Comments on the paper by Coveney and Penrose 'On the validity of the Brussels formalism in statistical mechanics'

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COMMENT

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The authors state, in the introductory section of their paper [1], that they are looking only at a 'small part' of the Brussels formalism. Curiously, the title of their paper does not reflect this restriction and refers to the general validity of the Brussels formalism. The reader may easily verify that in the recent references (reference [4] given by the authors in [1]), none of the assumptions discussed in their paper is used.

The criticisms are focused on a few papers published about twenty years ago. However, even restricted to these papers, their claims do not apply. Let us point out two major misrepresentations:

- No assumption of an underlying Hilbert space structure was ever considered as a part of the Brussels formalism, neither at that time nor since. On the contrary, it was even shown (see [2]) that the Brussels scheme cannot be realized within a normed space framework. The need to go to generalized spaces, such as rigged spaces, was lately emphasized in various papers (see [3]).

- No finite-dimensional subspaces were ever introduced by the Brussels school, as the superoperator P was chosen to project on the vacuum of correlation, in both classical and quantum systems. In the quantum case, for instance, the projector selects the infinite set of diagonal elements of the density operator ρ in a suitable basis and is therefore infinite-dimensional. The 'minimum requirement' of an infinite-dimensional subspace, stated by the authors for including the 'long-time tails', was thus met.

A single exception is reference [11] of their paper, where a one-dimensional subspace related to a projection on the 'relevant' subsystem, namely a discrete level, has been used.

References

[1] Coveney P V and Penrose O 1992 *J. Phys. A: Math. Gen.* **25** 4947–66
[2] Courbage M 1982 *J. Math. Phys.* **23** 646, 652
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[3] 1992 Discussion of I Prigogine's contribution to the XXth Solvay Conference on Physics *Phys. Rep.* **219** 109
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