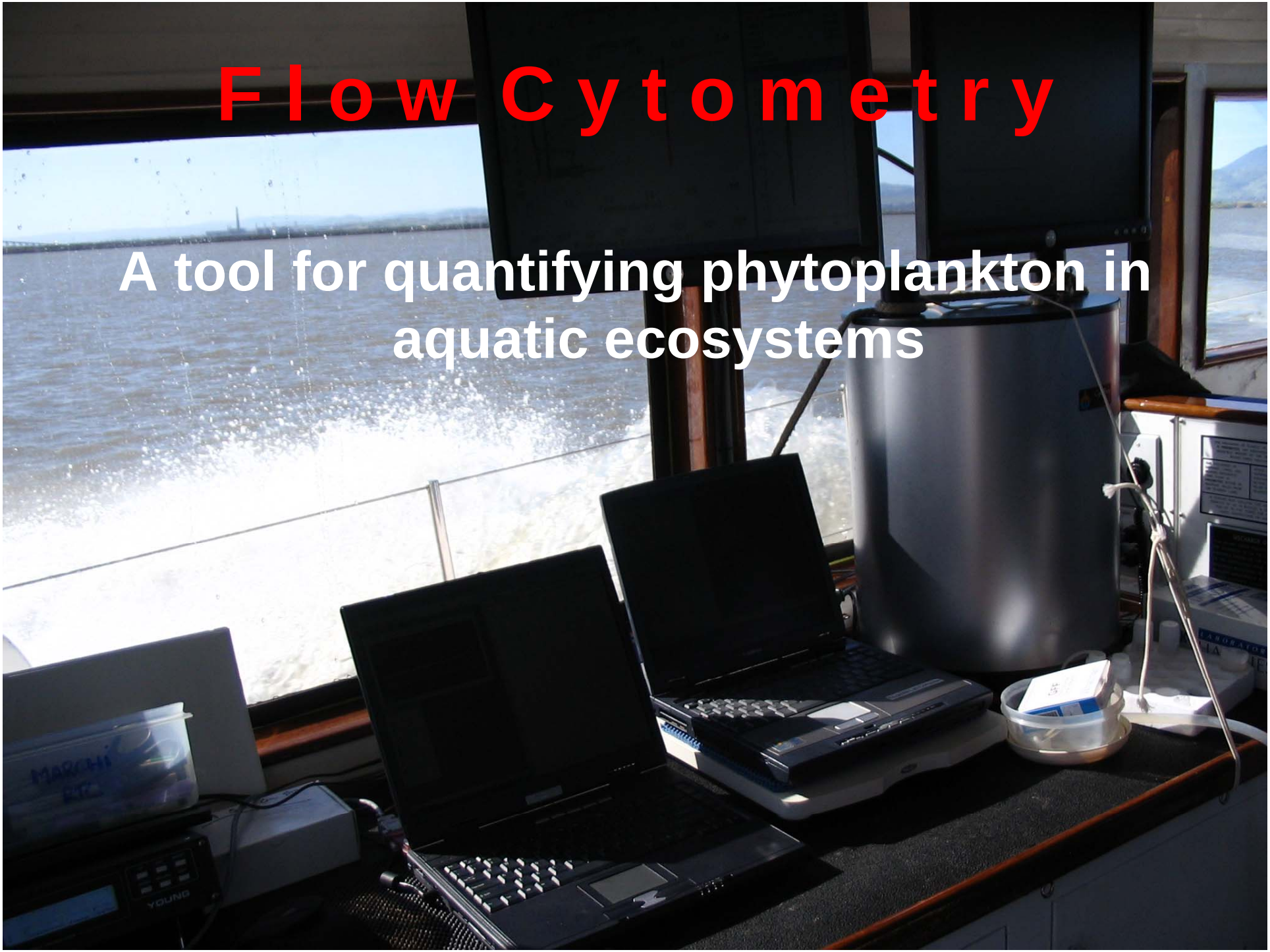
Flow Cytometry

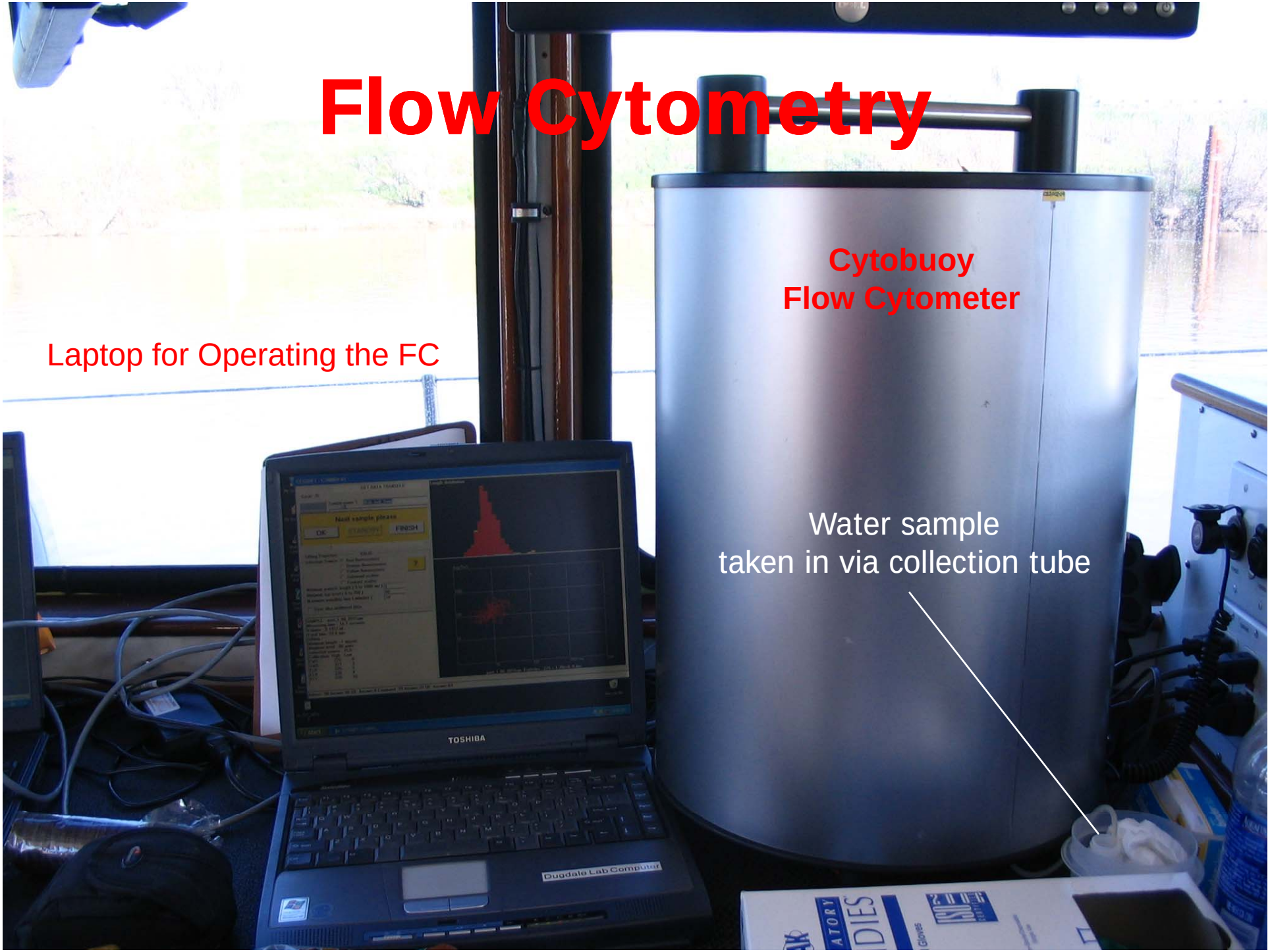
A tool for quantifying phytoplankton in aquatic ecosystems



