About aminoacyl-tRNA synthetases... In a process critical for accurate translation of the genetic code, aminoacyl-tRNA synthetasesattach amino acids specifically to cognate tRNAs, thereby \"charging\" the tRNAs. The catalysis is accomplished via a two-step mechanism. First, the synthetase activates the amino acid in an ATP-dependent reaction, producing aminoacyl-adenylate and releasing inorganic pyrophosphate. Second, the enzyme binds the correct tRNA and transfers the activated amino acid to either the 2' or 3' terminal hydroxyl group of the tRNA, forming the aminoacyl-tRNA and AMP.Aminoacyl-tRNA synthetases possess precise substrate specificity and, despite their similarity in function, vary in size, primary sequence and subunit composition. Individual members of the aminoacyl-tRNA synthetase family can be categorized in one of two classes, depending on amino acid specificity. Class I enzymestypically contain two highly conserved sequence motifs, are monomeric or dimeric, and aminoacylate at the 2' terminal hydroxyl of the appropriate tRNA. Class II enzymestypically contain three highly conserved sequence motifs, are dimeric or tetrameric, and aminoacylate at the 3' terminal hydroxyl of the appropriate tRNA.