

ME 592: **Fundamentals of Particle Image Velocimetry**

Lecture 1: Introduction

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Best* PIV reference!



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PARTICLE IMAGE VELOCIMETRY

A Practical Guide

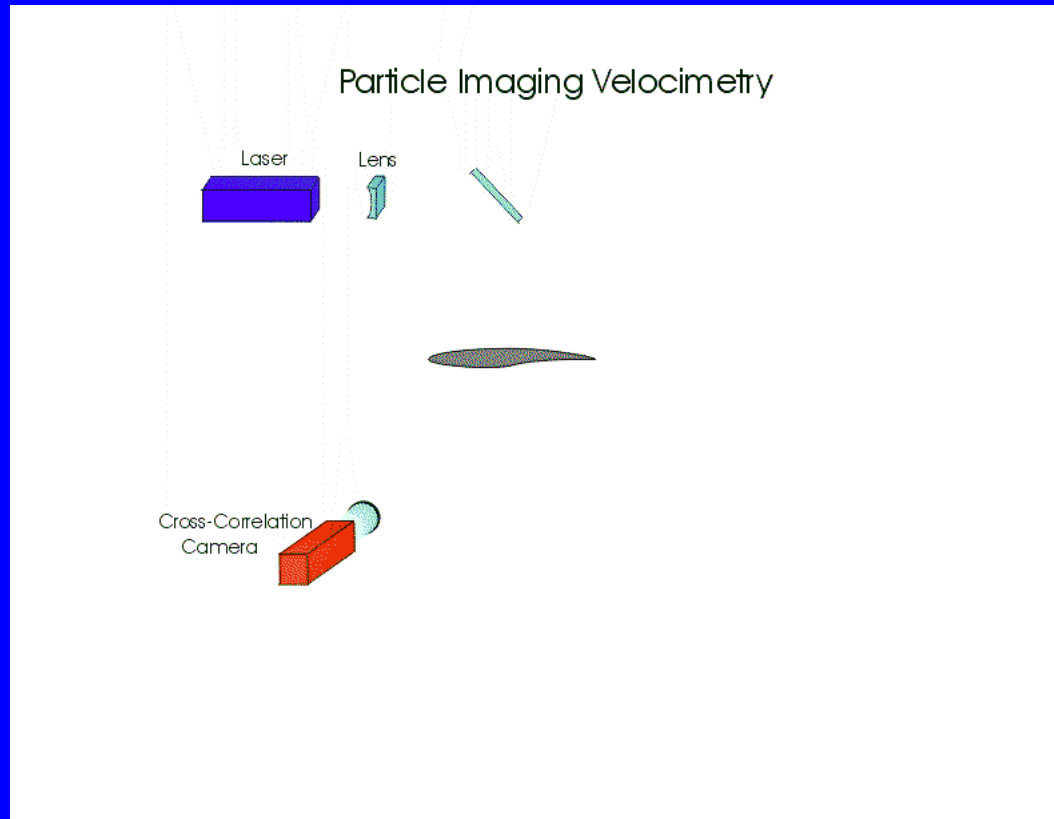


Second Edition

Springer

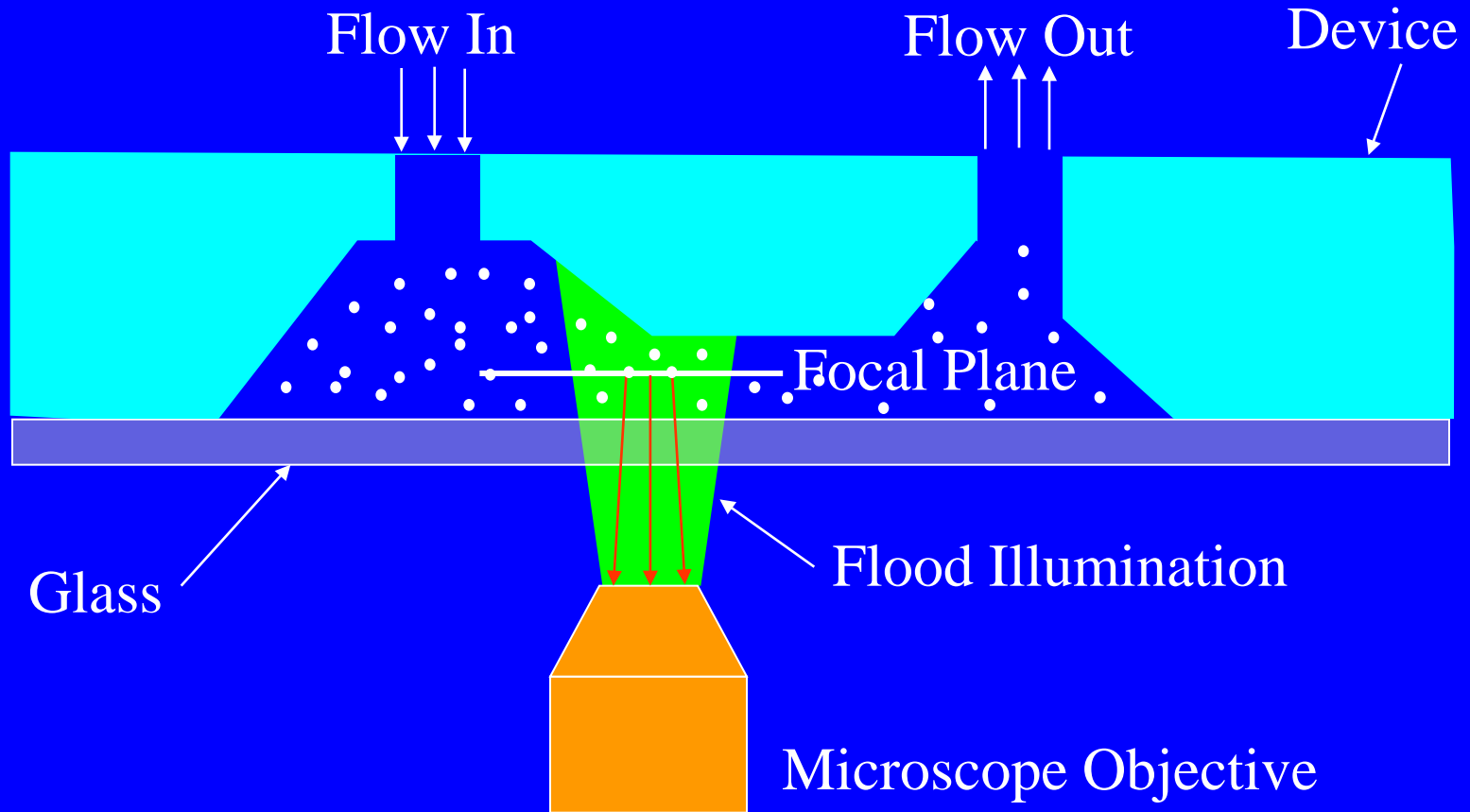
- 2nd edition of Springer PIV book published 2007
- Available *free of charge* from Purdue libraries through SpringerLink
- First assignment—read chapters 1 and 2
- *except for Adrian and Westerweel...