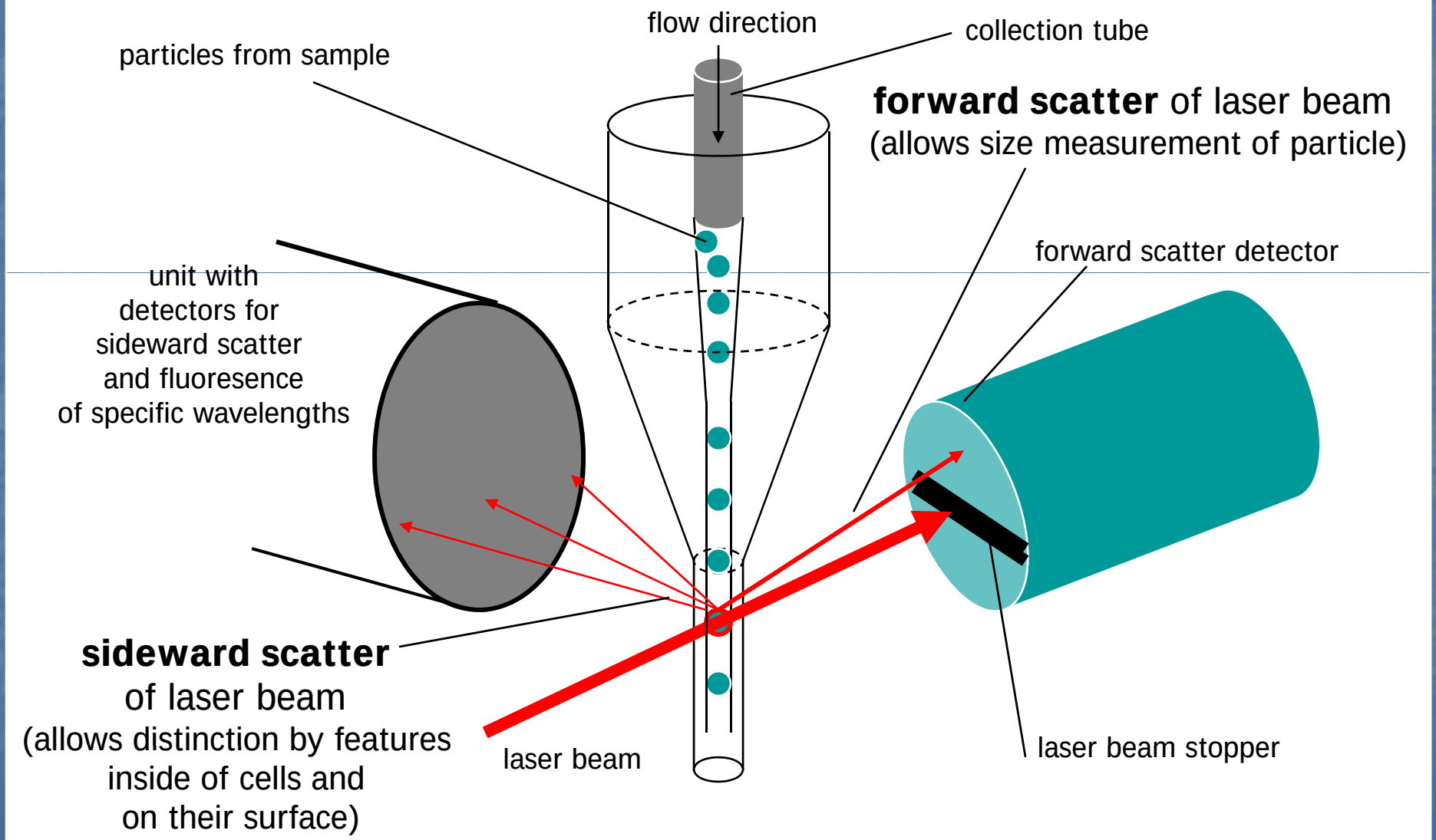
Water Sampling with the CTD

Water samples are used for chlorophyll filtering and flow cytometry

