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Structures of Self-Aminoacylating Ribozymes

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Attachment of amino acids to adapter RNA molecules is a key reaction in protein biosynthesis. The aminoacylation reaction is catalyzed in the cell by aminoacyl-tRNA synthetases. Recently, catalytic RNAs (ribozymes) that recapitulate this activity by transferring the aminoacyl moiety from a pre-formed adenylate to their own 3'-termini have been obtained through in vitro selection by M. Yarus and coll. (Univ. of Colorado at Boulder). We have obtained crystals of a 66-nucleotide variant ribozyme that accepts any aminoacyl moiety, complexed with an aminoacyl-adenylate analog that diffract x-rays to 3Å at NSLS. We have collected a 99% complete native data set to 3.1Å, with an R-merge of 5%, and data for some candidate heavy atom derivatives. Derivative search is still in progress. The structural information obtained in this study will reveal the configuration of the active site of these ribozymes, suggest a mechanism of catalysis and point out the minimal structural requirements for the catalysis, since these are relatively small enzymes.