

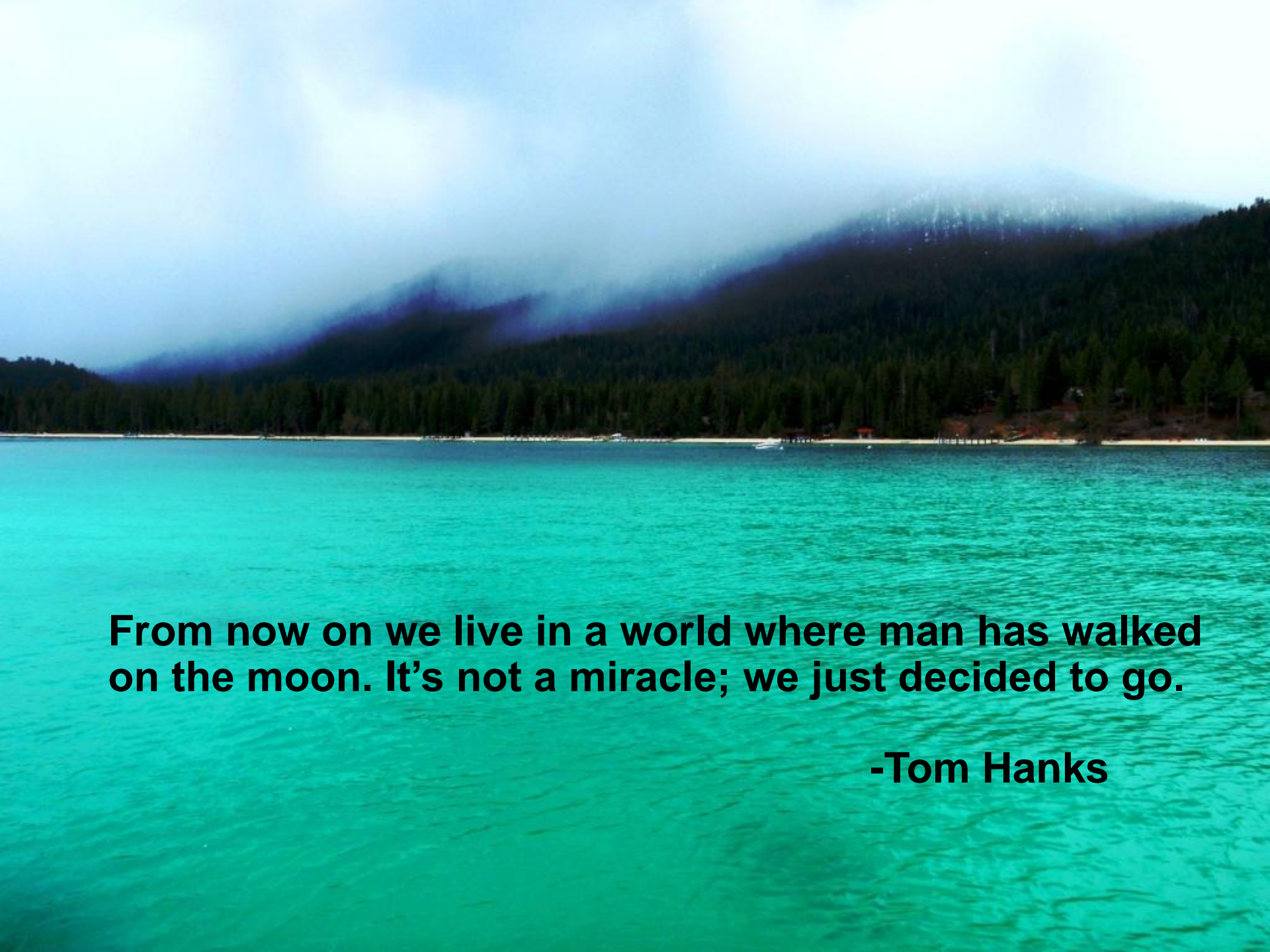
A microscopic image of water containing numerous small, dark, irregularly shaped particles. Some particles are elongated, while others are more rounded. A red scale bar in the top left corner indicates a length of 50 micrometers. The background is a dark, grainy grey.

50 μm

Methods for Assessing Fine Particle Number, Concentration and Size Distribution in Water

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John E. Reuter and
S. Geoffrey Schladow



From now on we live in a world where man has walked on the moon. It's not a miracle; we just decided to go.

-Tom Hanks

What's a particle?

Organic Particles

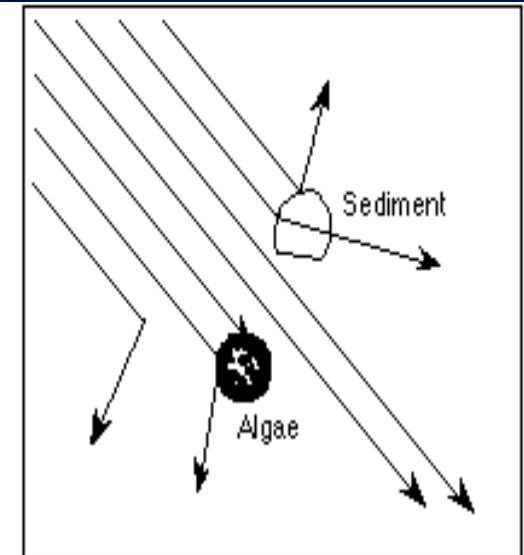
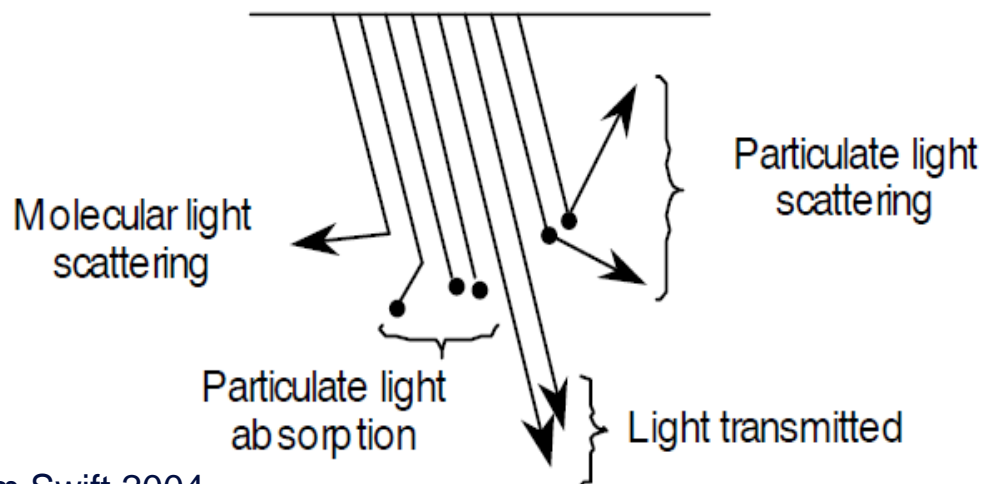
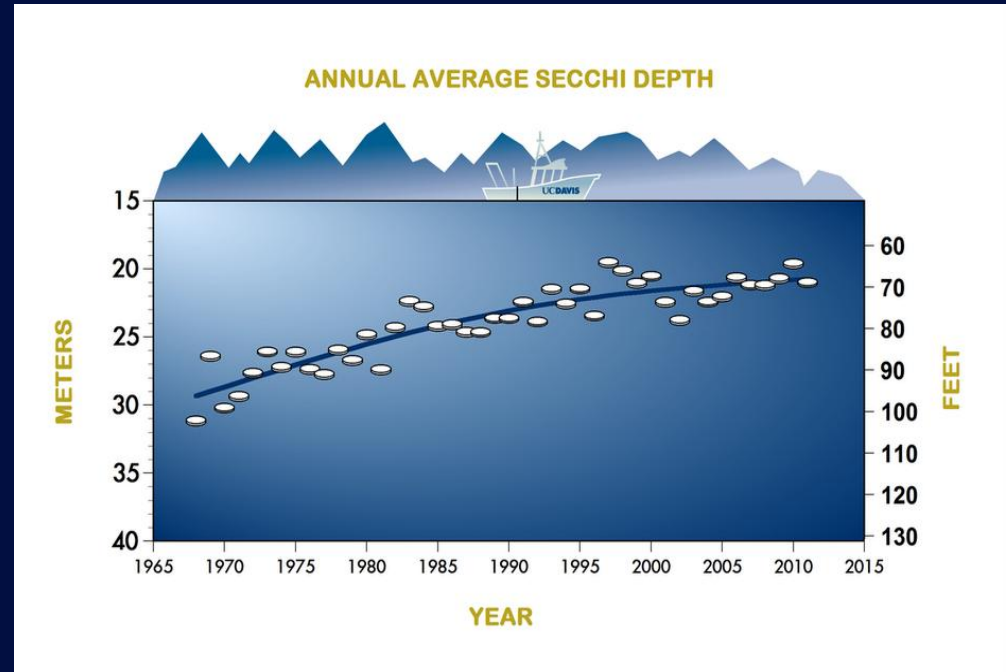
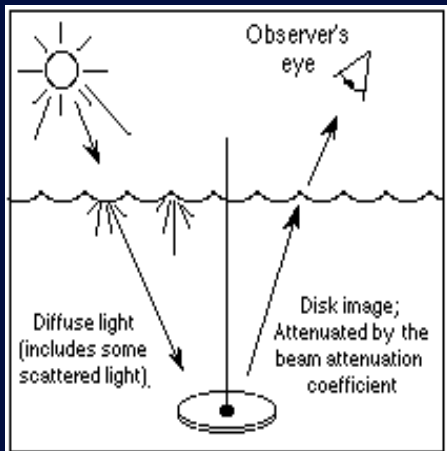


