明治大学先端数理科学インスティテュート

MIMS現象数理カフェセミナー

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A reaction diffusion model for understanding phyllotactic formation

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Abstract： Phyllotactic patterns in plants are well known to be related to the golden ratio and Fibonacci sequence. Actually, many mathematical models using the theoretical inhibitory effect were proposed to reproduce these phyllotactic patterns. In 1996, Douady and Couder introduced a model using magnetic repulsion and succeeded in reproducing phyllotactic patterns numerically. On the other hand, it was recently revealed in biological experiments that a plant hormone, auxin, regulates the phyllotactic formation as an activator. Then, there arises a natural question as to *how the inhibitory effect can be related to the auxin*. In this talk, we will propose a reaction diffusion model by taking account of auxin behavior in plant tips. This model can link the auxin behavior of the activator to the inhibitory effect in the stem tip. Moreover, we will show the relationship between Douady and Couder's model and our model by singular limit analysis. It also provides us with the potential function corresponding to the inhibitory effect, and the bifurcation diagram.

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