References and history about misuse of Boltzmann in physiology

Bob Eisenberg <bob.eisenberg@gmail.com> Sat, Feb 8, 2014 at 8:47 AM
Reply-To: bob.eisenberg@gmail.com
To: jinnliu <jinnliu@mail.nhcue.edu.tw>, Bob Eisenberg <beisenbe@rush.edu>, Bob Eisenberg <bob.eisenberg@gmail.com>

Dear Jinn

Here is an example of the misuse from the present President of the American Biophysical Society Pancho (nickname for Francisco) Bezanilla whom you will
meet this or next week (he is a good friend. His wife Nani (nickname for Ana) Correa will be there too. She is also a very good friend and an extraordinary molecular biologist of channels.

see eq. 1 of Bezanilla, F. and C. A. Villalba-Galea (2013). "The gating charge should not be estimated by fitting a two-state model to a Q-V curve." The Journal of General Physiology.

I also include the original Hodgkin Huxley 1952 reference, see highlight on p. 503.

Hodgkin, A. L. and A. F. Huxley (1952). "A quantitative description of membrane current and its application to conduction and excitation in nerve." J. Physiol. 117: 500-544.

There may be an earlier reference but I have to dig it up.

Hodgkin, A., A. Huxley and B. Katz (1949). "Ionic Currents underlying activity in the giant axon of the squid." Arch. Sci. physiol. 3: 129-150.

The original theory (INcorrect, and NOT used in the Nobel Prize work of the Hodgkin Huxley 1952 papers is described in this 1949 paper and in the Huxley Trends article,
also attached. Hodgkin and Huxley abandoned the incorrect atomic scale theory described there for the phenomenological reduced 'model' in the 1952 paper. That is quite correct---although not perfectly---as far as it goes. Somehow they attached the wrong name to the Fermi distribution! I am glad they are not alive for me to ask them why they did that and to embarrass them. I strongly suspect that Hodgkin knew of this error (but not Huxley). When I spoke to him about these matters, which I did many times from 1961 till his death, he always emphasized that he learned physical chemistry and statistical mechanics after 1952, I believe actually after 1954 or 1955, in a apologetic tone. He never said explicitly what he was apologetic about but I did tease him that he used "driving force" for the electrochemical potential difference and he said he did not know that name when they were writing the 1952 papers, saying something like "Bob, we were too busy doing experiments to have learned that then.")

As ever
Bob

as ever

Bob

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Return Address for email: beisenbe@rush.edu or bob.eisenberg@gmail.com

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On Sat, Feb 8, 2014 at 1:50 AM, jinnliu <jinnliu@mail.nhcue.edu.tw> wrote:

> Dear Bob,
>
> Your revision is wonderful. I like it very much.
> Please see my remark and minor revision in yellow.
>
> I finally solve all the non-equilibrium problems. Our equilibrium model in this Ana paper can indeed be extended to the non-equilibrium flow case. I'll try to write the flow paper as soon as I organize all my numerical data.
>
> Best,
>
> Jinn
>
> -----Original message-----
> **From:**Bob Eisenberg<bob.eisenberg@gmail.com>
> **To:**Jinn Liang Liu 劉晉良<jinnliu@mail.nhcue.edu.tw>,Bob Eisenberg<beisenbe@rush.edu>,Bob Eisenberg<bob.eisenberg@gmail.com>
> **Date:** Fri, 07 Feb 2014 22:13:23
> **Subject:** Ana_02_07-Bob.docx
> Dear Jinn
>
> Here is my latest revision.
>
> I am trying to make the paper IRRESISTABLE
> for the audience
>
> As ever
> bob

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3 attachments

Bezanilla 2013 Boltzmann Gating charge is not two state.pdf
921K

HH4 Quantitative Description with Boltzmann highlight.pdf
4120K

Huxley History Trends Neuroscience article old no good theory Vol 25 November 2002.pdf
68K