2P283 細胞濃度制御のためのマイクロ流体ケモスタット
Microfluidic chemostat for cell density control
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Recently, synthetic biology based on constructive approaches, such as genetically engineering of living cells, has attracted attention. For genetic engineering, culturing living cells in a steady condition is required, and chemostats based on inflow and outflow of culture media are often used. However, it is difficult to observe a cell while culturing because chemostats require large volume of media (>0.1 L). In this study, to conquer this problem, we propose a microfluidic chemostat based on water-in-oil microdroplets. The inflow and outflow of media are controlled by droplet fusion and fission. We formulated a numerical model and investigated it by simulations. We believe that this chemostat can be applied to single-cell observation and promote synthetic biology.

2P284 微小液滴を用いた非線形化学反応間の相互作用
Interaction among nonlinear chemical reactions based on microdroplets
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The interaction among cells plays an important role in collective behavior of cells. Especially, interaction between cells processing information like neural cells is asymmetric, and the asymmetry of their interaction is considered to be essential. Although the interactions between cells have been theoretically and experimentally studied, the effects of asymmetric interaction have not been revealed yet. Here, to study asymmetric interactions, we propose a system based on microdroplets that contain a nonlinear chemical reaction. In this system, the interaction between droplets is controlled by fusion and fission of droplets. We believe that our system will help to understand the complex behavior exhibited by cells processing information.

2P285 自律的に駆動する複雑形状粒子の並進、回転、円運動
Translation, rational, circular motions of self-driven complex-shaped microparticles
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Microorganisms produce their autonomous motions based on chemical-mechanical energy conversion with their motor proteins. Recently, micrometer-sized self-driven particles using chemical energy have received attention because they provide interesting physical insights about dynamical structures of microorganisms such as bioconvection, colony formation, etc. However, existing self-driven particles show only translational motion due to their simple shapes (ex. sphere, rod, etc.). Here, we report anisotropic complex-shaped self-driven particles exhibiting translational, rotational, and circular motions. We hope our particles will provide many insights for understanding of autonomous motion and micron-sized dynamical structures based on chemical-mechanical energy conversion.

2P286 The analysis of energy transfer in Chaotic Dynamical Systems 2
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We propose a new method for analysis of the mechanism of the energy transfer in systems of large degrees of freedom including proteins. It is a combination of the wavelet transformation and PCA and is called the wavelet PCA. We have applied the wavelet PCA to the Fermi-Pasta-Ulam (FPU) coupled oscillator system. In addition, we study a coarse graining model of biomolecules called the elastic network model using our method. We will also think of another method for the analysis of the energy transfer mechanism in these systems.

2P287 イメージングバイオマーカーを用いた標的細胞検出のためのオンチップマルチイメージングセルソータシステムの認識アルゴリズム開発
Development of the cell imaging biomarker identification algorithm for on-chip multi imaging cell sorter system
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We have developed an on-chip multi imaging cell sorter system to identify and purify target cells based on their morphological characteristics, which we call "imaging biomarker". In this study, we adopted an algorithm for typical parameters such as cell area, perimeter, and nucleus area were evaluated to identify characteristic target cells, which express "imaging biomarkers". In result, target cells can be successfully identified and purified using those imaging biomarkers, and by using the system, clustered circulating tumor cells were purified from a sample blood as an example. These results indicate the developed algorithm is useful for identification of target cells having characteristic morphologies depending on imaging biomarkers.

2P288 標的細胞特定のためのイメージングバイオマーカー：血中循環がん細胞クラスター同定の例
Imaging biomarkers for identification of target cells: Identification of clustered circulating tumor cells as an example
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An on-chip multi-imaging cell sorter was developed to purify target cells using "imaging biomarkers", which are indexes for image information of cell morphology including cell clustering and the cluster size. One advantage for using imaging biomarkers is overcoming undesired cell contamination by removing clustered cells. Another is achievement of the collection of clustered samples without any dye staining. The formation of cell clusters is important information for diseases, because blood immune system responds to antigens and forms their clusters. We applied it for the identification of circulating tumor cells (CTCs) without any labeling, and successfully identified them from model rat bloods. These results indicated the usefulness of the imaging biomarkers.