<http://www.lerc.nasa.gov/WWW/OptInstr/piv/pivdemo.htm>



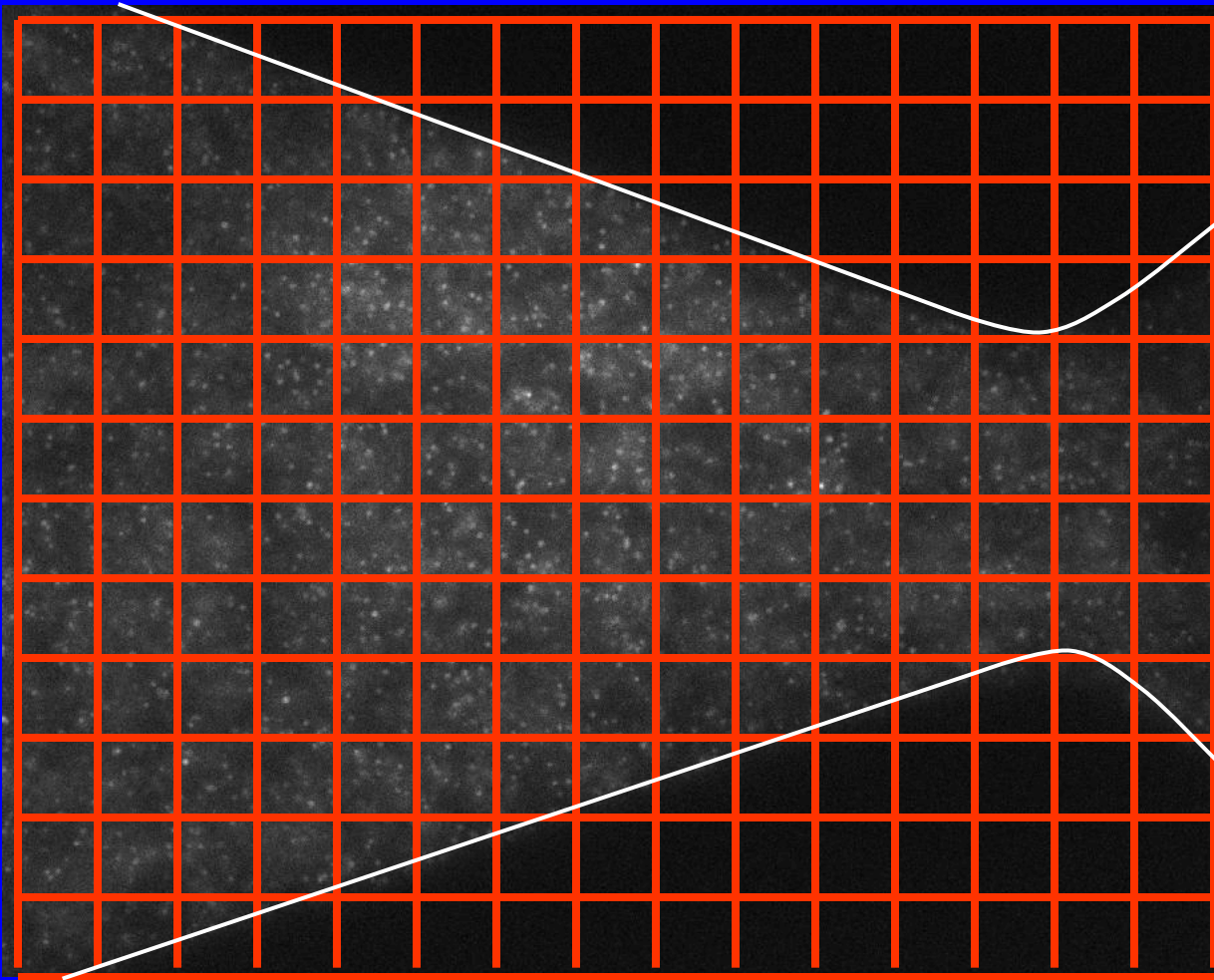
Courtesy of NASA Glenn Research Center

Micro-PIV Schematic



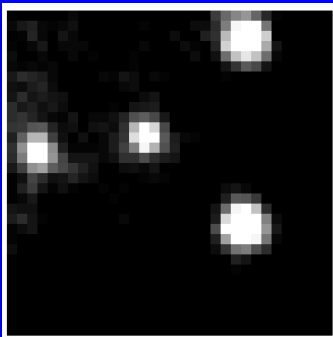
Typical Micro-PIV Image

