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THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

SEMINAR ON APPLIED MATHEMATICS

Nonreciprocal Interactions - Drops of Active Liquids and Arrested Coarsening

By

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Abstract

After briefly reviewing the recent effort of physicists and mathematicians alike to break Newton'sthird law to make systems active [1], we introduce particular continuum models featuring suchnonreciprocal interactions that destroy the gradient dynamics structure of well-known models.First, a thin-fi lm model for partially wetting drops on solid substrates is made active byincorporating a nonreciprocal coupling to a polarisation fi eld in the form of self-propulsion andactive stress [2]. We show that the employed polarisation-surface coupling results in (hysteretic)transitions between resting and moving drops, the splitting of drops, and chiral motion. Second, weintroduce a nonrecipocal Cahn-Hilliard model [3,4], show that all its linear stability thresholds maybe mapped onto the ones of a Turing reaction-diffusion system [4], and indicate how thenonreciprocal interactions arrest and stop coarsening, and give rise to localised and/or oscillatorystates [4]. Finally, we argue that the nonrecipocal Cahn-Hilliard model indeed is of universalimportance as it corresponds to the last missing amplitude equation out of eight that should existif considering a classifi cation of linear instabilities of uniform constant states based on threefeatures: small- vs large-scale, stationary vs. oscillatory, and with vs. without conservation law [5].The talk ends with a brief outlook.

References

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Date : 8 May 2023 (Monday)

Time : 4:30pm – 5:30pm

Venue : Room 4475 (Lifts 25/26)

All are Welcome!