



Tuesday, March 13th, 2012, 4:00 P.M.

Room No. 109, DASAN bldg. 1st Floor

(Host: Prof. Euiheon Chung / Language: English)

***Vorticella convallaria* : a protozoan for fluid
dynamics, biophysics and biomimetics**

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A sessile protozoan *Vorticella convallaria* (*Vc*) is regarded as a model microorganism for fluid dynamics, cell mechanics and bioinspired engineering. 1) Because *Vc* generates strong eddy flow for food capture by cilia beating, its peristome cilia layer is considered as a model system for micromixers in microfluidic systems. 2) For danger evasion *Vc* coils its tethering stalk, and the spasmoneme inside the stalk is responsible for the stalk coiling. Because the spasmoneme is a unique biological motor powered by Ca^{2+} -binding, the spasmoneme serves as a model organelle for Ca^{2+} -based cell motility. 3) During the stalk contraction, the spherically shrunken cell body is retracted toward the substrate at cm/sec speed. This poses a complicated fluid dynamics problem: a sphere unsteadily moving toward the solid surface at finite Reynolds numbers. 4) To overcome drag on the moving body, the spasmoneme generates force of ~ 10 nN normally and ~ 100 nN maximally. Along with the unique energy source and ultrafast contraction, this strong contractile force makes the spasmoneme an attractive model system for biomaterials. In this talk, I will outline cellular motility aspects of *Vc*, present analyses of mechanical performances of *Vc* and suggest possible applications of *Vc* in engineering systems.

Biography

Dr. Sangjin Ryu recently joined the Department of Mechanical and Materials Engineering at the University of Nebraska-Lincoln as an assistant professor. Dr. Ryu received his BS and MS degree in mechanical engineering from Seoul National University in 1997 and 1999, respectively, and his PhD in Mechanical Engineering from Massachusetts Institute of Technology in 2009. He worked for Daewoo Motor Company from 1999 to 2001 and Agency for Defense Development from 2001 to 2004. Before joining UNL, Dr. Ryu was a postdoctoral research associate in School of Engineering of Brown University from 2009 to 2011. His research interests lie in the general area of fluid mechanics and cell mechanics.