Microthruster: Magnification 40x, particle size 700 nm



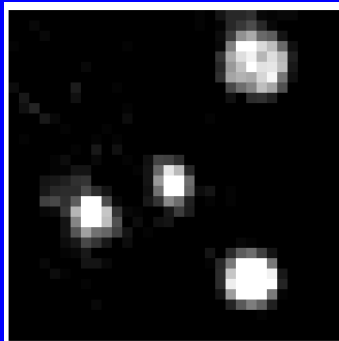
Cross-Correlation PIV

Interrogation Region #1



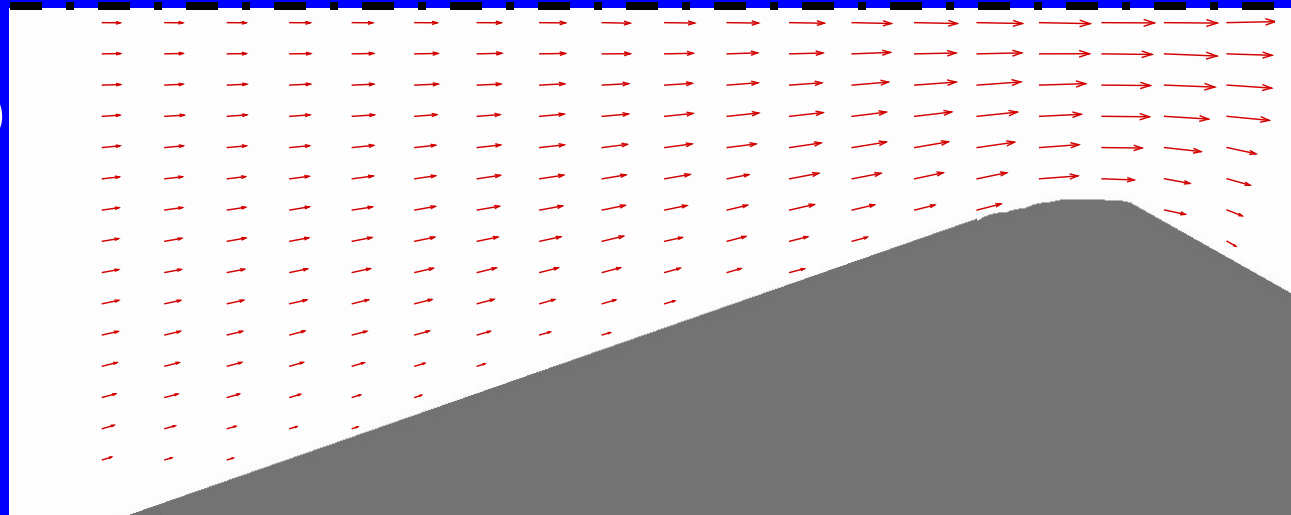
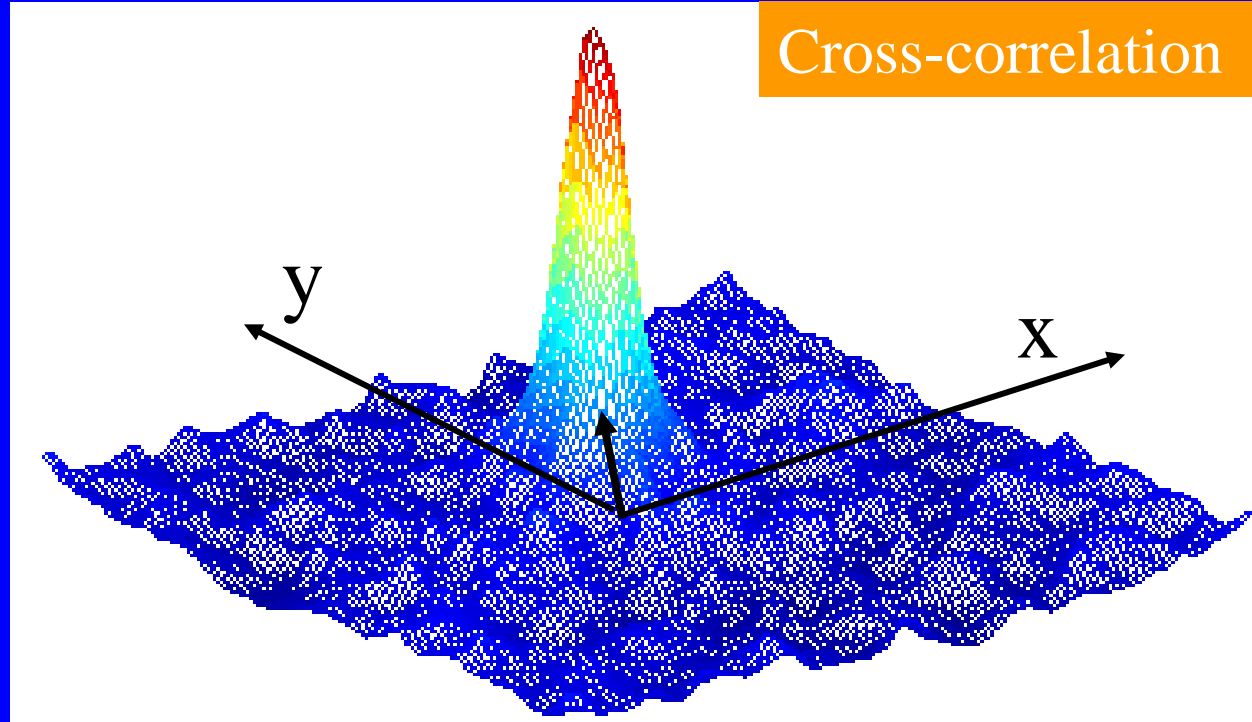
$f_k(i,j)$

