

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

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**Potential competing interests:** No potential competing interests to declare.

This is a really interesting and timely contribution to an exciting field generating some intense interest at present. Unfortunately I think that the author does not realise just how many people need to read it: he has written it in an unhelpfully obscure way, that is, referring to things that he already expects the reader to know about (see "Comments: Obscurity" below).

The author has written it as a "note", but in my opinion he should rethink, and rewrite it as a formal paper (properly structured with section headers etc.). What he has to say is both important and timely, and of interest across the whole of science since it has direct relevance to the formal treatment of irreversible systems (which is pretty much all systems, with very few exceptions!). These systems have traditionally been treated as approximations of reversible systems (since it is the reversible systems that have been thought to be tractable), but Mouloupoulos' is the sort of essential basic work that will make irreversible systems tractable as well.

I am deeply interested in these things: see:

- [C.Jeynes, How "Berry Phase" analysis of non-adiabatic non-Hermitian systems reflects their geometry, \*Entropy\* 25 \(2023\) 390 \(10pp\)](#)

which is a (very brief) paper surveying the (very extensive) literature and trying to explain it for a more general audience. Had I been aware of this work I would have included it ...

In my opinion this present work is written very well; nevertheless it still needs to be rewritten with a more realistic estimate both of the importance of the work and also (consequently) of the wide audience it deserves.

## Comments: obscurity

The first sentence is quite a good example. "*Concepts of non-Hermiticity*"? It is best to assume a wide readership, so that you should start with a nice concise explanation of Hermiticity, obviously tilted to the things you are going to go on to say. Yes, I know that Wikipedia really does this rather well, but you can give the sort of authoritative account (just a phrase, or a sentence, perhaps two) that Wikipedia can cite.

The reason I say this is that the whole paper is about details of Hermitian (and non-Hermitian) treatments that are generally overlooked. So you should start from the beginning. Don't assume the reader knows (anyway: however

knowledgable, everyone has blind spots). And don't cite textbooks! Textbooks are good when you really want to know, but they are not good when you are deciding whether or not you want to know, as here!

"... *unlike the typical case of non-Hermitian models discussed in the literature (involving open systems)*" So cite some examples here. The knowledgable will have their own favorite examples, but the others (most readers, probably) won't know any examples! Give them some (with citations)!

"*Apart from this novelty, we remind the reader that the above mentioned paradoxes had been noted in applications of the Ehrenfest theorem and Hellmann-Feynman theorems, with some related but separate discussions on the quantum mechanical uncertainty relations. These few works were totally disconnected to each other ...*" But you are connecting them, and apparently first to do so! I am willing to believe that indeed you are since the literature on such issues has multiplied dramatically recently, and the field seems to have collapsed into multiple – largely disconnected – sub-fields. This work is a serious attempt to remake some of these essential connections. By the way, you are guaranteed that most readers will not immediately know what the Ehrenfest and Hellmann-Feynman theorems are: you need to tell them (briefly). Bear in mind that you are likely to be quoted by Wikipedia – make what you say quotable!

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## Comments: Equations

In this work it is really important to get the equations to look right. The knowledgable will understand what you mean, but the majority of readers will just get confused (or give up). The trouble is that this sort of non-standard scientific publishing potentially has a very wide audience indeed, which makes it of much more importance to get the details right. Usually the scientific journal typesetters sort out the details but here you must do it yourself. Annoying and tedious, but absolutely necessary.

The presentation of the equations is woefully bad.