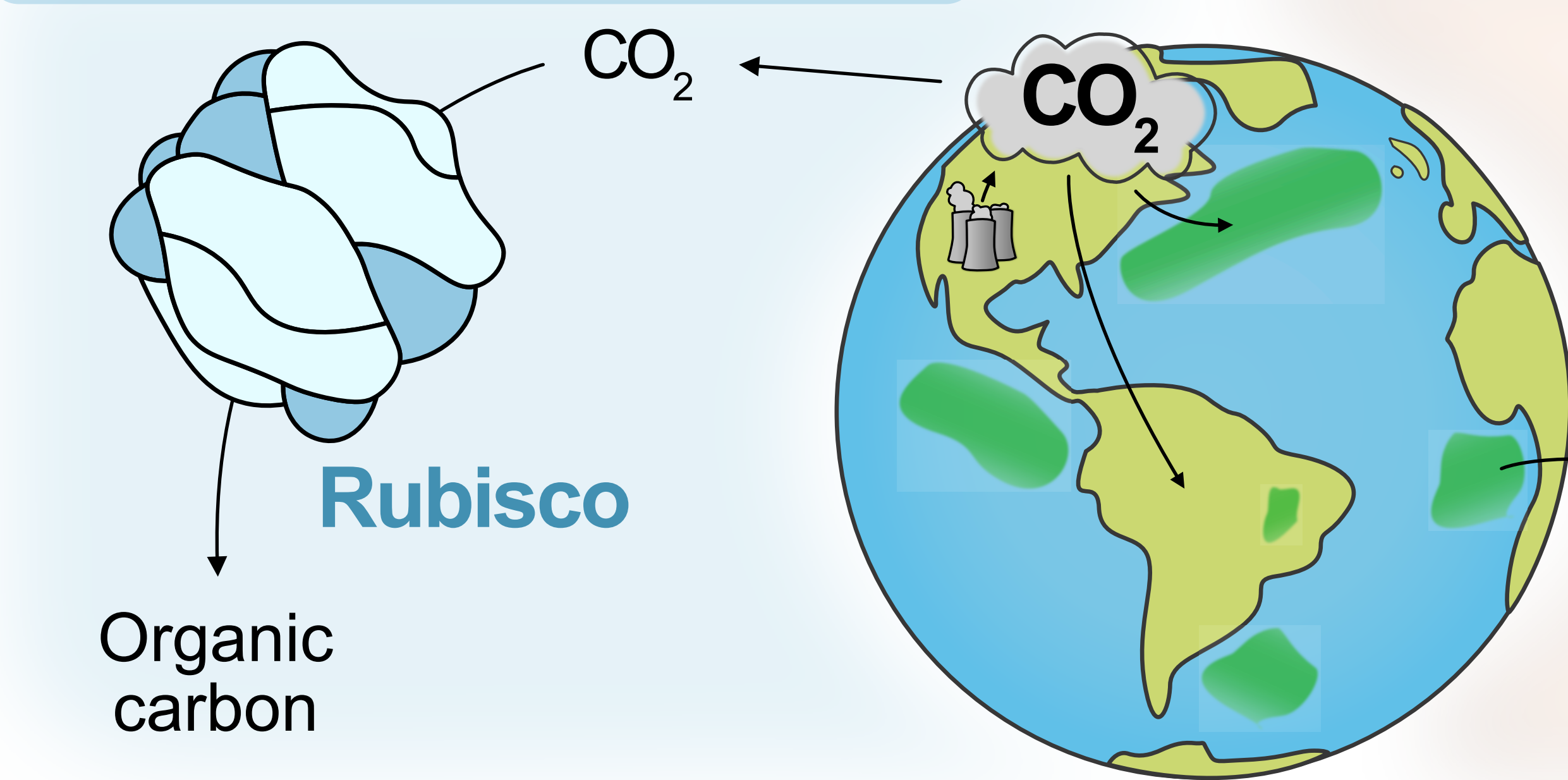


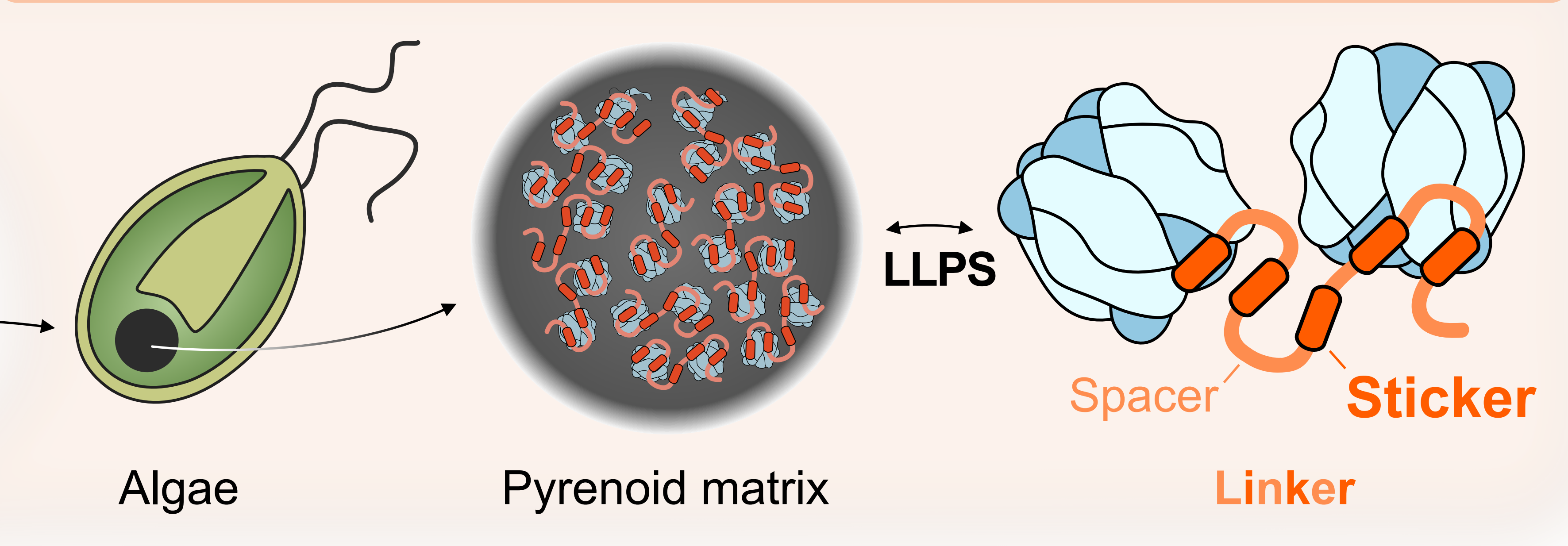
Inside the Pyrenoid: How Multivalency Shapes Rubisco Organization and CO₂ Fixation

James Barrett^{1,2,t,*}, Gaurav Kumar^{1,2,t}, Phillippe Van der Stappen^{3,4,t}, Alex Payne-Dwyer¹, Onyou Nam^{1,2}, Jack Shepherd^{1,5}, Lewis Frame^{1,3}, Jamieson Howard^{1,3}, Vuk Malis³, Clément Dégut^{1,6}, Mike Hodgkinson¹, Ralf P. Richter^{7,8}, Charley Schaefer^{5,9}, Michael J. Plevin^{1,6}, Maria Hondele^{3*}, Mark C. Leake^{1,5*}, Benjamin D. Engel^{3*}, Luke C.M. Mackinder^{1,2,10*}

