

# Why Do Algae Always Get a Bad Rap? A brief primer on phytoplankton



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Illinois Lake Management Association  
33<sup>rd</sup> Annual Conference Bloomington, IL

# Topics

- What they are
- What they do
- Why they are important
- What they need
- Where they are found
- When algae go wild
- How to find out more on your own

# Phytoplankton

Primary Producers

# Forms and Habits

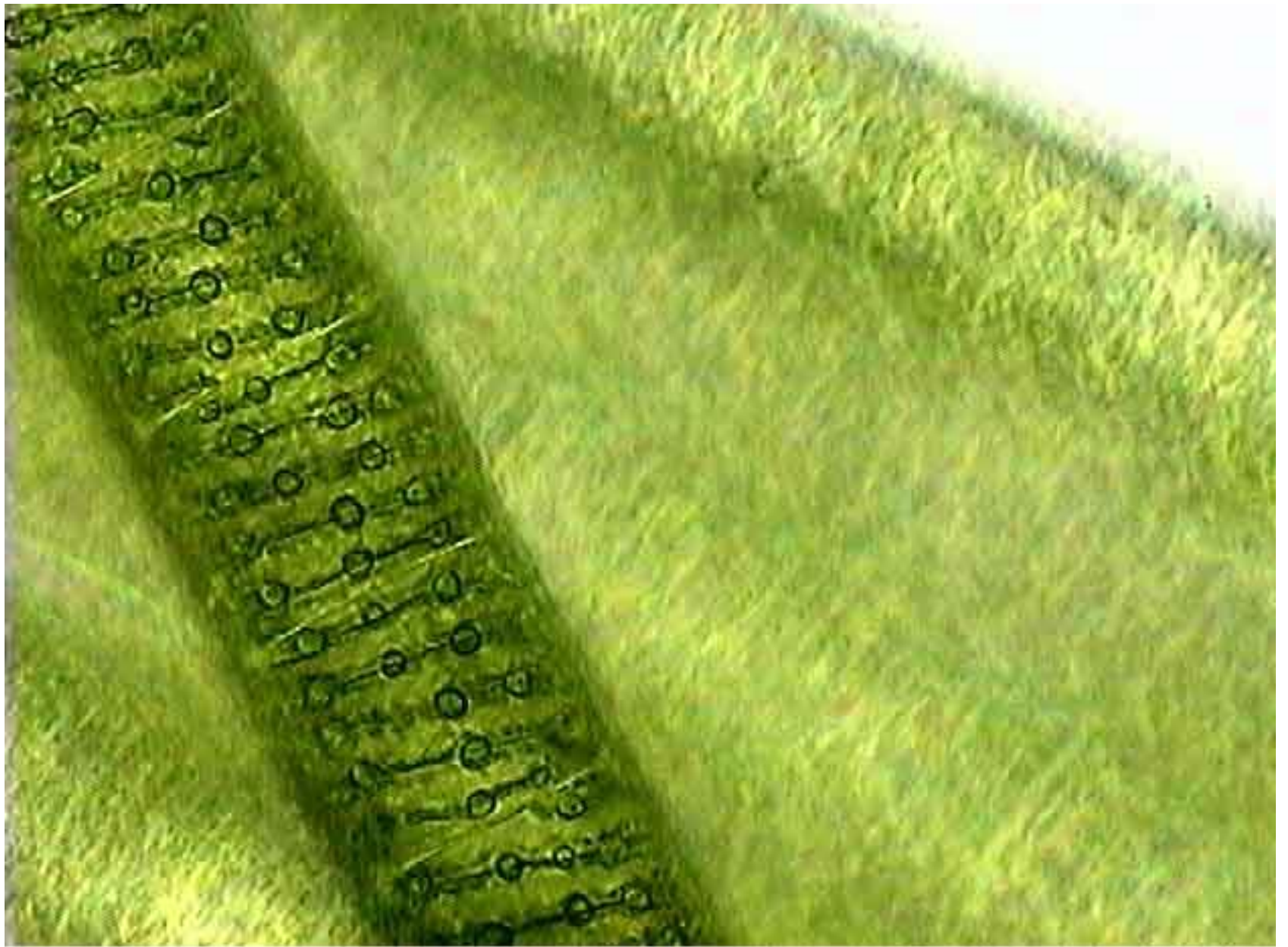
- Solitary
- Colonial
- Free floating
- Attached

