GeomPack: Geometry and packing in material structure and biology

The PMV Satellite Programme on Geometry and packing in material structure and biology at Aberystwyth University, known as GeomPack, convened experts in computational, combinatorial, and discrete geometry, physicists, and virologists. The month-long programme in the summer of 2023 highlighted the mathematical challenges and the practical applications of packing problems in fields such as virology and soft-matter physics. Geompack crowned a year of celebrations marking 150 years of Mathematics at Aberystwyth University.

Notable attendees included Thomas Hales, known for resolving the Kepler conjecture, and Chaim Goodman-Strauss from the National Museum of Mathematics in New York. Goodman-Strauss discussed the Einstein tile, a geometrical breakthrough allowing for a non-repeating tessellation of the plane with a single tile.

Reidun Twarock's evening lecture at the Aberystwyth Science Café, linking packing problems to viral self-assembly, underscored the relevance of this topic in the current global health context to a broader audience, blending mathematics and biology. Structural colour (Manoharan, Schroeder-Turk) also emerged as a theme: how nature uses packings of, for example, spheres, or minimal surfaces such as the gyroid, to generate colour. Presentations from photographer Kym Cox and graphic artist Mark Eaglen, taking inspiration from packings of bubbles and the scutoid cell, provided a very different, and very welcome, view of how geometry appeals to other communities.

With more than half of the participants from overseas, the programme stimulated many new collaborations, and has also led to a developing collaboration with industry. At the time of writing, it is still too early to say how these will evolve. Live-streaming talks and sharing the recordings on YouTube has also helped to strengthen the packing community. Online seminars will continue, plans are underway to host a follow-up meeting outside the UK, and further funding for scientific exchanges is being sought, all with the aim of sustaining and expanding the collaborative network fostered at Geompack.