Flow Cytometry

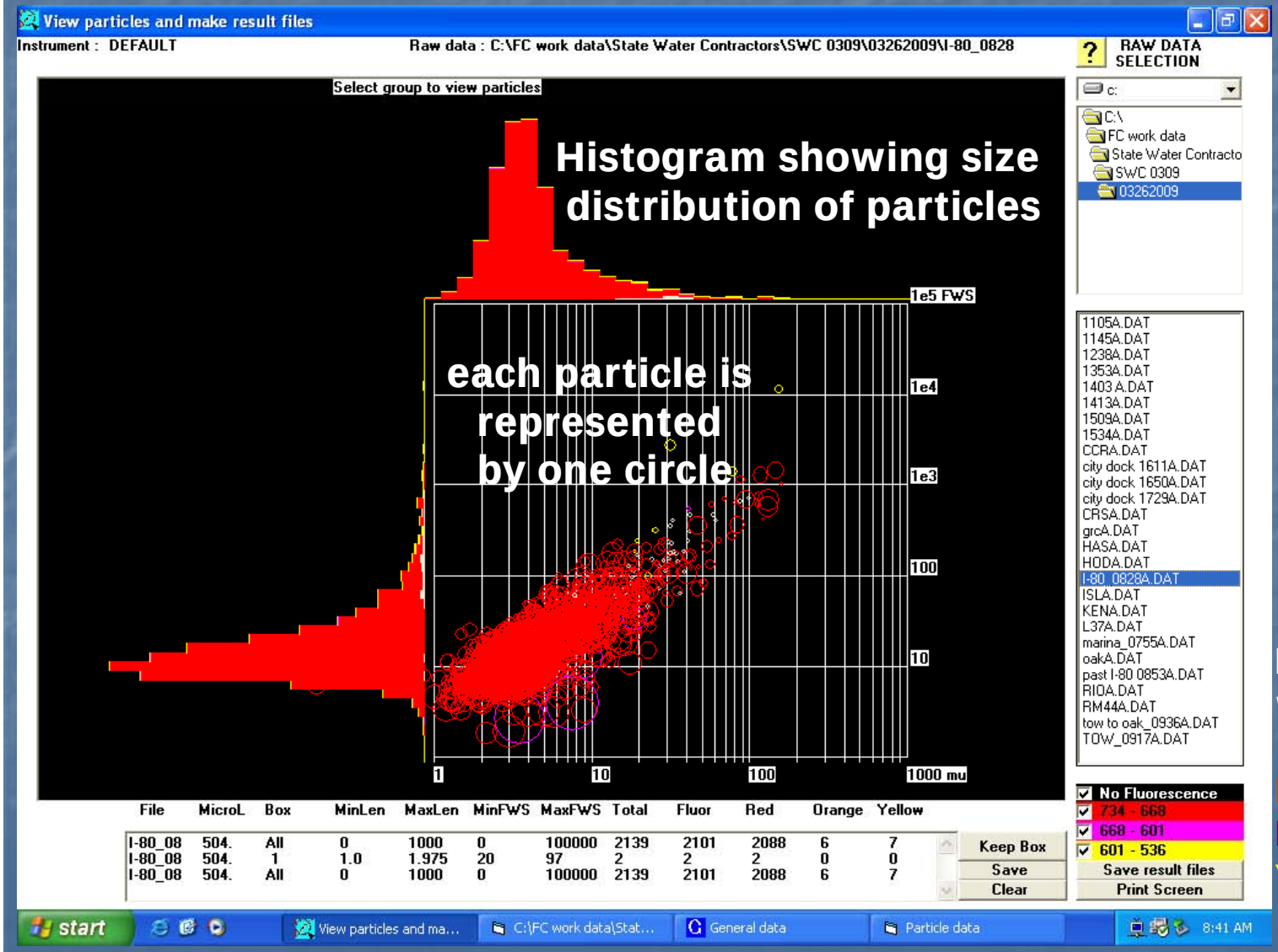


Flow Cytometry – how it works



Flow Cytometry Results