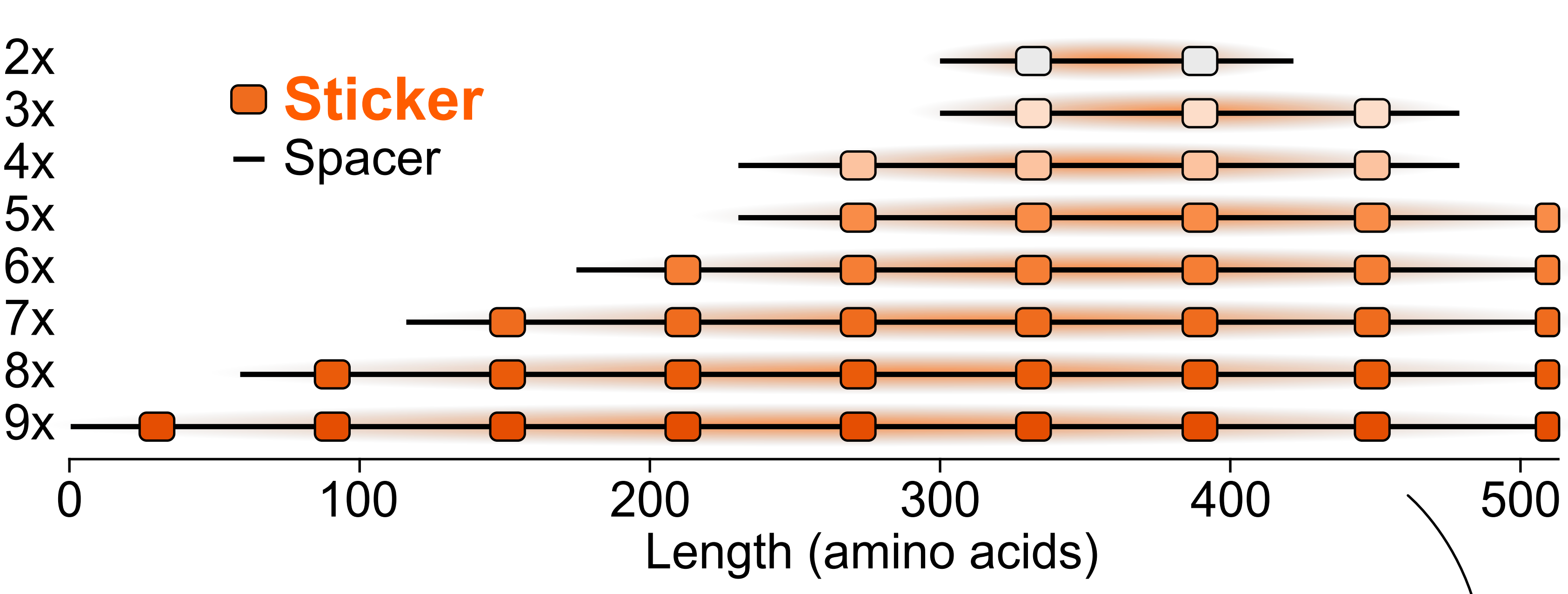
Rubisco fixes all of Earth's CO₂



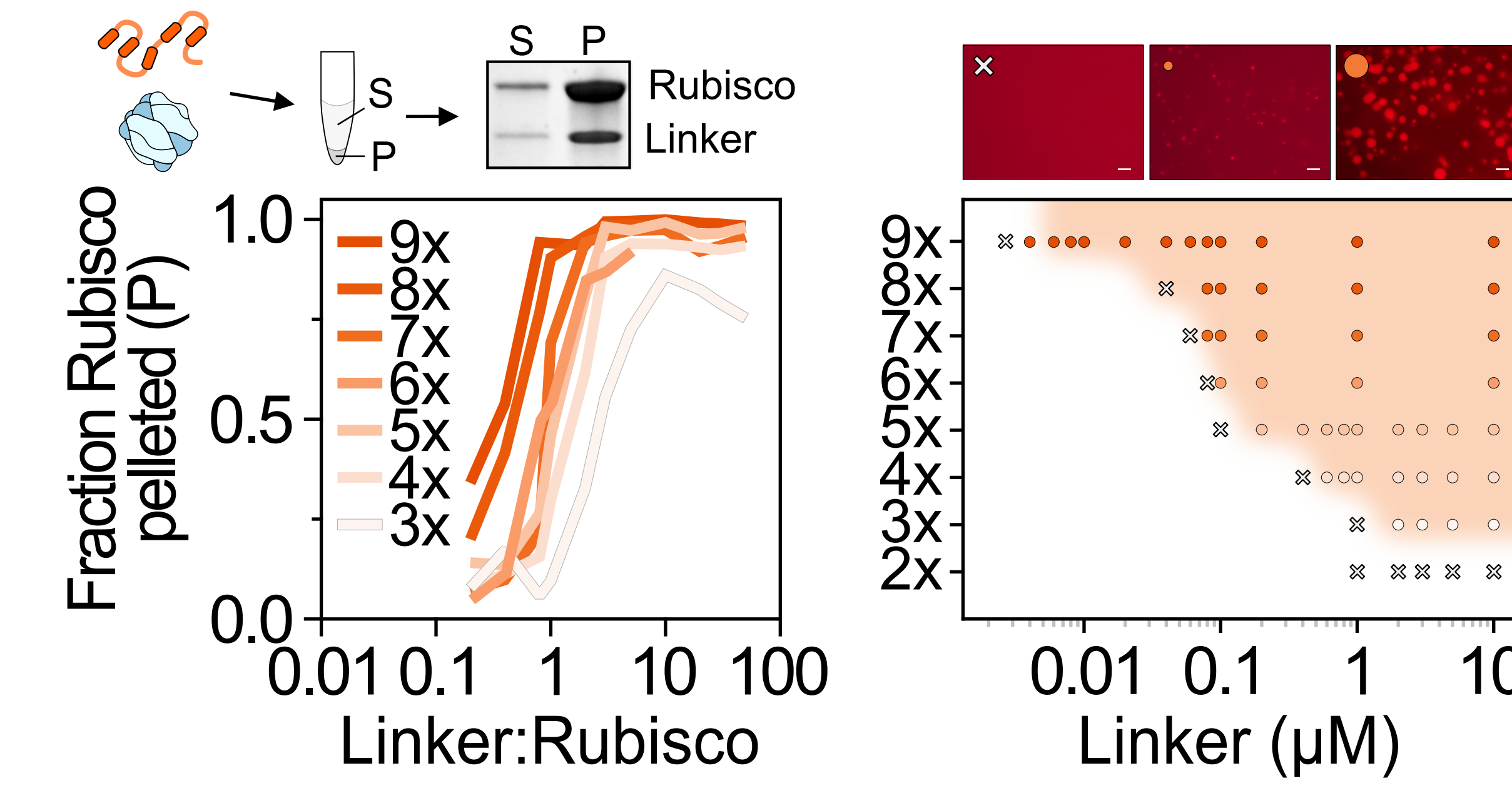
Pyrenoids are Rubisco condensates