Interrogation Region #2



$g_k(i,j)$

Cross-correlation



Microcantilever driven flow

collaboration with University of Colorado

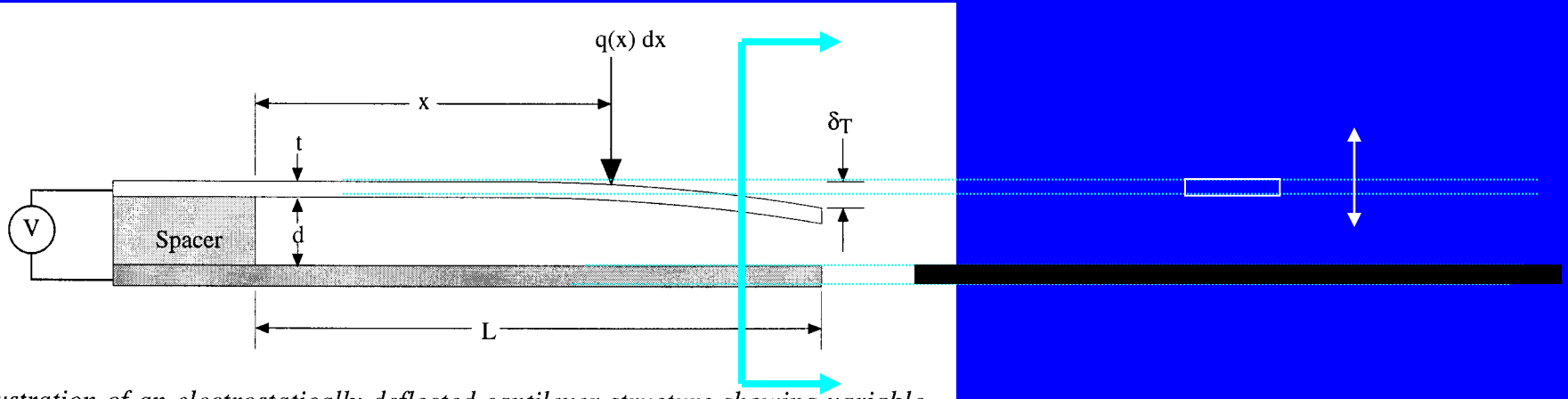
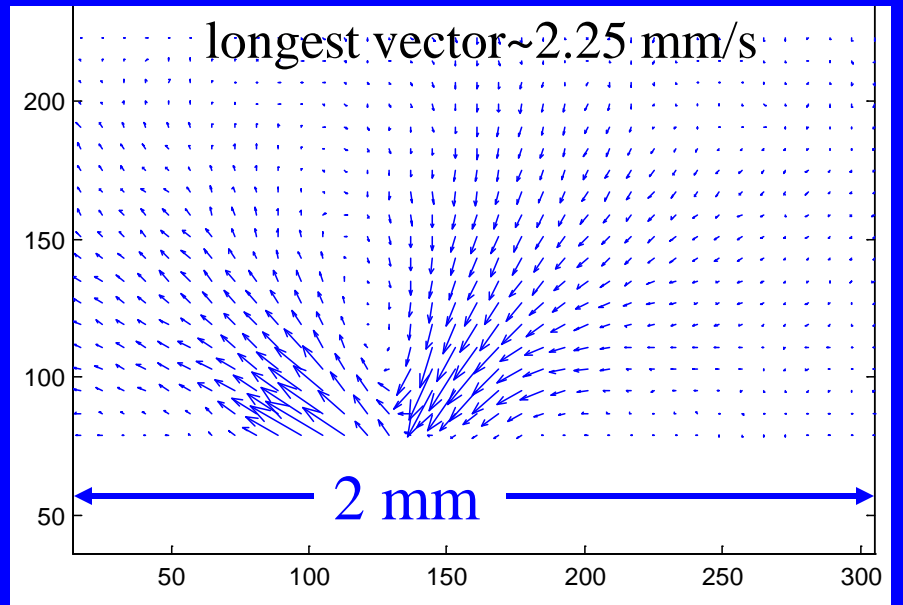
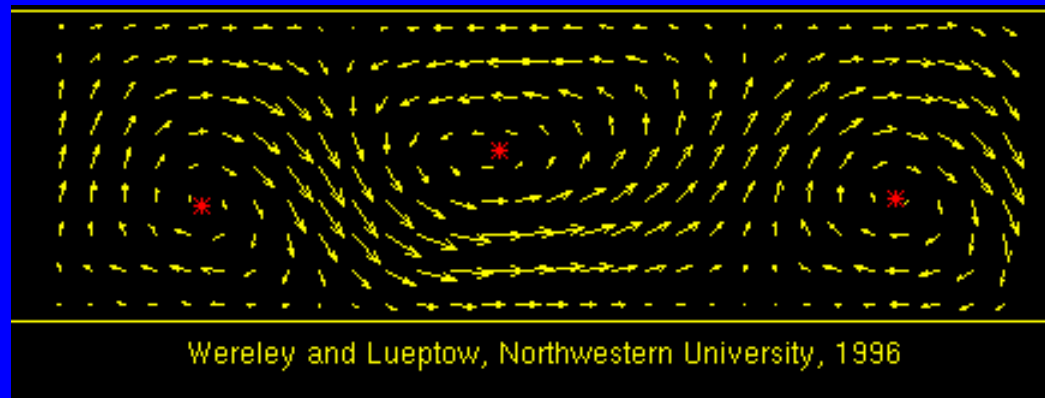
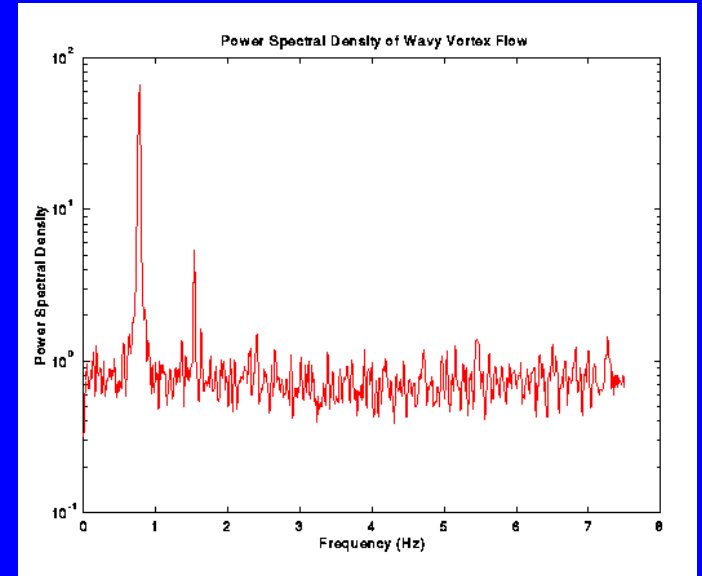
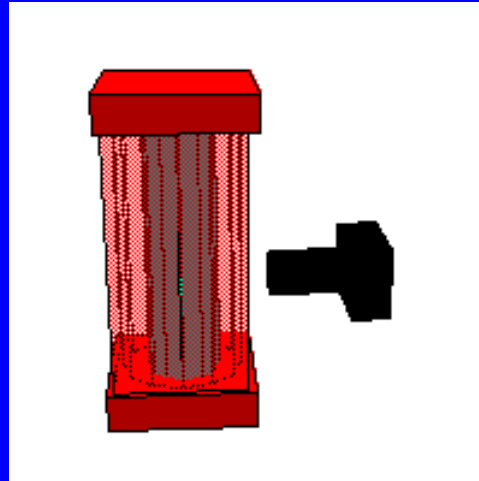
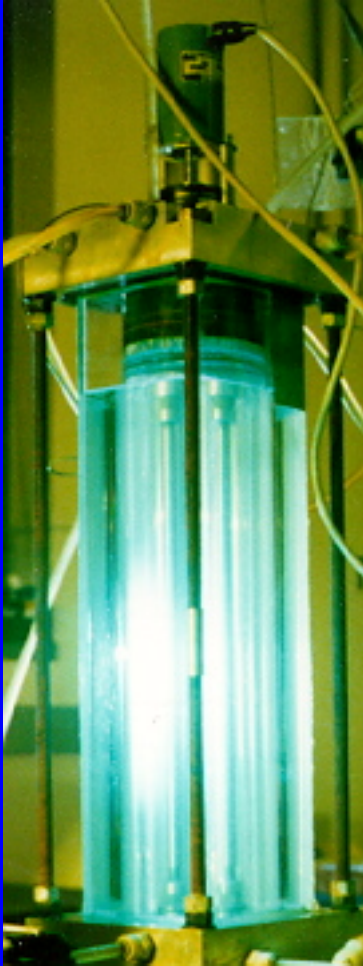


Illustration of an electrostatically deflected cantilever structure showing variable definitions for analysis. After Petersen (1978a).