I-80, station with high abundance of small particles



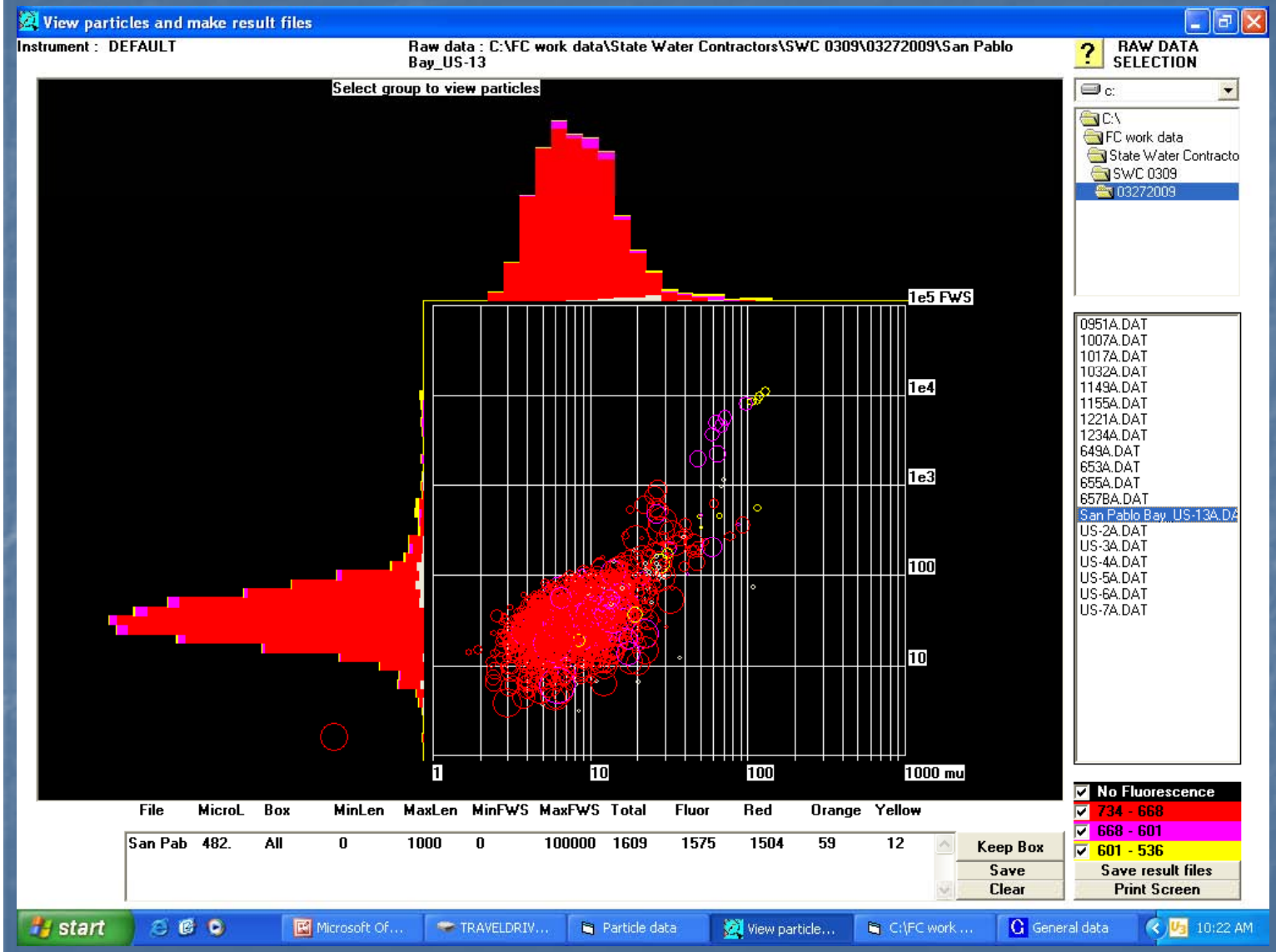
Example:
data view window from I-80 sample

