Going dotty: biogenic production of opto-electrical nanomaterials for biological and technological applications.

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The Nobel Prize for physics awarded for graphene in 2012 recognised the growing field of carbon nanomaterial research and its potential for real-world application. One promising group of carbon nanomaterials are carbon dots (CDs) which show potential for multiple applications from new-generation batteries, catalysts, LEDs, anticounterfeiting and supercapacitors, to biological applications including bioimaging, biosensors and drug-delivery. CDs also have significant direct biological effects themselves, for example our work has shown that they can directly impact on fundamental life processes such as photosynthesis, with the application of specifically functionalised CD to plants leading to rapid uptake of the CD and increase in photosynthesis resulting in a nearly 20% increase in crop yield. The precise link between the specific properties of unique CDs and their biological effects is still not determined or predictable. All the work done so far on CDs has been on synthetically produced CDs, however we have evidence that CDs can also be produced biogenically, opening up new routes of production and potentially new diversity of specific CDs with unique properties. This project will

i) Investigate the biogenic production of CDs and their diversity

ii) Compare the properties of biogenic CDs to those produced synthetically.

This project will be supervised by an interdisciplinary team across Biology, Chemistry, Physics and Electrical Engineering.