formed by phase separation in algae



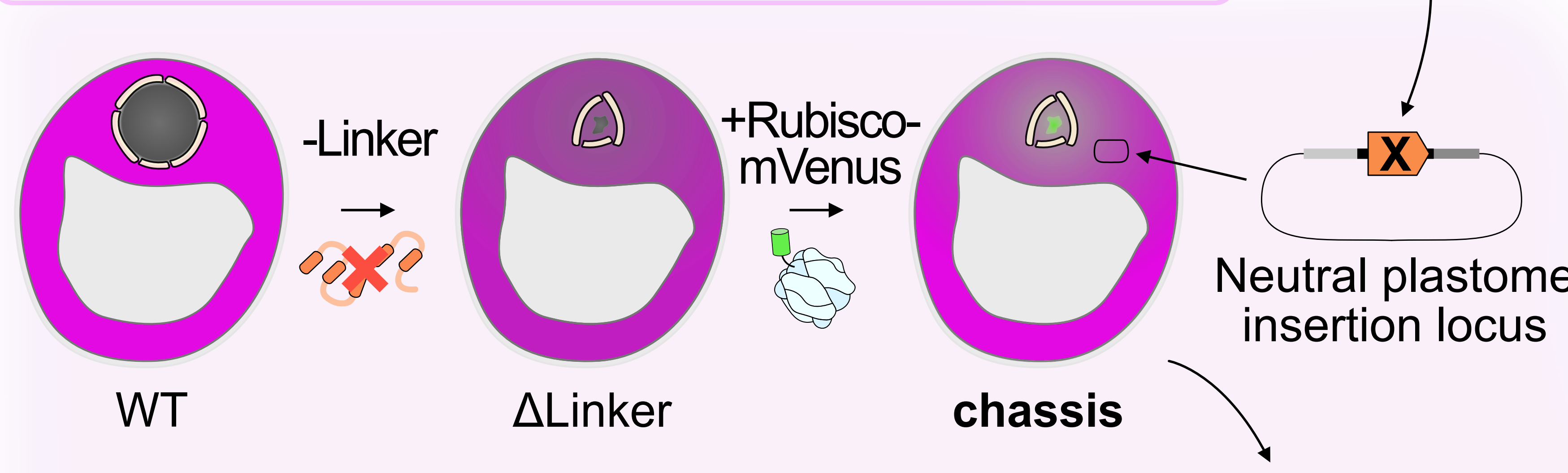
Linker variants to study effects of valency on Rubisco condensation



