3P133 NaCl、NaI 水溶液におけるハイパーモバイル水の熱容量及び密度の評価
Estimation of Heat Capacity and Density of Hyper-Mobile Water in NaCl and NaI Solutions
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Hydration shells of ions in NaCl and NaI solutions were previously reported to consist of hydroporphic water (HMW) which has higher dielectric relaxation frequency than bulk water as given by precision microwave dielectric spectroscopy (DRS).(J. Phys. Chem. A 117, (2013) 4851-4862) In this study, apparent density and heat capacity of HMW was estimated based on difference scanning calorimetry (DSC) and solution density measurements. Using the numbers of HMW per alkali-halide by DRS, both heat capacities of HMW around ions in NaI and NaCl solutions were estimated to be about 10% lower than that of bulk water. Density of HMW was estimated to be lower than that of bulk water even if there was bound water on Na⁺ ions having higher density.

3P134 低周波超音波により引き起こされたメダカ胚における卵黄球の収縮と出血
Shrinkage of yolk sphere and bleeding on medaka embryo caused by low frequency ultrasound
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This study focuses on the biological effect of acoustic cavitation on living tissue. A medaka embryo was exposed to continuous low-frequency and high intensity ultrasound (30 kHz, 20-150 kPa). The standing wave was formed in the experimental bath filled with degas water. The medaka embryo in a tube was located in the pressure antinode. Based on the stage of embryonic development, the samples was categorized into 3 types, within 1) 12 hours, 2) 5 days, 3) 10 days. After exposure, the effect was investigated in the microscope. The biological effect was confirmed as the shrinkage of yolk sphere in case of 1), the bleeding from blood vessels around the yolk in case of 3). High-speed imaging during exposure suggested that acoustic cavitation related to these damages.

3P135 アフリカツメガエル卵成熟過程における卵母細胞の ATP産生
ATP production in Xenopus laevis oocytes during maturation
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To understand ATP metabolism during oocyte maturation, we developed an ATP imaging system in Xenopus oocytes with FRET-based ATP indicator, ATeam. Now, we are using albino oocytes to observe more accurate ATP changing. ATP imaging in albino oocytes is under investigation with 2-deoxyglucose and oligomycin A as inhibitors of glycolysis and oxidative phosphorylation, respectively. These inhibitors are also injected into wild-type Xenopus oocytes to study the effect(s) on ATP production during oocyte maturation. White spot is the hallmark of maturation in Xenopus oocytes; therefore, the timing of the appearance of white spot was compared between oocytes with or without inhibitor(s) during progesterone induced maturation.

3P136 3次元培養下での再生皮膚の発生における反応拡散機構による羽毛原基パターン再構築
Reconstruction of feather bud patterning by a reaction-diffusion mechanism during bioengineered skin development in 3D culture
Kentaro Ishida, Toshiyuki Mitsui (Coll. of Sci. & Eng., Aoyama Gakuin Univ.)

Feather bud development requires epithelial-mesenchymal interactions that result in the periodic pattern formation of the feather buds during skin development. To explain this pattern formation, Turing’s reaction-diffusion model for the activator-inhibitor type has been adopted. We have developed a bioengineered chick skin and feather buds that exhibited normal skin characteristics, including the size of the feather buds, the interbud distance and several gene expressions. Inhibition of FGF signaling by treating with inhibitors during the feather bud formation led to fusion of the feather buds, which in turn can be described by the reaction-diffusion model. Thus, we have developed a 3D culture system to regenerate embryonic chick skin as a feather bud-forming field.

3P137 電気ー機械相互作用を考慮した心筋細胞群モデル
Model of Cardiac Muscle Cells with Reference to Electro-Mechanical Interaction
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Cardiac stretch-activated ion channels have an important role in interaction between ion current and stretch activation in heart muscle. Though it is important to evaluate the effect of interaction quantitatively, there are few models for such electro-mechanical interaction. In this study, we propose a simple network model of cardiac muscle cells with reference to electro-mechanical interaction in order to analyze propagation of cardiac excitation-contraction coupling theoretically and numerically. In spite of the simplicity of the proposed model, it realized normal and abnormal behavior of cardiac impulse propagation among cells by changing the strength of interaction between electronic and mechanical dynamics.

3P138 骨格筋繊維の急激な伸張に対する張力応答のシミュレーション
Simulation of force responses to fast ramp stretches in the skeletal muscle fibres
Youjiro Tamura¹, Akira Ito², Andrew Cresswell¹ (¹SNCT, ²SNCT, ³UQ HMS)

We have proposed a muscle model based on a viscous fluid between actin and myosin molecules (1992). Macroscopically, this fluid model makes a muscle model that consists of Maxwell elements (2005). The muscle model is essentially different from Huxley model, because the force responses due to a sudden length changes come from the viscous elements. Bagni et al. (1998) measured the force responses to fast ramp stretches in frog skeletal muscle fibres and recorded the velocity changes during the stretches. We test the muscle model and conclude that the initial fast phase comes from a viscous element in parallel. Since the viscosity is centesimal of that of the Maxwell element, we think that the viscosity originates in the parallel components like titin and/or collagen.