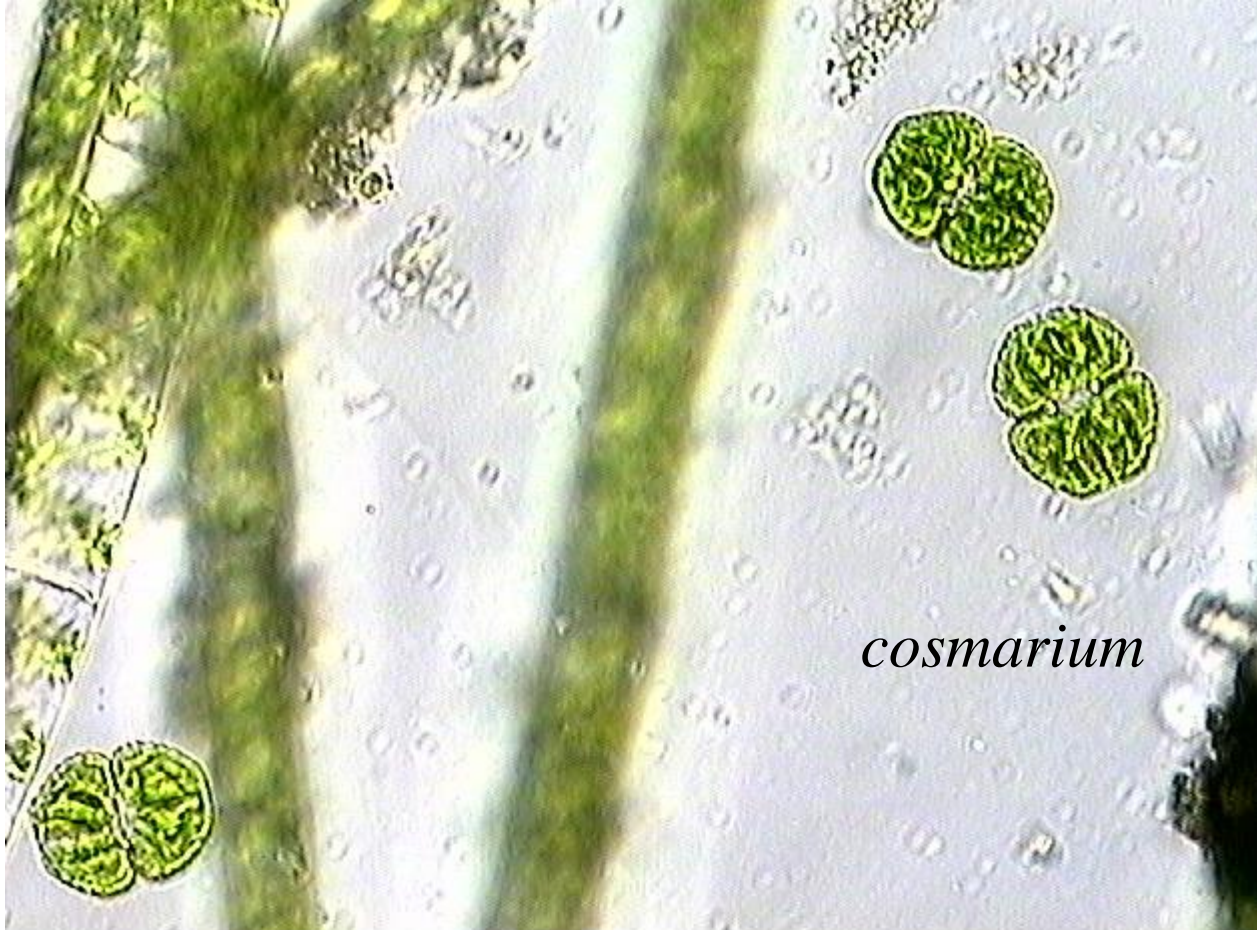


# Common Phyla

- Chlorophyta (Green Algae)
- Chrysophyta (Yellow-green or Yellow-brown algae) includes the diatoms
- Euglenophyta (Euglenoids)
- Pyrrhophyta (Dinoflagellates)
- Cyanophyta (Cyanobacteria) : Bluegreen “algae”

