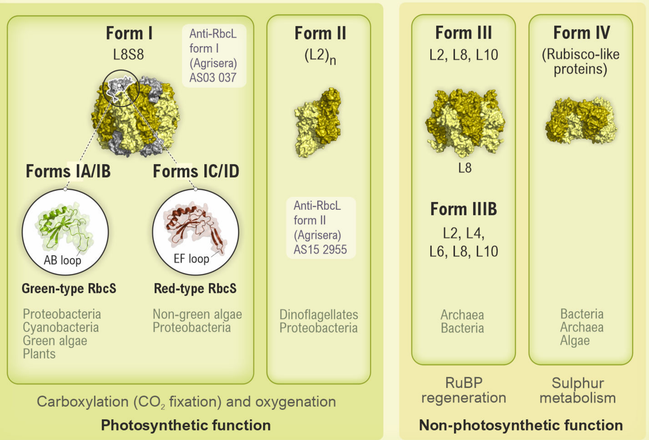
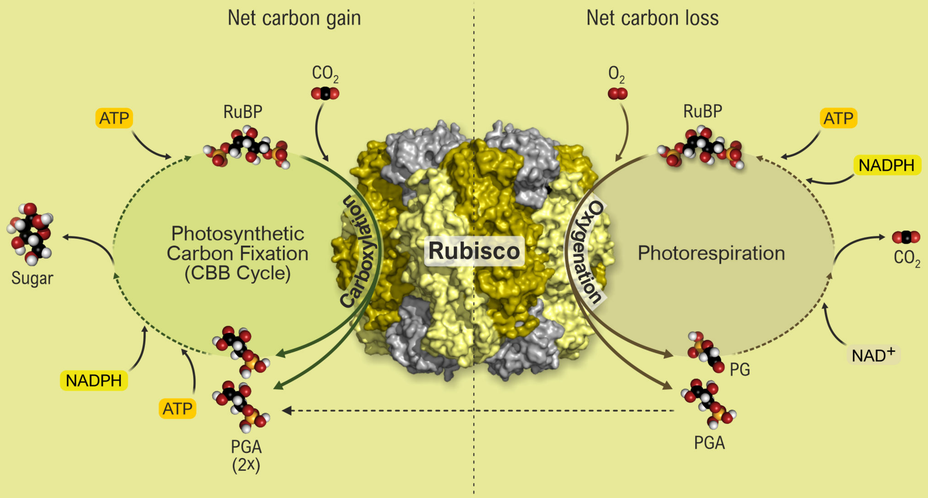
Best wishes for your research
Govindjee

