Preface

The knowledge that guanine-rich DNA can form unusual structures has its origin in findings that precede the double-helix structure by 50 years. However, the nature of the guanine aggregation, at the polynucleotide helix level, was only revealed in the 1960s by fibre diffraction and other biophysical studies. These showed that guanine polynucleotides form four-stranded helices held together, not by the Watson–Crick base-pair motif, but by four guanines hydrogen-bonded in-plane G-quartets. This type of structure appeared initially to have little biological relevance until it was demonstrated that natural G-rich sequences in telomeric DNA at the ends of chromosomes could form such structures, at least *in vitro*. The study of quadruplex biophysical chemistry made steady progress in the 1990s, with NMR and to some extent X-ray crystallography defining some structural detail. The biology of quadruplexes remained a relatively unexplored area until it was demonstrated that small-molecule stabilisation of the single-stranded ends of telomeric DNA into quadruplexes, is an effective way of inhibiting telomerase activity, and could therefore lead to anti-telomerase anticancer therapy. Furthermore, a growing number of quadruplex-specific proteins are being discovered. There is now the increasing realisation that non-telomeric sequences in human and other genomes can form (or perhaps can be induced to form) quadruplexes, and that these quadruplexes play a role in the regulation of gene expression. The diversity in quadruplex architecture is also of increasing interest, even though much remains to be established, and rules relating sequence to fold cannot yet be defined.

We believe that it is now timely to review many of these themes, and so clarify where the quadruplex area is going. We have been fortunate in being able to bring together many of the leading experts in this exciting field, and are grateful to them for having delivered their manuscripts so promptly.

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