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Activation of *Cyanidium caldarium* RUBISCO. Michael Baranowski, Boguslaw Stec, Dept. of Chemistry, Univ. of Texas at El Paso, El Paso, TX, 79968.

The X-ray structure of not activated Ribulose - 1, 5 - bisphosphate carboxylase/oxygenase (RUBISCO) from red algae *Cyanidium caldarium* has been determined at 1.95 Å resolution. The structural organization of the enzyme is hexadecameric (L8S8) similar to that from spinach enzyme. In variance with higher eukariotic organisms the sequence of the large and small subunit of RUBISCO is encoded by the chloroplast DNA. The small subunit has low sequence homology to the small subunit of spinach enzyme and was found to have new structural feature consisting of two-stranded β-sheet near the internal four-fold symmetry axis that in the complete assembly forms en eight-stranded beta barrel. The structure showed unexpectedly a bound CO2 molecule at the active site. Subsequent studies confirmed the initial assessment and in two other crystal structures we were able to trap pre-activation complex with a metal ion and not covalently bound CO2. The mechanism of activation will be presented and the chemistry discussed.