Inorganic Particles



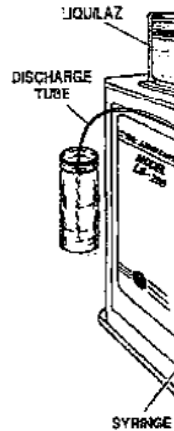
Why do I care about particles?

Jassby, A. D. et al. 1994
Swift, T. J., et al. 2006



From Swift 2004

Measuring Particle Size Distribution



LS-2
(Pat)

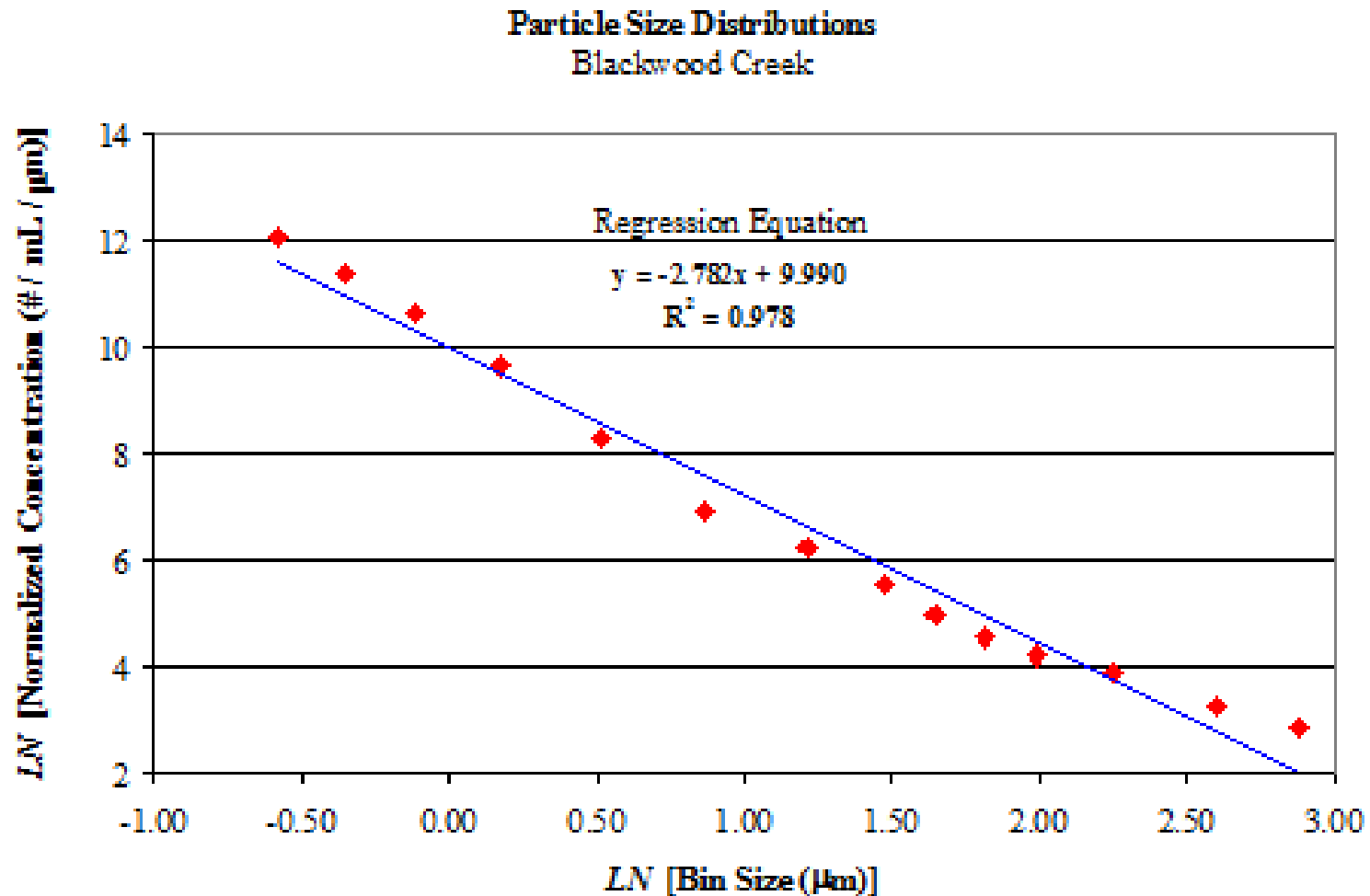
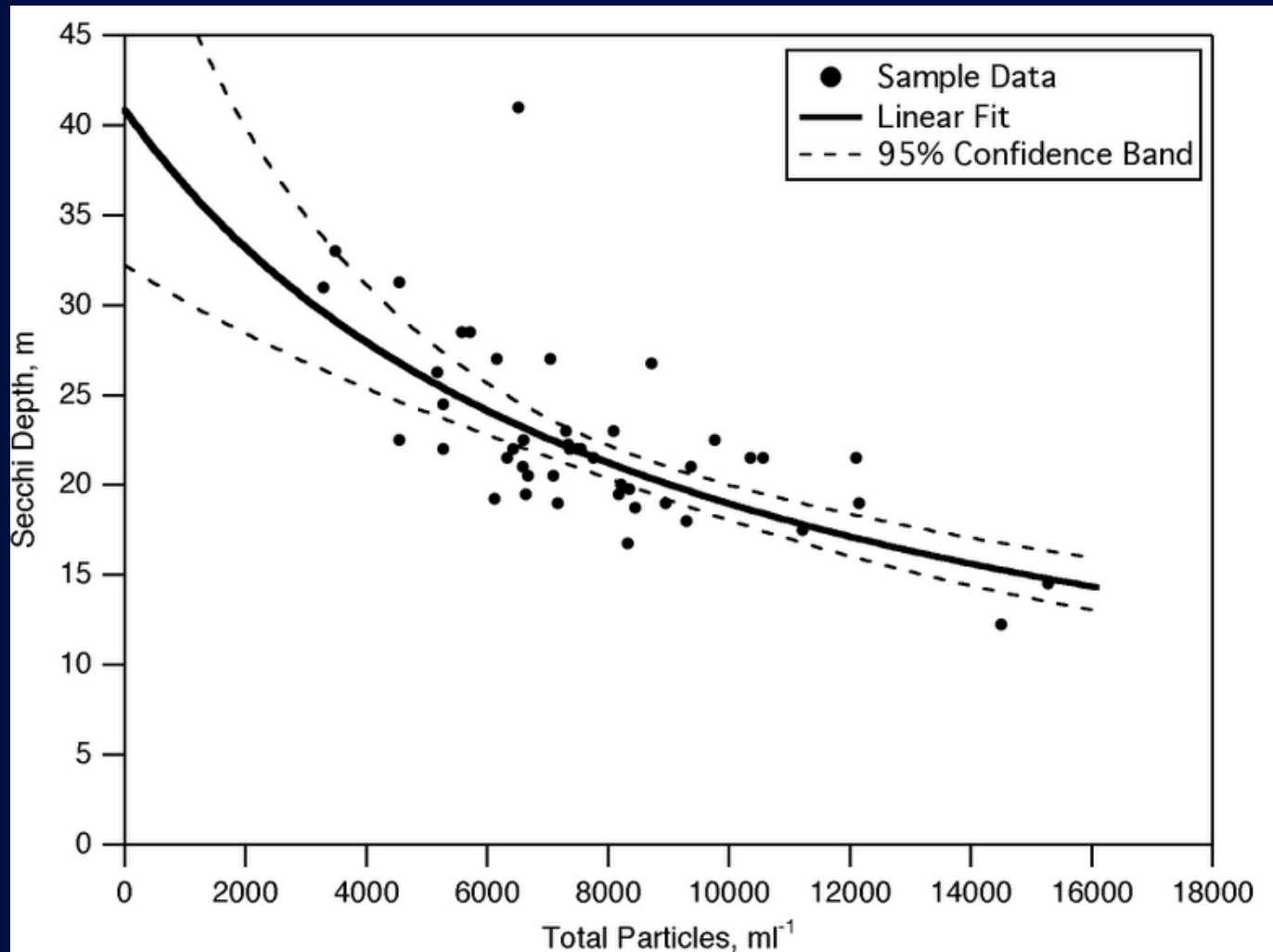


