

Synchrotron Investigations

8.5 Case study 4: Revealing the molecular origins of life

Article can be found at:

- http://www-ssrl.slac.stanford.edu/research/ligase_summary.html

Revealing the Molecular Origins of Life

From UCSC press release <http://www-ssrl.slac.stanford.edu> (30 April 2007)

Researchers from the University of California, Santa Cruz, using macromolecular crystallography beam line 9-1 at SSRL have determined the three-dimensional structure of an RNA enzyme, or 'ribozyme,' that carries out a fundamental reaction required to make new RNA molecules. Their results provide insight into what may have been the first self-replicating molecule to arise billions of years ago on the evolutionary path toward the emergence of life. The findings are published in the March 16 issue of the journal *Science*.



William Scott and postdoctoral researcher Michael Robertson determined the structure of a ribozyme that joins two RNA subunits together in the same reaction that is carried out in biological systems by the protein known as RNA polymerase. The ribozyme used in the study is not an entirely self-replicating RNA molecule, but it does carry out the fundamental reaction required of such a molecule – a 'ligase' reaction creating a bond between two RNA subunits.

The ribozyme has three stems that radiate from a central hub. The active site where ligation occurs is located on one stem, and the structure shows that the molecule folds in such a way that parts of another stem are positioned over the ligation site, forming a pocket where the reaction takes place. A magnesium ion bound to one stem and positioned in the pocket plays an important role in the reaction, Robertson said.

To learn more about this research see the full scientific highlight at:

http://www-ssrl.slac.stanford.edu/research/highlights_archive/ligase.html

Michael P. Robertson and William G. Scott (2007). The structural basis for ribozyme-catalyzed RNA assembly. *Science*, 315, 1549-1553.