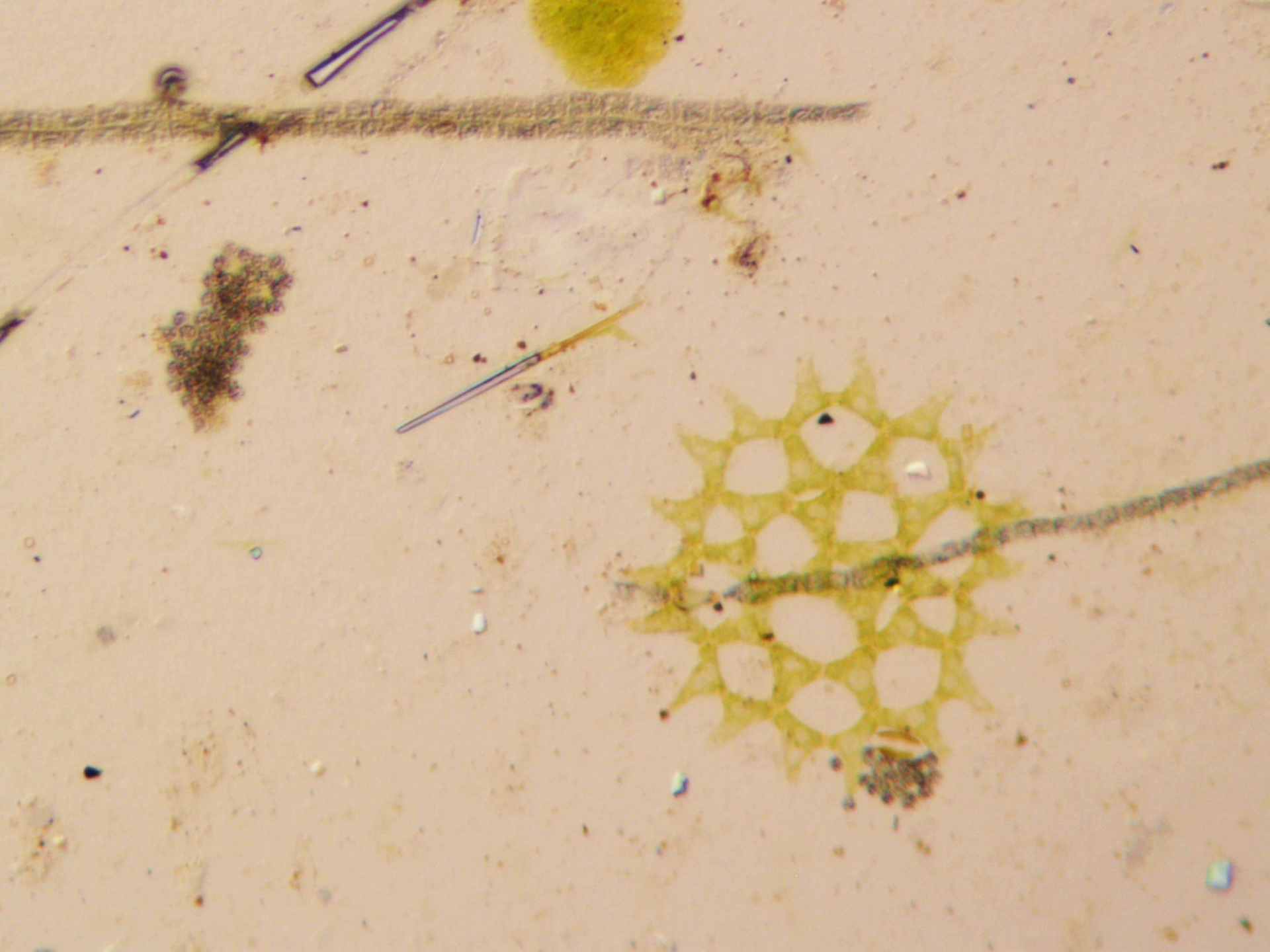
# Green Algae





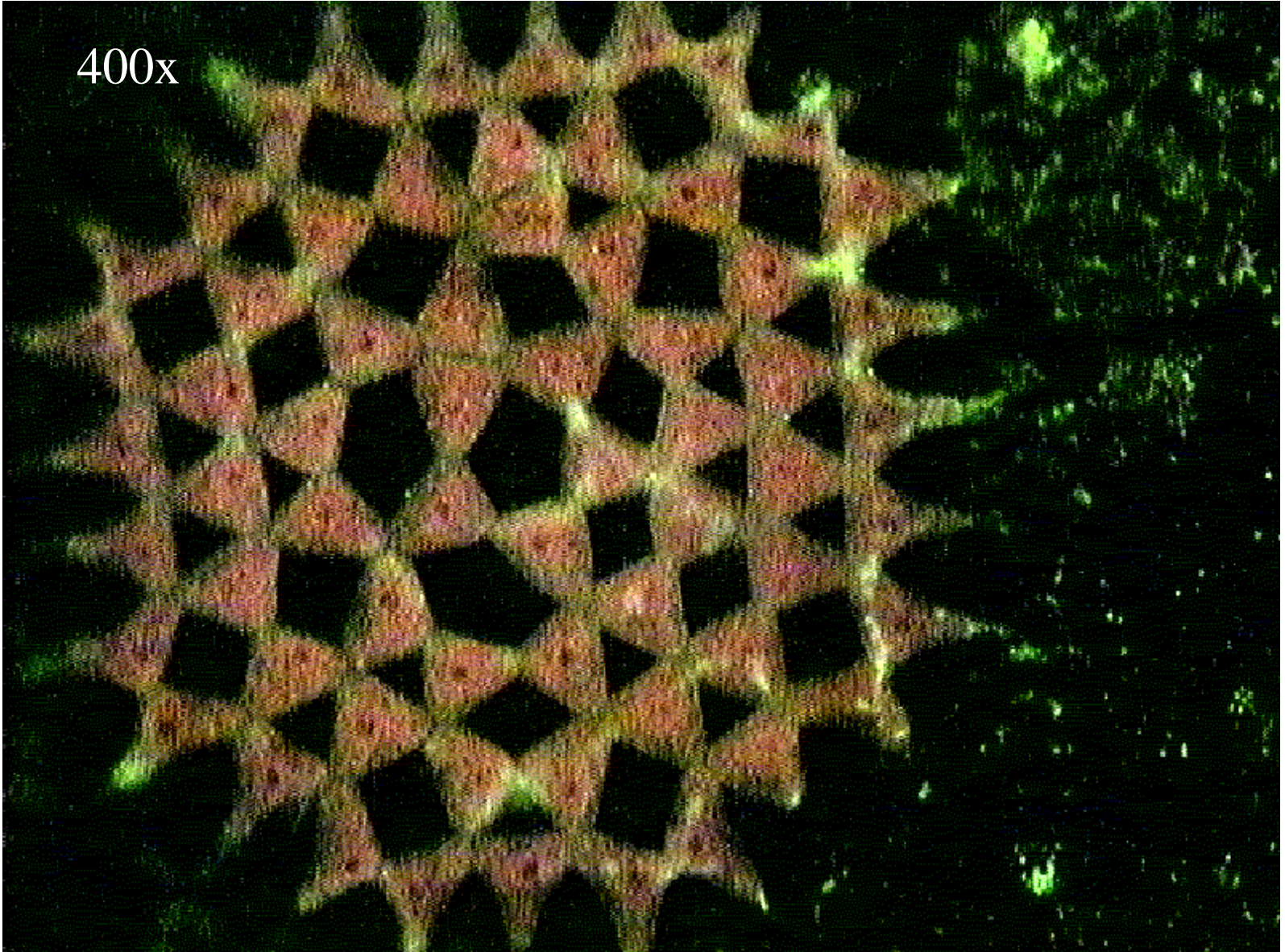
*cosmarium*