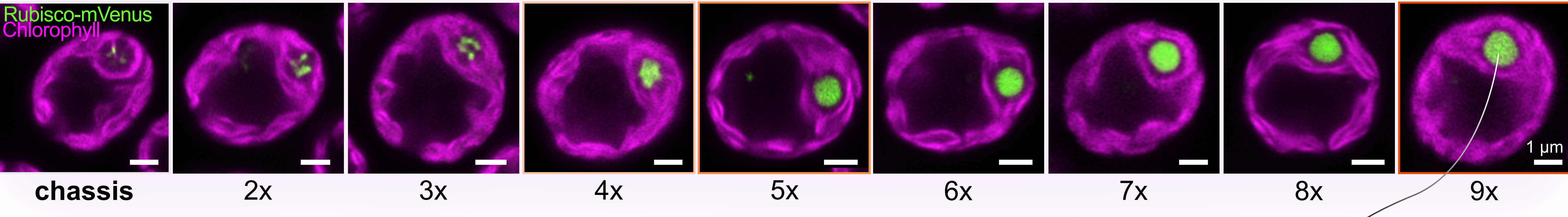
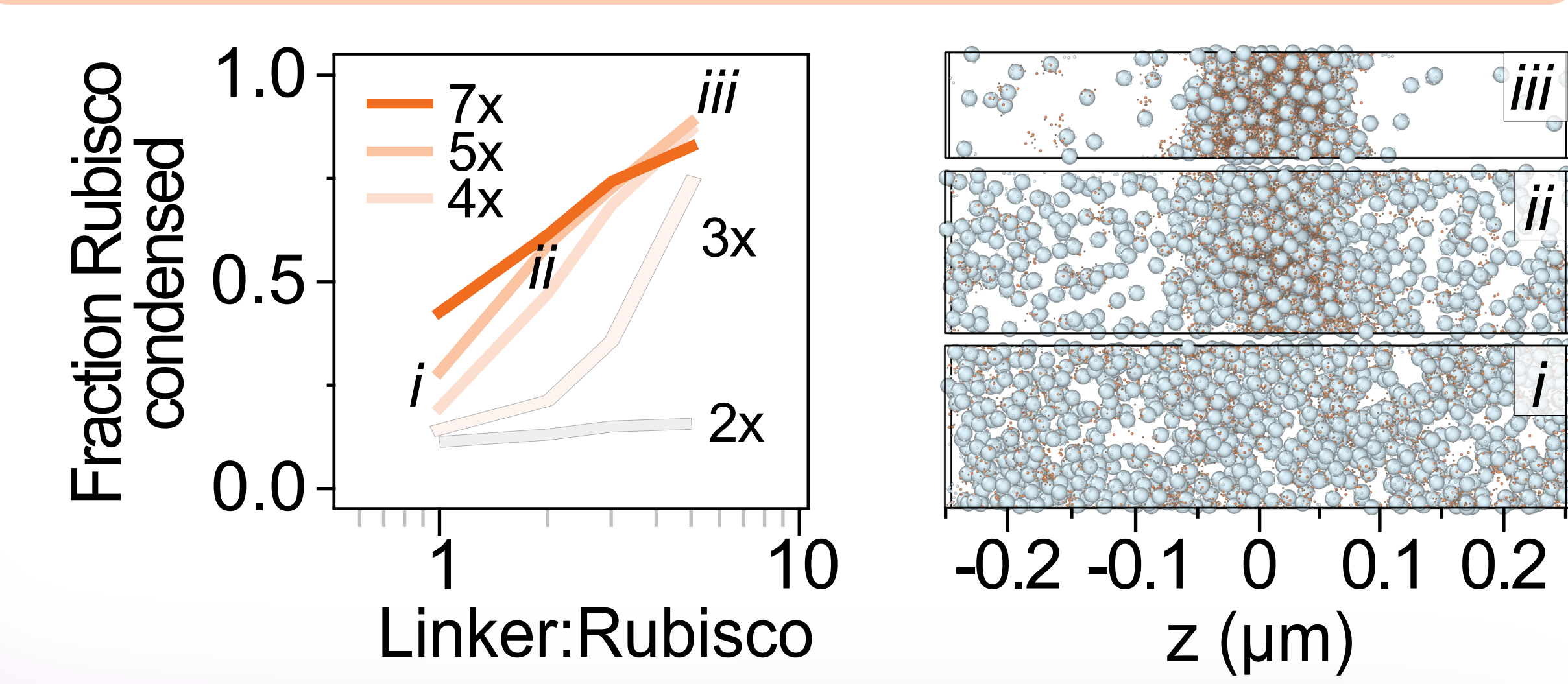
Valency enhances Rubisco condensation *in vitro*