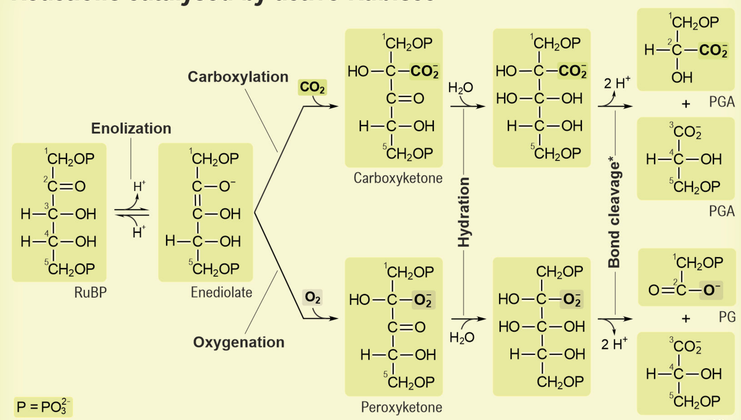
Rubisco: An Enzyme of Global Importance

Molecular forms of Rubisco and their function



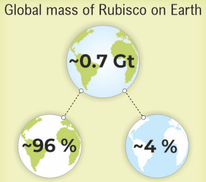


Reactions catalysed by active Rubisco

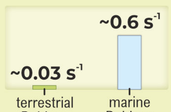


Some facts about Rubisco

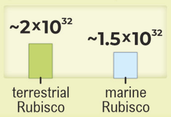
Global mass of Rubisco on Earth



Average effective catalytic rate



CO_2 molecules fixed per second

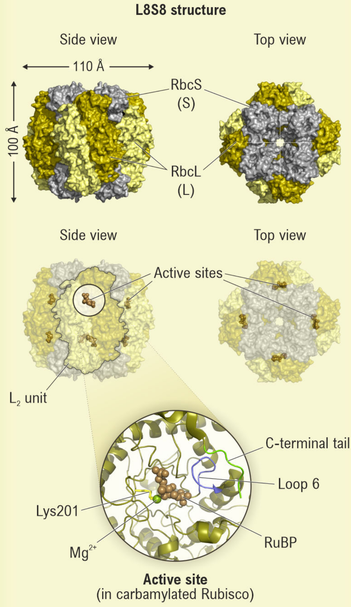


~10^{14} kg
CO_2 fixed annually by Rubisco

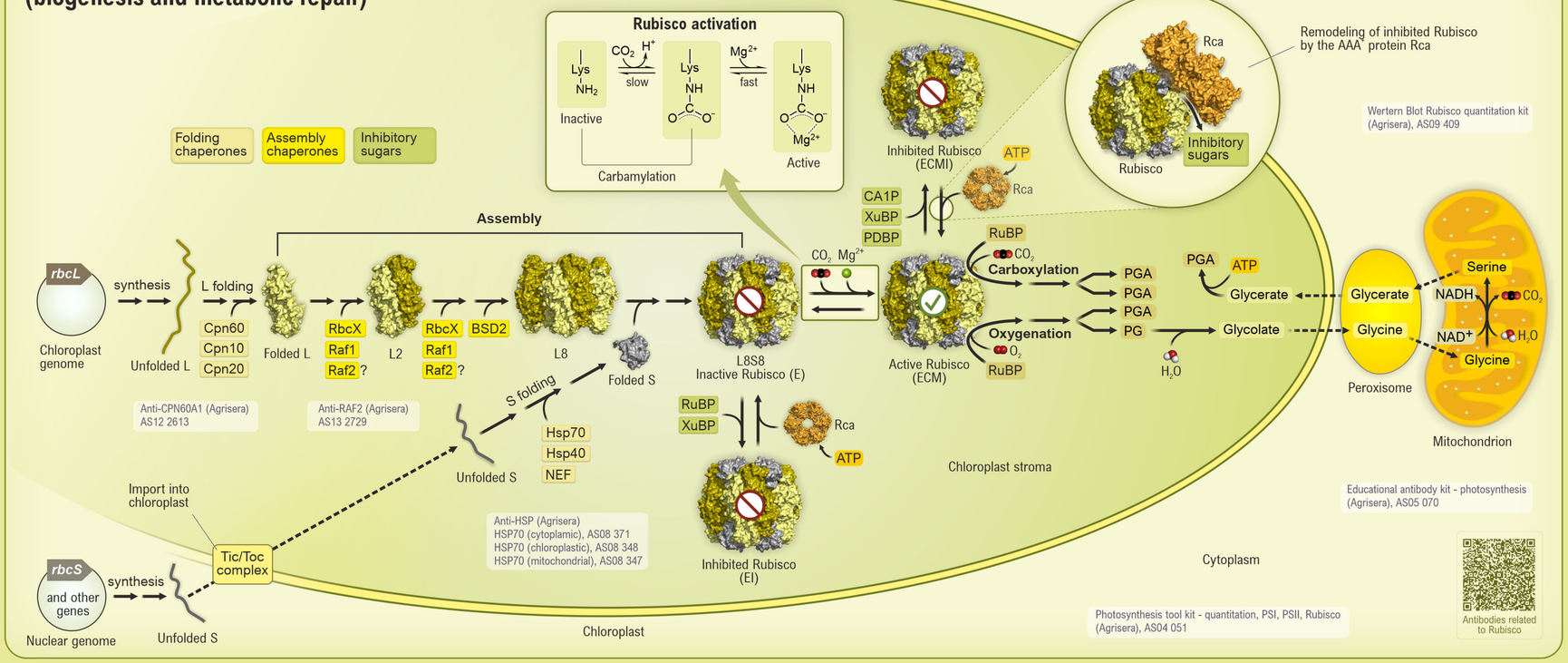
~3 %
of total leaves mass belongs to Rubisco

