From super water repellency to drag reduction

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Interaction of Water with Surfaces

plants & leaves

ponds & insects

soil

The Natural World

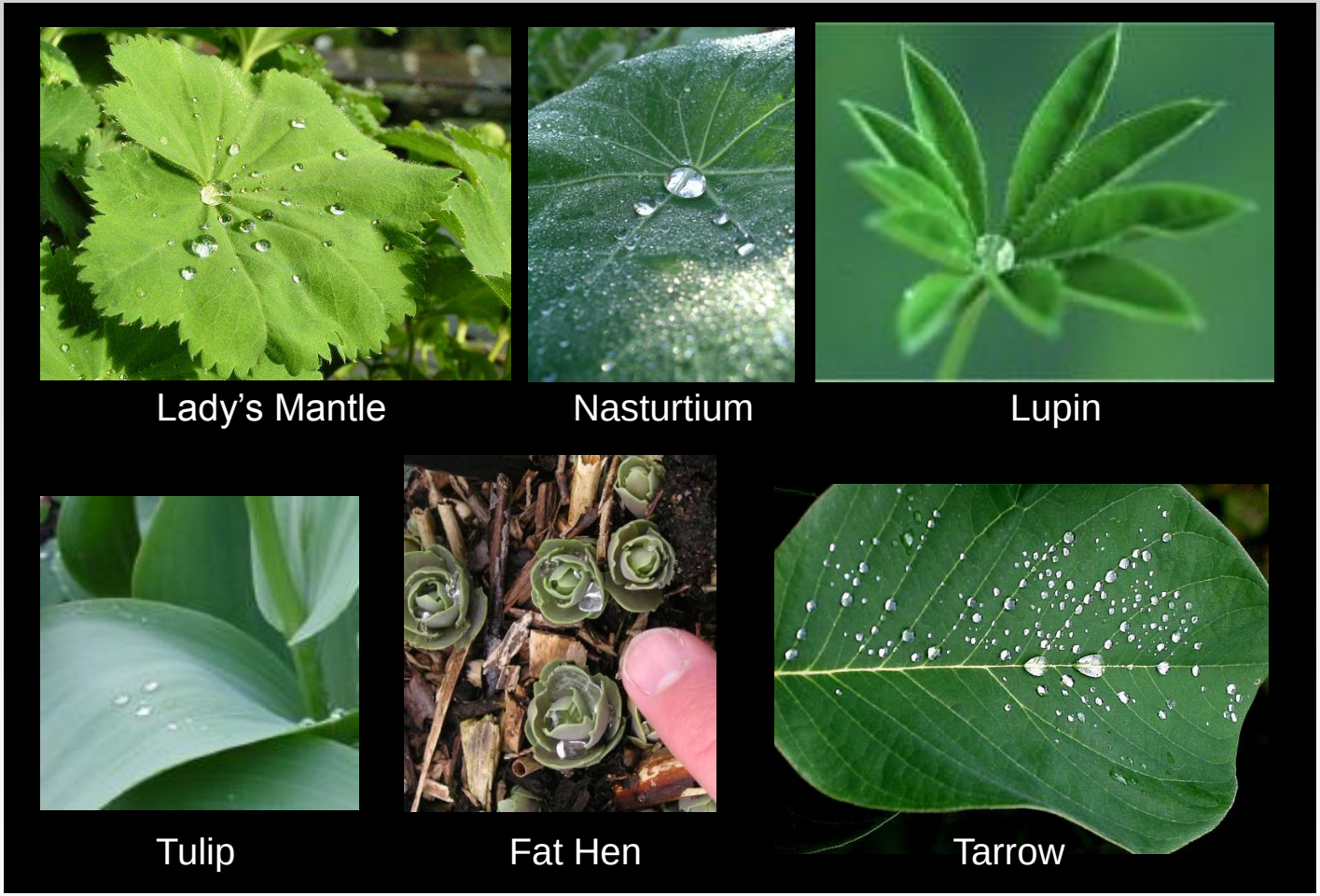
channels

clothes

windows & roofs

The Man-made World

Super Water Repellence: Plants and Leaves



Lady's Mantle, Honeysuckle, Fat Hen, Tulip, Daffodil, Sew thistle (Milkweed), Aquilegia, Nasturtium, Cabbage/Sprout/Broccoli (Image Sources: Various)

Size Matters: Fact or Fiction?