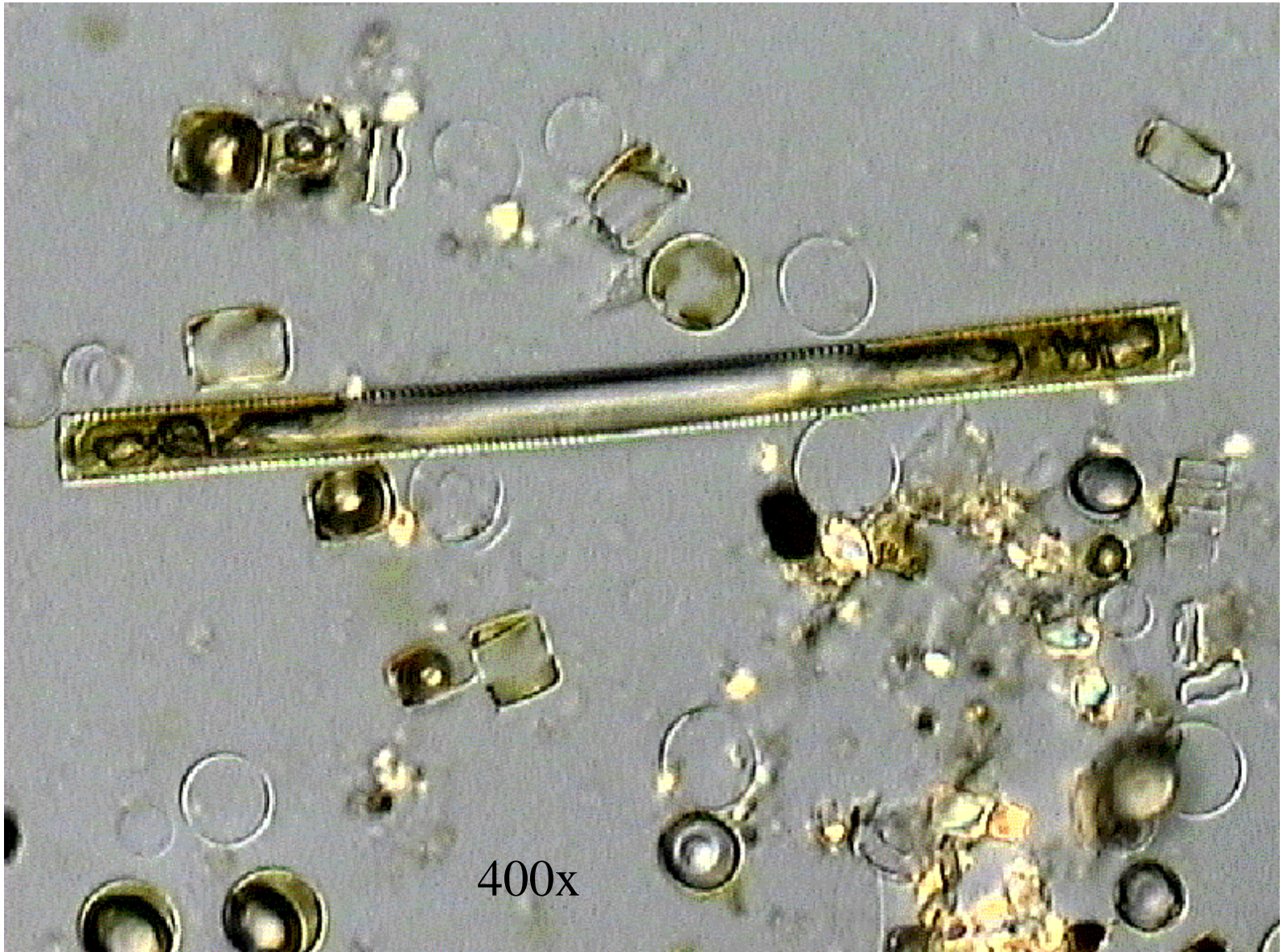
400x





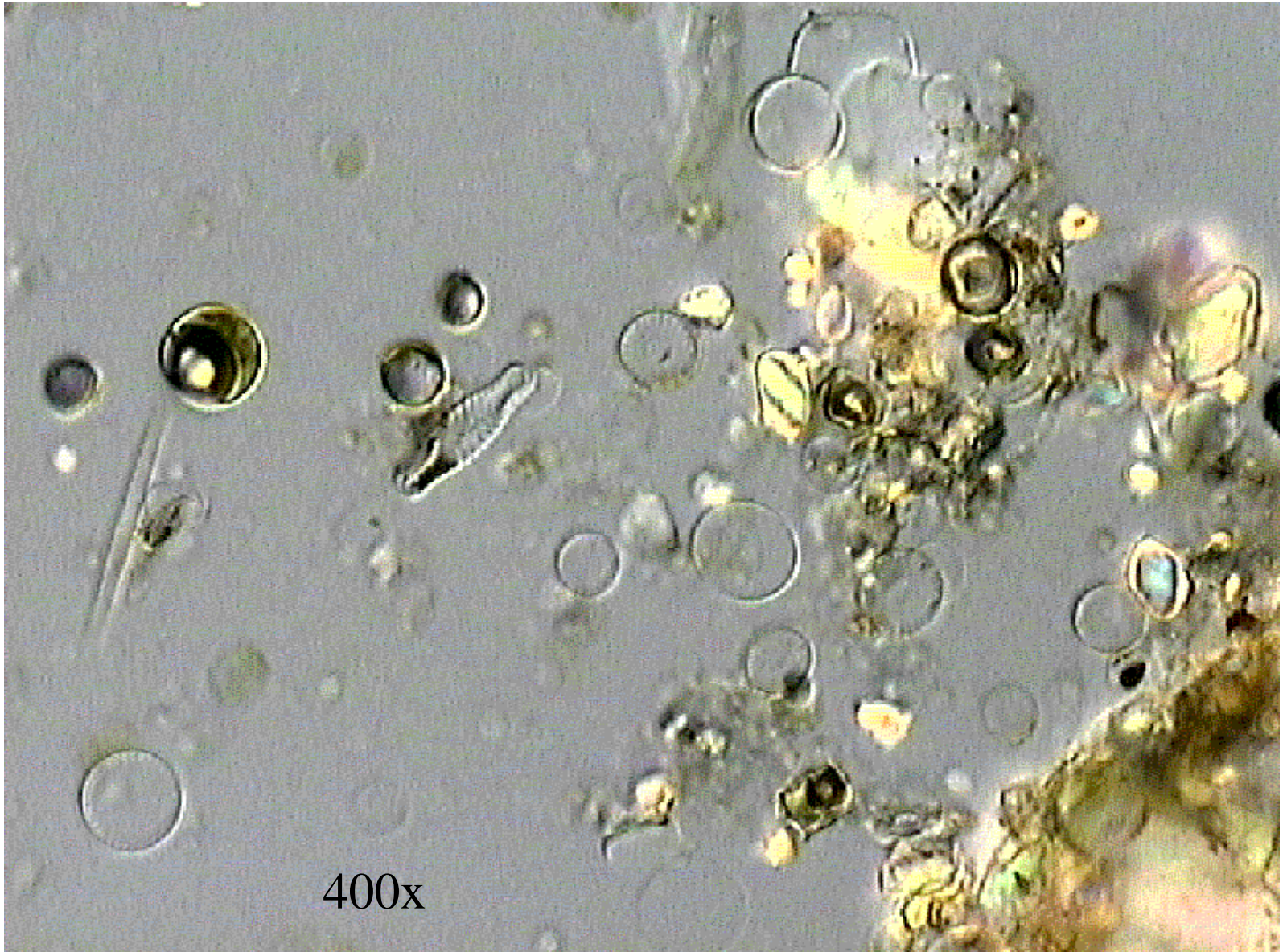
# Yellow-Green Yellow-Brown Algae





