

物理教室

物性コロキウム

日時： 7月17日（金）14：40－16：10

場所： 理学研究科合同B棟 745号室（大学院講義室I）

講師： 山本 量一 氏（京都大学大学院工学研究科化学工学専攻 教授）

題目： 自発運動する生物系における集団運動の発現

(Emergence of collective dynamics in active biological systems)

要旨：

Collective behavior is widespread in biological systems, occurring at distinct scales with varying degrees of complexity. It has been observed in such systems as swimming microorganisms, insect swarms, fish schools, and bird flocks, as a bottom-up self-organization which produces non-trivial global patterns from local rules. We, however, still do not fully understand the underlying mechanisms behind the complex collective behaviors seen even in very simple systems, such as crawling cells or swimming bacteria.

We studied the collective behavior of spherical swimming particles which move autonomously in the absence of any external driving force, by conducting 3D simulations with fully resolved hydrodynamics [1]. We show, for the first time, that hydrodynamic interactions are sufficient to generate persistent collective density fluctuations which propagate throughout the system (bouncing back and forth between the walls) [2]. Furthermore, this swarming is sensitive to the strength and type of swimming motion [2]. The observed dynamics strongly resembles the macroscopic flocking characteristic of animal swarms.

Examples of anomalous collective behavior are seen also in other systems such as “crawling cells on substrate [3]” and “self-organization of cells in skin tissue [4]”. I would like to talk about them if time allows.

References

[1] J. J. Molina, Y. Nakayama, and R. Yamamoto, *Soft Matter* **9**, 4923 (2013).

[2] N. Oyama, J.J. Molina, and R. Yamamoto, arXiv:1504.06914.

[3] R. Yamamoto, unpublished.

[4] S. Schnyder, K. Sugimura, A. Kubo, and R. Yamamoto, unpublished.

連絡先：川勝 年洋（795-6438）

☆ 14:35 よりコーヒー、紅茶、お菓子を用意します。カップを持ってお集まり下さい。

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