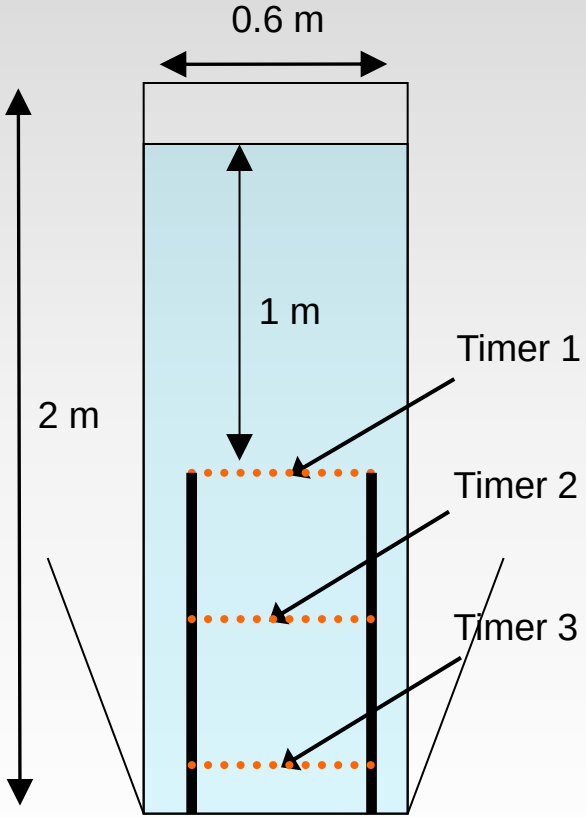
The Movie – Antz (1998)

Courtesy: BigWave Productions

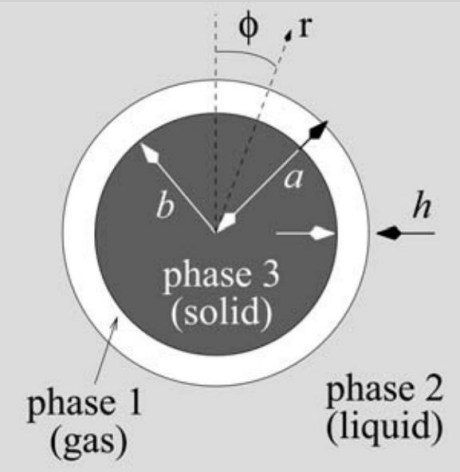
Is it just imagination?
Or could it happen?

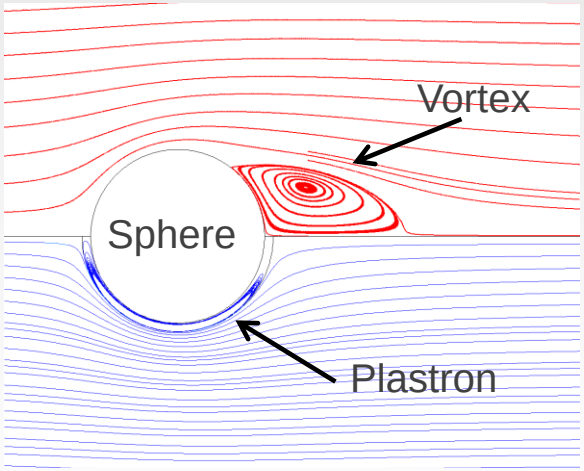
Experiment: Stokes Drag and Terminal Velocity

