DNA occupies its familiar duplex form when it is ‘asleep’ and not being processed. When it is in action its structures are very different indeed. The recognition of DNA replication forks and other Y-shaped DNA and RNA junctions using nanosized metallo-supramolecular cylinder arrays [1-4] will be discussed together with work on new agents that recognise tetraplex DNAs found in gene promoter regions. We have shown that our cylinders bind strongly and preferentially to DNA fork structures and prevent DNA transactions in vivo, that they are taken up readily into cancerous cells and rapidly localise in cell nuclei, where they interfere with the processing of DNA leading to cell cycle arrest followed by apoptosis, without inducing genotoxicity or mutagenicity. The key challenge of how to build from in vitro biophysical observations to demonstrate what chemistry is happening in the cell, where and how quickly it is occurring and how that induces the biological response will be addressed. The talk will also explore the integration of this approach with other approaches from the field of nanoscience.

References
2 C. Ducani, A. Leczkowska, N. J. Hodges, M. J. Hannon, Angew Chem Int Ed., 2010, 49, 8942—8945