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June 13th, 2023

Dear Dion,

I would like to nominate Marybelle Cameron-Pack for the Undergraduate Paper Award for her paper entitled "A personal cost of cheating can stabilize reproductive altruism during the early evolution of clonal multicellularity" published in 2022 in Biology Letters (Cameron-Pack ME, König S, Reyes-Guevara A, Reyes-Prieto A, AM Nedelcu. 2022. Biology Letters 18: 20220059); attached. Her paper was featured in The New Scientist – "Algae cells that cheat are more likely to die of environmental stress" (https://www.newscientist.com/article/2326482; by James Dinneen; 28 June 2022).

Understanding how cooperation evolved and is maintained remains an important and often controversial topic because cheaters that reap the benefits of cooperation without paying the costs can threaten the evolutionary stability of cooperative traits. Cooperation – and especially reproductive altruism, is particularly relevant to the evolution of multicellularity, as somatic cells give up their reproductive potential in order to contribute to the fitness of the newly-emerged multicellular individual. In this paper, Marybelle investigated cheating in a simple multicellular species – the green alga *Volvox carteri*, in the context of the mechanisms that can stabilize reproductive altruism during the early evolution of clonal multicellularity. She found that the benefits cheater mutants can gain in

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terms of their own reproduction are pre-empted by a cost in survival due to increased sensitivity to stress. This personal cost of cheating reflects the antagonistic pleiotropic effects that the gene coding for reproductive altruism – *regA*, has at the cell level. Specifically, the expression of *regA* in somatic cells results in the suppression of their reproduction potential but also confers them with increased resistance to stress. Since *regA* evolved from a life-history trade-off gene, we suggested that co-opting trade-off genes into somatic cell differentiation can provide a built-in safety system against cheaters in other clonal multicellular lineages.

Marybelle graduated from UNB this May and she has been accepted in the PhD program at UCL, in the UK, with a full scholarship.

Please let me know if you required additional information.

Sincerely,

Aurora M. Nedelcu

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