

**Reply to "Comment on 'Equilibrium order parameters and chemical potentials  
in rotating superfluids' "**

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While we find Combescot's physical point plausible, we disagree with his characterization of the context and logical structure of our argument.

Combescot<sup>1</sup> gives a plausible and interesting resolution to the discrepancy between the hydrodynamics used by Liu and Cross<sup>2</sup> (the validity of which is confirmed in an important special case by our paper<sup>3</sup>) and the papers by Combescot<sup>4</sup> and Nagai<sup>5</sup> to which we primarily refer. We would put his point this way: When a mistake in Ref. 4 is corrected (see footnote 8 of Ref. 1) and when the implications for the structure of the chemical potential of the  $\bar{\Gamma} \times \bar{\nabla} \rho$  term in the mass current<sup>6</sup> are taken into account, then the disagreements with Ref. 2 cited in Refs. 4 and 5 are removed.

Combescot also correctly points out that we assert that the equations proposed in Refs. 4 and 5 do not

have our exact equilibrium state as a solution, but do not support this assertion with an analysis of those equations. In our view, however, our assertion only sets statements made in Refs. 4 and 5 into the context of our special case. We do not think that Combescot and Dombre<sup>7</sup> reveal that we were misinterpreting those papers or that Ref. 7 contains all of the ingredients of the resolution offered in Ref. 1; the mistake in Ref. 4, for example, is not corrected in Ref. 7.

We should also remark that our use of Eq. (6) to characterize the disagreement follows Nagai [see Eq. (1) of Ref. 5 and the text that follows].

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<sup>1</sup>R. Combescot, Phys. Rev. 25, 3392 (1982) (preceding Comment).

<sup>2</sup>M. Liu and M. C. Cross, Phys. Rev. Lett. 41, 250 (1978).

<sup>3</sup>T. L. Ho and N. D. Mermin, Phys. Rev. B 21, 5190 (1980).

<sup>4</sup>R. Combescot, J. Phys. (Paris) L41, 207 (1980).

<sup>5</sup>K. Nagai, J. Low Temp. Phys. 38, 677 (1980).

<sup>6</sup>M. Ishikawa, K. Miyake, and T. Usui, in *Physics at Ultralow Temperatures*, edited by T. Sugawara, S. Nakajima, T. Oht-

suka, and T. Usui (Physical Society of Japan, Tokyo, 1978), p. 159. See also N. D. Mermin, in *Modern Trends in the Theory of Condensed Matter: Proceedings of the February 1979 Karpacz Winter School*, edited by A. Pekalski and J. Przystawa (Springer, Berlin, 1980), p. 28.

<sup>7</sup>R. Combescot and T. Dombre, Phys. Lett. A 76, 293 (1980).