ONR MURI Review Meeting ✦ Princeton, NJ

Hydrodynamics of Non-traditional Propulsion Bio-inspired Flexible Propulsors For Fast, Efficient Swimming: What Physics Are We Missing?

✦ Thursday, Sept 29th 2016 ✦

Time	Content	Presenter
08:00 – 08:30	**Registration and Breakfast**	
08:30 – 08:35	**General Introduction and local logistics**	**Lex Smits (Princeton)**
08:35 – 08:45	Opening Remarks	Dr. Bob Brizzolara
08:45 – 09:15	Project Overview	Hilary Bart-Smith (UVA)
SESSION 1: Speed and Efficiency in Thunniform Swimming		
09:15 – 10:15	Tuna swimming kinematics	George Lauder (Harvard)
	Propulsion by passively flexible foils: tuna tail shape and flexibility and use of pressure distributions for force estimation (TUNA SESSION?)	George Lauder (Harvard)
	Role of peduncle on swimming performance: real and artificial	Greg Lewis & Roger Zhu (UVA)
	Effect of spanwise flexibility on the performance of a bio-inspired tuna tail	Pan Han, Junshi Wang, Roger Zhu (UVA)
10:15 – 10:45	Discussion	
10:45 – 11:15	**Break**	
SESSION 2: Speed and Efficiency in Cetacean Swimming		
11:15 – 12:45	Overview	Frank Fish (West Chester)
	Dolphin swimming kinematics	Frank Fish (West Chester)
	Optimal fluke flexibility in orca's fast and efficient swimming	Yan Ren, Haibo Dong (UVA)
	How smooth is a dolphin?	Dylan Wainwright (Harvard)
	Morphology and physical properties of the cetacean tail fluke	Will Gough (West Chester), Greg Lewis (UVA)
	Investigating the wake structures and performance of a simplified model of a flexible cetacean peduncle and fluke	Samane Zeyghami (Lehigh)

12:45 – 13:15	Discussion	
13:15 – 14:00	**Lunch**	
SESSION 3: Speed and Efficiency in Salmonidae Swimming		
14:00 – 15:00	Overview	George Lauder/ Haibo Dong
	Three-dimensional swimming kinematics of trout and pressure distribution around the body	George Lauder (Harvard)
	How trout swim: hydrodynamic advantages of body-fin interaction and caudal fin flexibility	Geng Liu, Pan Han (UVA) Lauder Group (Harvard)
	Intermittent swimming in trout: 2 studies Analysis of a hydrofoil intermittently swimming in a viscous flow Geng Liu (UVA), Emre Akoz (Lehigh) Intermittent swimming of a self-propelled flexible hydrofoil in an inviscid flow Emre Akoz (Lehigh)	
15:00 – 15:30	Discussion	
15:30 – 16:30	**Lab tour**	
18:00	**Dinner (Prospect House)**	

Friday, Sept 30th 2016

Time	Content	Presenter
08:00 – 08:30	**Breakfast**	
SESSION 4: Fundamental Physics: "Rules for Swimming"		
08:30 – 10:30	Overview	Lex Smits (Princeton)
	Non-sinusoidal waveform actuation, with sensitivity analysis	Lex Smits, Clancy Rowley (Princeton)
	Adjoint-based optimization of waveform shape	Clancy Rowley (Princeton)
	Feedback control for pitch-heave flapping maneuvers	Clancy Rowley (Princeton)
	Scaling laws of self-propelled swimming: Physical and cyber-physical experiments for efficient and high thrust propulsion	Keith Moored (Lehigh), Lex Smits (Princeton)
	Unifying rules for aquatic locomotion	Mehdi Saadat (Harvard)
	An evolving swimming gait: Evolutionary optimization of a non-sinusoidal and intermittent swimming gait	Fatma Ayancik (Lehigh)
	Bio-inspired flow sensors for feedback control	Joe Zhu (UVA)
10:30 – 11:00	Discussion	
11:00 – 11:30	**Break**	
SESSION 5		
11:30 – 12:15	Three-dimensional vortex wake structure of fish-like propulsion	Justin King, Rajeev Kumar, Melissa Green (Syracuse)
12:15 – 13.00	Wake Signatures and Optimal Design of Underwater Sensory Systems For Wake Detection	Eva Kanso (USC)
13:00 – 13:30	**Lunch and close of meeting**	