

Review of: "Non-Hermiticities even in quantum systems that are closed"

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The author describes the role that non-hermiticity plays in several areas of quantum physics and tries to draw a connection between them. It's an interesting area of quantum theory that has drawn a lot of attention.

However, I think the connection the author is trying to draw deserves more careful and more detailed treatment, as currently the exposition in the paper does not seem fully developed and fully convincing:

1. For example, the particle on a ring problem is used by the author to show that there could be ostensible violation of the Heisenberg uncertainty principle (HUP) which can only be resolved by introducing non-Hermitian terms. But in fact, it is known that the plane wave version of HUP is ill-suited to analyzing periodic boundary conditions since $\Psi(x) \sim \Psi(x + a)$ and the position operator is not well defined. See an explanation here: <https://physics.stackexchange.com/questions/253859/heisenbergs-uncertainty-principle-derivation-in-a-ring> and <https://physics.stackexchange.com/questions/233266/how-can-i-solve-this-quantum-mechanical-paradox>. Therefore, it seems undermotivated to introduce non-Hermiticity here.
2. On the other hand, the appearance of dissipation-less currents have also been shown to exist in toy Maxwell models where the gauge field satisfies periodic boundary conditions enforced by a (heavy, non-dynamical) fermion field. See <https://journals.aps.org/prd/abstract/10.1103/PhysRevD.87.105012> and <https://journals.aps.org/prd/abstract/10.1103/PhysRevD.93.065049>. Again, no non-Hermiticity has been necessary in these models.

I think a better style for this paper might be to stick with one or two examples and follow a pedagogical approach and draw the connections between some concrete physical models/systems in more detail.

There are some typos in eq (4) and subsequent expressions, i.e. H^\dagger instead of $H +$ in several places. This can confuse the reader.