Have you ever wondered how plants transform from pale seedlings growing in the dark to green plants when exposed to light? This rapid change is made possible by a remarkable structure inside plant cells called the prolamellar body (PLB). The PLB is an example of diamond-type cubic membranes – intricate three-dimensional structures that follow periodic patterns and serve as highly efficient storage systems for cellular components.

Our research aims to decode the molecular tools plants use to sculpt these complex membrane structures. Just as architects need specific materials and tools to construct buildings, cells need specialized proteins to shape their internal membranes. We will investigate how two key proteins – LPOR and CURT1 – work together to bend and shape membranes into their precise three-dimensional patterns. Understanding these molecular building blocks and their interactions will reveal how plants achieve such remarkable precision in membrane architecture.

While scientists can create similar structures in the laboratory using synthetic materials, nature's version achieves unique properties that we cannot yet replicate. By studying how plants create these structures, we hope to unlock the molecular mechanisms behind their formation. This knowledge could lead to breakthrough applications in medicine and biotechnology, from developing more effective drug delivery systems to creating new biocompatible materials.

Our interdisciplinary team combines plant biology, membrane biophysics, and evolutionary science expertise to tackle this challenge. We'll study how these proteins evolved across different plant species and use cutting-edge techniques to observe their function both in living plants and in laboratory models.

This research represents more than understanding a biological process – it's about learning from nature's engineering to develop better solutions for human needs. By bridging the gap between biological and synthetic systems, we aim to create a blueprint for designing new materials that could benefit both medicine and industry.