Structure of Rubisco (form I)

(most common in plants, cyanobacteria, and green algae)



How does Rubisco work in plants and green algae? (biogenesis and metabolic repair)



Rubisco Poster: Structure and function of the enzyme Rubisco (ribulose-1,5-bisphosphate carboxylase/oxygenase; EC 4.1.1.39). For further information, see [1-8]. Send comments to G. Govindjee (gov@illinois.edu) or to D. Shevela (info@scigrafik.se). **Abbreviations:** ATP, adenosine triphosphate; BSD2, bundle sheath defective-2; CA1P, 2'-carboxy-D-arabinitol-1-phosphate; CBB cycle, Calvin-Benson-Bassham cycle; NAD+, nicotinamide adenine dinucleotide (oxidized form); NADPH, nicotinamide adenine dinucleotide phosphate (reduced form); NEF, nucleotide exchange factor; PG, 2-phosphoglycolate; PDBP, D-glycero-2,3-pentodiulose-1,5-bisphosphate; PGA, 3-phosphoglycerate; Raf, Rubisco accumulation factor; Rca, Rubisco activase; RuBP, ribulose-1,5-bisphosphate; XuBP, D-xylulose-1,5-bisphosphate. **Note:** We used coordinates from the PDB entries 1bxn, 1rcx, 2cwx, 2qyg, 3zw6, 4rub, and 5rub to obtain the structures, presented here. **Acknowledgements:** We thank Lars Olof Björn for valuable comments and corrections and Joanna Porankiewicz-Asplund for the background picture. We are highly grateful to Agrisera for being a sponsor of the poster design, printing, and free distribution at conferences around the world. **Citation:** Shevela D, Hayer-Hartl M, Andersson I, Govindjee G (2020) Rubisco: Enzyme of Global Importance, *Agrisera Educational Poster* 4: doi:10.6084/m9.figshare.24061755. **References:** [1] Andersson I (2008) Catalysis and regulation in Rubisco, *J. Exp. Bot.* 59, 1555-1568; [2] Bracher A, Whitney SM, Hartl FU, Hayer-Hartl M (2017) Biogenesis and metabolic maintenance of Rubisco, *Annu. Rev. Plant Biol.* 68, 29-60; [3] Andersson I, Backlund A (2008) Structure and function of Rubisco, *Plant Physiol. Biochem.* 46, 275-291; [4] Wilson RH, Hayer-Hartl M (2018) Complex chaperone dependence of Rubisco biogenesis, *Biochemistry* 57, 3210-3216; [5] Trösch R, Mühlhaus T, Schroda M, Willmund F (2015) ATP-dependent molecular chaperones in plastids - More complex than expected, *Biochim. Biophys. Acta* 1847, 872-888; [6] Bar-On YM, Milo R (2019) The global mass and average rate of Rubisco, *Proc. Natl. Acad. Sci. U.S.A.* 116, 4738-4743; [7] Bhat JY, Milicic G, Thieulin-Pardo G, Bracher A, Maxwell A *et al.* (2017) Mechanism of enzyme repair by the AAA+ chaperone Rubisco activase, *Mol. Cell* 67, 744-756; [8] Ogren WL (2003) Affixing the O to Rubisco: discovering the source of photorespiratory glycolate and its regulation, *Photosynth. Res.* 76, 53-63.

Agrisera Antibodies
www.agrisera.com

Poster 4 - Rubisco: Enzyme of Global Importance, 2020 (updated 2025)

© 2020 Dmitry Shevela[1], Manajit Hayer-Hartl[2], Inger Andersson[3] & Govindjee Govindjee[4]

[1]Umeå University, Sweden; [2]Max Planck Institute of Biochemistry, Germany; [3]Uppsala University, Sweden; [4]University of Illinois at Urbana-Champaign, USA

Plant Meetings Calendar
Sign up your meeting, or check what is coming!
https://plantae.org/events-calendar/

Graphics©Dmitry Shevela @ SciGrafik