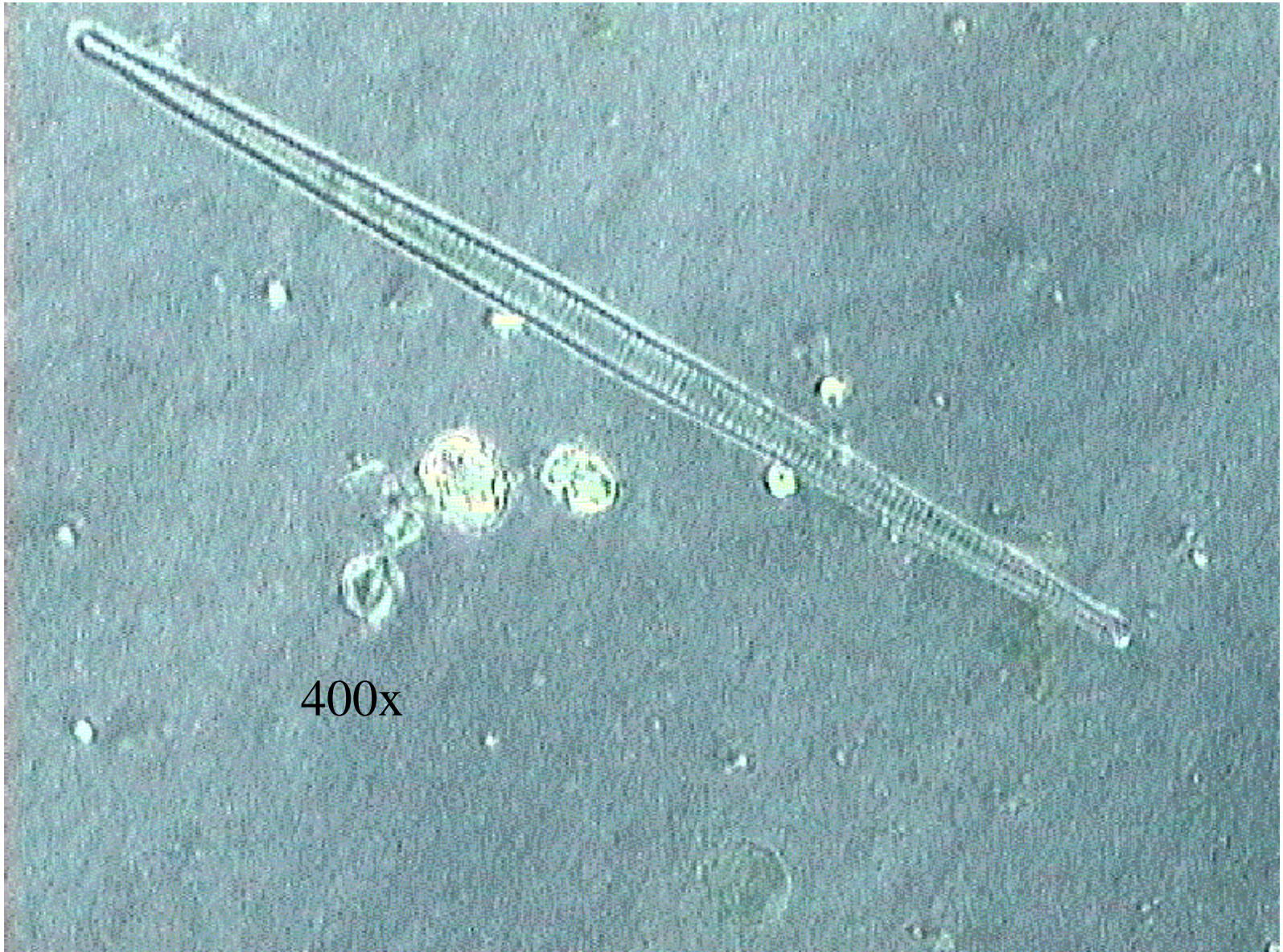
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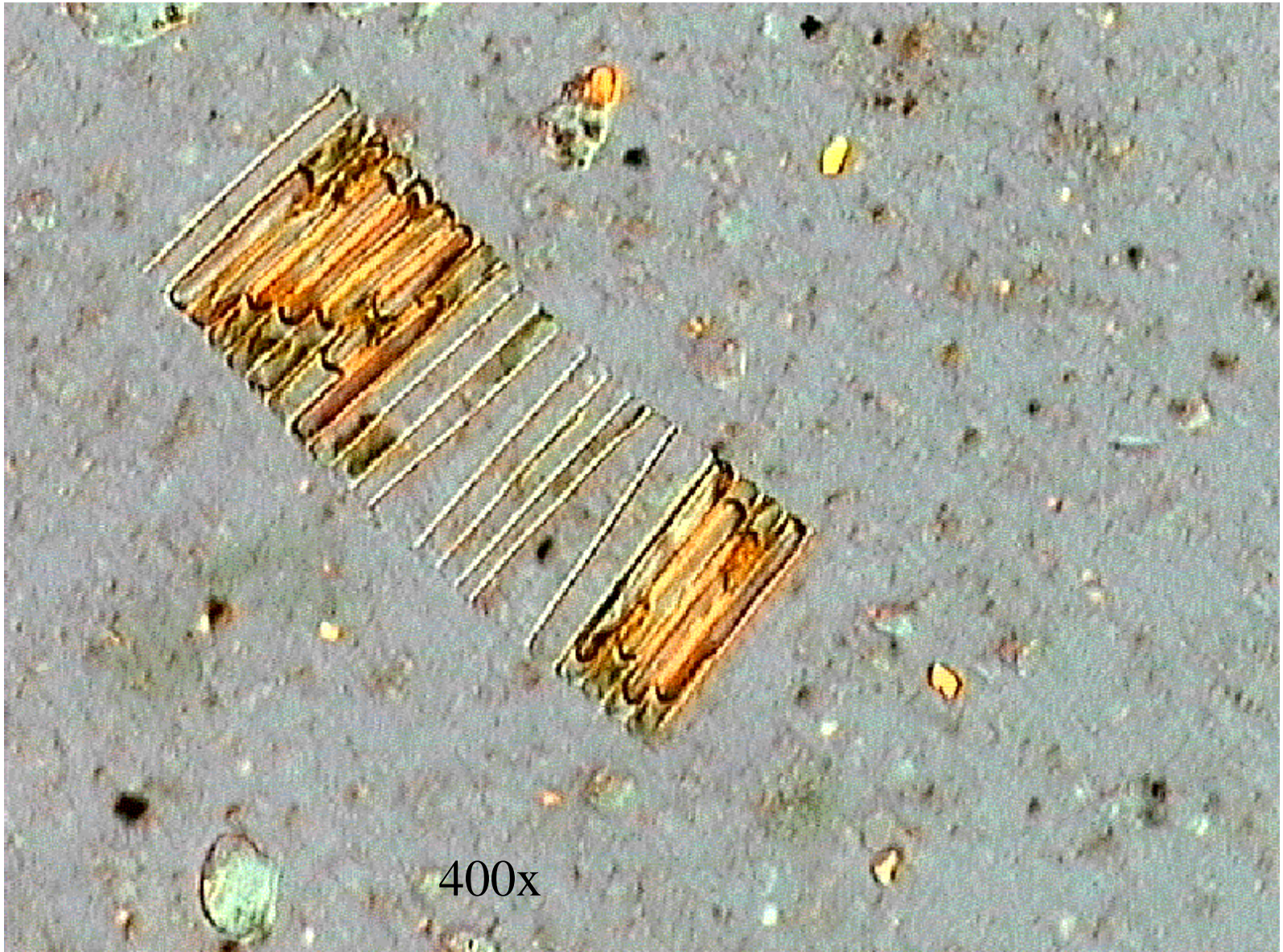
