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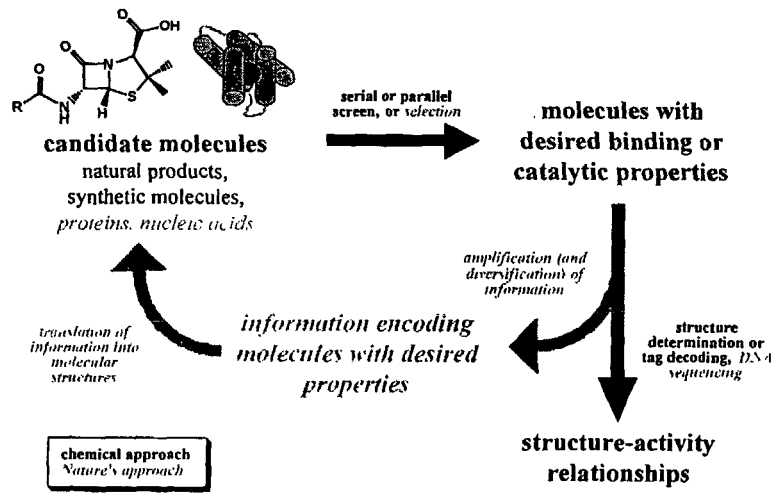
(54) Title: EVOLVING NEW MOLECULAR FUNCTION



(57) Abstract: Nature evolves biological molecules such as proteins through iterated rounds of diversification, selection, and amplification. The present invention provides methods, compositions, and systems for syntheiszing, selecting, amplifying, and evolving non-natural molecules based on nucleic acid templates. The sequence of a nucleic acid template is used to direct the synthesis of non-natural molecules such as unnatural polymers and small molecules. Using this method combinatorial libraries of these molecules can be prepared and screened. Upon selection of a molecule, its encoding nucleic acid template may be amplified and/or evolved to yield the same molecule of the present invention allow for the amplification and evolution of non-natural molecules in a manner analogous to the amplification of natural biopolymer such as polynucleotides and protein.

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