ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

DIPARTIMENTO
DI FARMACIA
E BIOTECNOLOGIE

AVVISO DI SEMINARIO

Il giorno 13 maggio 2026
alle ore 12

Prof. Sergey N . Krylov

Full Professor - Center for Research on Biomolecular Interactions, York University, Toronto, Canada
(ospite Proff. Bartolini, Bolognesi, Uliassi)

terrà un seminario in lingua inglese dal titolo:

Causes and Consequences of Gross Inaccuracies in Binding and Potency Studies: Time to Act

in presenza:
AULA MAGNA Biochimica, I piano
Via Irnerio, 48, Bologna

Personale docente e ricercatore, dottoranti, assegnisti/borsisti e studenti sono cordialmente invitati

ABSTRACT

Reliable decision-making in drug discovery, chemical biology, and diagnostic development depends on accurate measures of molecular recognition and function. Yet affinity and potency studies often treat imprecision, that is, random error, as the sole marker of data quality, while overlooking inaccuracy, that is, systematic bias. In this seminar, I will explain why standard assays for binding affinity (Kd), enzyme kinetics (Km), inhibition (Ki), and surrogate potency (IC_{50}, EC_{50}) can hide systematic deviations of orders of magnitude, even when curve fits look acceptable and standard errors are small.

Drawing on our recent theoretical and experimental studies [1-9], I will show how amplified propagation of concentration errors in nonlinear regression models can distort decisions in hit triage and candidate ranking. I will also demonstrate accessible browser-based tools for estimating accuracy of Kd, Km, etc. from individual binding curves.

Finally, I will outline the goals of an emerging consortium that brings together academic laboratories with instrumentation and high-throughput screening developers to establish reliable experimental practices and consensus reporting standards.

The seminar offers researchers across this broad area concrete steps to improve the credibility and fitness-for-purpose of binding and potency data.

Relevant Publications

1. Wang, T.Y.; Chan, T.; Krylova, S.M.; Krylov, S.N. A Fundamental Source of Misclassification in Single-Concentration Binding Screens. ChemRxiv 2026. https://chemrxiv.org/doi/full/10.26434/chemrxiv.15002218/v1

2. Wang, T.Y.; Dhillon, P.; Matsunaga, K.-i.; Tan, H.P.; Kimoto, M.; Hirao, I.; Krylov, S.N. Deterministic Error Propagation in Kinetic Kd Determination: General Theory with Application to Surface-Based Assays. ACS Sensors 2026, accepted. ChemRxiv 2026. https://chemrxiv.org/doi/full/10.26434/chemrxiv.15002022/v1

3. Wang, T.Y.; Dhillon, P.; Schreiber, S.; Krylova, S.M.; Golemi-Kotra D.; Jose, J.; Krylov, S.N. Introducing Quantitative Assessment of Michaelis Constant (Km) Accuracy. ChemBioChem, under review. 2025, 26(24), e202500660. https://doi.org/10.1002/cbic.202500660

4. Wang, T.Y.; Bijlani, A.; Kaiyum, Y.A., Krylova, S.M.; Johnson, P.E.; Krylov, S.N. A Browser-Based Tool for Assessing Accuracy of ITC-Derived Parameters: Kd, ΔH°, and n. ChemBioChem 2025, 26(15), e202500194. https://doi.org/10.1002/cbic.202500194

5. Wang, T.Y.; Krylov, S.N. Deterministic Error Propagation in ITC: Revealing Multi-Fold Errors in Kd Values Under Standard Conditions. Biophysical Chemistry 2025, 323, 107455. https://doi.org/10.1016/j.bpc.2025.107455

6. Wang, T.Y.; Latimer, J.; Rukundo, J.-L.; Kogan, I.; Krylova, S.M.; Schreiber, S.; Kohlmann, P.; Jose, J.; Krylov, S.N. A Practical Approach to Quantitatively Assessing Equilibrium-Constant Accuracy from a Single Binding Isotherm. Precision Chemistry 2025, 3(2), 89–104. https://doi.org/10.1021/prechem.4c00085

7. Wang, T.Y.; Rukundo, J.-L.; Mao, Z.; Krylov, S.N. Maximizing the Accuracy of Equilibrium Dissociation Constants for Affinity Complexes: From Theory to Practical Recommendations. ACS Chemical Biology 2024, 19(9), 1852–1867. https://doi.org/10.1021/acschembio.4c00259

8. Krylov, S.N. Underestimation of the Complexity of Kd Determination: Causes, Implications, and Ways to Improve. ACS Measurement Science Au 2024, 4(3), 231–232. https://doi.org/10.1021/acsmeasuresciau.4c00023

9. Wang, T.Y.; Ji, W.; Evetron, D.; Le, A.T.H.; Krylova, S.M.; Fournier, R.; Krylov, S.N. Fundamental Determinants of the Accuracy of Equilibrium Constants for Affinity Complexes. Analytical Chemistry 2023, 95(42), 15826–15832. https://doi.org/10.1021/acs.analchem.3c03557

BIOGRAPHICAL SKETCH

Sergey Krylov obtained a degree equivalent to a PhD from Moscow State University and completed postdoctoral training at the University of Alberta. He joined York University as an Associate Professor in 2000 and was promoted to Professor in 2006. In 2020, he received the honorary title of Distinguished Research Professor. He has held a Canada Research Chair Tier II and a York Research Chair Tier I and has received multiple research awards. Since 2009, he has served as Director of the Centre for Research on Biomolecular Interactions (CRBI). His research focuses on developing disruptive technologies for disease detection, drug development, and fundamental biological studies. He is also Director of the Catalyzing Interdisciplinary Research Cluster "Technologies for Identification and Control of Infectious Diseases" (TEPD) and Director of the NSERC CREATE program "Technology-Enhanced Pharmaceutical Development" (TEPD).