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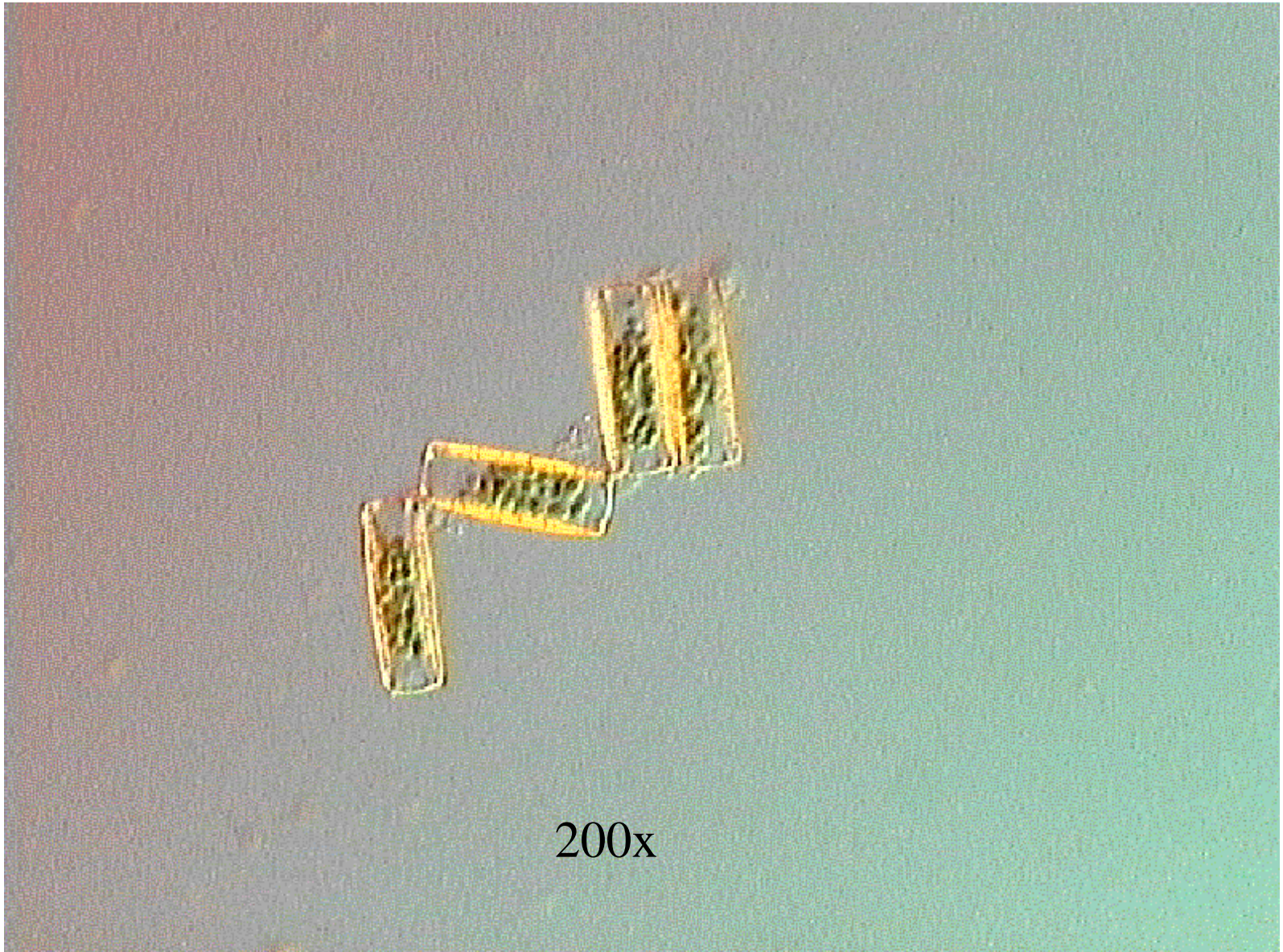
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400x



