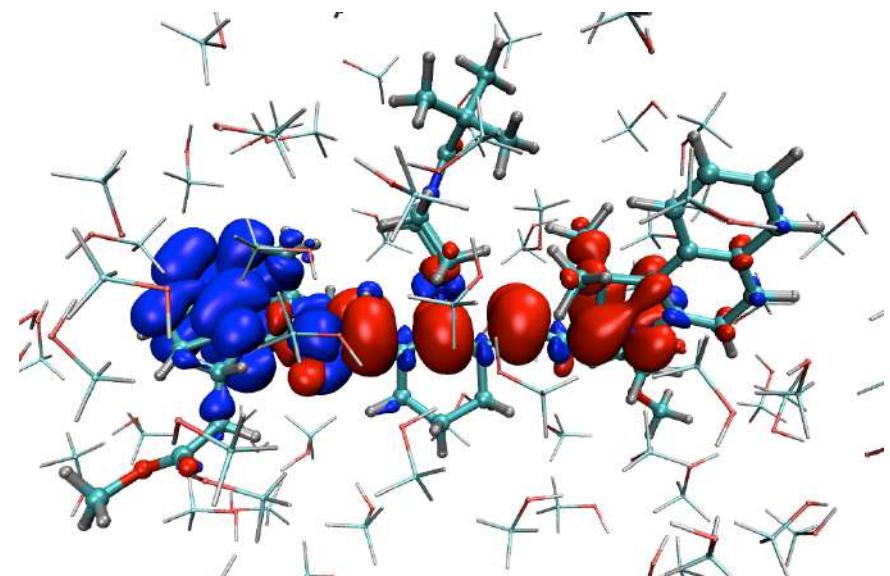


Electrons on the dye

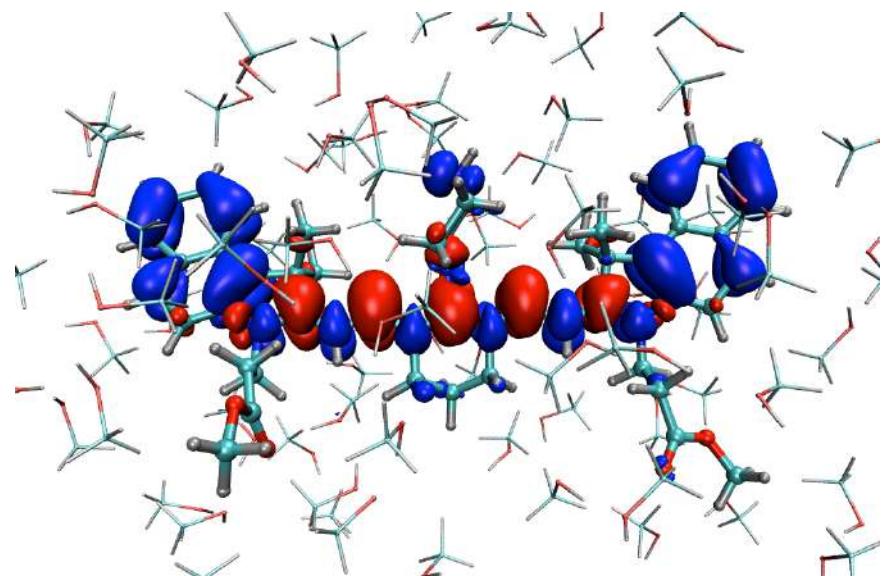
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Outside cancer cell



