

This manuscript appears to make the argument that there is a qualitative difference between electrons and holes, such that normal state conductivity occurs only with electrons and superconductivity occurs only with holes. In Eq. (6), the author writes the Drude expression for the conductivity due to electrons, but there was no corresponding equation for holes, as is usually written with $n_n(t)$ replaced by p or $p(t)$ and m^* replaced by m_p^* , such as in Chapter 17 of Mardar, *Condensed Matter Physics* (Wiley, 2000). Thus, the transport carriers just depend upon the sign of the second derivative of the relevant energy band. In many metals and superconductors, there are both electron and hole bands. One example is Sr_2RuO_4 , which has two electron bands and one hole band, and all three participate in both the normal state conduction and the superconductivity, with essentially the same value of the superconducting gap, as seen in beautiful scanning tunneling experiments by H. Suderow *et al.*, *New J. Phys.* **11**, 093004 (2009). [As an aside, it should be noted that earlier Knight shift reports of triplet superconductivity in that material have been both recently contradicted by A. Pustogow *et al.*, *Nature* **574**, 72 (2019) and retracted by K. Ishida *et al.*, ArXiv: 1907.12236v2.] Also recently, twisted bilayer graphene was doped with either electrons or holes, and both metallicity and superconductivity were found for both electron and hole dopings [M. Yankowitz *et al.*, *Science* **363**, 1059 (2019)]. Since the BCS theory applies to either electrons or holes, and can easily be extended to multiple bands of both carrier types, the argument for “throwing out the baby with the bathwater” is not compelling.

Second, the thermodynamic arguments made in this manuscript are unrelated to the superconducting carriers of a material. The author just states in Section V that making non-adiabatic changes to a system leads to heating. This would *also* apply to hole conduction and to hole superconductivity, as holes also scatter off of impurities and phonons, as discussed in many textbooks, such as the one cited above. Since this manuscript gives the incorrect impression that there are qualitative differences between both the thermodynamics and the normal state conduction of metals and superconductors with electron or hole conduction, it should not be published.