Histogram shows relative abundance of particles arranged by size and fluorescence qualities

Fluorescence wavelengths:

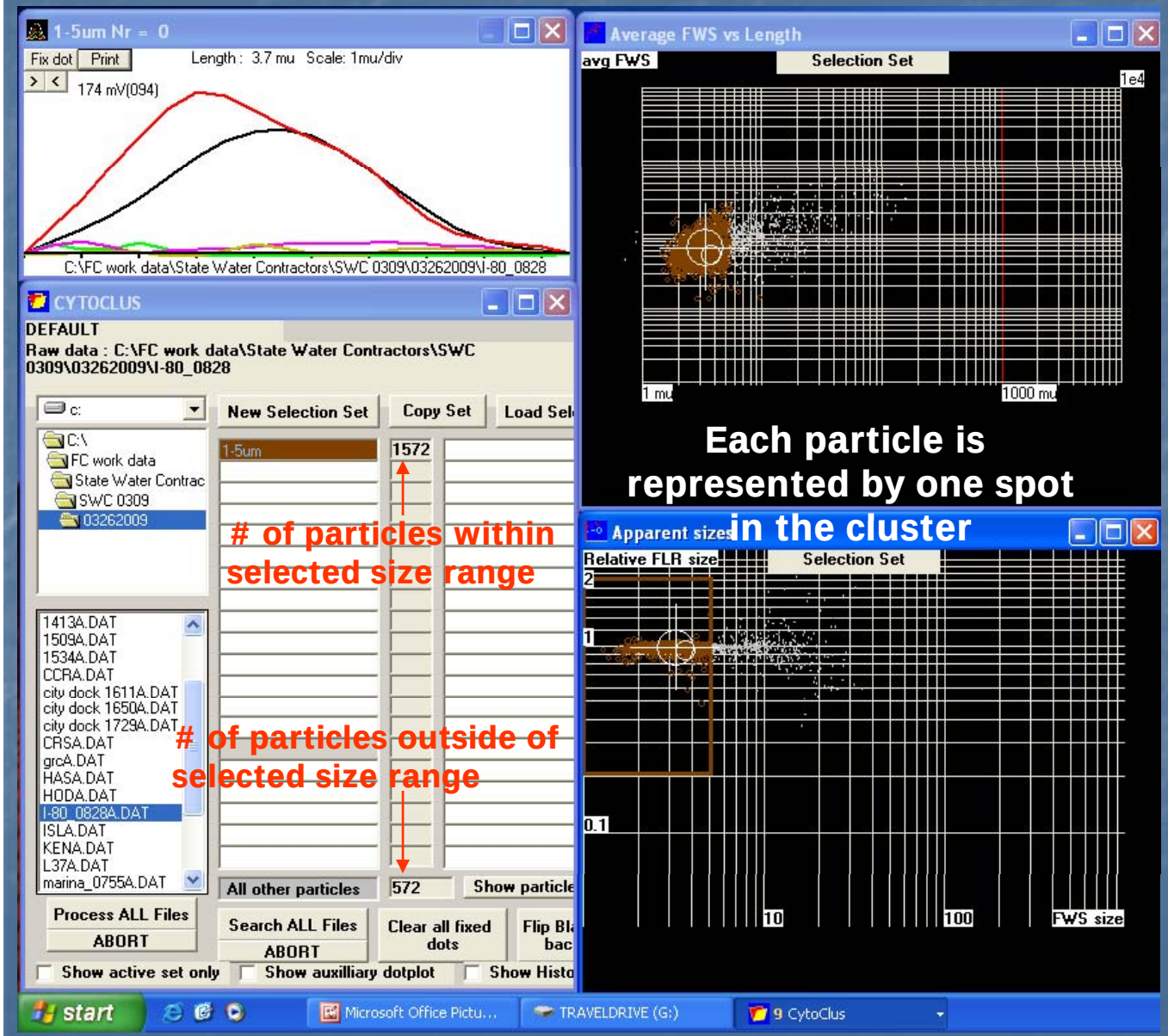
Red: Chlorophyll
Purple: Phycoerythrin
Yellow: Phycocyanin

