

# The Chemist's Interactions

Seminars @ the Chemistry Department

Monday, 4<sup>th</sup> October 2021



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ROOM  
G11  
h 14.30

## Myths and Models in Physical Organic Chemistry: Mills-Nixon; CIP, Through-Bond Coupling; Polar Pi-Effects

Physical Organic chemists place a priority on simple models for abstracting structure/physical property relationships in Organic chemistry that promote our understanding the energetics and mechanistic conformational, mechanistic and stereochemical phenomena. Despite the basic tenet that resistance to refutation is the gold standard for acceptance of a model, the success of a model at forecasting phenomenological outcomes becomes more and more the modern basis for support of its continued application. This effect can be seen as stemming from the move toward career success metrics based on citation and cult of personality. Consequently, untenable corollaries to a successful model may be hard to dispel from the literature because the attractiveness of such mythology draws in a community of believers who seek to find and prove rather than disprove, which create a self-fulfilling cycle. Four such cases in Physical Organic chemistry will be discussed: Mills-Nixon; CIP, Through-Bond Coupling; Polar Pi-Effects. In each case, a basic model had been previously developed to explain a Physical Organic chemistry phenomenon and this prior model had served the community well. It was the extension of the model to a supposed "analogous" situation, which we believe proves to be untenable. Thus, in every case there is no basis for continued propagation of the theory; nonetheless Organic chemists persist in applying the model.

[1] Mills-Nixon Effects: Wherefore Art Thou? Siegel, J. S. *Angew. Chem. Int. Ed. Engl.* **1994**, *33*, 1731.

[2] Mills-Nixon Effects? Frank, N. L.; Siegel, J. S. (Book Chapter) in *Adv. in Theoretically Interesting Molecules*, Thummel R. P., Ed., *JAI Press*, **1995**, *3*, 209-260.

[3] X-ray Diffraction Evidence for a "Cyclohexatriene" Motif in the Molecular Structure of Trisbicyclo[2.1.1]hexabenzene: Bond Alternation after Refutation of the Mills-Nixon Theory. Bürgi, H.-B.; Baldrige, K. K.; Hardcastle, K.; Frank, N. L.; Siegel, J. S.; Ziller, J. *Angew. Chem. Int. Ed. Engl.* **1995**, *34*, 1454.

[4] Stereogenicity and Local Chirality. Mislow K.; Siegel J.S. *J. Am. Chem. Soc.* **1984**, *106*, 3319

[5] Enantiopure C5 Pentaindenocorannulenes: Chiral Graphenoid Materials. Guo, T.; Li, AS; Xu, J; Baldrige K.K.; Siegel, J.S. *Angew. Chem. Int. Ed. Engl.* **2021**, *60*, online.

[6]  $\pi$ - $\Sigma$ - $\pi$  Through-Space Coupling and "Long" C-C Single Bonds. Baldrige, K. K.; Battersby, T.; Vernon Clark, R.; Siegel, J. S. *J. Am. Chem. Soc.* **1997**, *119*, 7048.

[7] Solvation vs Cation- $\pi$  Effects: Differential pK values of pyridine/phenyl and pyridine/tetrafluorophenyl and lutadine. Cozzi, F.; Baldrige, K. K.; Siegel, J. S. *Angew. Chem. Int. Ed.* **2012**, *51*, 2903-2906.



The event will be streamed on zoom.us  
for external participants!

For registrations: [valentina.colombo@unimi.it](mailto:valentina.colombo@unimi.it)



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