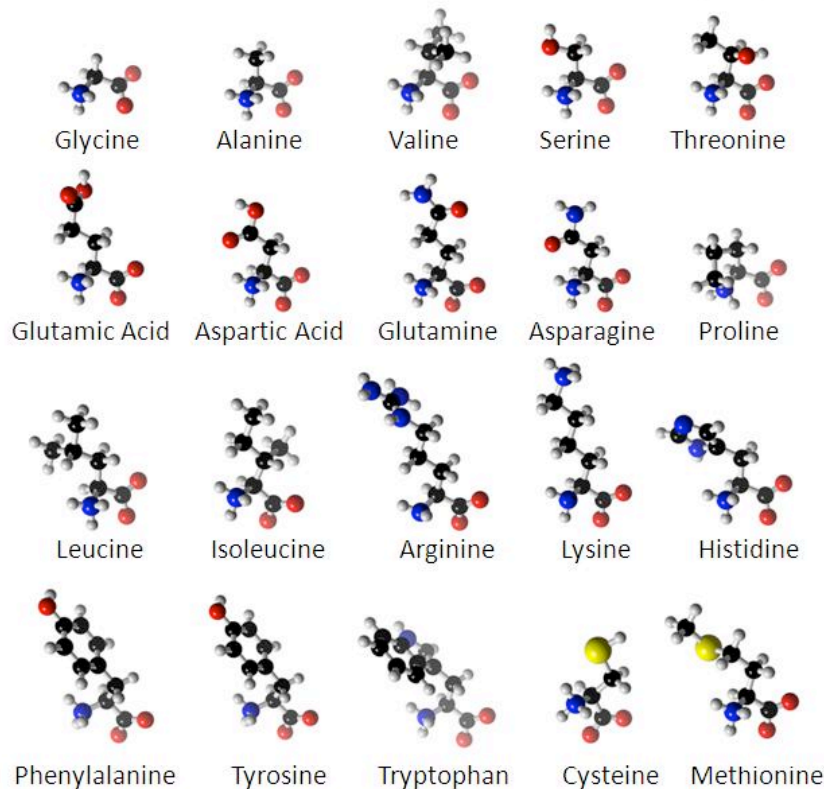


The evolution of a genetically encoded amino acid alphabet



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Life on our planet has evolved to construct itself from two distinct types of polymer - nucleic acid and protein - linked by an interface known as the genetic code. By ~3 billion years ago, evolution had standardized each biopolymer to comprise a specific repertoire, or alphabet, of monomeric building blocks: 4 nucleotides and 20 amino acids. Even the interface had arrived at a standard genetic code specifying exactly which amino acid is "meant" (encoded) by each possible 3-nucleotide genetic code-word (codon). Here I will present three aspects of research to understand how and why this fundamental evolutionary outcome emerged, with an emphasis on the amino acid alphabet. First, I'll briefly introduce previous work that reveals the standard genetic code as decidedly non-random in terms of the pattern by which amino acids are assigned to codons. Through a brief discussion of possible interpretations for this finding, I will turn to current research that seeks to make sense of evolution's "choice" of amino acids from a larger pool of chemical possibilities. I will then finish by describing new projects that seeks to reconcile different lines of evidence for the origin and growth of the amino acid alphabet.