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Law of Mass Action does not conserve charge

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To: Chun Liu <liu@math.psu.edu>, "Bob Eisenberg beisenbe@rush" <beisenbe@rush.edu>

Dear Chun

I have been working hard on the attached and would greatly appreciate your comments.

Do you think it, Fig. 2 in particular would be useful in my talk at PSU?

The gist of the story is this

Chemists have been interested in making molecules, not in signals or interactions with the environment, not in charge, and so they have not noticed that their standard formulation of chemical reactions does not conserve charge.

Mathematicians often do not notice that accumulation of charge at a node is fundamentally different from accumulation of mass, because of the existence of displacement current, which automatically and exactly charges the electrical potential by $i_{\text{displacement}} = \partial V / \partial t$ so the current entering a node EXACTLY equals the current leaving the node, when current is defined to include displacement current. Current MUST be defined this way if it is to be the source of the magnetic field that allows light to propagate through a vacuum.

Mass accumulating at a node does not satisfy any simple universal law. It accumulates and has effects that depend on the details of the constitutive equations and system. No generalization of mass flow equivalent to Maxwell's generalization of current flow is known.

It will be fun to get together and talk this over

As ever

Bob

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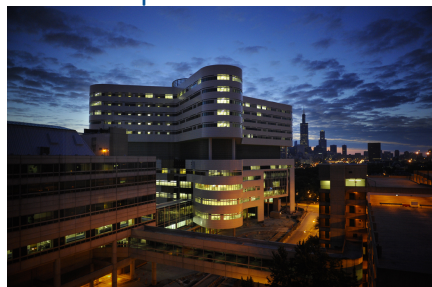
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New hospital tower at Rush



2 attachments

 **Mass Action and Conservation of Charge January 18-1 2014 .docx**
375K

 **Mass Action and Conservation of Charge January 18-1 2014 .pdf**
750K