**Long and Short Range Interactions in the Regulation of the Amoeboid Motility**

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*Dictyostelium* is considered to be a solitary amoeba while food is available and turning into a social cell upon starvation. We are showing here that, even when food in plentiful, *Dictyostelium* cells interact with each other through multiple mechanism both by contact and through secreted factors to regulate their motility and spreading.
We created small colonies using micro-stencils and tracked the cell trajectories as they spread out in order to better investigate the onset of these collective behaviors[1]. From data analysis and simulation of an elementary model, we demonstrate that contact interactions act to speed up the early population spreading by promoting individual cells to a state of higher persistence, which constitutes an as-yet unreported contact enhancement of locomotion. a phenomenon we called CEL (Contact enhancement of Locomotion). Our findings also suggest that the current modelling paradigm of memoryless active particles may need to be extended to account for the history-dependent internal state of motile cells.
At longer time, the average cell speed is reduced by secreted Quorum Sensing factor (QSF) that accumulates in the media and acts at long range to prevent cells to drift too far apart from the others[2]. The cAMP-independent response to this unidentifed, high-molecular-weight molecule includes a reduction of the cell movements, in particular through the down-regulation of a mode of motility with high persistence time. Using indirect estimation of the QSF concentration and mathematical analysis of the cells' response, we demonstrate that the QSF production is under negative feedback: the secretion rate decreases linearly as a function of the concentration, which gives the cells a way to detect when they exceed a density threshold. The combination of CEL and QSF effects on cell motility might result into an optimization of space utilization.

[1]Contact enhancement of locomotion in spreading cell colonies. (2017 J. d'Alessandro, A. Solon, Y. Hayakawa, C Anjard, F. Detcheverry , *Nature physics*

[2]Collective regulation of cell motility using an accurate density sensing system. J. d'Alessandro, J.P Rieu, C. Rivièrey and C. Anjard. Submitted to *interface*