

Title: Physics in Nature Presentation: Seed Dispersal, What a Drag?

Date: Aug 19, 2011 09:00 AM

URL: <http://pirsa.org/11080095>

Abstract:

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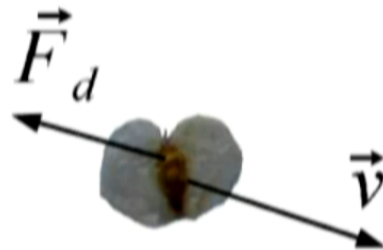
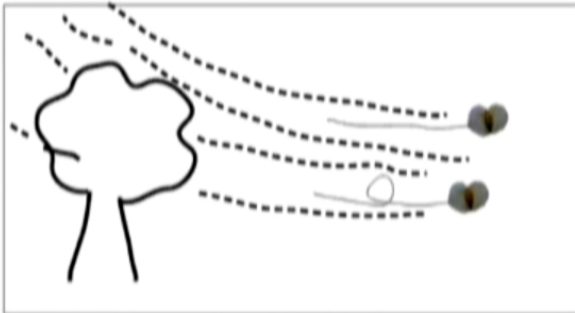
Seed dispersal

-What a drag?

Hjalmar Eriksson
PSI 2011/12



Wind dispersal



\vec{F}_d — drag force, velocity dependent



Drag equation

ρ – fluid density

A – area

v – velocity

C_d – drag coefficient

At terminal velocity

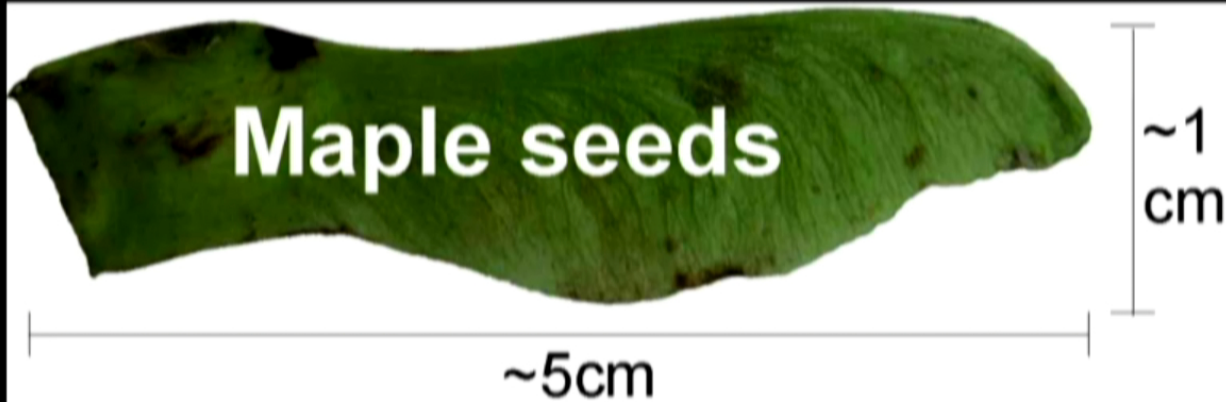
$$\vec{F}_{tot} = m \vec{g} - \vec{F}_d = 0 \quad \Rightarrow \quad C_d = \frac{2mg}{A \rho v_{term}^2}$$

Birch seeds

$m \sim 0.3\text{mg}$
 $r \sim 2\text{mm}$
 $v \sim 0.44\text{m/s}$



Gives $C_d \sim 1.9$



$m \sim 0.25g$
 $v \sim 1.3m/s$

Gives $C_d \sim 5$
VERY LARGE

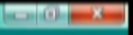
But maple seeds spin creating lift:

http://www.youtube.com/watch?v=WLBalf3ofTs&feature=player_detailpage

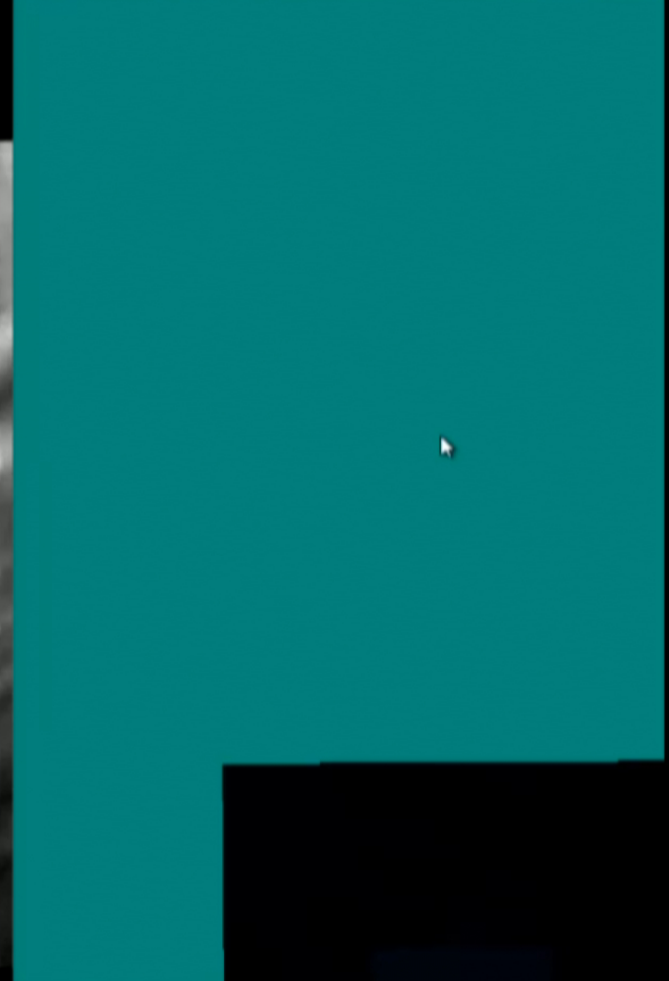
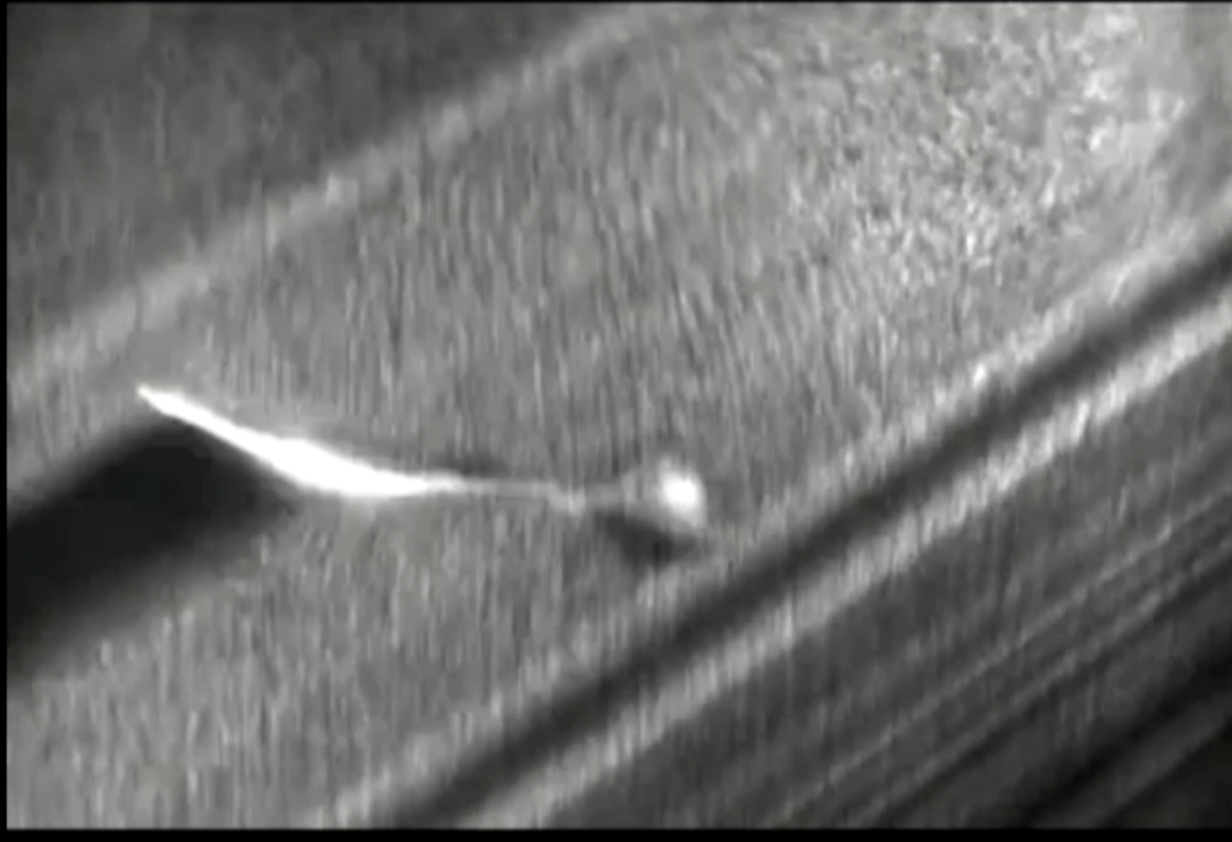