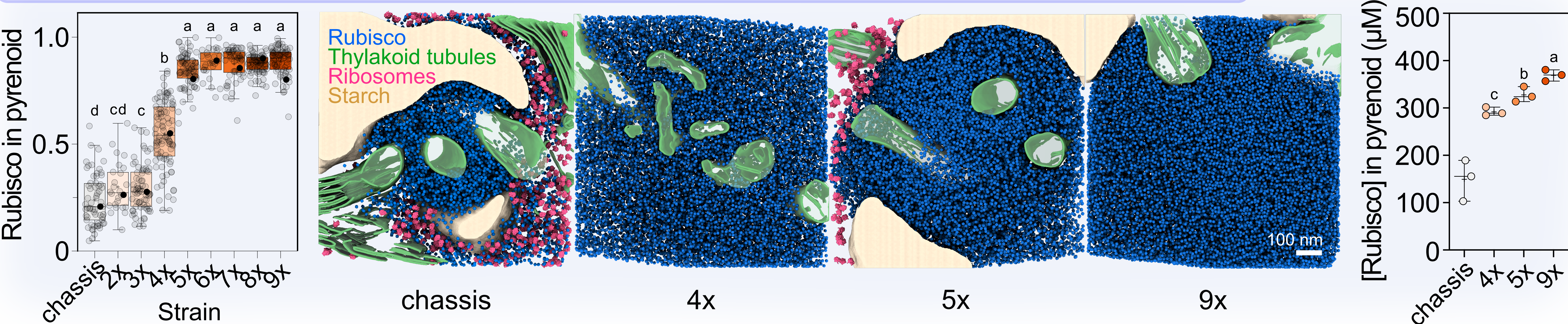
Creation of a chassis strain to test valency effects *in vivo*



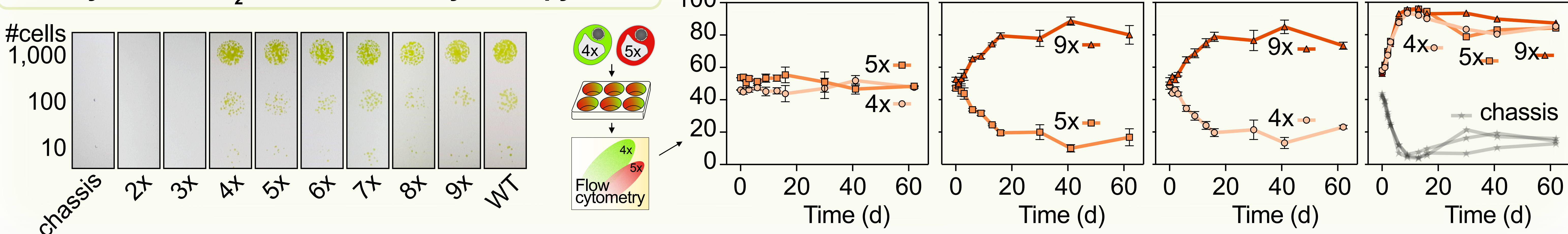
Valency enhances Rubisco condensation *in silico*



Multi-scale imaging reveals valency affects partitioning and packing density of Rubisco in the pyrenoid



Valency affects CO₂-fixation efficiency in the pyrenoid



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