Signaling between entities with opposite thermodynamic arrows of time

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With appropriate boundary conditions systems can interact while maintaining opposite thermodynamic arrows of time [1]. One can now raise two questions: are there regions of the universe where the thermodynamic arrow points oppositely, and if there are, would we notice? If the answer to the second question is "no," there would be no way to investigate the first. As in [1], the issue is studied using models. The models are variations of the cat map and baker's transformation. The scheme in [1] was to consider systems A and B and to give A a low entropy state at parameter time 0, and B low entropy at T. With no coupling, in the interval $t \in [0, T]$ this gives them opposite thermodynamic arrows. With weak coupling the arrows persist and the main effect is a speedup of equilibration. In considering signals our goal is to answer an extreme question: if an opposite arrow supernova went off nearby, would we notice? This is modeled by considering paired exemplars of the time evolution, differing from one another in that (say) A has two very different propagation rules at some particular intermediate time. We than look for specific effects on B. The short answer is, yes, we do see effects on B. This will be illustrated in our presentation. Does this mean that one can contemplate the cat paradoxes of [1]? (We avoid the politically incorrect reference to "grandfathers.") We don't know, but we believe that the supernova would do more than simply make us sweat.

[1] L. S. Schulman, *Opposite Thermodynamic Arrows of Time*, Phys. Rev. Lett. **83**, 5419-5422 (1999).