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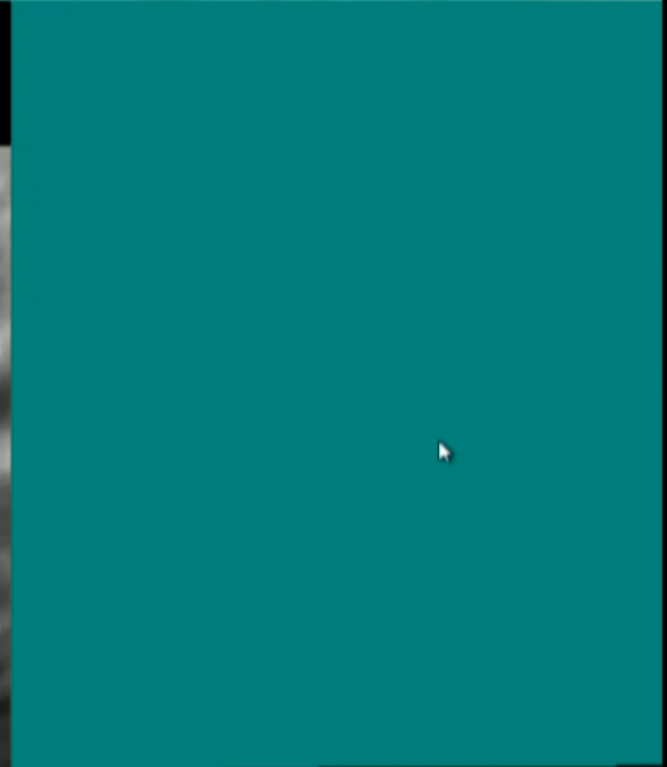
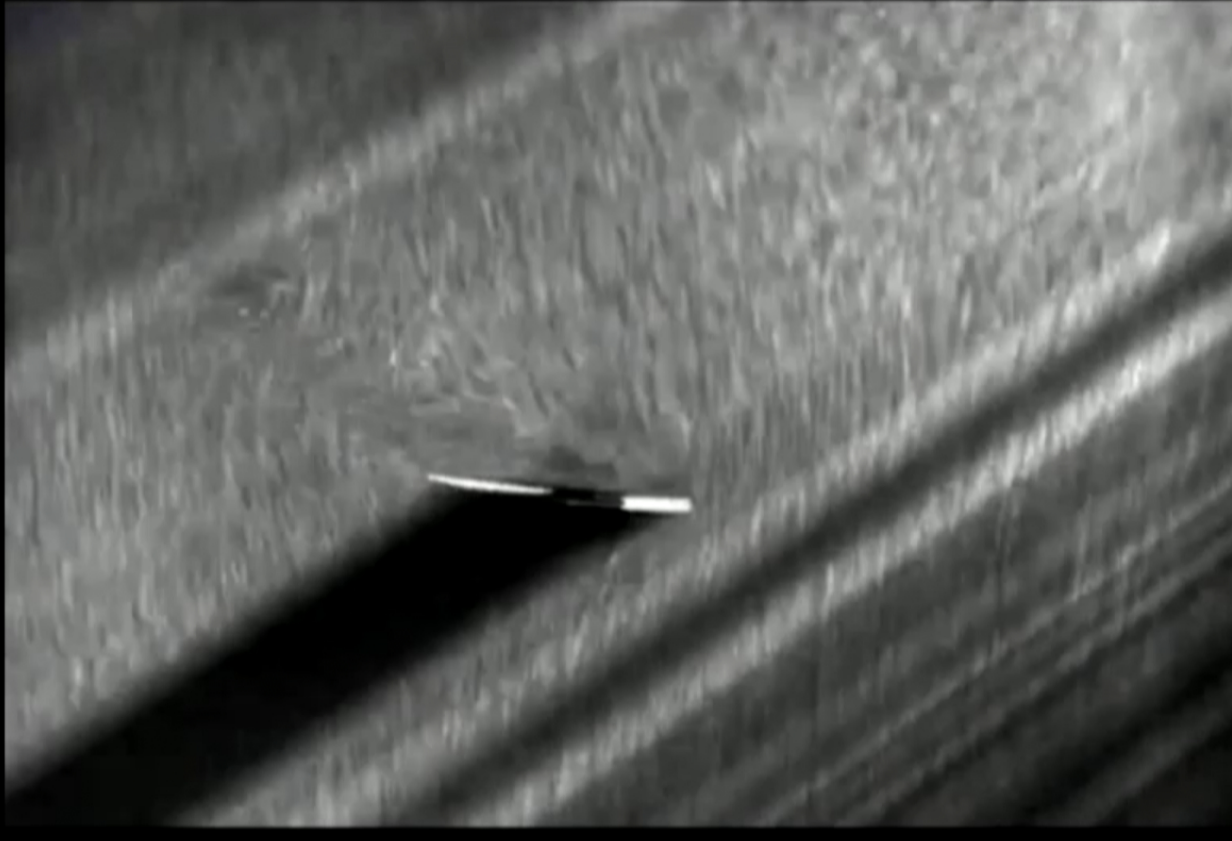
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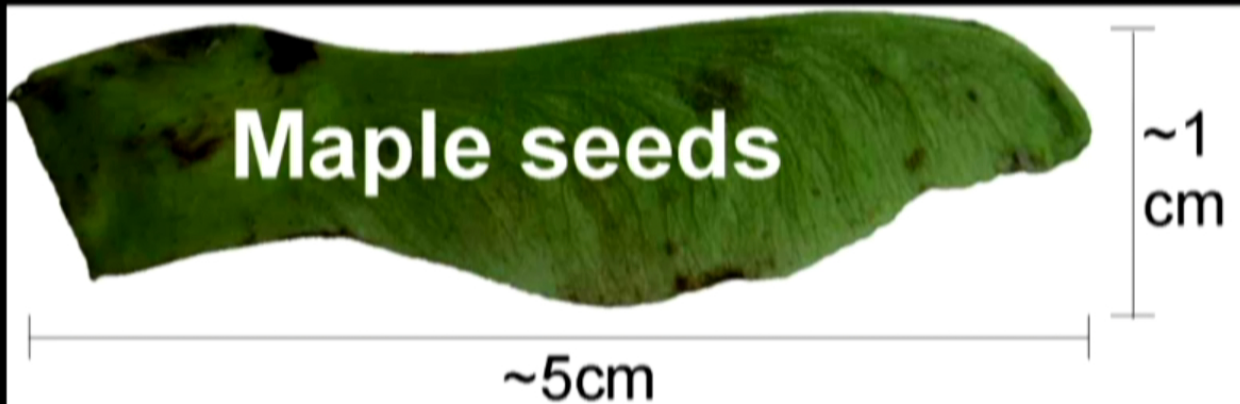


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$m \sim 0.25g$
 $v \sim 1.3m/s$

Gives $C_d \sim 5$
VERY LARGE

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Maple seed flight

Lift equation

$$F_l = \frac{C_l}{2} \rho A v^2$$

Model seed \times 

$$F_l = \frac{C_l}{2} \rho l \int_0^L (\omega x + v_{term})^2 dx$$

$\omega \sim 5\text{rev/s}$ Gives $C_l \sim 2 >$ airplane wings

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**Other
strategies
for wind
dispersal**

means more interesting physics!

