

Talk: Biomimetics on gecko locomotion: From Biology to Engineering

Abstract: Geckos have been studied for many years for their excellent moving abilities on various substrates. The paper reports our studies on the gecko adhesive mechanism, attaching and detaching dynamics, artificial adhesive materials and modification, gecko-inspired robot. Here we measured the contact/ tribo-electrification, results show that contact/tribo-electric charge between toes of gecko and substrate greatly influence the adhesion between setae and substrate. Our studies show that geckos prefer to detach from substrate by toe abduction, instead of peeling from substrate. Vertically carbon-nanotube array increases the adhesive, space circumstance heavily decreases the adhesive performance of polymer-based adhesive materials. We developed gecko-inspired robot and carried out experiments on micro-gravity simulating status.

Dr. Zhendong Dai, Fellow of International Society of Bionic Engineering, director and founder of IBSS at NUAA, Professor of Astronautics, Mechanical Engineering, Mechanics, Materials Science and Engineering. He obtained his Master and Doctor degree from NUAA in 1986 and 1999 respectively.

He set up a theory of tribo-irreversible thermodynamics from 1995 to 2000, started bionic study by joining Gorb group in Institute of Development Biology, Max-Planck-Institute, Germany, in 2000.

He developed 3D force sensors and set up a facility to measure the 3D reaction force and to observe the motion behaviors simultaneously, studied the adhesive mechanism and the detaching technique used by gecko were subtly investigated.

He has charged number of important projects, including two NSFC key projects and three key international collaboration projects, authored 6 books and more than 400 peer reviewed papers.

His research interests include biomimetic on legged locomotion—gecko-mimicking robot, biological gecko-robot, locomotion dynamics and artificial adhesive; lightweight structures and materials—bio-inspired lightweight structure, multifunctional foamed metal; and tribology.