Inside cancer cell



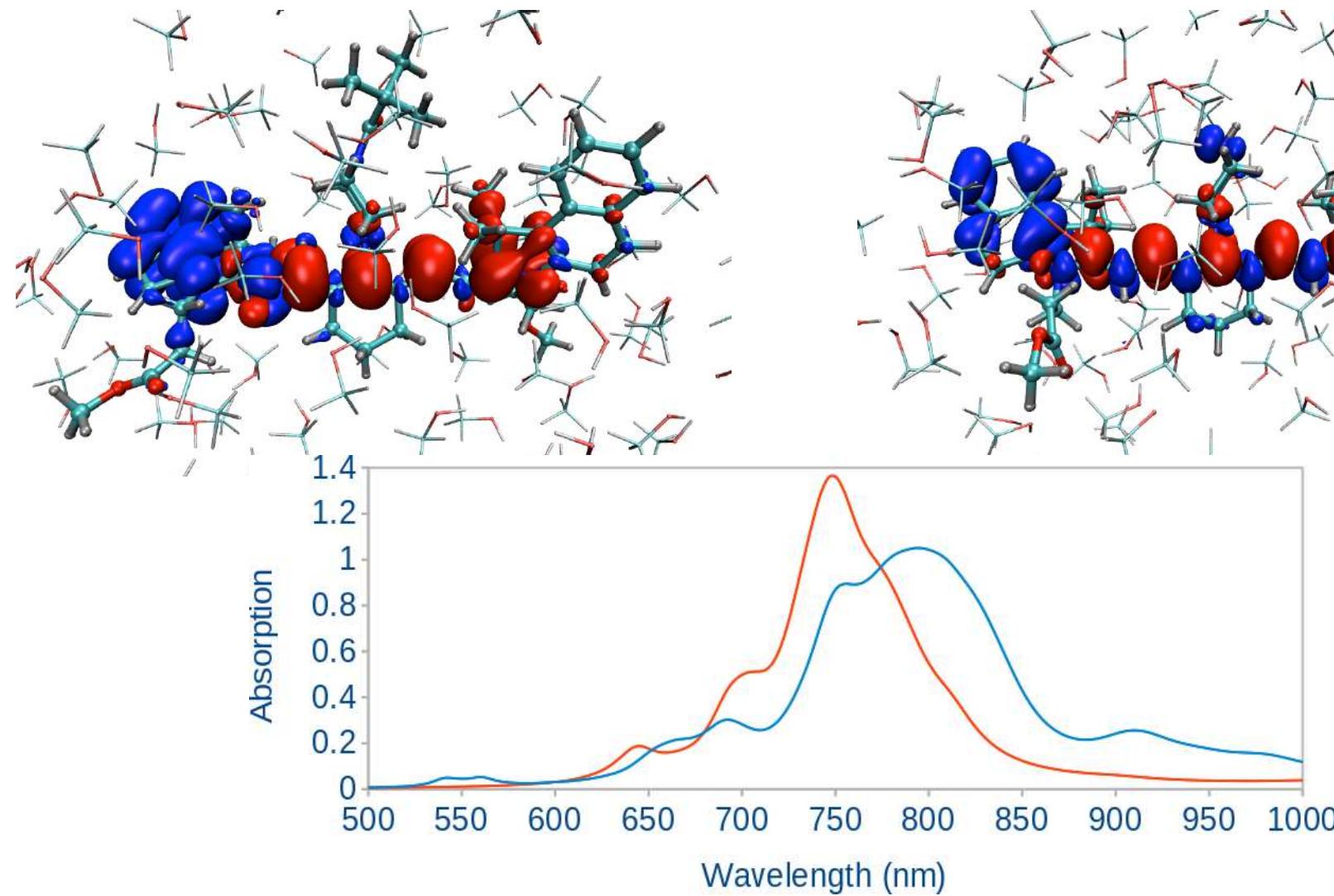
Absorption spectrum of the dye

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Outside cancer cell

Inside cancer cell



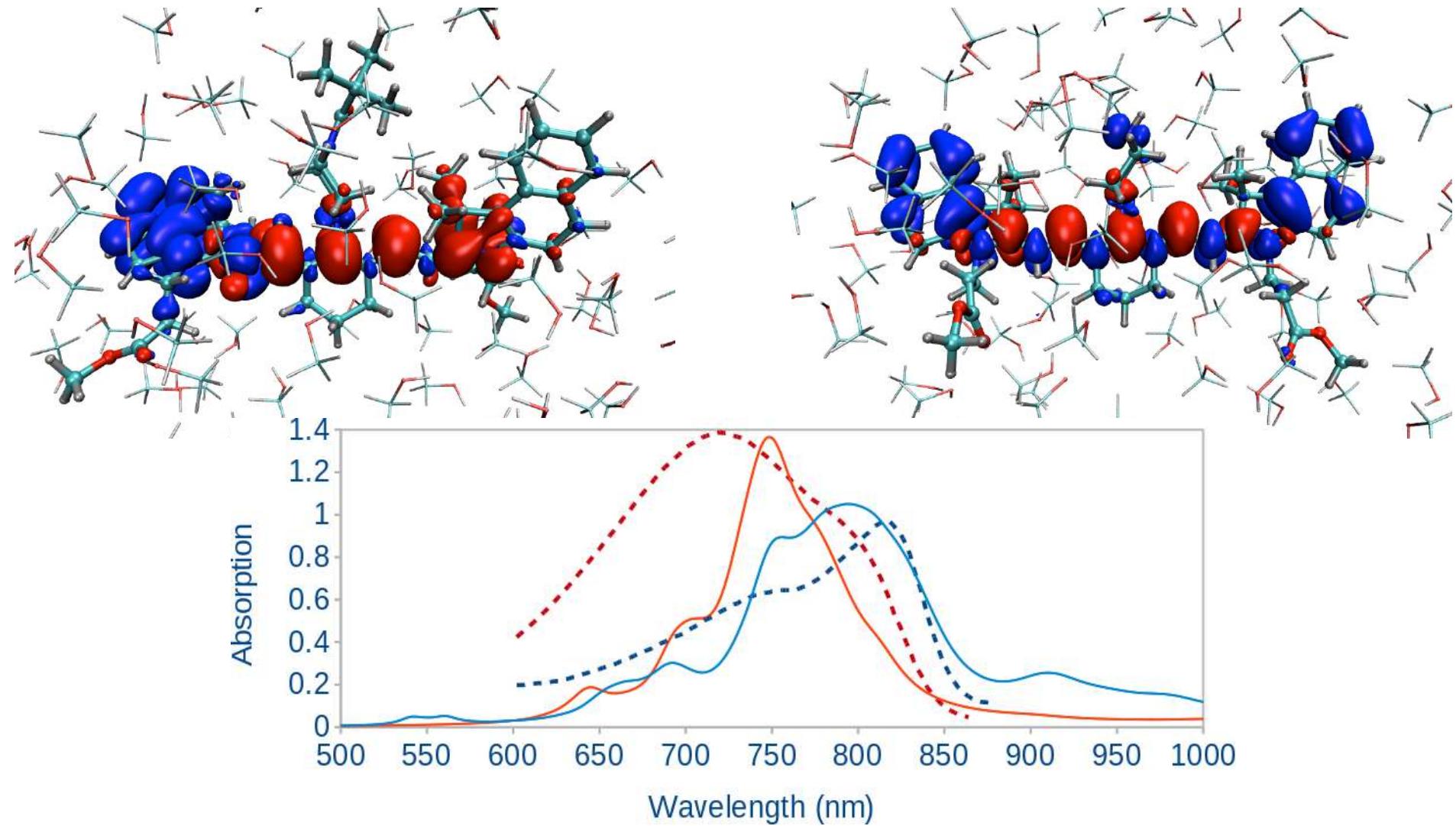
Absorption spectrum of the dye

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Dr Bohndiek, J Weber

Outside cancer cell

Inside cancer cell



Merging experiment and simulation

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Materials
Industry

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Dr Stone, Dr Jones
Granta Design, BP,
Samsung, Rolls-Royce