Figure 5.2: Log Transformed Particle Size Distribution for Blackwood Creek on 4/5/2002 at 07:40.

Figure 5.1: Particle Size Distribution for Blackwood Creek on 4/5/2002 at 07:40.

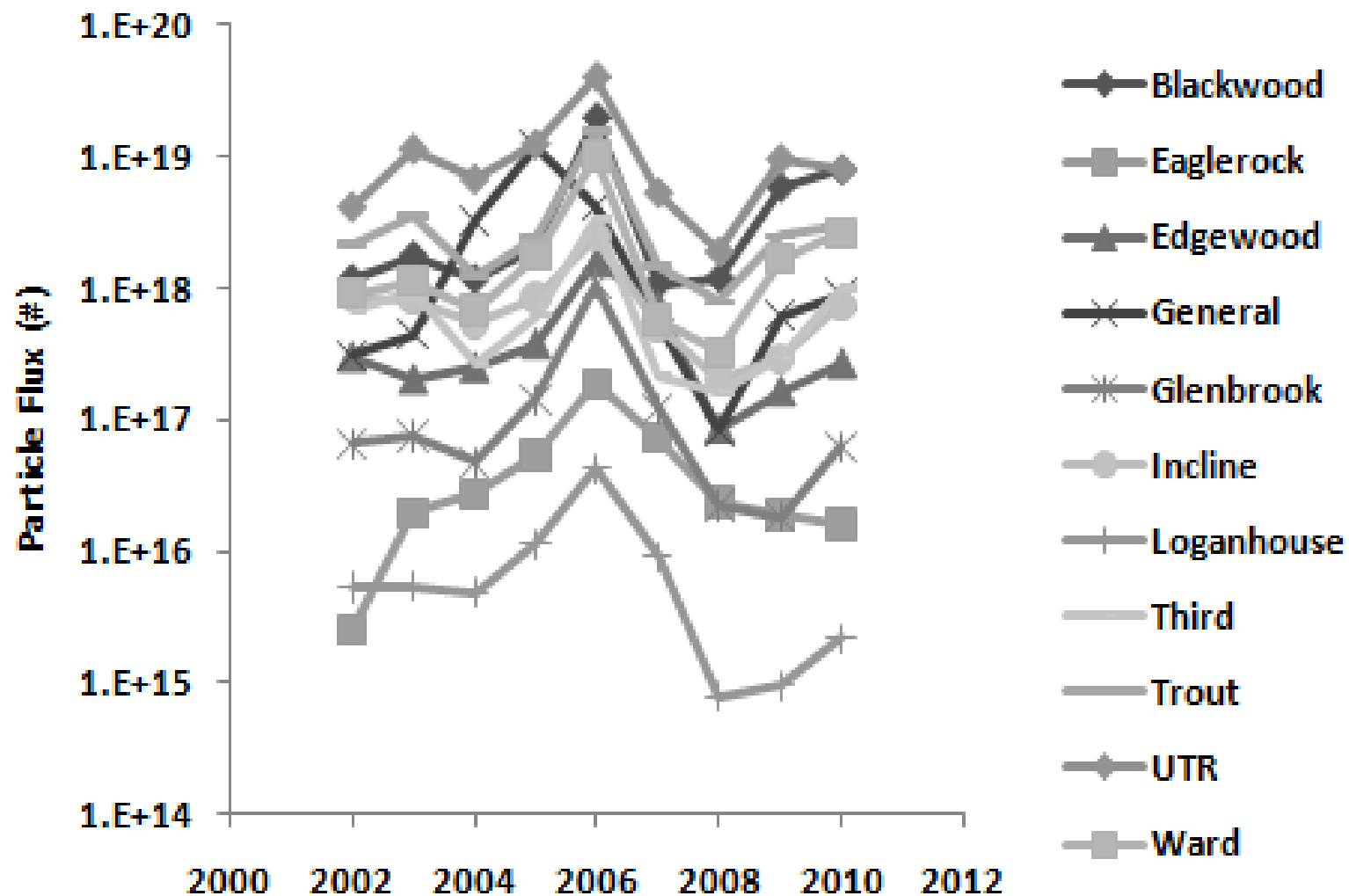
From

What's the deal with Lake Tahoe Particles?



