Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Symmetrical charge-charge interactions in ionic solutions and implications for cell division[1] ESHEL FARAGGI, Research and Information Systems, LLC — As is well known in electrolyte theory, electrostatic fields are attenuated by the presence of mobile charges in the solution. This seems to limit the possibility of an electrostatic repulsion model of biological interactions such as cell division. However, for a system of two charges in an ionic solution it is found that in the context of the symmetries of the system, the electrostatic repulsion between the two parts of a dividing cell are considerably increased as compared to the electrostatic repulsion between two bare charges in a dielectric. This increase in repulsion, directly resulting from interactions between the symmetrical parts of the solute system, was found to be dependent on the magnitude of the charges and the separation between them. It was also found that this increases reaches a steady state for separation greater than a solvent determined length scale related to the Debye length. These findings strongly suggest that electrostatic interactions can play a crucial part in the physical forces that are involved in biological interactions. Most fundamentally this work presents a general physical force by which one can mechanically understand cell division. Such understanding will lead to unforetold new ways in medicine, biology, chemistry, and physics.

[1]The continuous support of Natali Teszler is gratefully acknowledged

Eshel Faraggi
Indiana University Purdue University Indianapolis and
Research and Information Systems

Date submitted: 01 Nov 2012 Electronic form version 1.4