

## **Engaging Undergraduates in Crystallographic Research: “Structure of the *Yersinia pestis* UDP-glucose-1-phosphate uridylyltransferase”**

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The NIH Summer Internship Program in Biomedical Research (SIP) provides undergraduates the opportunity to spend a summer working in an NIH lab under the supervision of a scientist. The program lasts approximately 8-12 weeks and is sponsored by the NIH Office of Intramural Training & Education. Here, we describe our experience with the SIP program and present a training module designed to introduce undergraduate students to various aspects of crystallographic research including molecular cloning, protein construct design and expression, purification by various chromatographic techniques, crystallization of macromolecules, X-ray diffraction and structure solution and refinement. As a case study, a review of the literature was performed to select a protein of biomedical interest and the student solved the structure within the summer training period. In this case, the *Yersinia pestis* UDP-glucose-1-phosphate uridylyltransferase (UDP-glucose pyrophosphorylase), a potential anti-plague drug target was investigated. The research project demonstrated the interdisciplinary breadth of crystallographic research and its important role in structure-based drug design research.