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Collagen Crystallography: From Early Fiber Diffraction to High-resolution Structures. Jordi Bella, Wellcome Trust Centre for Cell-Matrix Research, Faculty of Life Sciences, Univ. of Manchester, Manchester M13 9PT, UK.

Fifty years ago the collagen triple helix was derived from fiber diffraction analysis. The resulting low-resolution models remained controversial for decades on the precise conformational parameters of the helices and the nature and patterns of hydrogen bonding. Crystallographic studies on synthetic peptides with collagen-like sequences have confirmed the essential features of the collagen triple helix and have clarified many of these long-standing controversies. High-resolution crystal structures have established that: (1) the collagen triple helix contains structural waters; (2) the degree of triple-helical twist is dependent on collagen sequence and environment; (3) the lateral packing of triple helices in the crystal lattices shows the intermolecular spacing and quasi-hexagonal arrangement seen in collagen fibrils; (4) peptides with an extremely simple charge distribution are capable of generating staggered arrangements; and (5) weak Cα–H···O=C hydrogen bonding interactions occur systematically in the collagen triple helix and cooperate with conventional hydrogen bonds. This talk will review the main findings of the high-resolution crystallographic studies to date and will include new data from two recent crystal structure determinations.