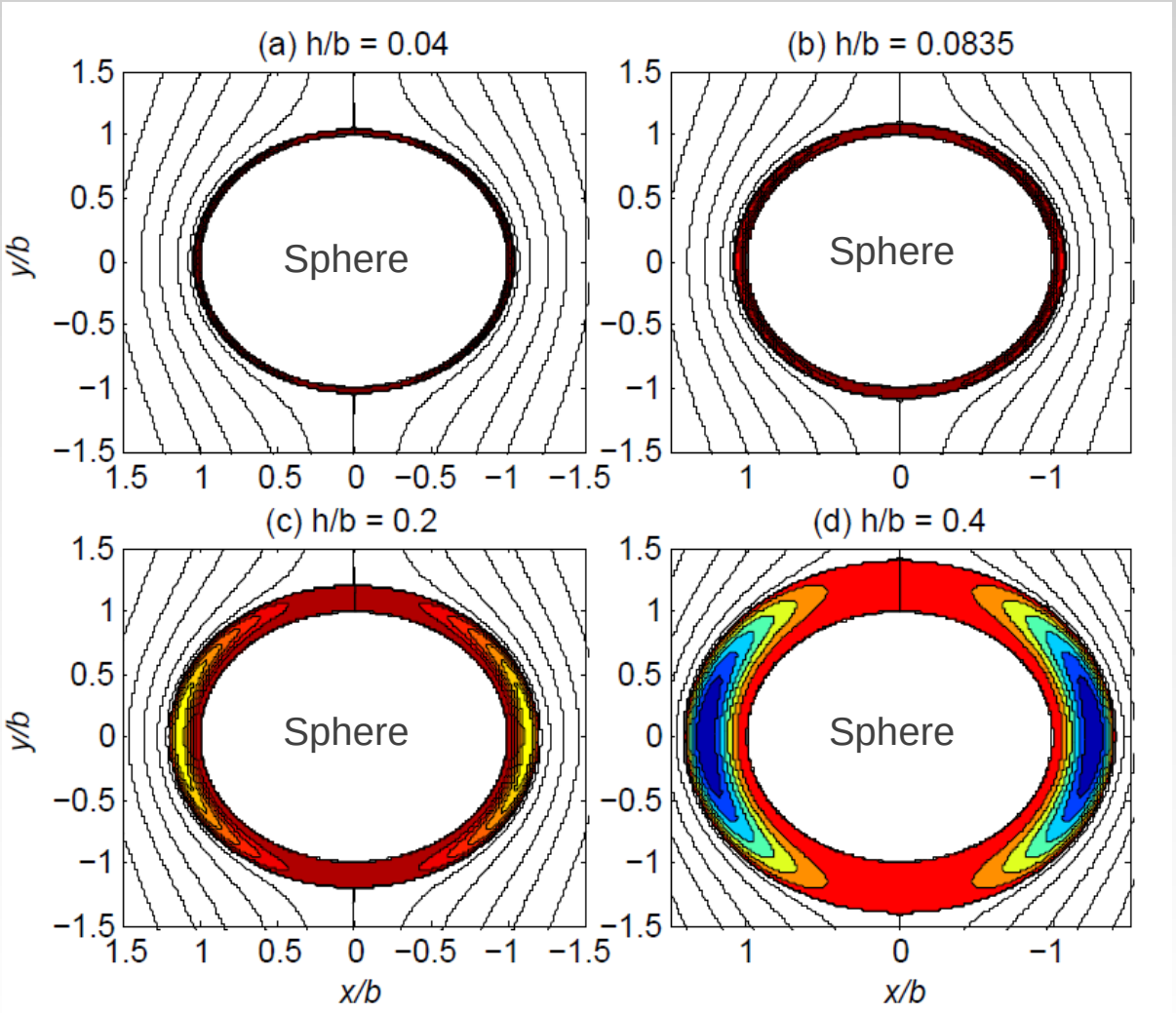
In the presence of a fluid, a falling object eventually reaches a terminal velocity. Textbooks tell us that in water the terminal velocity does not depend on the surface chemistry …. But is that true?