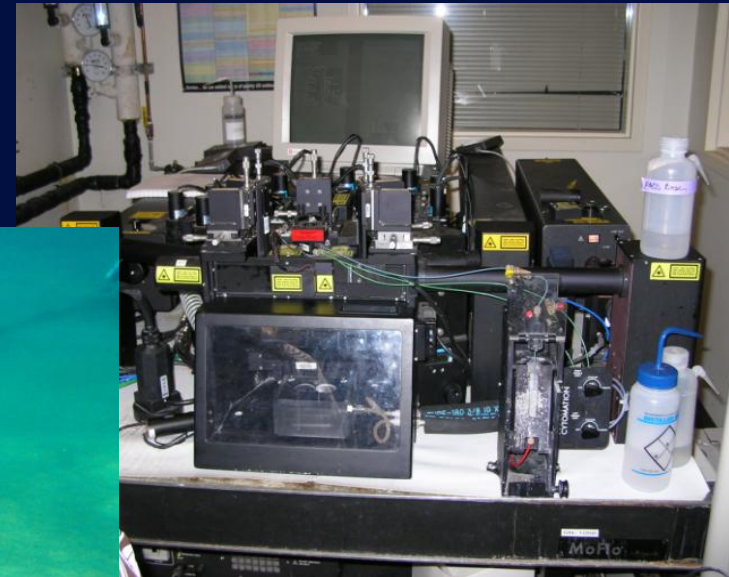
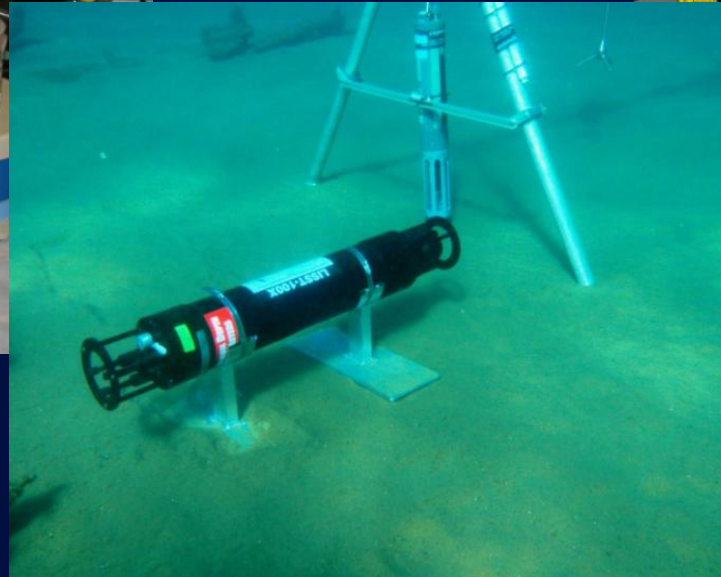
Swift, T.J. 2004

Long Term Monitoring



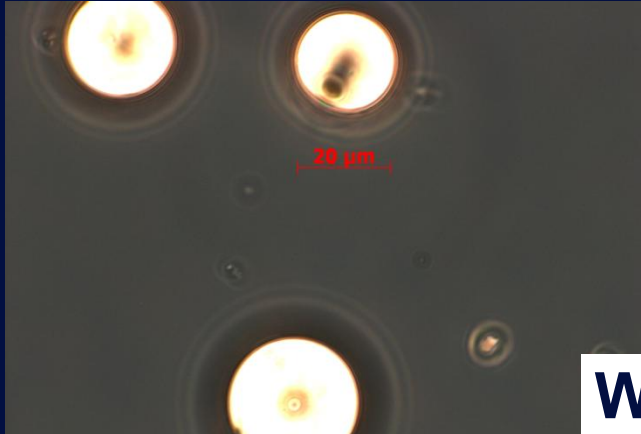
- **What methods can we use to measure fine particles (<20 μm diameter) in CLEAN lake water?**
- **How do differences in instruments and differences in particles influence particle size and number data?**
- **How do particle attributes influence results?**

Instrumentation

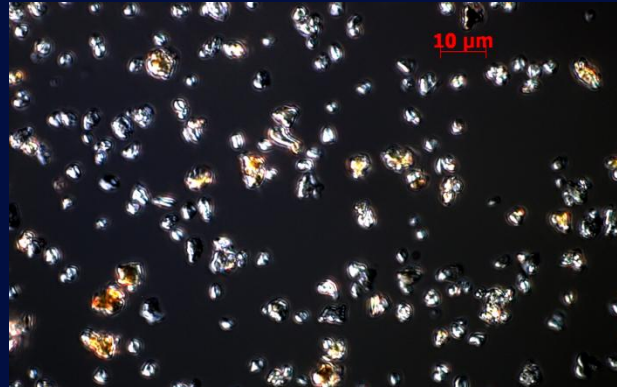


Instruments	LiQuilaz	LISST-100X	MoFlow Cytometer	Light Microscope
Spatial Resolution	Poor	Excellent	Poor	Poor
Temporal Resolution	Poor	Excellent	Poor	Poor
Range	0.5-20 μm	1.25-250 μm	0.1-20 μm	Wide
Special Feature	Low range	In-situ	Absolute counts	Accuracy?

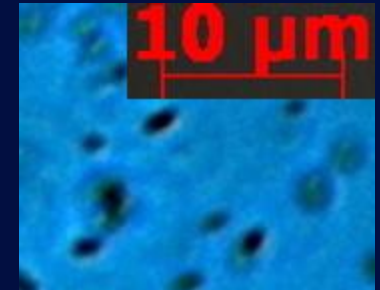
Particles Considered



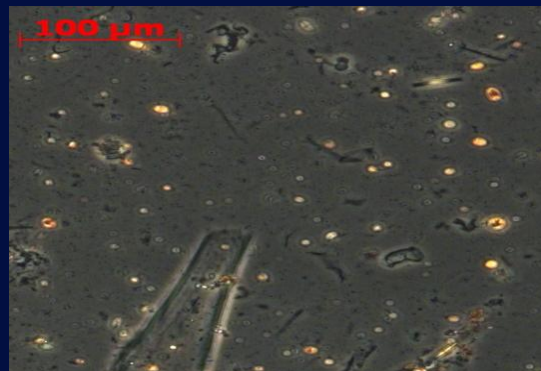
Glass and PS Beads



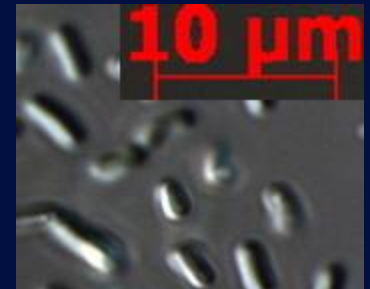
Washoe County Road Dust



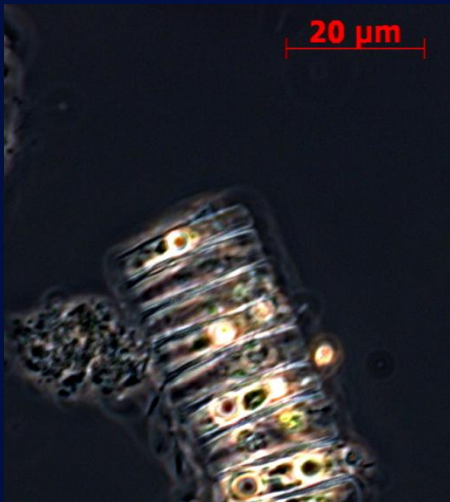
P. fluorescens



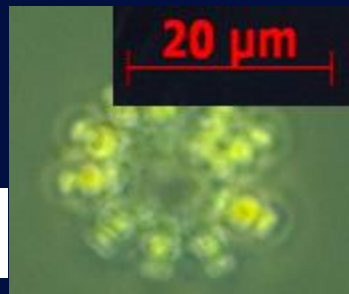
Marla Bay(0m)



