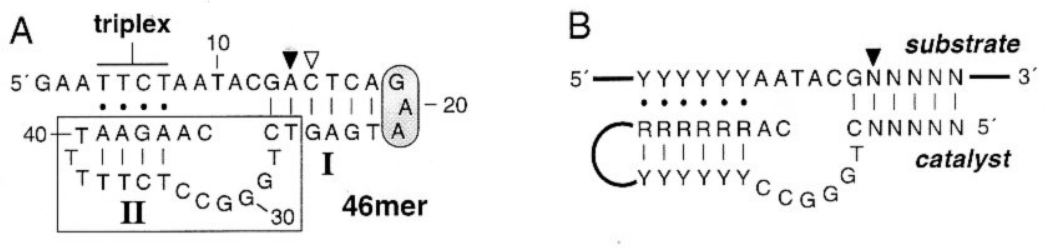
Breaker Laboratory

Molecule of the Year

1996

"Class II" DNA-cleaving Deoxyribozymes

Fig. 1. Schematic representation of the structural features of class II self-cleaving deoxyribozymes.[1] (**A**) Minimal 46-nucleotide class II deoxyribozyme with catalytic core (boxed). Filled and open arrowheads identify primary and secondary oxidative cleavage sites, respectively. (**B**) Consensus sequence and structural features of the class II motif (Y, R, and N represent, pyridine, Purine, and any base, respectively).



In recognition of the discovery of that DNA can catalyze its own destruction, and to acknowledge that significant advances in our understanding of this process have been made using class II self-cleaving deoxyribozymes, the status of Breaker Laboratory "Molecule of the Year" has been conferred upon this class of catalytic DNAs..

Class II deoxyribozymes exhibit the fourth catalytic activity of DNA to be recognized – oxidative DNA cleavage. Several unique features of catalysis by nucleic acids were first recognized with the class II motif. For example, the deoxyribozyme requires only copper ion cofactors, with no obvious source of reducing power, to mediate oxidative DNA destruction. Substrate recognition is mediated, in part, by the formation of a DNA triplex structure. In addition, this DNA can be tailored to cleave different DNA substrates by altering the molecular recognition potential of the substrate-binding arms. These findings indicate that a far greater potential exists for the catalytic function of DNA.

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[1] Carmi, N., Balkhi, S. R. and Breaker, R. R. (1998) Cleaving DNA with DNA. *Proc. Natl. Acad. Sci. USA* **95**, 2233-2237.