Perfect Superhydrophobicity – Drag Reduction







B. Gruncell & ND. Sandham (Southampton)

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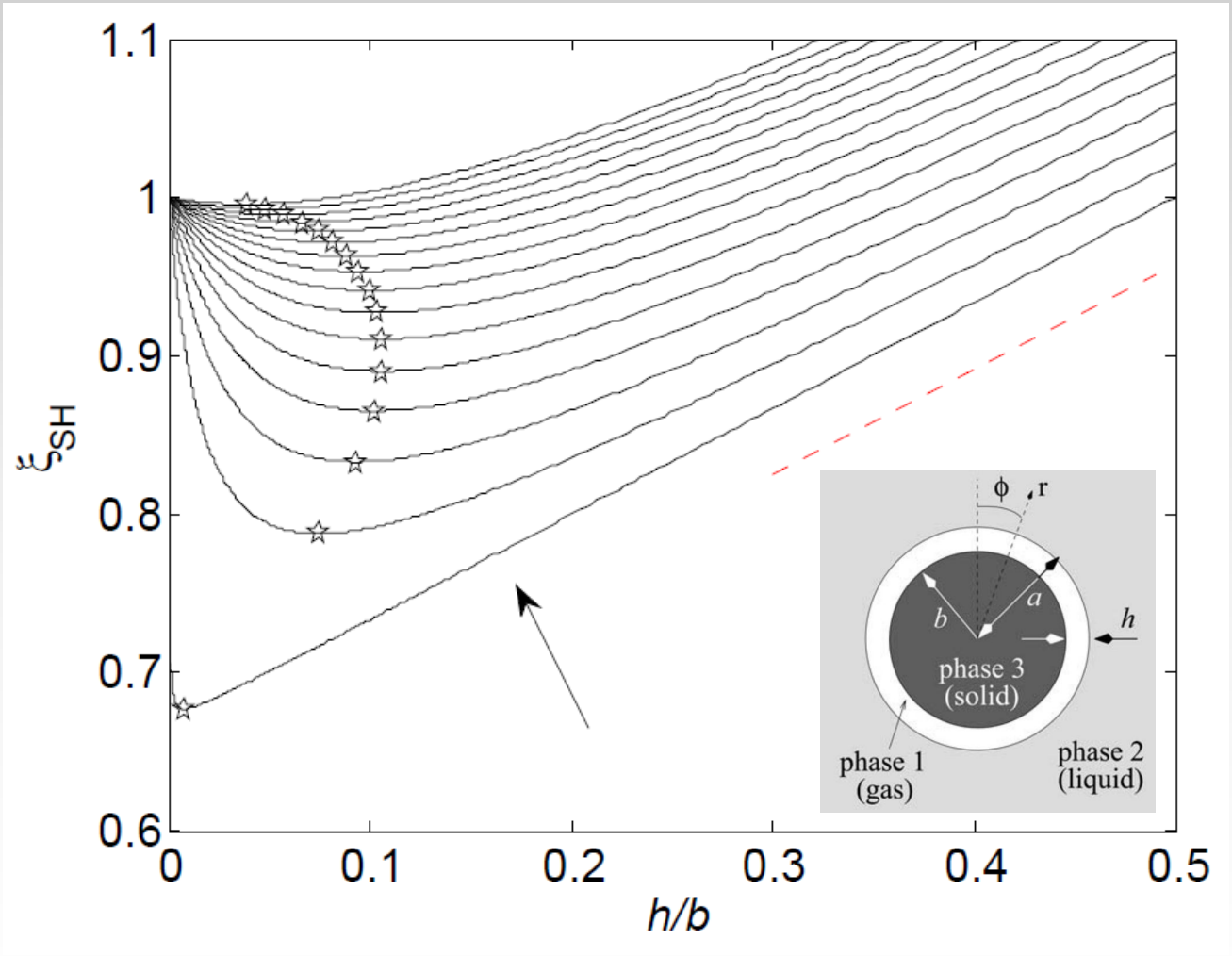
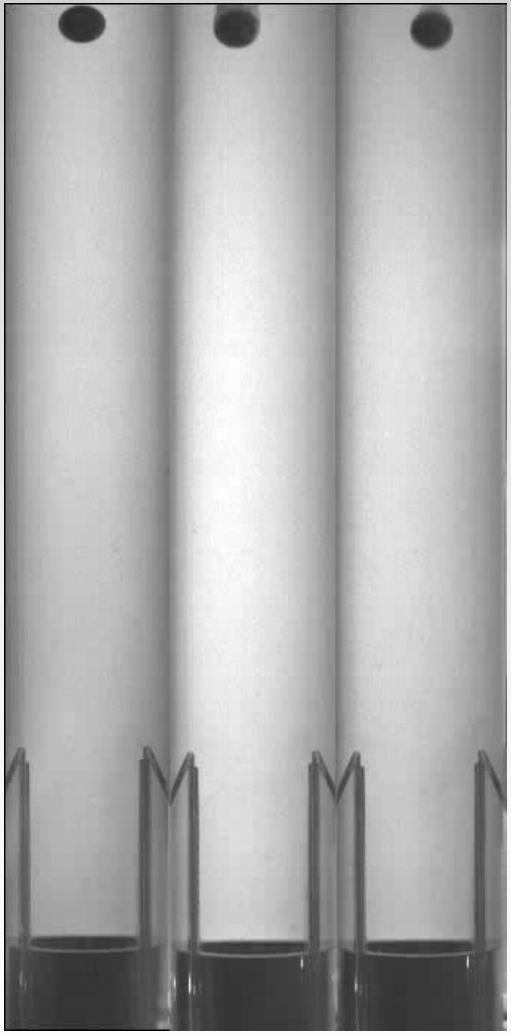
Theory: Bubble and Plastron Drag Reduction