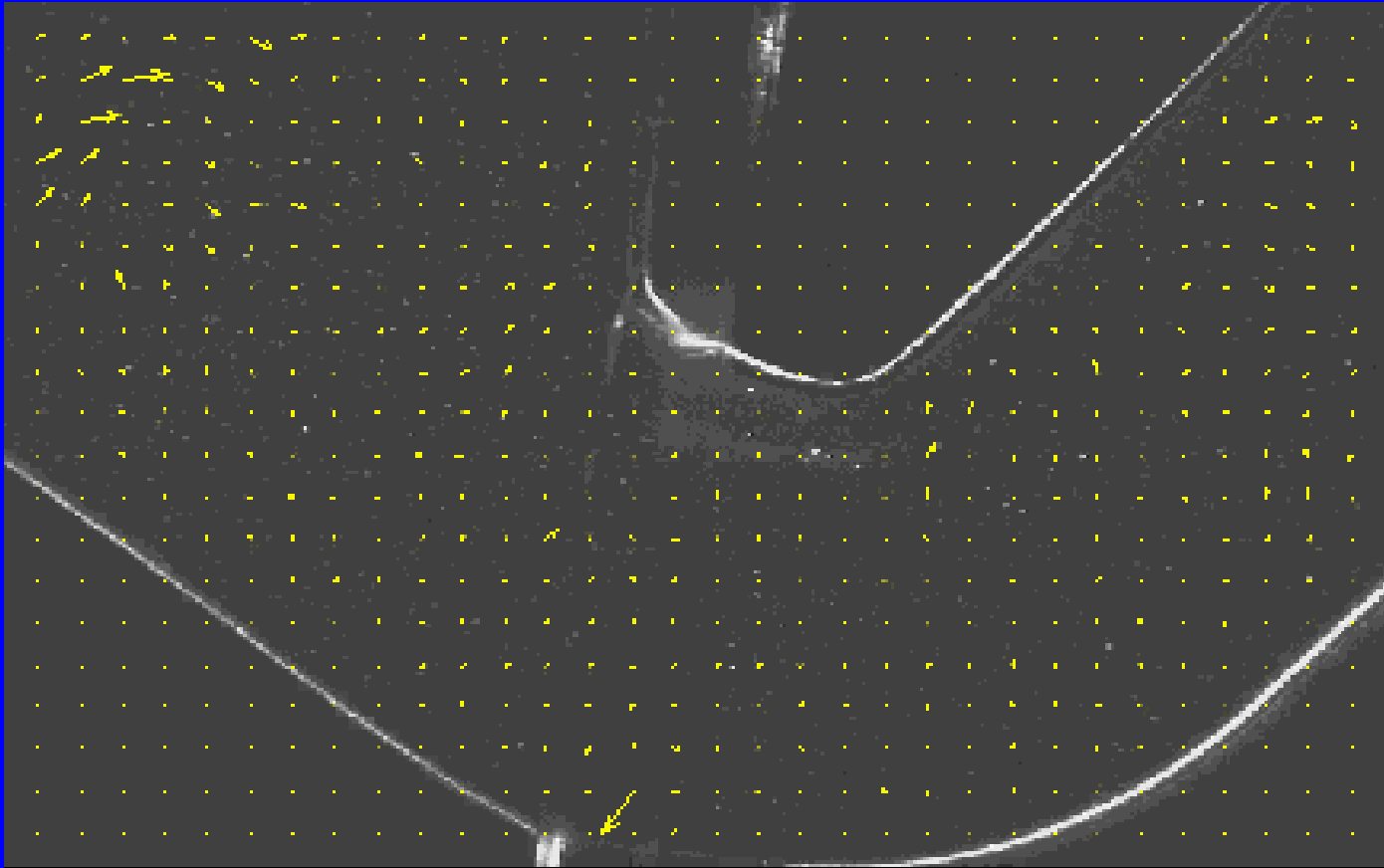


Rotating Filter Separator

my PhD work

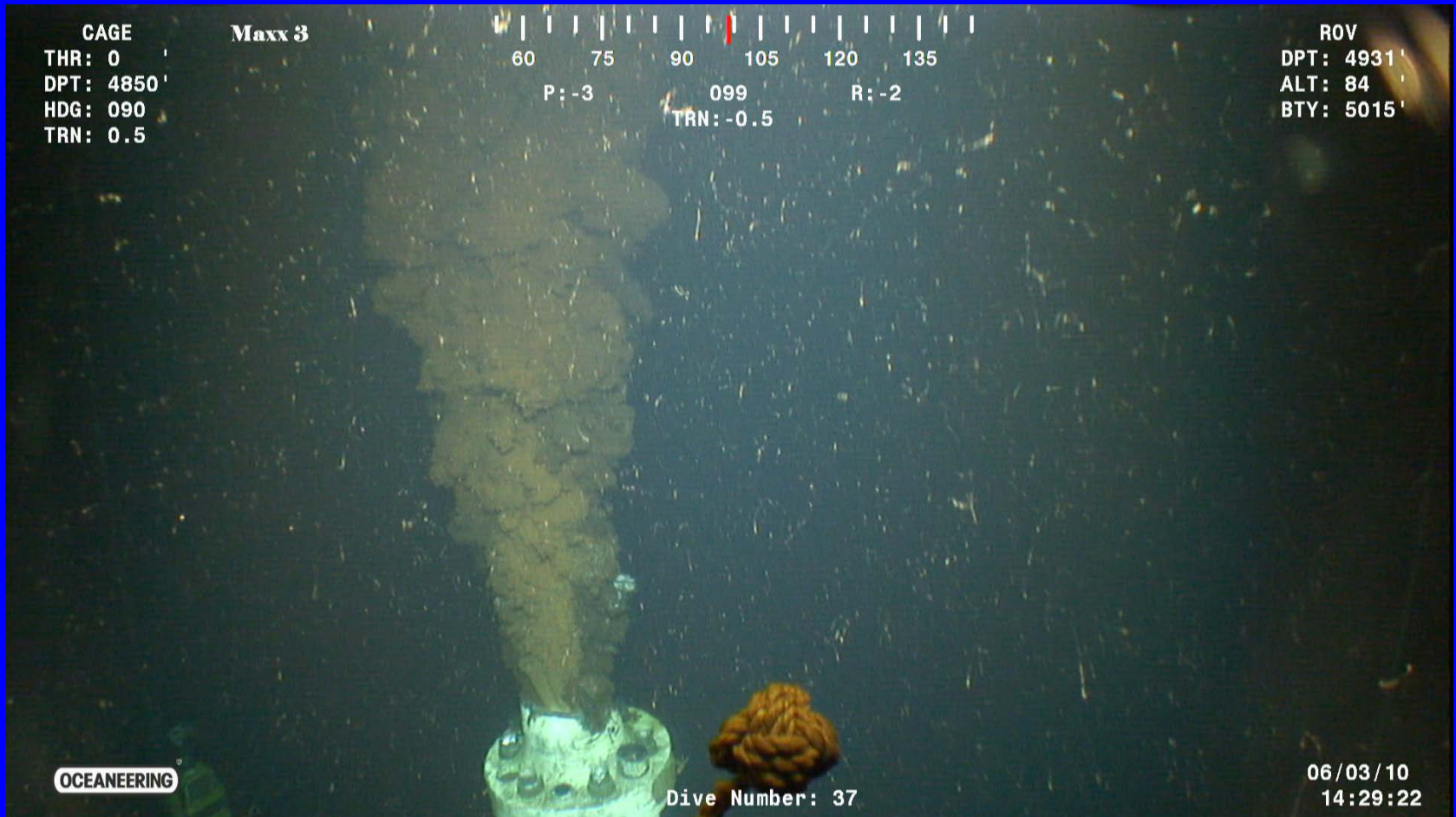


Flow through, er, plumbing fixtures consulting job



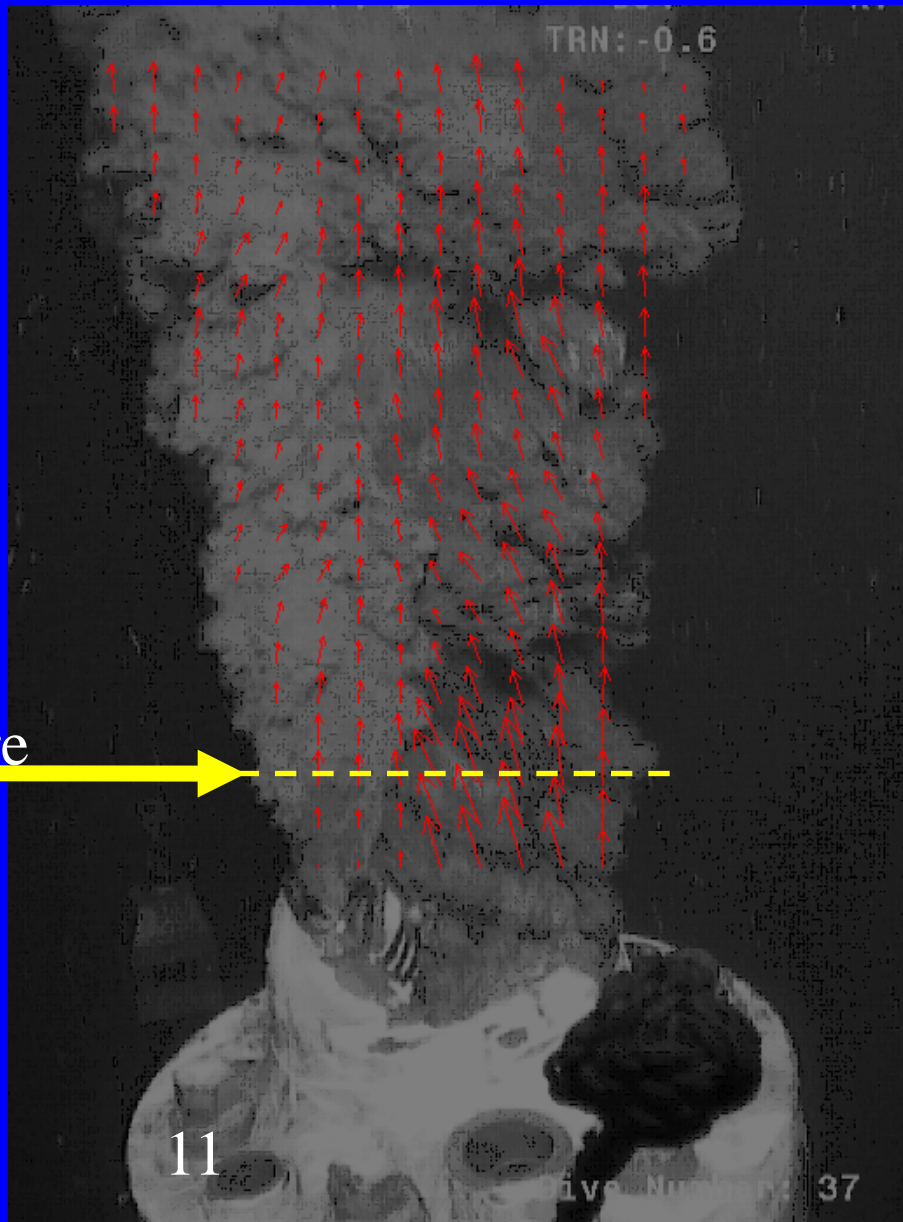
play movie

Oil Spill

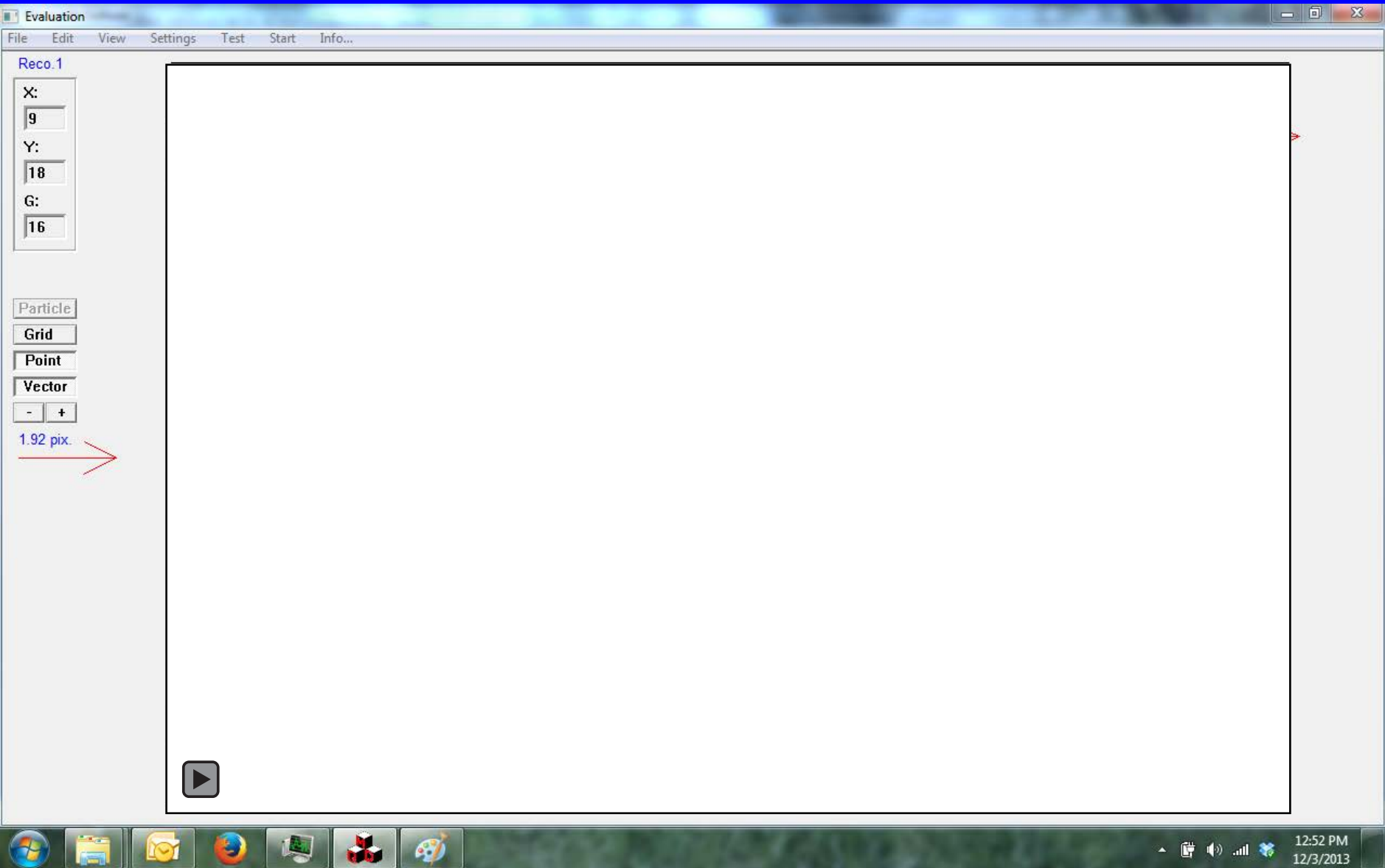