S. elongatus



F. crotonensis

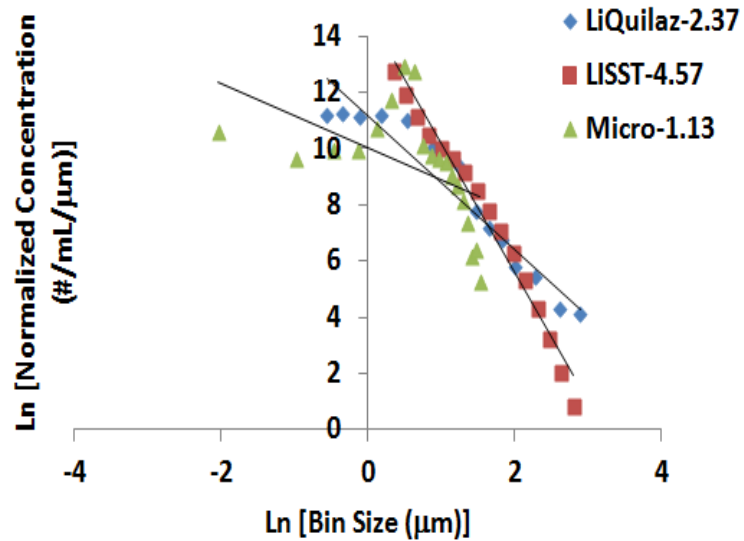


A. formosa

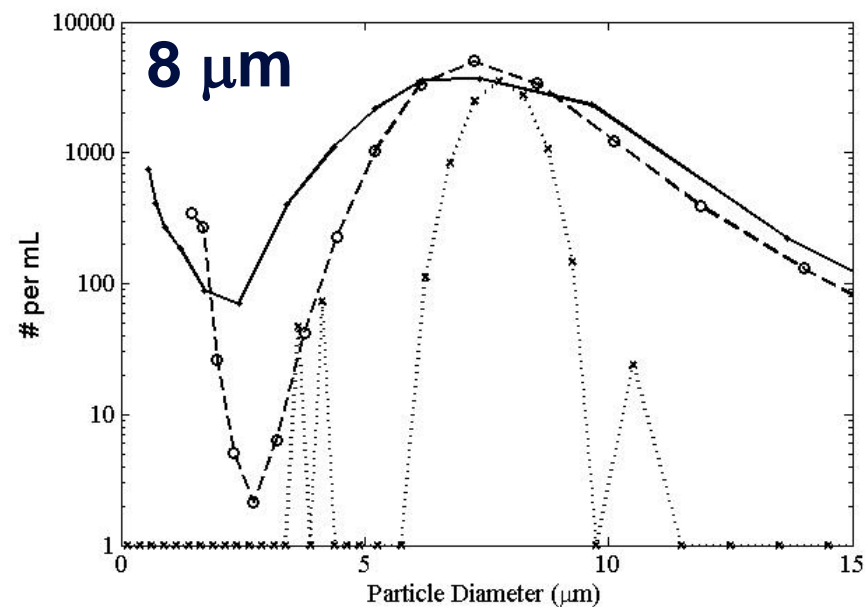
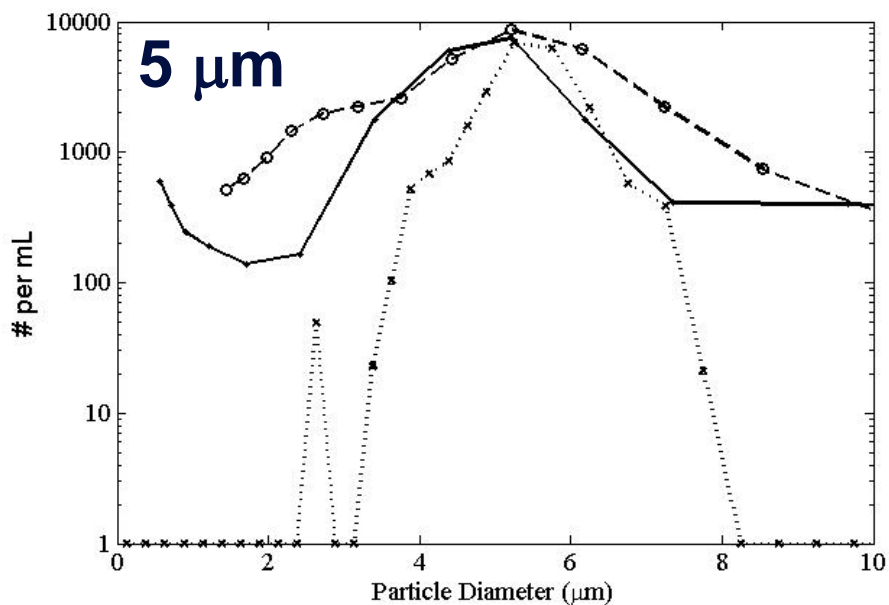
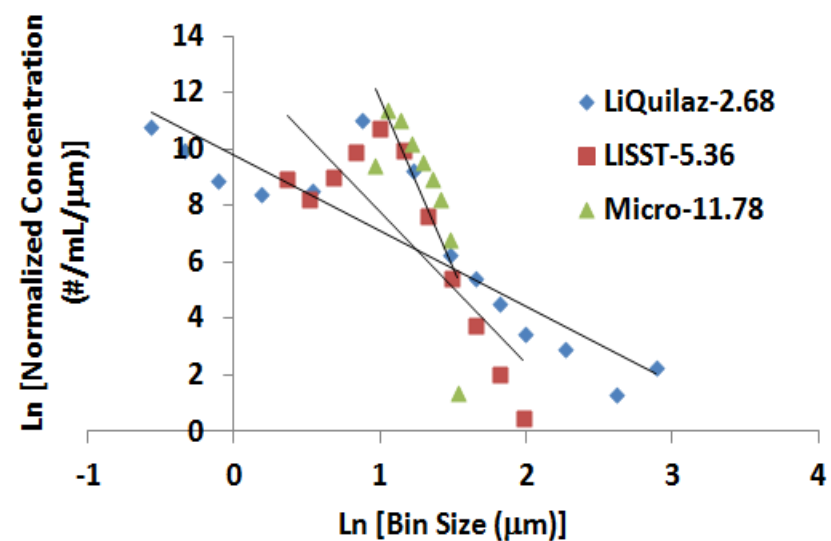