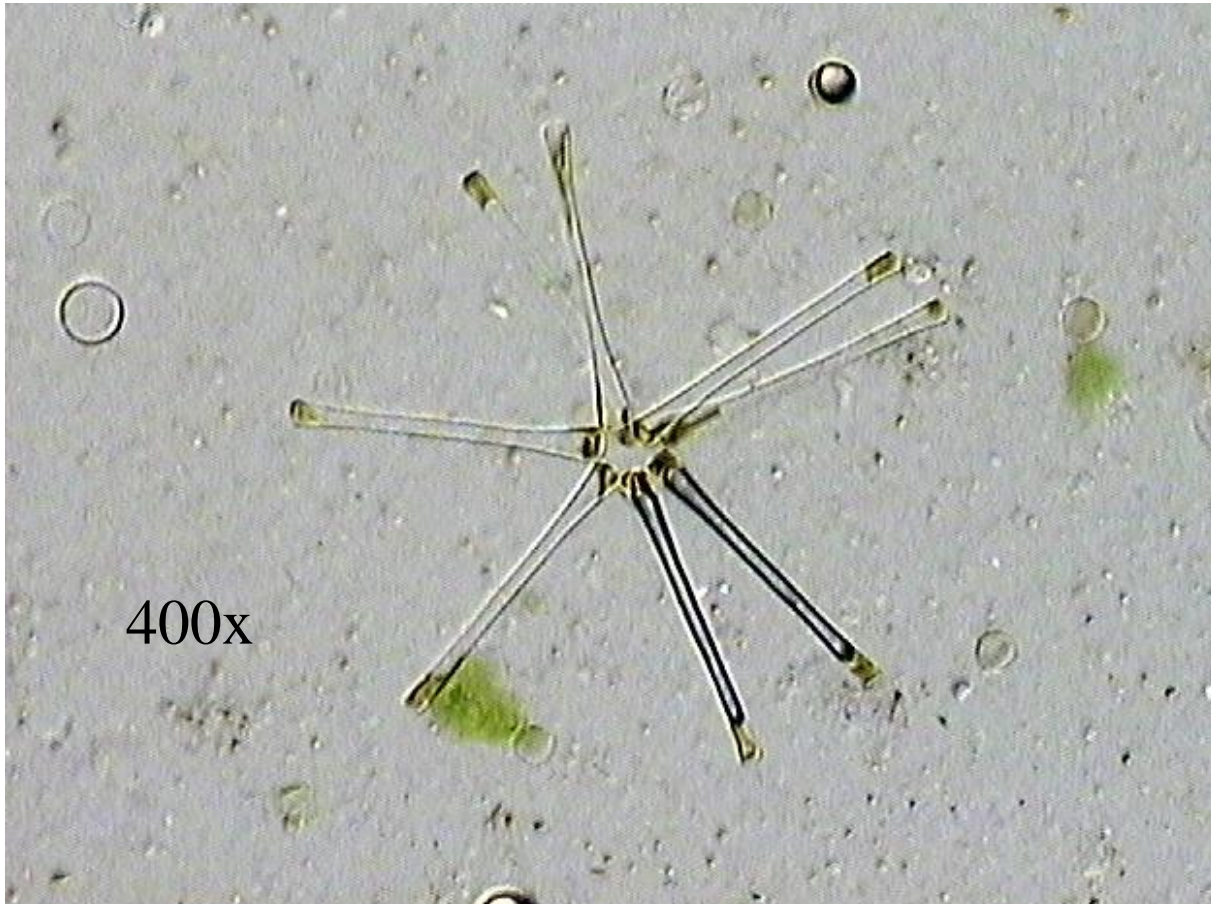


200x



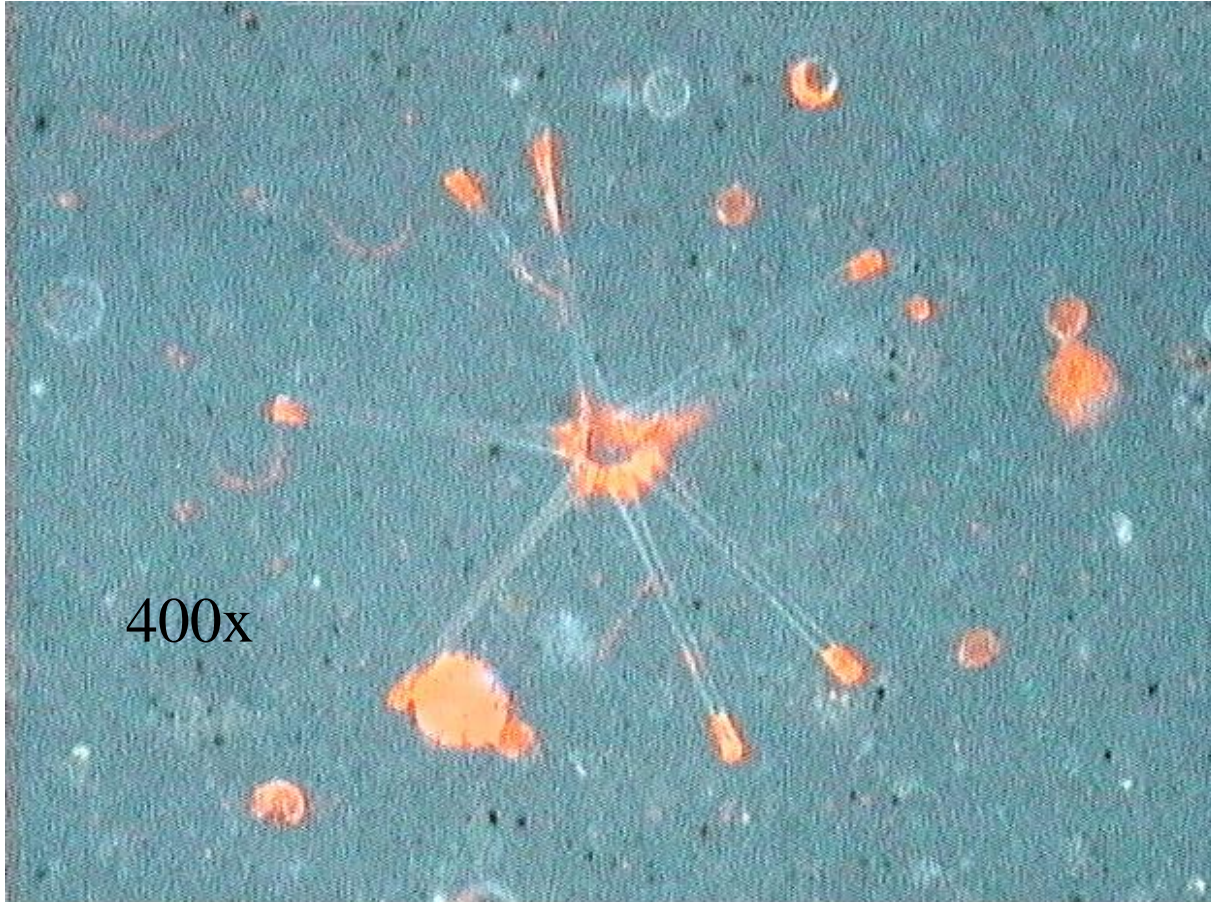
# Astrionella: Diatom

DIC



# Astrionella: Diatom

## Fluorescence







*Dinobryon*