PIV results

Velocity calculated here
Avg disp 8.27 pixels

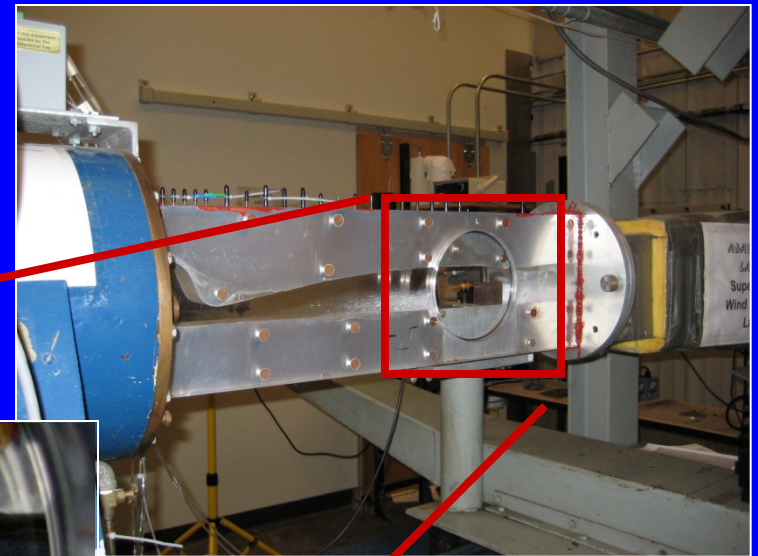


Student Projects

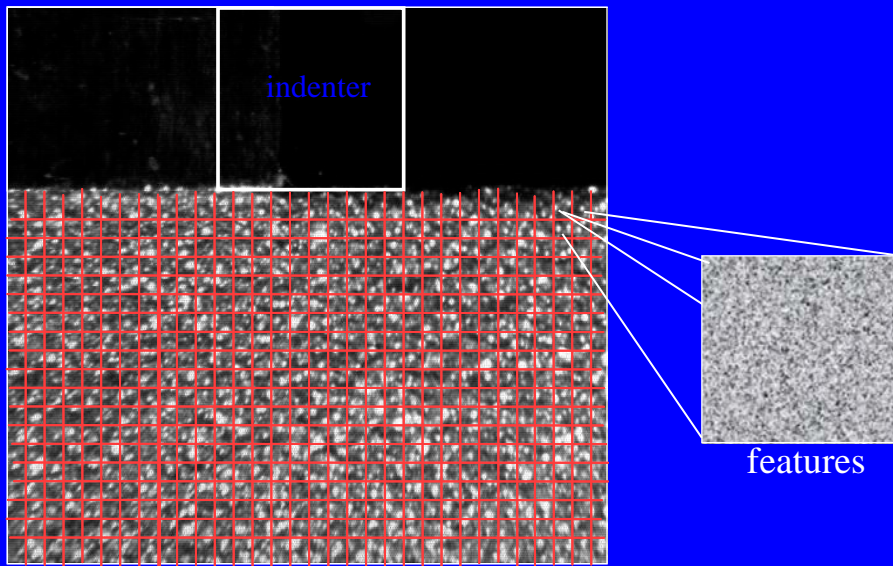


BOS Setup

- Purdue Mach 2.5 Supersonic Tunnel
- Models Tested
 - 25°, 0.24" Compression Ramp
 - Double Wedge
 - Heat Gun



