

ation on alternate bases in order to maximize the distance between charged cytosines. Movement of the imino proton from one strand to the other would be greatly slowed, as in the crystal structure of 1-methylcytosine¹⁸. (However, symmetric C·C⁺ pairs have been observed^{1,7}). In the tetrad, the cytosine N3 nitrogens are maximally separated, allowing disorder in the pattern of protonation with a concomitant free energy gain. A further electrostatic advantage comes from the reversed orientation of the carbonyl and amine dipoles in successive base pairs (Fig. 4d). Last, the tetrad presents extensive sugar-sugar van der Waals contacts that would be absent in a C·C⁺ duplex.

The structure reported here includes a new motif for nucleic acids: intercalated base pairs. This motif is designated the 'i-motif'. It seems to form readily in sequences containing stretches of deoxycytidine, because it has now been partly characterized in several other sequences. For instance, d(T₂C₈T₂), d(TC₃), d(TC₃T) and d(C₄TC₄) form tetramers (as shown by gel filtration chromatography¹² and they display the unusual H1'-H1' NOESY crosspeaks (not shown). The i-motif could possibly be a common feature of structures containing parallel strands. In

contrast, the merging of two antiparallel duplexes of Watson-Crick pairs would necessitate placing one sugar-phosphate backbone of one duplex within the minor groove of the other, which seems impossible.

In our conditions, the d(TC₃) tetrad is not stable at pH 7.0. But, in other conditions, this or other oligomers containing cytidine sequences might produce tetrads at physiological pH and be biologically important. In particular, the C-rich strand of telomeres, whose structure is of current interest^{19,20}, includes extensively repeated sequences such as C₃A₂, C₄A₂ or C₄A₄ (ref. 21). A length of single strand consisting of four consecutive sequences such as these could fold to form the i-motif, analogous to the formation of G-tetrads by sequences representative of the other strand²²⁻²⁵. □

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ERRATUM

Microsecond-resolved XAFS of the triplet excited state of Pt₂(P₂O₅H₂)₄⁴⁻

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THE penultimate sentence of the first introductory paragraph of this letter should read, "We find that the triplet excited state of Pt₂(P₂O₅H₂)₄⁴⁻, with a lifetime of about 4 μs, undergoes a contraction in the separation of the P-planes of 0.52 ± 0.13 Å relative to the ground state." As published, the contraction was wrongly attributed to the Pt-Pt distance. □