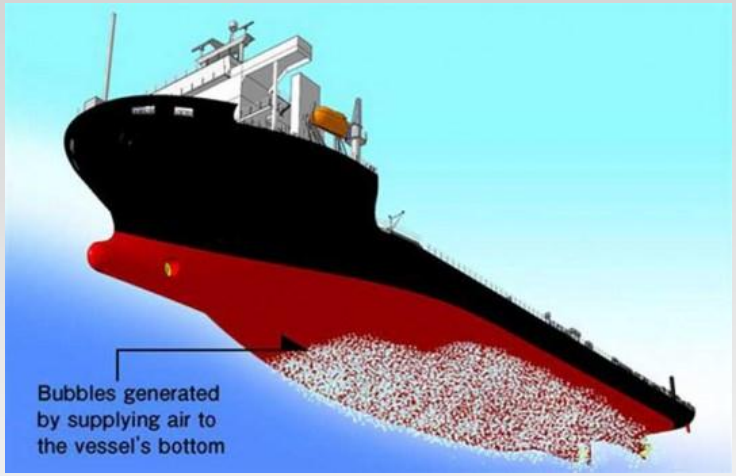


Vakarelski et al's Leidenfrost Experiments



Active Air Lubrication Does Exist

Mitsubishi Air Lubrication Concept



Dutch Air Chamber Energy Saving (ACES)

On November 29 (2010), NYK-Hinode Line Ltd. took delivery of a new module carrier* that was built at the Koyagi Plant of Mitsubishi Heavy Industries' Nagasaki Shipyard & Machinery Works. The vessel, named *Yamato*, has been equipped with an innovative air-lubrication system that uses bubbles to reduce frictional resistance. *Yamato* is the second vessel to *Yamatai*, which is the world's first vessel for overseas transport to have permanent installation of air-lubrication system

Materials Methods for Passive Air Lubrication

The question my research addresses is:

Can the combination of hydrophobicity and micro- and/or nano-structured topography create not only super water repellence, but also a surface coating giving air-lubrication and drag reduction without the active input of energy?

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