US-13, station with high abundance of larger particles



Notice the shift of the histogram towards the right and the presence of purple bars (indicating cells with high phycoerythrin content)

Selection Sets For Size



Cytoclus Program:

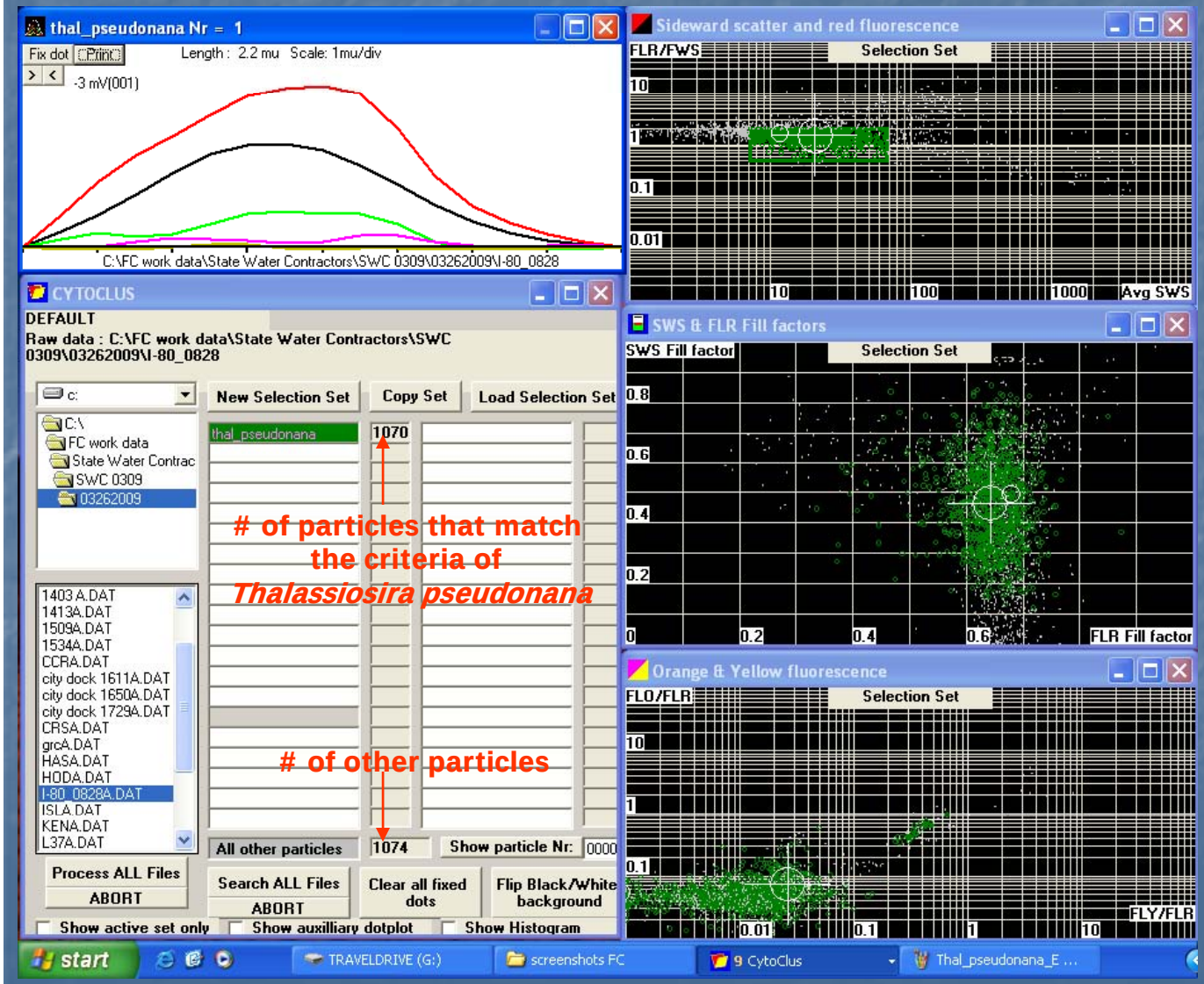
Allows to create specific selection sets with focus on various parameters (light scatter & fluorescence)

