

**Hao Liu, Ph.D.**

Professor of Biomechanical Engineering  
Gradual School of Engineering  
Chiba University  
1-33, Yayoi-cho, Inage-ku, Chiba-shi  
Chiba 263-8522  
Japan



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## **Lesson from Insects: Robustness Strategies for Bio-inspired Flying Robots**

Insect and bird size drones – micro air vehicles (MAV) that can perform autonomous flight in natural environment are now an active and well-integrated research area. Bio-inspired flapping wing propulsion possesses potential of high lift-generating capability under low-speed flight conditions and may provide an innovative solution to the dilemma of small autonomous MAVs. Here with a focus on robustness strategies and intelligence in bio-flights in terms of morphology, dynamics and control, we present the state of the art of flapping wing aerodynamics, flexible wing and wing-hinge dynamics, passive and active mechanisms in stabilization and control, as well as insect-inspired flapping MAVs.

### **CV**

Hao LIU is professor of mechanical engineering at Chiba University, and director of Chiba University and Shanghai Jiaotong University International Cooperative Research Center (CU-SJTU ICRC). He was a senior research scientist in RIKEN (2000~2003), an assistant professor in Nagoya Institute of Technology (1998~2000), a research scientist in Japan Science and Technology Agency (JST) (1993~1997), and a research scientist in Ship Research Institute (1992~1993). He received a BS degree from Dalian University of Technology in 1985 and received his MS and PhD degrees, both in fluid engineering, in 1989 and in 1992, respectively. He is the author and a co-author of more than 170 papers in refereed journals, mainly dealing with computational mechanics, biomechanics in flying and swimming, fluid-structure interaction, biomimetics, insect-inspired micro air vehicles, and bio-inspired engineering as well as multi-scale, multi-physical modeling of the cardiovascular system, and predictive medicine. He is serving as an associate editor-in-chief of *Acta Mechanica Sinica* and editorial members of *Biomimetics & Bioinspiration and Journal of Bionics Engineering*. He has given more than 80 seminars and invited lectures in internationally reputed institutions and conferences, and has been a guest chief scientist of RIKEN, a visiting chair professor at Shanghai Jiao Tong University, visiting professors of Chinese Academy of Sciences' Graduate School and The Hong Kong University of Science and Technology. His professional views have been quoted in several news media, including NHK, AFP, Thomson Reuter, Yomiuri-Shimbun, Asahi-Shimbun, Nihon Keizai Shimbun, Nikkan Kogyo Shimbun as well as the Science Channel Network of the JST.