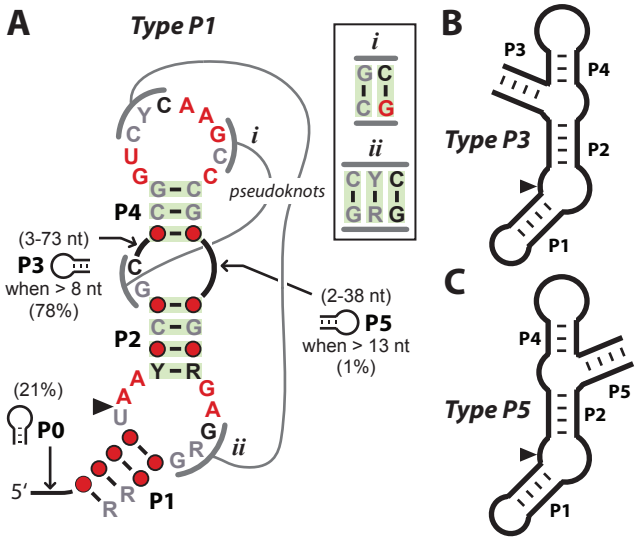
Breaker Laboratory

Molecule of the Year

2012

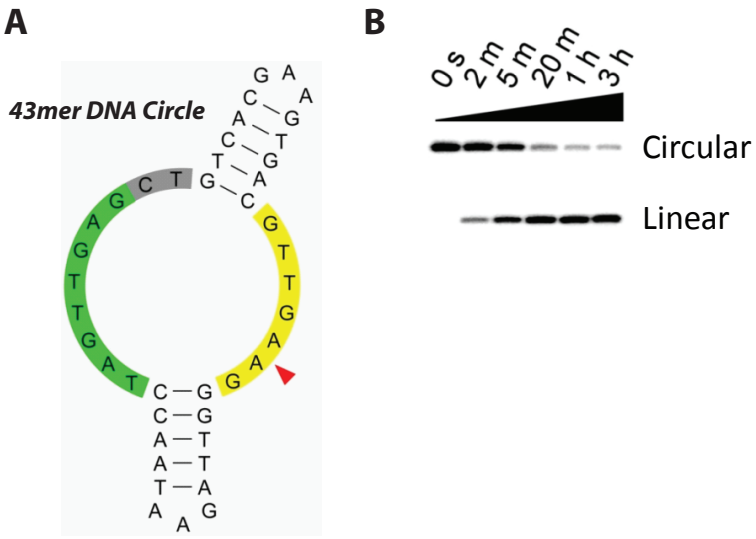
Twister Ribozymes

Fig. 1. (A) Consensus sequence and secondary-structure model of twister ribozymes, **(B, C)** and permuted variants.



Small Self-hydrolyzing DNAs

Fig. 2. (A) Consensus sequence and secondary structure of Class I self-cleaving DNAs. **(B)** Activity of a self-hydrolyzing DNA circle.



In recognition of the discovery[1] of twister ribozymes, only the 11th natural class of catalytic RNA known, and in recognition of the creation[2] of small DNAs that cleave DNA by hydrolytic mechanisms, the status of Breaker Laboratory "Molecule of the Year" is conferred upon these findings.

Ribozymes catalyze chemical transformations by forming catalytic active sites to function like protein enzymes, and some of these RNA enzymes are believed to have been important in organisms from the "RNA World". Despite the fundamental roles played by some ribozyme classes in all organisms, there are very few classes known to exist in nature. The discovery of twister ribozymes, a new type of self-cleaving RNA, represents only the 11th validated class. Furthermore, numerous representatives of twister ribozymes exist in many species of bacteria and eukarya, suggesting that these ribozymes serve important biochemical roles in cells from at least two of the three domains of life.

DNA also can be forced to catalyze chemical reactions, and the discovery of a very small DNA motif that catalyze DNA hydrolysis highlights several opportunities. For example, small self-cleaving DNA constructs can be engineered for various applications, and similar inherently unstable DNAs can be found in nature.

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1. *A. Roth, Z. Weinberg, A. G. Y. Chen, P. B. Kim, T. D. Ames, R. R. Breaker. A novel class of self-cleaving ribozymes is prevalent in many species of bacteria and eukarya. (submitted).*

2. *H. Gu, K. Furukawa, Z. Weinberg, D. F. Beremson, R. R. Breaker. Small, highly-active DNAs that hydrolyze DNA. (submitted).*