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To the Editors,

Please consider this presubmission inquiry relating to my proposed manuscript *Self-Organised Criticality in a Self-Organising Model of Thermoregulatory Huddling.*

Huddling is an adaptive group-level behavior that emerges from simple local interactions between animals. Huddling is a particularly important self-organising system because the behavior that emerges at the group-level has a direct impact on individual fitness; the huddle insulates the group against the cold, allowing them to thermoregulate at reduced metabolic cost. However, huddling can only occur if individuals contribute heat, i.e., by thermogenesis. The huddle is therefore both a cooperative group behavior and a competition. Contributing too much heat is costly but contributing too little compromises the ability of the huddle to self-organise.

In this paper I present results from a model of huddling, as derived in my recent *PLoS Computational Biology* paper *A Self-organising Model of Thermoregulatory Huddling* (Glancy, Gross, Stone, Wilson, 2015), showing how the tension between group-level cooperation and individual-level competition can generate self-organised criticality. By evolving the thermal physiologies of huddlers, under pressure to thermoregulate at minimal metabolic cost, the model predicts a power-law in the distribution of metabolic rates on an evolutionary timescale. Self-organised criticality, as evidenced by the emergence of a power-law distribution, is a defining feature of complex systems. Hence the model shows how self-organisation and natural selection can interact to generate complexity, in the context of a biological system (huddling) where this interaction can be investigated empirically.

The model of self-organising thermoregulatory huddling was directly constrained by and validated against data from a growing body of animal behavior research (Glancy, Gross, Stone, Wilson, 2015). I show here how this model of animal behaviour reduces to a particle system, and explain the emergence of self-organised criticality in the evolution of the model in terms of the underlying statistical physics of particle interactions. I therefore feel that the paper is particularly well suited for publication with *PLoS Computational Biology*, and that it will appeal to a broad readership at the interface between biology and physics.

If guidance of a specific editorial board member is helpful at this stage I suggest Prof. Carl T. Bergstrom, whose expertise in the evolutionary implications of social dynamics is especially relevant to the manuscript proposal. I was also extremely grateful for the consideration of Prof. Jeffrey Schank as the guest editor for our 2015 *PLoS Computational Biology* paper, and I consider his expertise in evolutionary modeling and huddling to be particularly relevant to the current manuscript too.

I thank you in advance for your consideration of the manuscript and look forward to the suggestions of the editorial staff about the suitability of *Self-Organised Criticality in a Self-Organising Model of Thermoregulatory Huddling* for submission to *PLoS Computational Biology*.

Yours sincerely,

Stuart Wilson

References

Glancy J, Gross R, Stone J, Wilson SP (2015) A self-organising model of thermoregulatory huddling. PLoS Computational Biology 11(9): e1004283.