Experimental database



Computational predictions



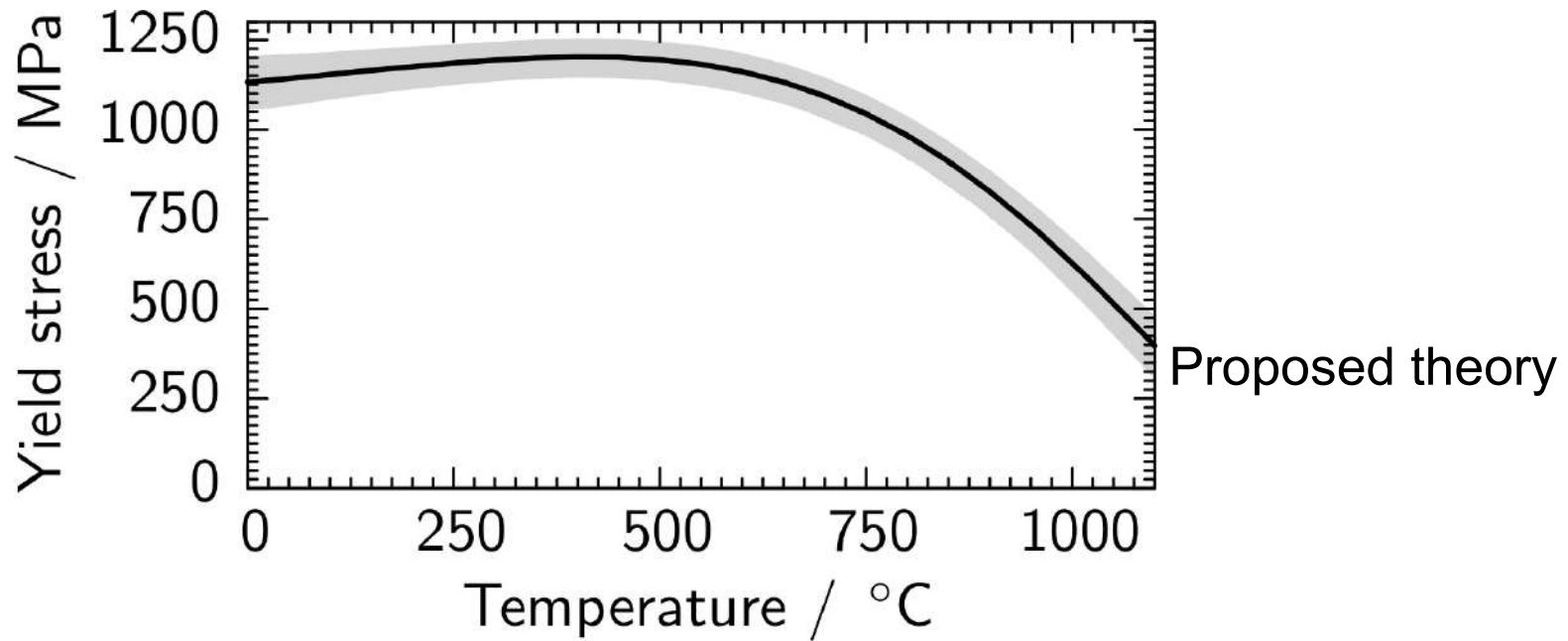
Predict new material



Testing the yield stress

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Industry

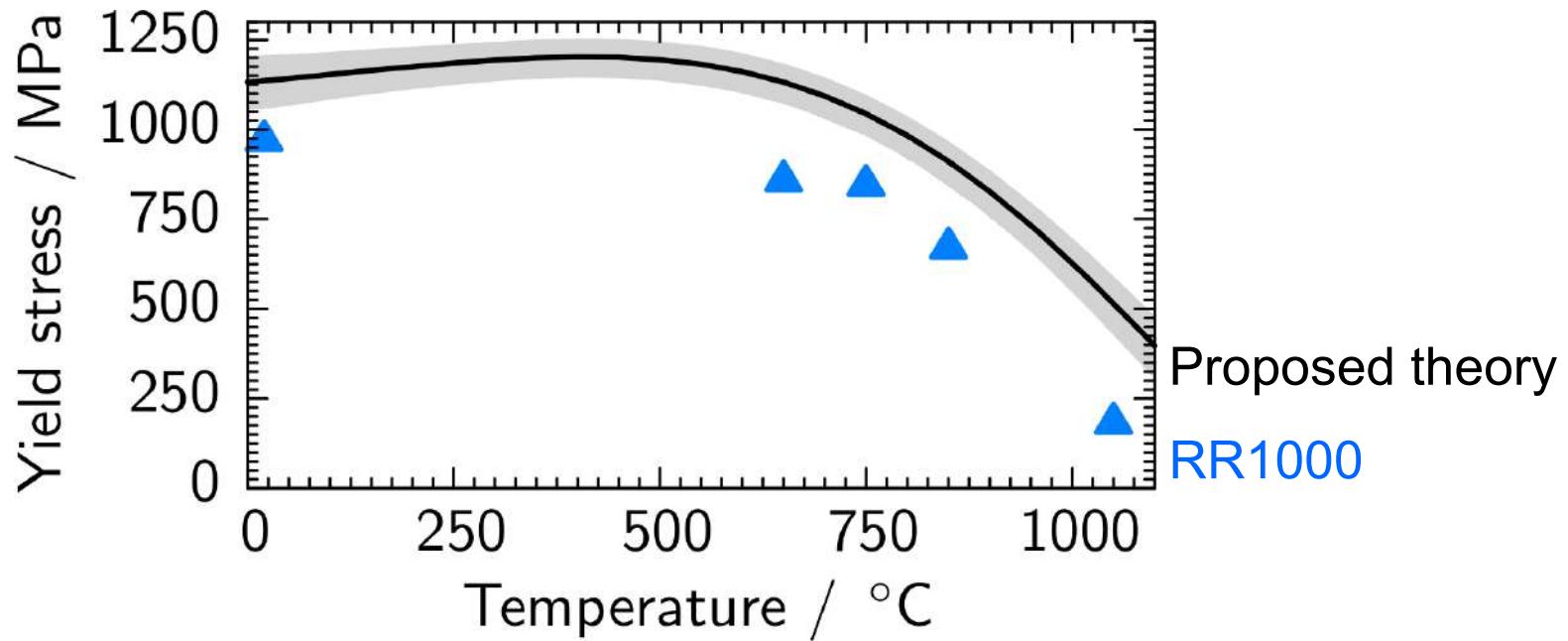
Dr Conduit
Dr Stone, Dr Jones
