

## **A UROP perspective by Zhiyuan Zhang**

Summer 2025 (undertaken in the Department of Chemistry at Imperial College London's White City campus)

Zhiyuan Zhang was a Year 3 undergraduate at Imperial College London in 2024-2025: MSci in Chemistry, Department of Chemistry.

**UROP title:** Probing electron-phonon coupling in soft nanomaterials using ultrafast impulsive Raman spectroscopy

I have long been fascinated by the origin of the colours we see, which led me into the quantum world where electronic dynamics hold the key to this question. I want to explore this area more deeply, as much of my study so far has been quite theoretical. I spent three years looking for a UROP opportunity and was very fortunate to finally receive one. My supervisor, Artem, kindly welcomed me and invited me to do research under his guidance. To secure the research experience, the department required a bursary (to be in place in order for the Dept to approve its registration), which also improved my wellbeing by reducing living-cost pressures. I wasn't very confident about getting one at first, but I tried my best, thought carefully about my career plans, and gathered information from the website, which, luckily, paid off.

My interest in electronic properties and my wish to pursue research in the future are the main reasons I undertook a UROP in the Optoelectronics Group. It gave me the chance to apply what I've learned to real systems and to gain practical knowledge. I worked on frontier materials—perovskite solar cells—which deepened and updated my understanding of cutting-edge photovoltaics.

Before starting, I read papers in related areas that my day-to-day supervisor sent me. During the project, I learned to analyse transient absorption (TA) data using techniques such as singular value decomposition (SVD) and global analysis, performed global fitting in Python, and became familiar with the practical experimental setup. I was fascinated not only by the technique itself but also by how powerful these methods are for solving the puzzle of complex spectra—for example, giving indications that electrons may form self-trapped states within the band structure. Altogether, this strengthened my understanding of optics and charge dynamics. I also got to know outstanding PhD students who were generous with their time and genuinely friendly.

These experiences not only strengthened my technical foundation but also built my endurance, grit, and ability to learn independently when facing unforeseen problems and varying levels of difficulty. In future projects and courses, these will be valuable skills for staying motivated and supporting steady personal growth. For anyone interested in research, I highly recommend applying for a UROP.