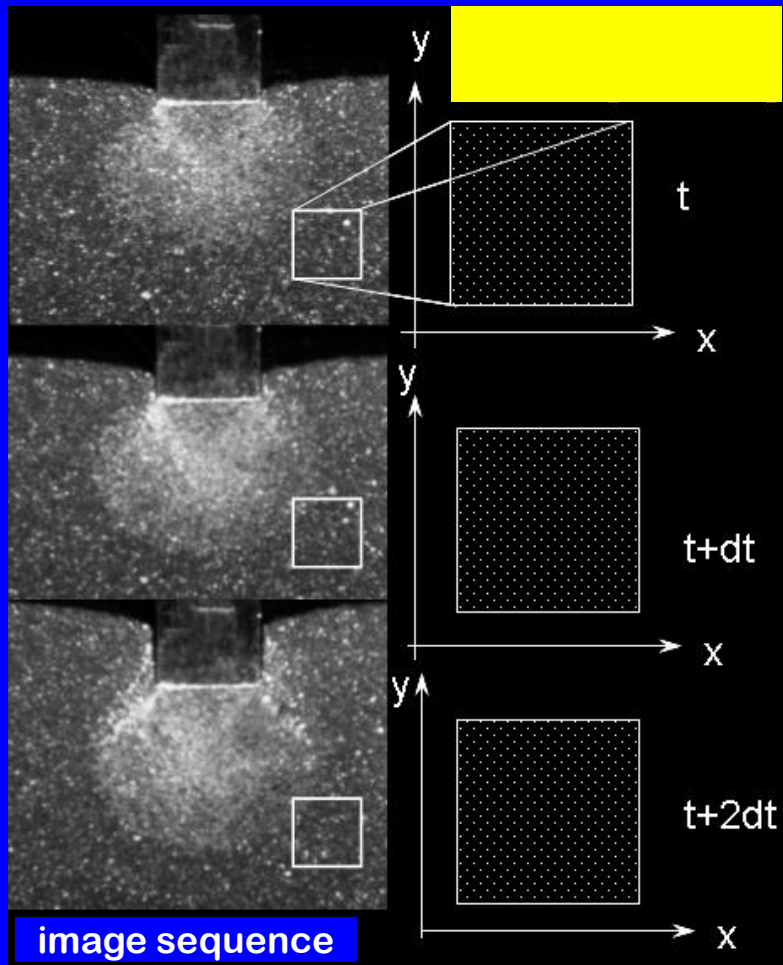
Particle Image Velocimetry (PIV)



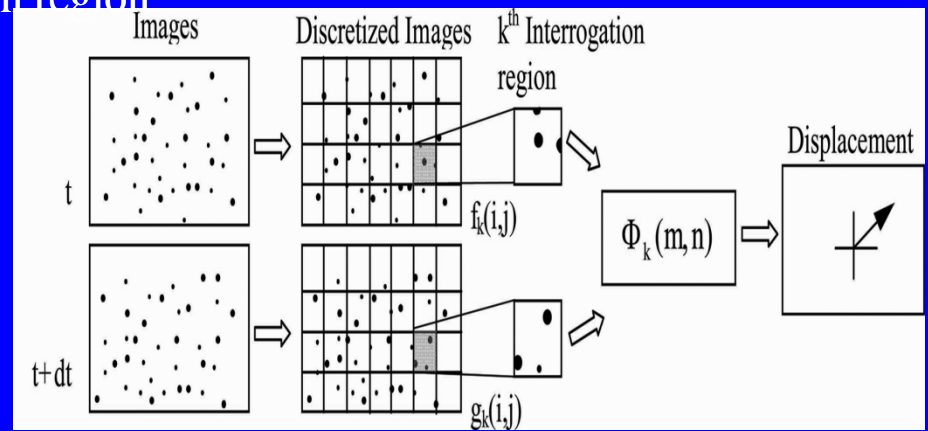
Punch Indentation

- Features created by abrasion
- Imaging during indentation
- “Artificial” grid is superimposed
- Displacements obtained by cross correlation