For size categories: a certain size range (here 1-5µm) in any data file gets marked, selection set then saved.

in application on field sample file (here from I-80) cells of the picked size range get counted separately.

Selection Sets for Specific Groups

Example: selection set from diatom *Thalassiosira pseudonana*



Cytoclus Program:

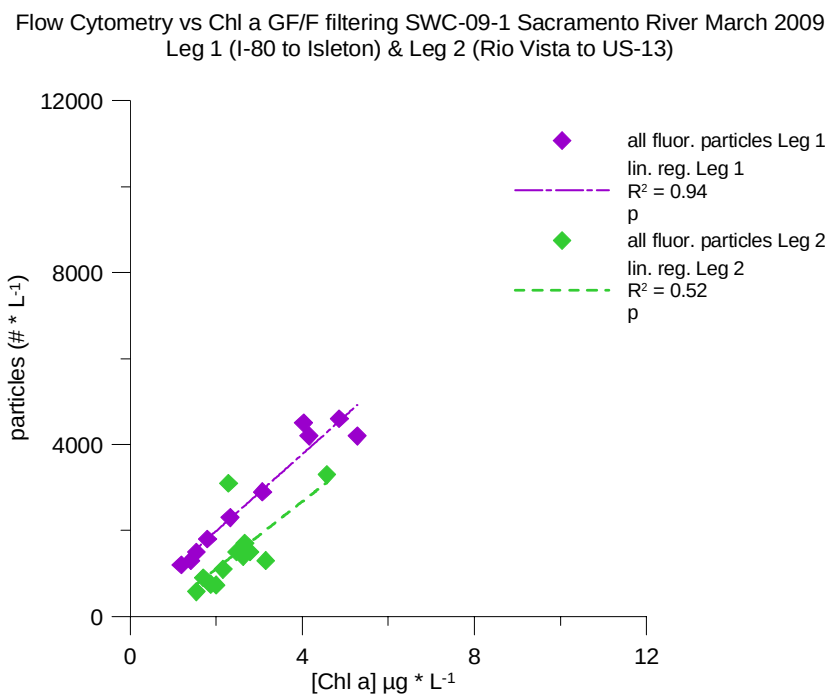
For group-specific selection sets, a pure culture of a species is needed;

→distinction by sideward scatter and fluorescence patterns.

in application on field sample file (here from I-80), cells with a sideward scatter/ fluorescence profile matching that of the original culture get counted separately.

Conclusions

- Together with other indirect methods, flow cytometry can provide information regarding abundance and biomass of phytoplankton.
- Using selection sets, there is potential for specific analyses down to the species level.
- In our study, flow cytometry data suggest differences in the phytoplankton assemblage that would not be apparent from chlorophyll measurements alone.


Flow Cytometry vs Chl a GF/F filtering SWC-09-1 Sacramento River March 2009
Leg 1 (I-80 to Isleton) & Leg 2 (Rio Vista to US-13)
12000
8000
4000
0
0
4
8
12
particles (# * L-1)
[Chl a] µg * L-1
all fluor. particles Leg 1
lin. reg. Leg 1
R2 = 0.94
p
all fluor. particles Leg 2
lin. reg. Leg 2
R2 = 0.52
p