

Accessible 3D Models of Molecules

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Proposal Title	Accessible 3D Models of Molecules
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The Idea	<p>This project aims to create kits of 3D models of molecules for schools and outreach activities. The models will be used to facilitate the understanding of viral structures, polymers and synthetic biology projects. The kits will include complete structures and also pieces to be assembled as 3D puzzles and will be a tool for teachers and researchers to teach about their subject in an interactive manner.</p>
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Who We Are	<p>Vanessa Bueno (Vanessa.Bueno@earlham.ac.uk): PhD student at Earlham Institute, Norwich: Mathematical modelling, bioinformatics, biotechnology.</p> <p>Roger Castells Graells (Roger.Castells-Graells@jic.ac.uk): PhD student at John Innes Centre, Biochemical Chemistry Department, Norwich. Biotechnology, virology, synthetic biology, microscopy.</p> <p>Elisabeth Gill (elg54@cam.ac.uk): PhD student at University of Cambridge, Department of Engineering, Cambridge. Bioprinting / printing of biomaterials, thermoplastic 3D printing.</p> <p>Charlie Owen (Charlie.Owen@jic.ac.uk): PhD student at John Innes Centre, Metabolic Biology Department, Norwich. Bioinformatics, plantgenome mining, natural products, systems and synthetic biology.</p>
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Implementation	<p>Aim:</p> <ul style="list-style-type: none">• Contribute to the dissemination of science in an innovative way.• Promote awareness of the research developed at the research institutes.• Introduce concepts like synthetic biology, 3D printing and self-assembly systems in an interactive manner.• Provide new tools for teachers and researchers to teach about their subject.• Create kits of 3D models of molecules to be used in schools and outreach activities.• Create open access 3D models files and documentation to allow the replication of the kits. <p>Methods:</p> <p>Selection of a set of structures to be 3D printed. It will be based on their relevance and interest.</p> <p>School material: We are going to produce models that can be used to introduce new concepts or complement existing ones in the class.</p> <p>Outreach material: Models designed from the need of the researchers to communicate their research.</p>
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Design and generation of the **3D printing files** using available programs and databases.

Printing of the models with the 3D printer. **Refinement** of the files if needed and reprinting.

Preparation of the models. For example, introduction of the magnets in the models that are composed of pieces and that form a 3D puzzle.

Writing of the supplementary information that will accompany the 3D printed models.

Design of the final kit.

Production of the kits and **presentation** of the project.

Outcomes:

- Ready to use kits of 3D models of molecules which will include supplementary documentation, for example background information in the topic.
- Open access 3D models files and documentation to allow the replication of the kits.
- Multipurpose materials that can be used at school for biology, chemistry or maths class, depending of the approach, and also for science outreach
- New interaction established between students from three different research centres.

Involved:

The project will involve the members mentioned in the above section “Who we are”.

Furthermore it is possible to consider the establishment of collaborations with teachers, researchers and other projects. For example, in a previously Open Plant funded project (Co-lab OpenPlant –Interdisciplinary workshops of science art and design) one of the outcomes from the workshops was a project called **VRICKS** (Virus Bricks), a citizen science based project that aims to connect students and general public with science. Both projects could benefit from a collaboration as some of the approaches can be complementary.

Additionally, there is also contact with the project “**Synthetic Biology for Schools: A multidisciplinary approach**”, from which could be possible to gain experience on how to bring new materials and synthetic biology ideas into schools.

Benefits and outcomes

1. The project will create kits that will be ready to use for schools and also for outreach activities. They will include the 3D printed models and the documentation on how to use the kits and explain the contents that they represent.
 2. The kits will allow the schools to get knowledge and updates about the latest advancements in research, with for example, information about contributions of synthetic biology projects.
 3. Promote the interest for science in the future generations.
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4. Open access 3D printing files and documentation to allow the replication of the kits.
 5. A new interaction will be set up between the members of the project, that are from the John Innes Centre, The Earlham Institute and the University of Cambridge, which will allow the combination of expertise in molecular biology, synthetic biology, bioinformatics and 3D printing.
 6. This is a multidisciplinary team that can lead to the generation of innovative educational resources with state of the art technologies.

**Sponsor for
the research
and cost
centre**

George Lomonossoff, John Innes Centre, Biological Chemistry Department,
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Budget

Production of the 3D structure kits (3D printer, 3D printing materials (PLA), magnets, materials for the kits, design, support documentation): £2750

Travel to/from Cambridge/Norwich: £250

Organization of a workshop/presentation of the project and distribution of the kits:
£1000
