

Reply to comment by J Walter on 'On the redundancy of the zeroth law of thermodynamics'

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COMMENT

Reply to comment by J Walter on 'On the redundancy of the zeroth law of thermodynamics'

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Abstract. It is pointed out that Walter's criticism of Carathéodory's principle is misplaced since the principle is irrelevant to the original argument; and the claim that the characterisation of the class of physical systems admitted for consideration already involves the notion of temperature is rejected.

The demonstration of the redundancy of the zeroth law does not rest upon, or make use of, Carathéodory's principle (1909) and to this extent the preceding comment (Walter 1989) is tilting at windmills. As pointed out in the original paper (Buchdahl 1986), any formulation of the second law, taken as a proposition concerning the ordering induced by the relation of adiabatic accessibility, will serve: all one needs to know is that the 1-form dQ associated with any given thermodynamic system in equilibrium is integrable.

The question whether Carathéodory's principle 'rephrases correctly the contents of the second law' cannot be answered unless one is first given an explicit statement of the law which is being rephrased. No such statement is provided.

I do not understand the insistent demand for a 'model set'; for to have a model set of a class of physical systems one must first have a physical characterisation of these systems. I have previously described what I understand a 'thermodynamic system' to be (Buchdahl 1970, 1975), namely, in essence, any system of a certain kind which is not mechanical. The notion of temperature does not enter into this definition.

References

- Buchdahl H A 1970 *The Concepts of Classical Thermodynamics* (Cambridge: Cambridge University Press)
— 1975 *Twenty Lectures on Thermodynamics* (Oxford: Pergamon)
— 1986 *J. Phys. A: Math. Gen.* **19** L561-4
Carathéodory C 1909 *Math. Ann.* **67** 355-86
Walter J 1989 *J. Phys. A: Math. Gen.* **22** 341-2