Granta Design, BP,
Samsung, Rolls-Royce



Testing the yield stress

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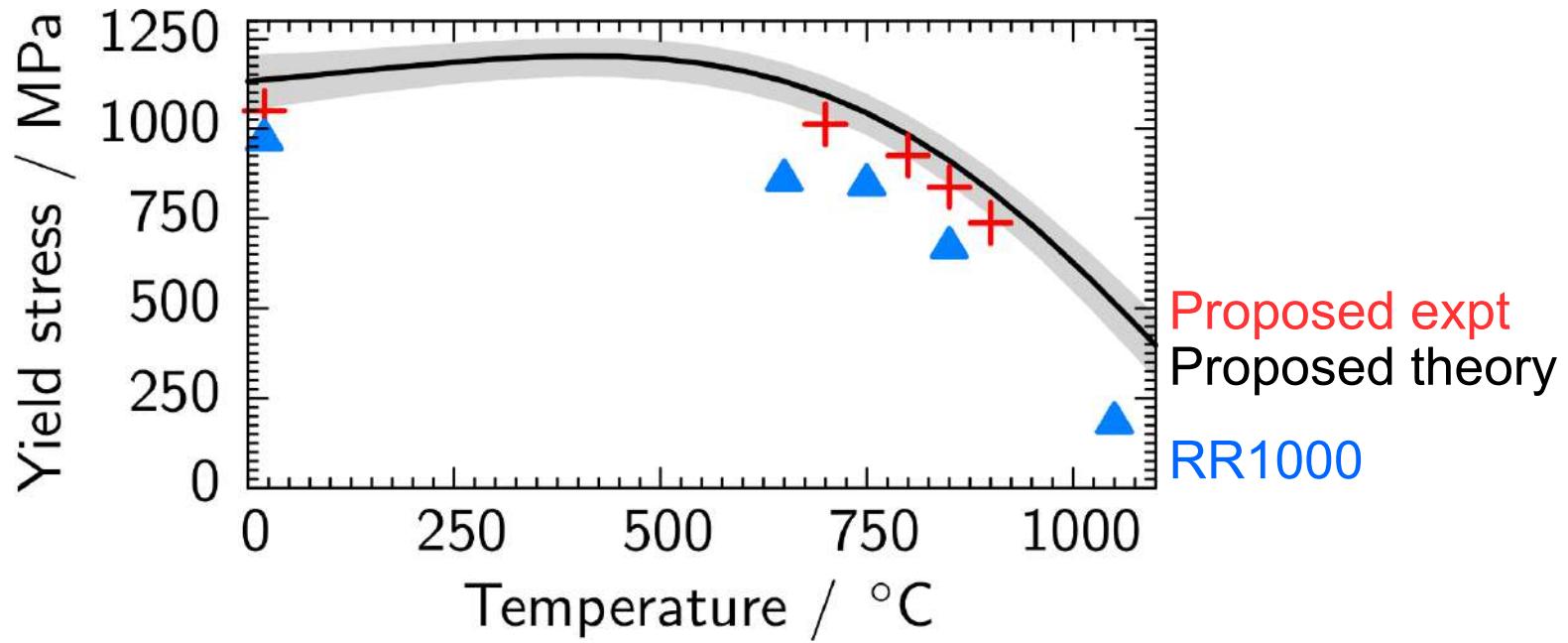
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Dr Stone, Dr Jones
Granta Design, BP,
Samsung, Rolls-Royce



