Division of Mechanical Science and Engineering	Research field	Biomechanical Engineering	Lab. ID MS34
Laboratory web site	https://biomech.w3.kanazawa-u.ac.jp/index-en.html		

Research subjects

The human ear, along with the human eye, is an important sensory organ working as an interface between humans and information in the outside world. Interestingly, the auditory system shows highly mechanical behavior from the earhole to the inner ear, such as the vibration of the tympanic membrane, the motion of the ossicles in the middle ear, the active stretching motion of the outer hair cells in the cochlea and the conformational changes of the motor protein "prestin." Research interests of the laboratory encompass many aspects of "hearing." To elucidate the mechanics of hearing and to contribute to the clinical treatment of hearing disorders, our efforts are focused on the development of computer simulation models, biomicromachines and diagnostic devices, as well as on molecular-level analyses by atomic force microscopy (AFM), molecular biology, bioengineering and genetic engineering.

Master/Doctor course: Education policy, curriculum, typical activity in the laboratory

In the laboratory, research meeting is held every other week, in which we discuss the progress of each theme and try to solve problems found in the research. Through this meeting, students will be able to summarize and present their own research and to learn about what the scientific discussion is. To understand the current trends in the field of research, a journal club is held once in a week, in which a new scientific paper is introduced by a lab member. Although each student has each research theme, the research is carried out with other lab members who conduct similar research.

Daily life in the laboratory, etc.

Since many research themes in the laboratory is related with medicine, we are conducting collaborative research with ENT doctors and audiologists. There are, therefore, opportunities to attend medical conferences and to discuss with medical doctors and paramedical personnel. One of the characteristics in our laboratory is that students are able to see and touch different types of research with various methods in one laboratory. Furthermore, the laboratory encourages students to go aboard, i.e., students have chances to attend not only domestic conferences but also international conferences.

Message or comments by the laboratory faculty staffs

Performing hearing tests on adults is straight forward because you can ask if they can hear a sound or not. However this is not the case with infants. If they have some trouble hearing, how can we find out what the problem is? The research interests of our laboratory encompass both basic research into hearing mechanics and the application of our findings in the development of hearing diagnostic devices and biomicromachine such as the development of a diagnostic system for newborn hearing screening, the numerical analysis of the hearing organ at the nanoscale level, the structural analysis of molecular motor expressed in the plasma membrane by atomic force microscopy and the development of an implantable drug delivery system for the treatment of hereditary hearing loss.

Recent Master theses in these 3 years (+ more if appropriate)

year.month	Thesis title (including English translation of Japanese thesis title)
2019.3	Development of a Wideband Frequency Impedance (WFI) Meter for Measuring Dynamic Characteristics of the Hearing System in Neonates
2019.3	Connection between Outer Hair Cell Dysfunction and the Dynamic Behavior of the Organ of Corti in the Gerbil Cochlea: Theoretical Considerations
2019.3	Functional Analysis of the Membrane Protein Prestin Expressing in the Inner Ear Cochlea
2018.3	Exploration of Novel Drug Candidates Based on Derivatives of Salicylate for Recovery of Localization of Pendrin Mutants Causing Hereditary Hearing Loss
2018.3	Development of a Cell Line Highly Expressing Motor Protein Prestin Labeled with AviTag
2017.3	Development of a New Planar Patch Clamp Device Applicable to Structural and Functional Analysis of Membrane Proteins
2017.3	Expression and Evaluation of the His-tagged Inner Ear Motor Protein Prestin
2017.3	Development of an Apparatus for Neonatal Hearing Diagnosis Which Uses Tympanometry
2017.3	Development of a Sweep Frequency Impedance (SFI) Meter for Neonatal Hearing Screening (NHS)

Recent Doctoral theses in these 3 years (+ more if appropriate)

year.month	Thesis title (including English translation of Japanese thesis title)

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