C. reinhardtii

2 micron glass



2.5 micron ps

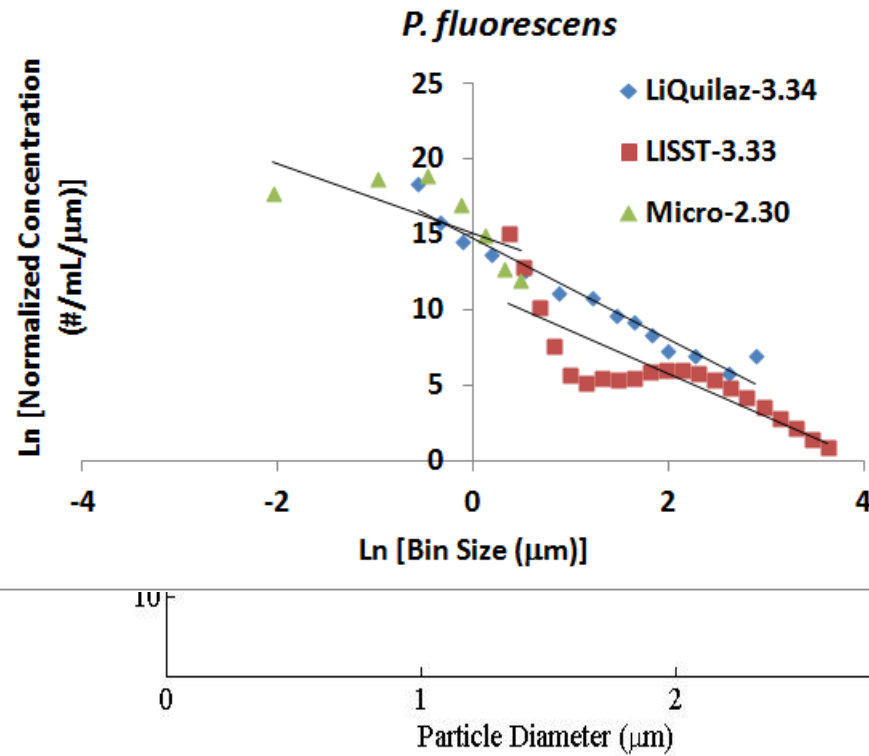


Glass Beads

Ellipsoid Bacterium ~0.5 μm Diameter

P. fluorescens

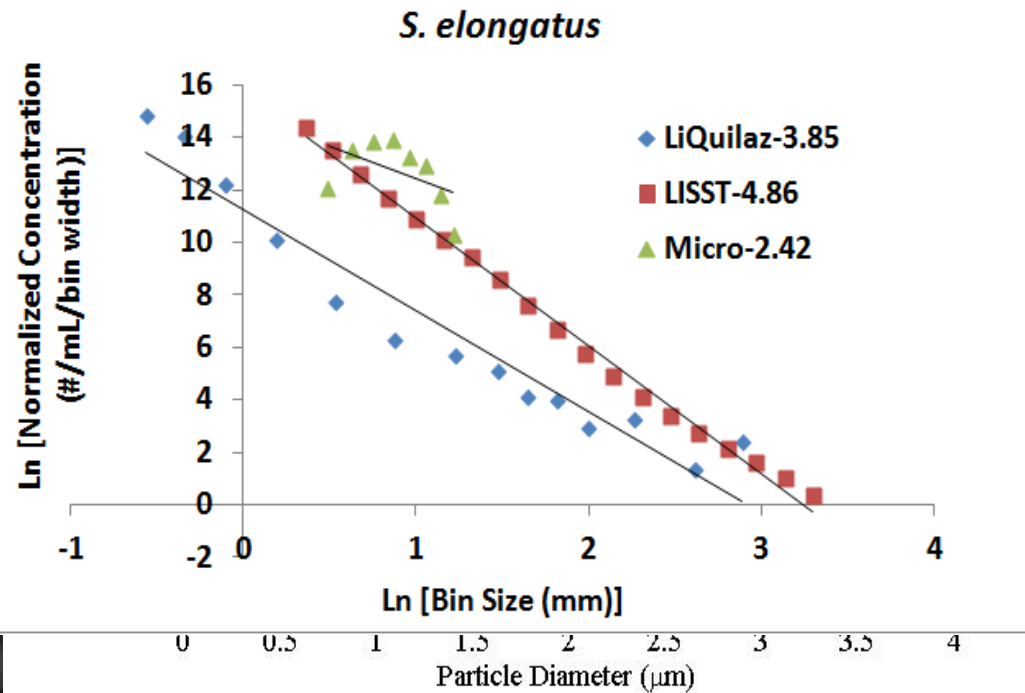
10 μm



Elipsoid Cyanobacterium ~2 μm Diameter

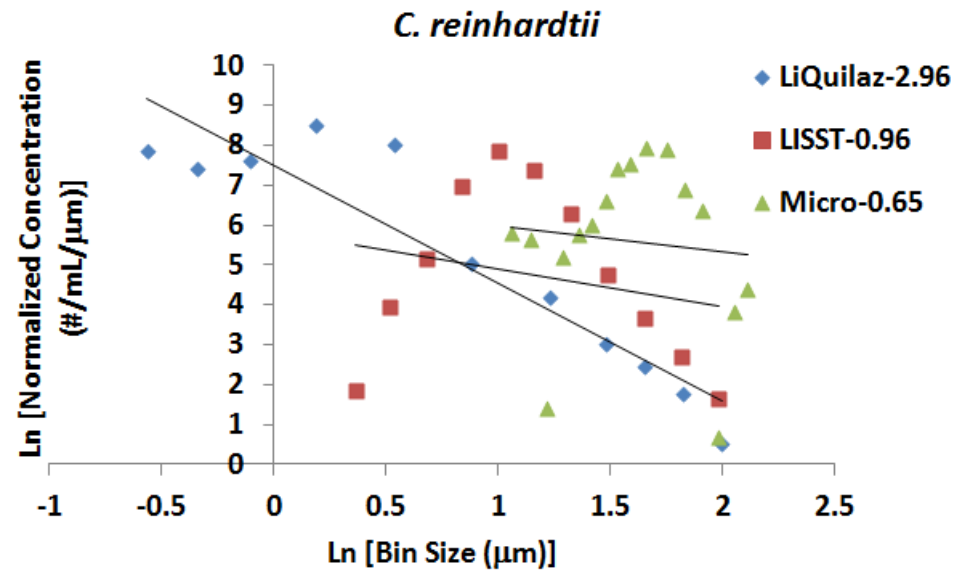
S. elongatus

10 μm



Spherical Chlorophyte ~5 μm Diameter

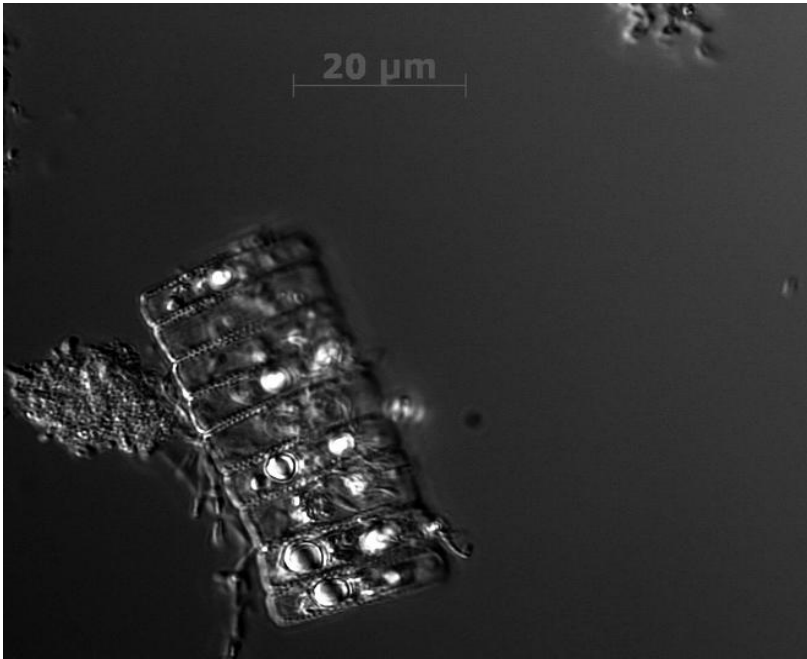
10 μm



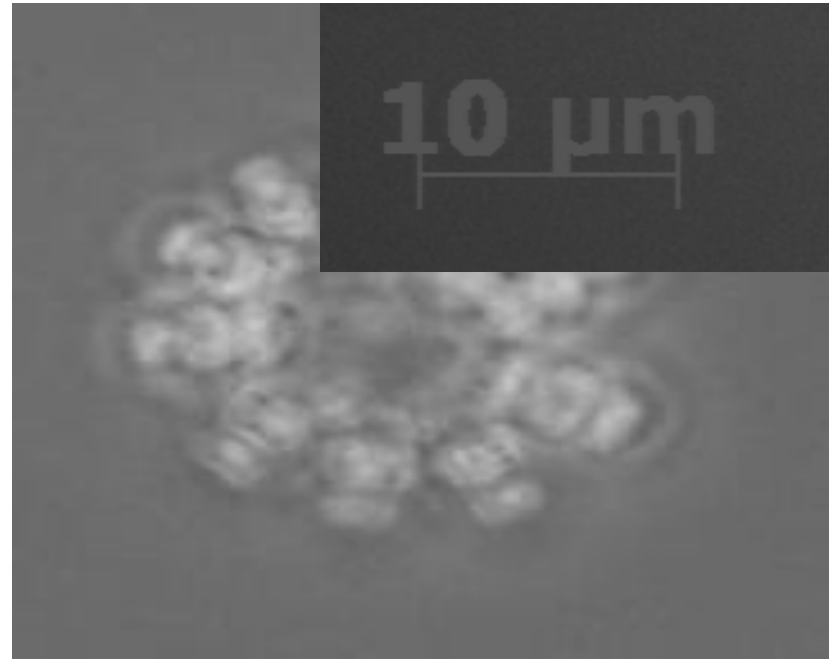
Particle Diameter (μm)