Testing the yield stress

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Dr Stone, Dr Jones
Granta Design, BP,
Samsung, Rolls-Royce



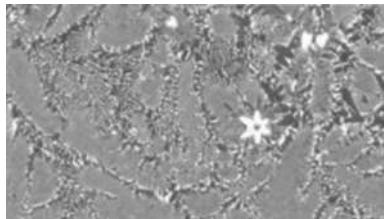
Materials discovered

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Cr-Cr₂Ta alloys

Intermetallics, 48, 62



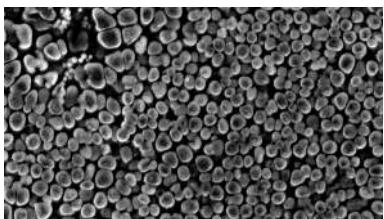
Lubricant



Ni disc alloy

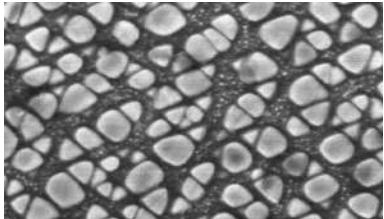
EP14157622

US 2013/0052077 A2



Combustor alloy

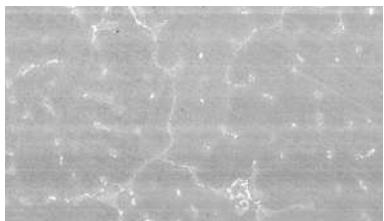
GB1408536



Mo-Hf forging alloy

EP14161255

US 2014/223465

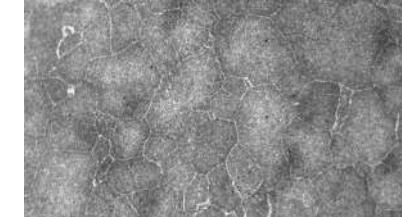


Li-ion battery



RR1000 grain growth

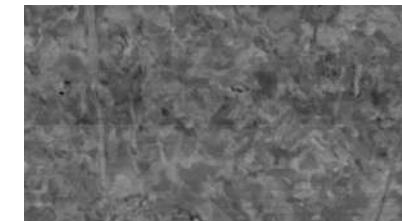
Acta Materialia, 61, 3378



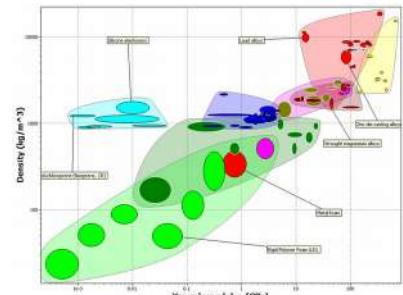
Mo-Nb forging alloy

EP14161529

US 2014/224885



Materials database



Summary

Apply theory to many-component interacting systems

Collaborations across Cavendish,
Cambridge, and industry