Particle Image Velocimetry (PIV)

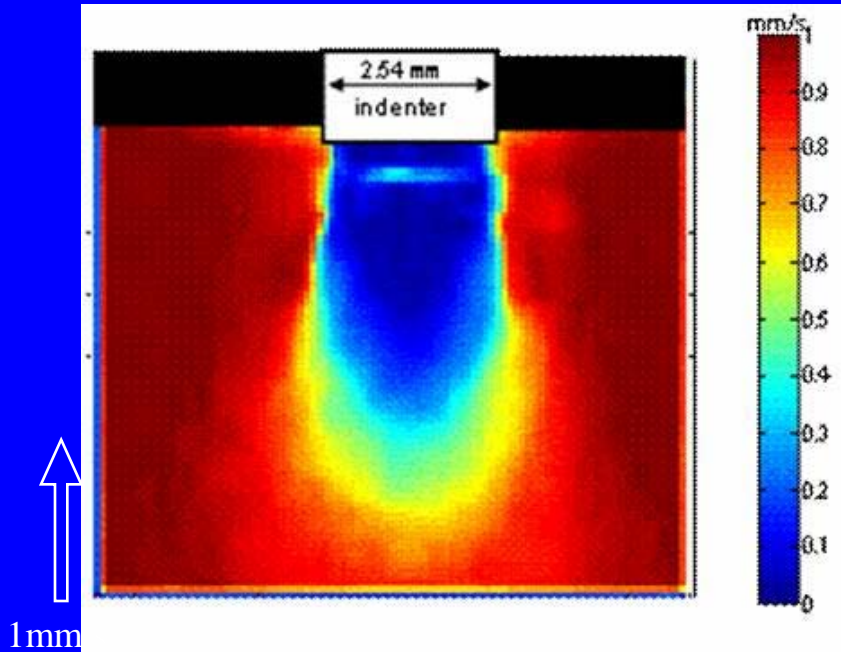


on region

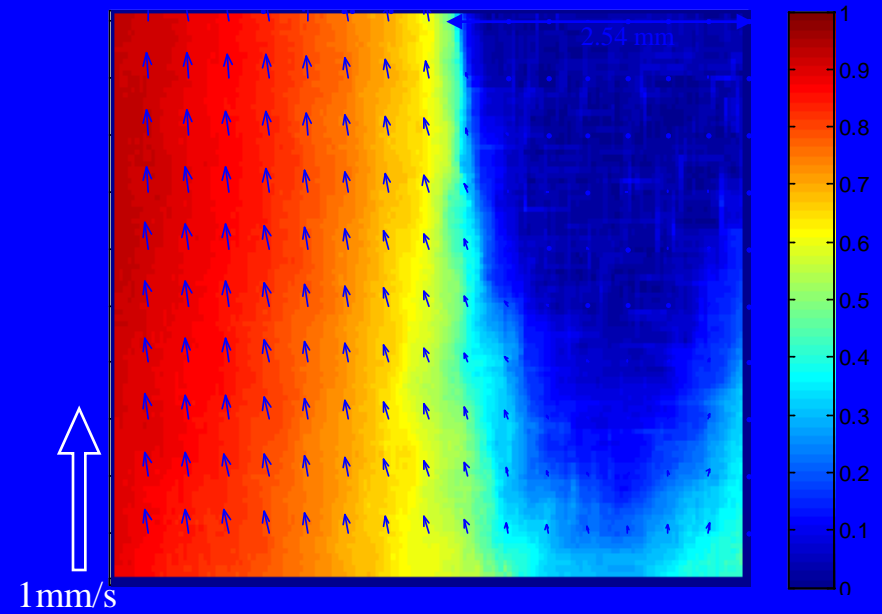


Velocity Field

Punch Indentation



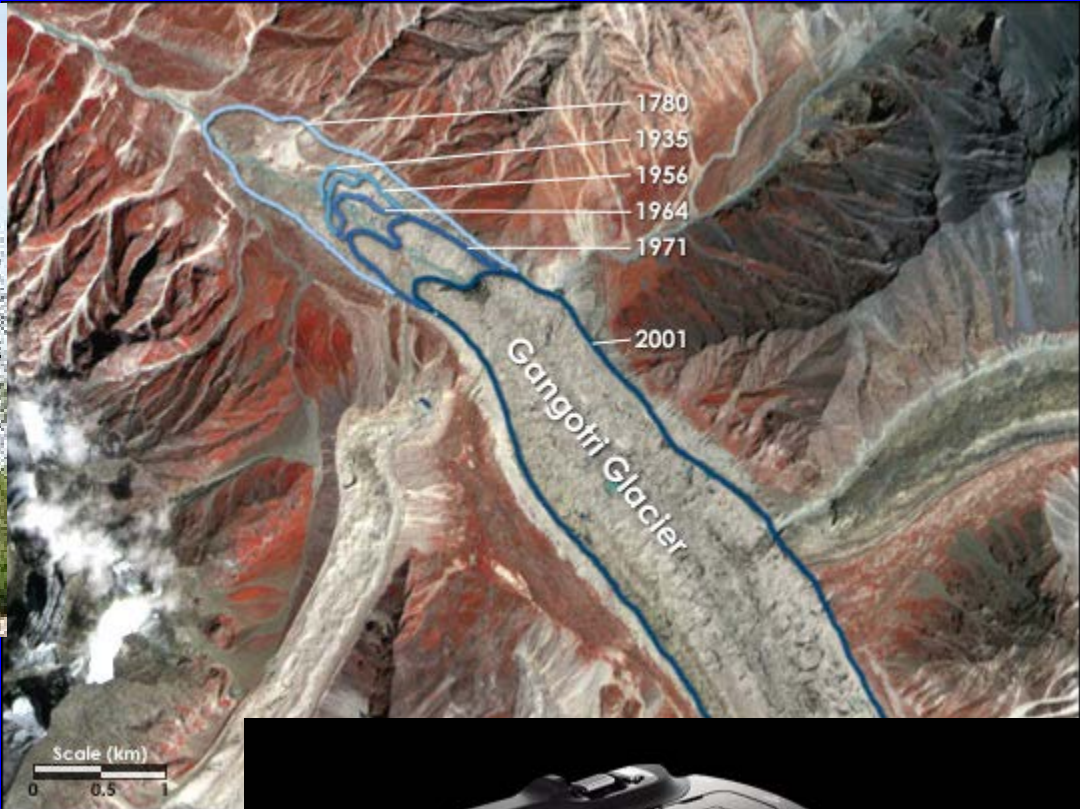
Low magnification
view



High Magnification
spatial resolution of 5 μm

Indentation speed of 1mm/s

Your possible project



Something
from your
own
research...

