REPLY

A. K. Raychaudhuri

Reply to L. Fernandez–Jambrina

Abstract We reply to the comment by L. Fernandez–Jambrina.

My paper [1] was commented in [2]. Here is my reply: The counter example is correct. It seems appropriate to clarify the situation that has emerged.

My paper established that all non-singular solutions are cylindrically symmetric and the paper also covered all cases when there is no non-separable function. In particular, they had time-reversed symmetry as a characteristic.

When a non-separable function is present, it was found that in general $p = k\rho = R(r)T(t)Q(r,t)$, Q being the non-separable function. The conservation relations then read

$$\frac{\partial(\ln p)}{\partial r} = -\frac{k+1}{2k}\frac{\partial[\ln R + \ln Q]}{\partial r} \tag{1}$$

$$\frac{\partial(\ln p)}{\partial t} = -\frac{k+1}{2}\frac{\partial[\ln R + \ln Q]}{\partial t} \tag{2}$$

which are consistent only if $k = 1(= -1$ giving negative pressure or density). Thus one has a stiff liquid. Again for the stiff fluid case one can generate families of non-singular solutions by introducing a suitable scalar function, as originally shown by Wainwright et al. and examples have been worked out by Griffiths and Bicak as well as by Fernandez-Jambrina. This scalar is the solution of the cylindrically symmetric wave equation in two dimensions and need not admit time reversal and indeed the counter example does not. Only this type of (time asymmetric)

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solution is missed in my paper. The time-symmetric solution of Griffiths–Bicak were commented upon.

However, it might be emphasised that the basic idea behind my paper that non-singular solutions are in a sense a set of measure zero has been vindicated and the characteristics of non-singular solutions have been identified.

References

1. Raychaudhuri, A.K: Gen. Relativ. Gravit. **36**, 343 (2004)
2. Fernandez–Jambrina, L.: Gen. Relativ. Gravit. **37**, 1–4 (2005)