C. reinhardtii

Organic non-conformists



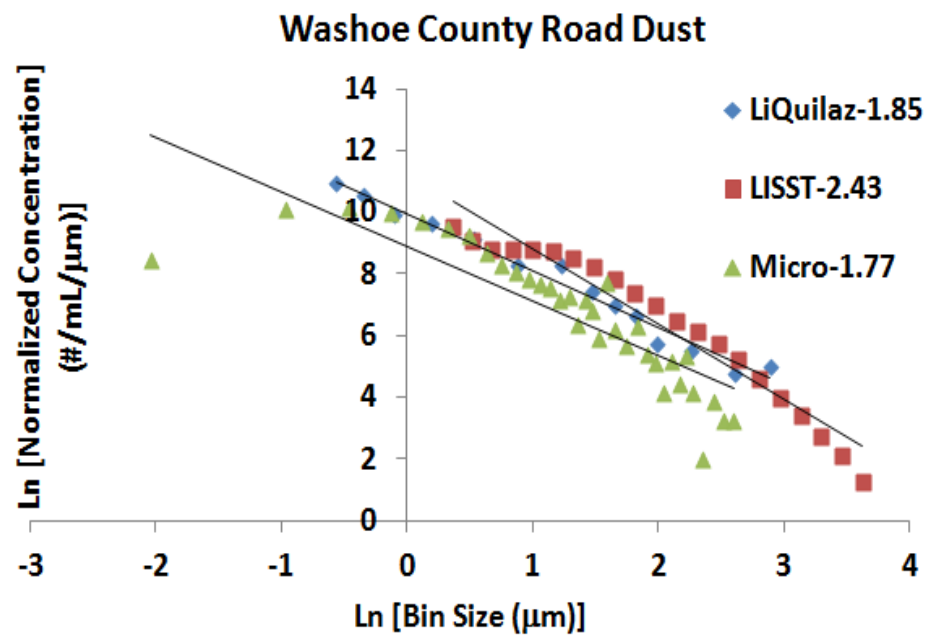
F. crotonensis



A. formosa

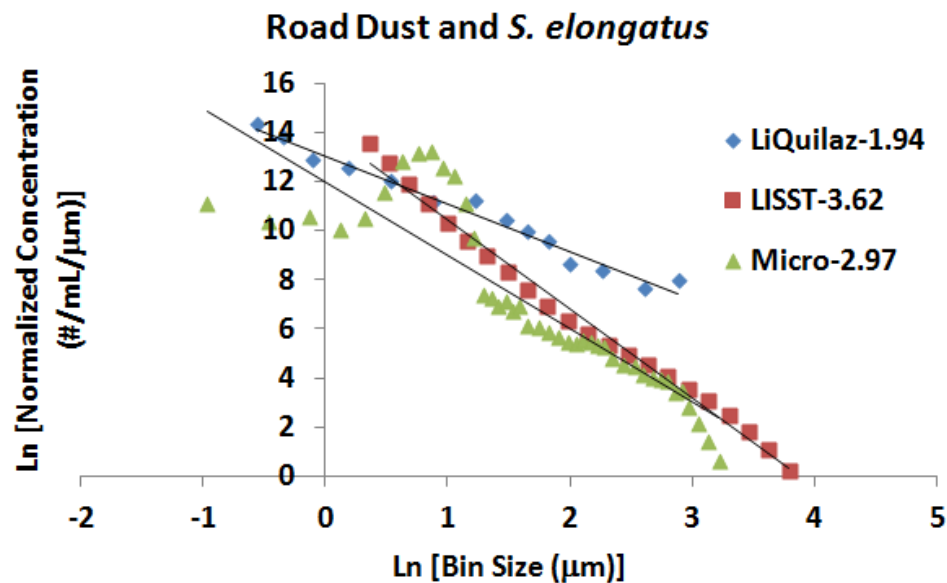
20 μm

Washoe County Road Dust

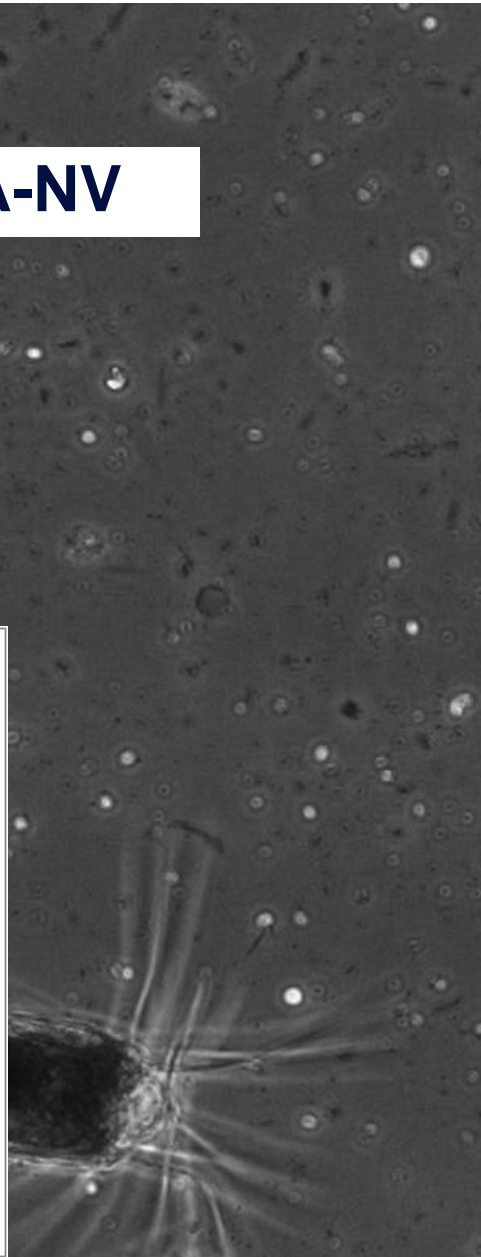
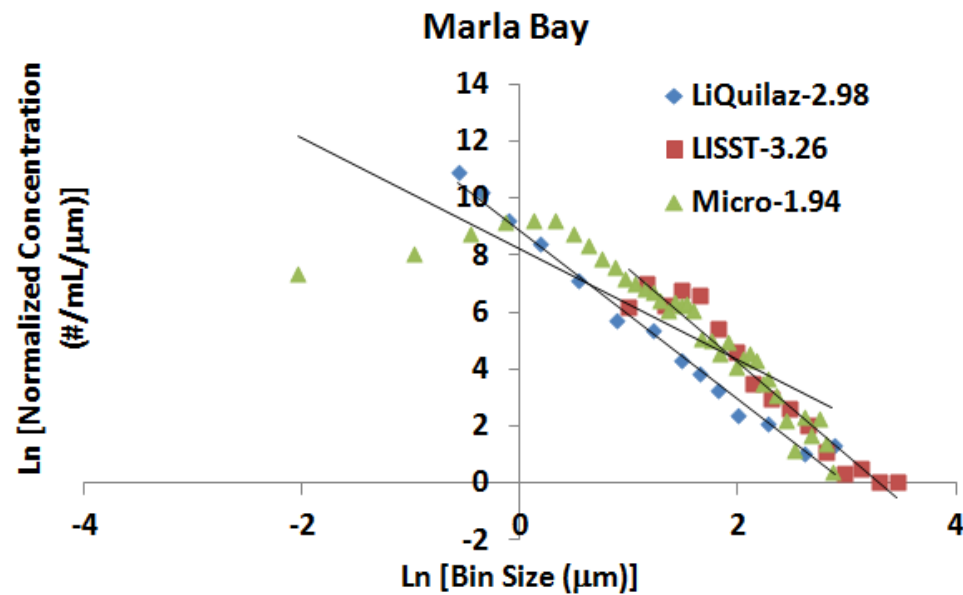


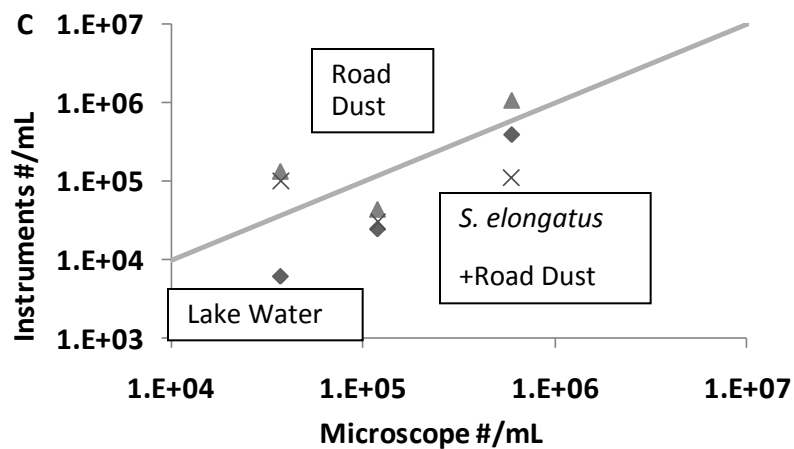
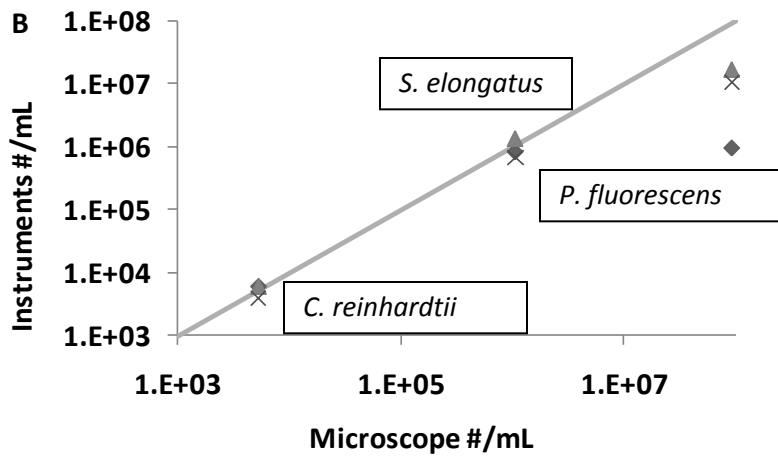
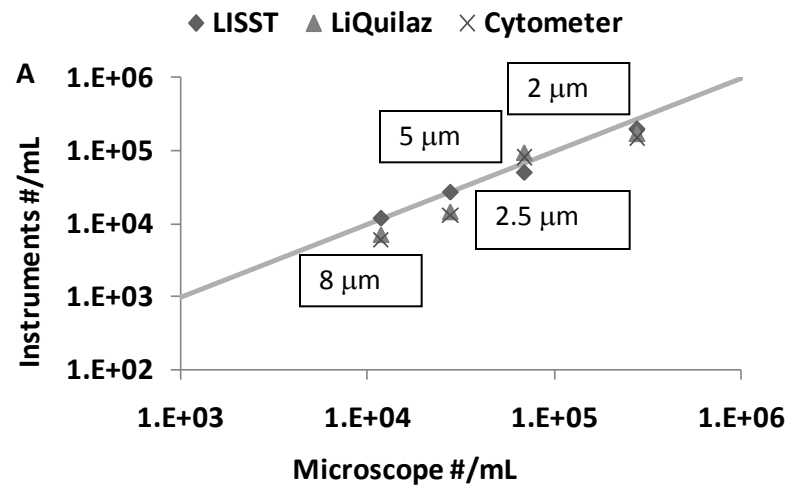
Washoe County Road Dust and *S. elongatus*

10 μm



Marla Bay (0m), Lake Tahoe, CA-NV





Conclusions

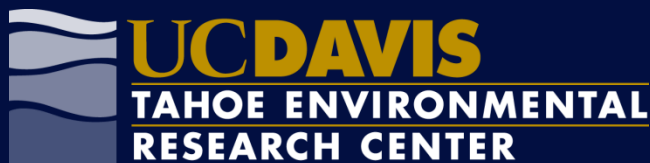
- **All particle counting methods introduce error**
- **The “real” PSD is hard to know**
- **Despite differences, PSD estimates need not hinder management because measurement error is sufficiently small.**

Acknowledgements



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Questions?

Before I came here I was confused about the subject. Having listened to your lecture I am still confused. But on a higher level.

- Enrico Fermi

