1058-57-39 **Dorothy Buck***, Dept of Mathematics, Imperial College London, London, sw7 2az, England, and **Ken Baker** and **Andrew Lobb**. *A Topological Model of Protein-Mediated Localized DNA Transformations.*

Many protein-DNA interactions, such as site-specific recombination and (type II) topoisomerase-mediated unknotting and unlinking, act by cutting and resealing (double-stranded) DNA segments in a localized way. These enzymatic reactions can be modelled in terms of tangles, 3-dimensional balls with two properly embedded arcs, each representing a segment of DNA. The action of the protein can be thought of as removing one tangle and replacing it with another – e.g. a topoisomerase-initiated crossing change as replacing a (+1) tangle with a (-1) tangle – leaving the rest of the DNA unchanged. This replacement can be straightforward (as in the topoisomerase example above) or quite complex.

Because of the plectonemic supercoiling of DNA, 'rational tangles' (formed by an alternating series of horizontal and vertical twists) are the most biologically relevant. We classify all possible rational tangles that can replace – in any prescribed manner – a given rational tangle, thus elucidating all possible protein-mediated localized changes of DNA. (Received January 14, 2010)