conferenceseries.com

8th International Conference on

PROTEOMICS AND BIOINFORMATICS May 22- 24, 2017 Osaka, Japan

Sungchul Ji

Ernest Mario School of Pharmacy, USA

RASER (Rate Amplification based on the Substrate-Enhanced Reaction) model of single-molecule enzyme catalysis

S ingle-molecule enzyme turnover times produce long-tailed histograms fitting the Planckian Distribution Equation (PDE), a generalized version of the blackbody radiation equation. RASER is the acronym derived from rate amplification based on the substrate-enhanced reaction, in analogy to laser (Light Amplification based on Stimulated Emission of Radiation). Just as the blackbody radiation equation of Planck, when generalized to PDE, was found to apply to single-molecule enzyme catalysis, so may the subatomic mechanisms of laser as here proposed. The quantization of the Gibbs free energy content of enzymes was inferred from the fitting of the single-molecule-molecule turnover-time histogram of cholesterol oxidase to PDE. When an enzyme molecule absorbs enough thermal energies through Brownian motions, it may be excited to the transition state from which the enzyme may be demoted back to one of its ground states in two ways – (i) spontaneously (as in "spontaneous emission" in laser), or (ii) induced by substrate binding (as in "induced emission"). During the substrate-induced deactivation of the excited enzyme, the excess energy may be released in a coordinated manner effectuating catalysis, just as the triggering photon-induced de-activation of population-inverted electrons in atoms results in the amplification of emitted photons as laser. The RASER model of enzyme catalysis thus embodies two of the most fundamental processes in physics, i.e., (i) energy quantization, and (ii) the light amplification via laser.

Biography

Sungchul Ji has completed his PhD from State University of New York at Albany and Post-doctoral studies from University of Wisoconsin in Madison, University of Pennsylvaniac School of Medicine, Max Planck Institute of Systems Physiology in Dortmund, and University of North Carolina School of Medicine at Chapel Hill, before joining the Faculty of the Rutgers University Ernest Mario School of Pharmacy in Piscataway, N.J. He has published two books on the Molecular Theories of the Living Cell (Springer, 2012) and the Cell Language Theory (World Scientific, 2017) and about 50 papers in reputed journals.

sji.conformon@gmail.com