2P175 有糸分裂キネシン Eg5 の機能性ループ L5へのフォトクロミック分子導入と光制御
Incorporation of photochromic molecule into the functional loop L5 of mitotic kinesin Eg5 and its photo regulation
Kumiko Ishikawa1, Yuki Tamura2, Shinsaku Maruta1 (Grad. Sch. of Bioinf., Grad. Sch. of Eng., Soka Univ., 2Dep. of Bioinf., Fac. of Eng., Soka Univ.)
It is believed that the loop L5 of kinesin is important for motor function. Interestingly mitotic kinesin Eg5 has a several times longer L5 in comparison with other kinesins. It has been demonstrated that the L5 of Eg5 performed as a stabilizer for the Eg5-specific inhibitors (STLC, monastrol) complexes. In this study, we prepared 8 mutants of Eg5 which have a single cysteine in L5 in order to incorporate photochromic molecules. We also synthesized thiol reactive spiropyran derivative monoiodoacetethyl-spiropyran (IASP). IASP was incorporated into the mutants stoichiometrically. The Eg5 mutant E118C modified with IASP showed reversible alteration of microtubule dependent ATPase activity upon UV and visible light irradiations. The other mutants were also examined.

2P176 原子間力顕微鏡によるコンフルエント細胞の力学測定
Mechanical measurements of confluent cells with an atomic force microscope
Yuki Ochi, Masahiro Tsuchiya, Yuki Saijo, Takaharu Okajima (Grad. Sch. Info. Sci. & Tech., Hokkaido Univ.)
Cells have mechanical interactions with surrounding cells. Thus, it is crucial to identify mechanical properties of cells in a large scale from intercellular regions. Recent studies revealed the traction forces of confluent cells during cell migration, but the stiffness of confluent cells has not fully understood. To measure such a mechanical property, we developed a home-made atomic force microscope (AFM), with a wide-range scanner, equipped with an upright optical microscope. In the AFM, a liquid-immersion objective lens was employed to focus and collect the laser light for optical lever. The AFM allowed us to map the height and the force volume might be correlated with number of focal adhesions. The mechanical measurements for intercellular regions. We found that the variation of the cell modulus decreased toward the cell center. We will show the detail relationship between the variability and the cell cytoskeleton. [1] Fabry et al. Phys. Rev. E (2003)

2P177 ゾウリムシのメタクロナルウェーブは外液の粘性だけでなく細胞表層の弾性も使って伝播できる
Metachronal wave travels not only in outer viscous fluid but also on elastic cell surface of Paramecium cells
Naoki Narematsu, Yoshiaki Iwadate (Fac. Sci., Yamaguchi Univ.)
Ciliary movements in protozoa move in metachronal coordination so as to maintain a constant phase difference between adjacent cilia. This coordination is called as “metachronal wave”. It is now generally thought that metachronal waves arise from hydrodynamic coupling between adjacent cilia at extracellular fluid. To confirm this, we planned to breakdown the hydrodynamic coupling of ciliary movements at a restricted portion of a Paramecium cell and observe whether metachronal coordination collapses or not. Metachronal waves passed over the portion where the hydrodynamic coupling was broken. To clarify the other mediator of the wave, we applied cyclic stretching of cell body. The frequency of metachronal wave became equal to that of the cyclic stretching.

2P178 細胞間力学変化量の空間不均一性：原子間力顕微鏡測定
Spatial heterogeneity of cell-to-cell mechanical variability measured by atomic force microscopy
Ryosuke Takahashi, Koari Kuribayashi-Shigetomi, Takaharu Okajima (Grad. Sch. Info. Sci. & Tech., Hokkaido Univ.)
Cell mechanics is crucial not only for understanding the mechanism of cell functions but also for diagnosing cell disease. Previous studies revealed that the averaged cell mechanical properties largely changed in intracellular positions. However, little is known how the cell-cell variability of cell mechanics depends on the cell positions. Using atomic force microscopy, we investigated the complex shear modulus, which exhibits single power-law behavior [1], of single cells cultured on micro-patterned substrates. We found that the variation of the cell modulus decreased toward the cell center. We will show the detail relationship between the variability and the cell cytoskeleton. [1] Fabry et al. Phys. Rev. E (2003)

2P179 AFM を用いた強制剥離による細胞接着力の評価
Evaluation of cell adhesion force by mechanical detachment using AFM
Mari Mishima1, Ryuzo Kawamura2, Tomoko Okada2, Chikashi Nakamura1,2 (1Dept. Biotechnol. Life Sci., TUAT, 2Biomedical Research Institute, AIST)
We developed a method to measure cell adhesion force by mechanical detachment from substrate. An AFM probe was fabricated to a needle shape with a hook-shaped tip to penetrate cellular membrane and pull up cells vertically. The adhesion forces defined as peak forces in detaching process were successfully measured for seven cell lines. We supposed that the force volume might be correlated with number of focal adhesions. Since the cell adhesion has close relations with the cell motility, we measured the average velocity of the cells. As a result, the migration velocity showed negative correlation with the adhesion forces among the measured cell lines. Concerning murine breast cancer cell lines, the adhesion force tends to be smaller in the more metastatic cells.

2P180 細胞内の力学環境に対する分子混和効果
Molecular crowding effects on intracellular mechanical environments
Kenji Nishizawa1, Kei Fujiwara2, Miho Yanagisawa1, Daisuke Mizuno1 (1Department of physics, Kyushu University, 2Department of Bioengineering and Robotics, Tohoku University)
We investigate crowding effects on cell mechanics by high-bandwidth micro rheology. For the model systems, viscoelasticity of BSA (family of globular proteins) and extracts taken from Escherichia coli were measured by changing their concentrations. The concentration dependence of viscosity fits well to empirical function \(\eta = \eta_0 \exp\{A\phi/(\phi_0-\phi)\}\) which is known to describe the characteristic behavior near glass transition. The concentration \(\phi_0\) at which the viscosity diverges, however, seems largely different between BSA solutions and extracts from cells. We found that the viscosity in cells is much lower than that in cell extracts. The uncaging in model systems are driven purely thermally while the spontaneous athermal forces can facilitate flows in cells or active systems.