There are multiple PhD scholarships available at the Centre for Cell Factories and Biopolymers (Griffith Institute for Drug Discovery, Griffith University, Australia)

https://www.griffith.edu.au/institute-drug-discovery/our-institute/cell-factories-biopolymers

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1. Project Title	Modular design and assembly of innovative biopolymer beads as drug delivery platform
Project description	The FDA-approved polyhydroxybutyrate self-assembles in engineered bacteria and forms spherical beads of approximately 200 nm in diameter. Such beads composed of polymeric core and protein shell are of considerable interest as drug carrier platform as they provide payload for drugs and their surface can be engineered to targeted drug delivery. Synthetic biology will be applied to engineer these beads for proof-of-concept studies aiming at cancer treatment in a mouse model.

2. Project Title	Self-assembled particulate vaccines for prevention of Q fever
Project description	Q fever is an infection by the intracellular pathogen *Coxiella burnetii* that can cause a severe flu-like illness. For some people, Q fever can affect their health and ability to work for many years. The bacteria are spread from animals, mainly cattle, sheep and goats. Current Q fever vaccines are only poorly protective and cause severe adverse effects. Escherichia coli will be bioengineered to assemble selected antigens into discrete particles to serve as self-adjuvanting vaccines which performance will be tested in guinea pigs.

3. Project Title	Development of a new biomaterials platform by combining biomimetics with microfluidics
Project description	Synthetic biology enables engineering of bacterial cells to serve as cell factories for the assembly of novel material such as tailor-made biopolymers attached to protein functions which mediate deposition of inorganics such as found in tooth formation. Biomanufactured materials will be subjected to microfluidics to control the formation hierarchical architectures. The new materials design space will be explored toward uses in medicine and industry.

4. Project Title	Bioengineering of innovative functional biomaterials for diagnosis of Q fever
Project description	Q fever is an infection by the intracellular pathogen *Coxiella burnetii* that can cause a severe flu-like illness. The sensitive and specific diagnosis of Q fever is important for early intervention and for control and management of the disease. *Escherichia coli* will be bioengineered to form polyester inclusions coated with selected antigens for development of a new skin and blood test for enhanced diagnosis of Q fever.

5. Project Title	Synthetic biology toward innovative virus-like particles
Project description	Virus-like particles (VLP) are self-assembled viral proteins that do not contain genetic material and are non-infectious. VLPs have been successfully developed into particulate vaccines for prevention of viral infections such as human papilloma virus or Hepatitis B. This project aims to link the assembly of VLPs with biopolyester synthesis inside engineered *Escherichia coli*. The VLP-biopolyester hybrid material will be characterised and its utility towards medical uses such as in drug delivery or as vaccine will be tested.

6. Project Title	Innovative bioseparation resins
Project description	The manufacture of biopharmaceuticals, such as therapeutic proteins, is increasingly facing limitations due to insufficient performance of existing purification processes. There is an urgent need for new bioseparation resins and methods to overcome this biomanufacturing bottleneck. This project aims to develop an innovative and disruptive platform technology for designing and manufacturing tailor-made high-performance bioseparation resins, to enhance manufacturing of biopharmaceuticals. Bacterial cell factories will be designed to produce polymer spheres which densely display specific binding domains for purification of biopharmaceuticals.

7. Project Title	Genome editing toward bacterial cell factories for synthesis and assembly of innovative materials
Project description	Bacterial cell factories were developed to demonstrate production of tailor-made biopolymers such as polyesters and polysaccharides. However, these production strains often lack stability and hence are not suitable for scalable cost-effective production of these materials. Here, the CRISPR-Cas9 system will be used for inserting three genes required for biopolyester synthesis and assembly of functional protein-displaying beads into the genome of the endotoxin-free *Escherichia coli* strain for stable and improved production of protein-coated polyester beads to serve as vaccine, drug carrier or diagnostic reagents.

8. Project Title	Protein engineering of protein switches for development of diagnostics tools
Project description	Sensitive and specific detection of serum antibodies is often used to diagnose infections. This project aims to develop a simple qualitative/quantitative device for detection of antibodies of interest. It will involve protein engineering of protein switches to incorporate antigens. Binding of the antibodies to the antigens will activate the protein switch which will result in release of a signal.

9. Project Title	Self-assembly of engineered biopolymers and proteins toward functional materials
Project description	Biopolymers and proteins can be bioengineered to self-assemble into defined hierarchical architectures. Here protein engineering will be applied to design proteins which link biopolymers such as alginate, bioloyester and spider silk to form complex hybrid materials. Stimuli sensitive peptide linkers will be inserted to generate responsive materials that for example can release drugs upon cellular uptake. This project will explore the design space of diverse biological building blocks assembled into innovative unique materials providing solution for major health and environmental challenges.

10. Project Title	Any idea with scientific impact and/or potential commercial outcomes
Project description	Prospective PhD students are invited to propose their own research project of interest. The proposed research needs to be novel, original, of high impact and/or commercially relevant. It needs to align with the mission of the Centre for Cell Factories and Biopolymers (Griffith University) such as “At the Centre for Cell Factories and Biopolymers, our mission is to research and develop innovative functional materials and technologies that can provide solutions for global health and environmental challenges.”