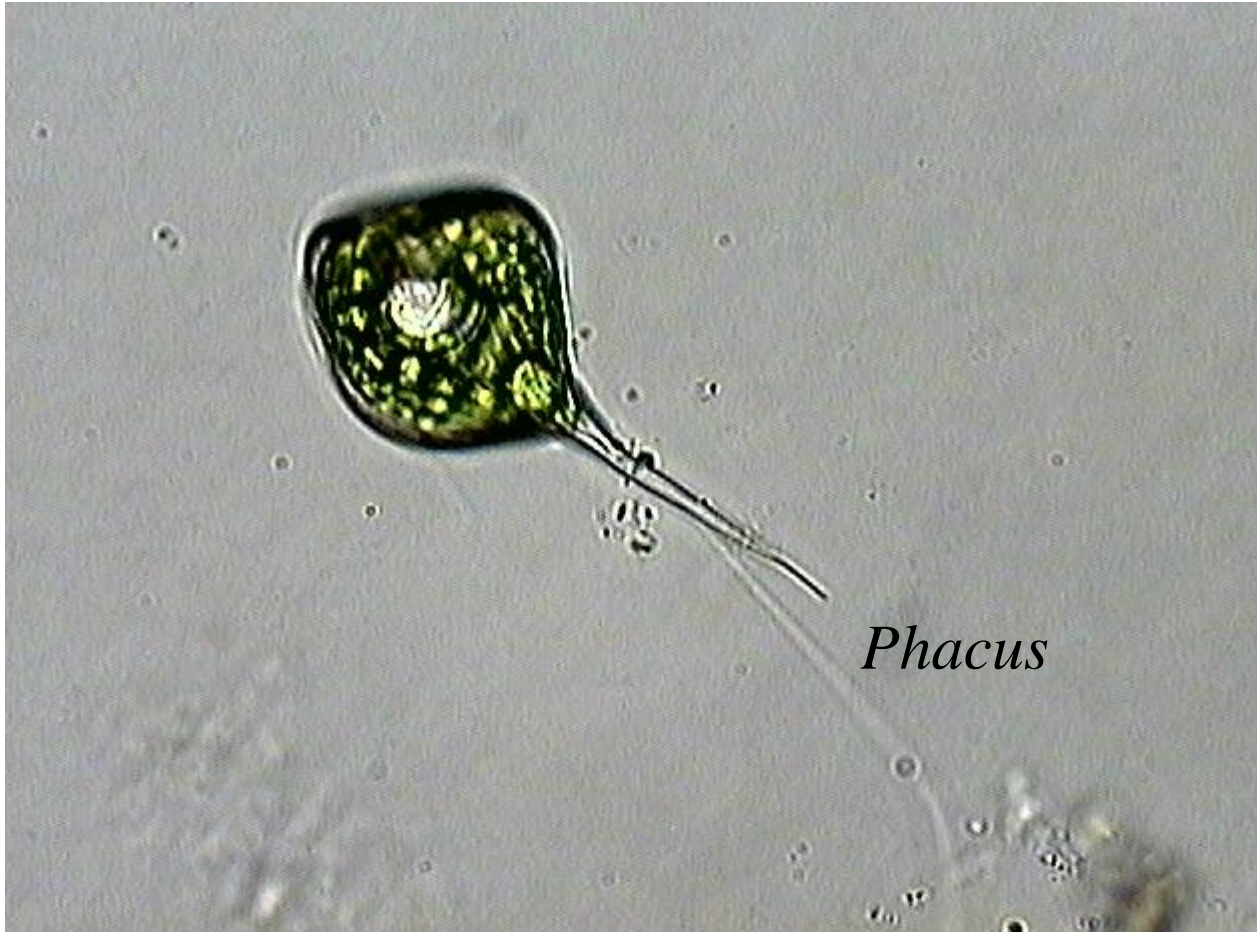
*Dinobryon*



*Dinobryon*

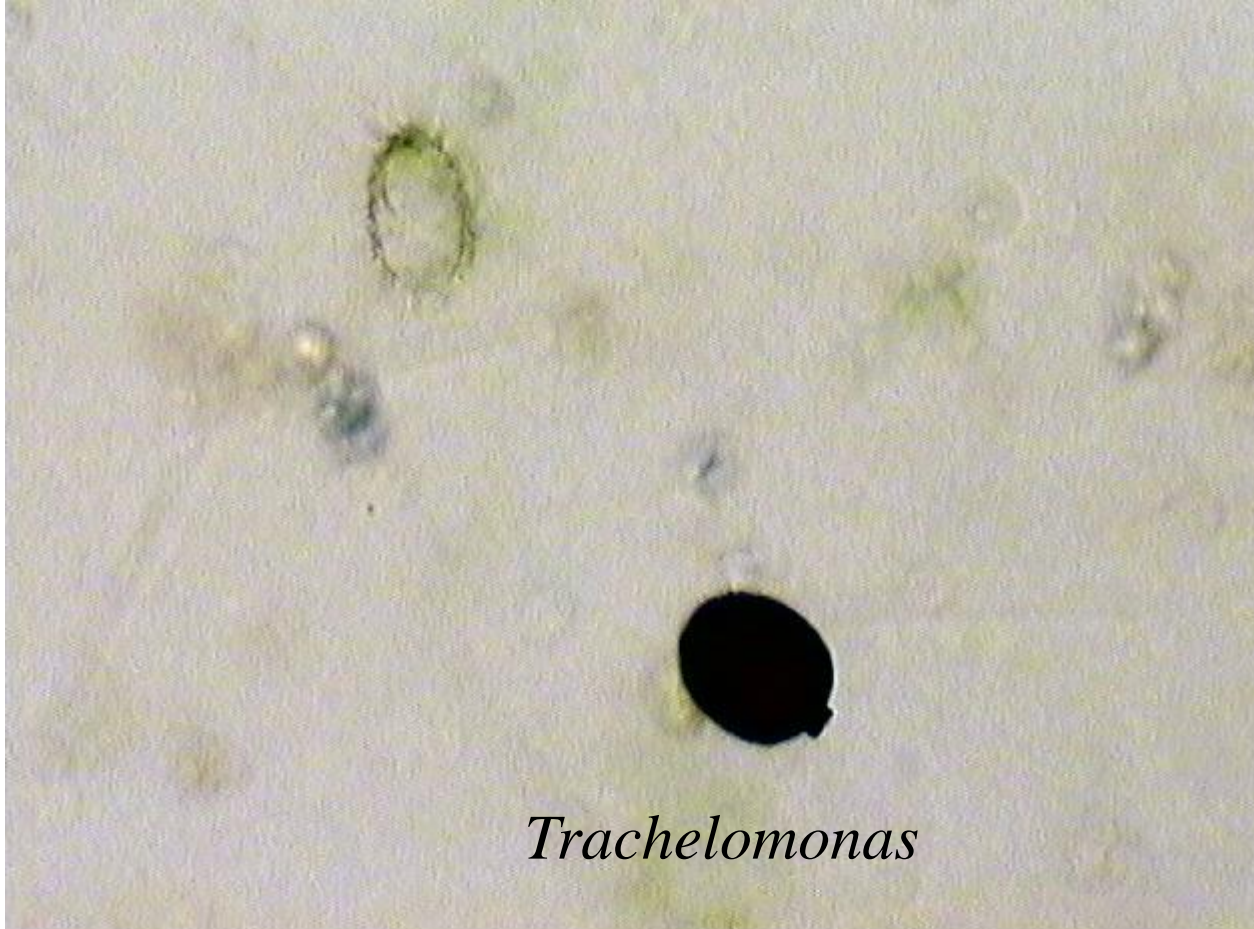
# Euglenoids





*Phacus*





*Trachelomonas*

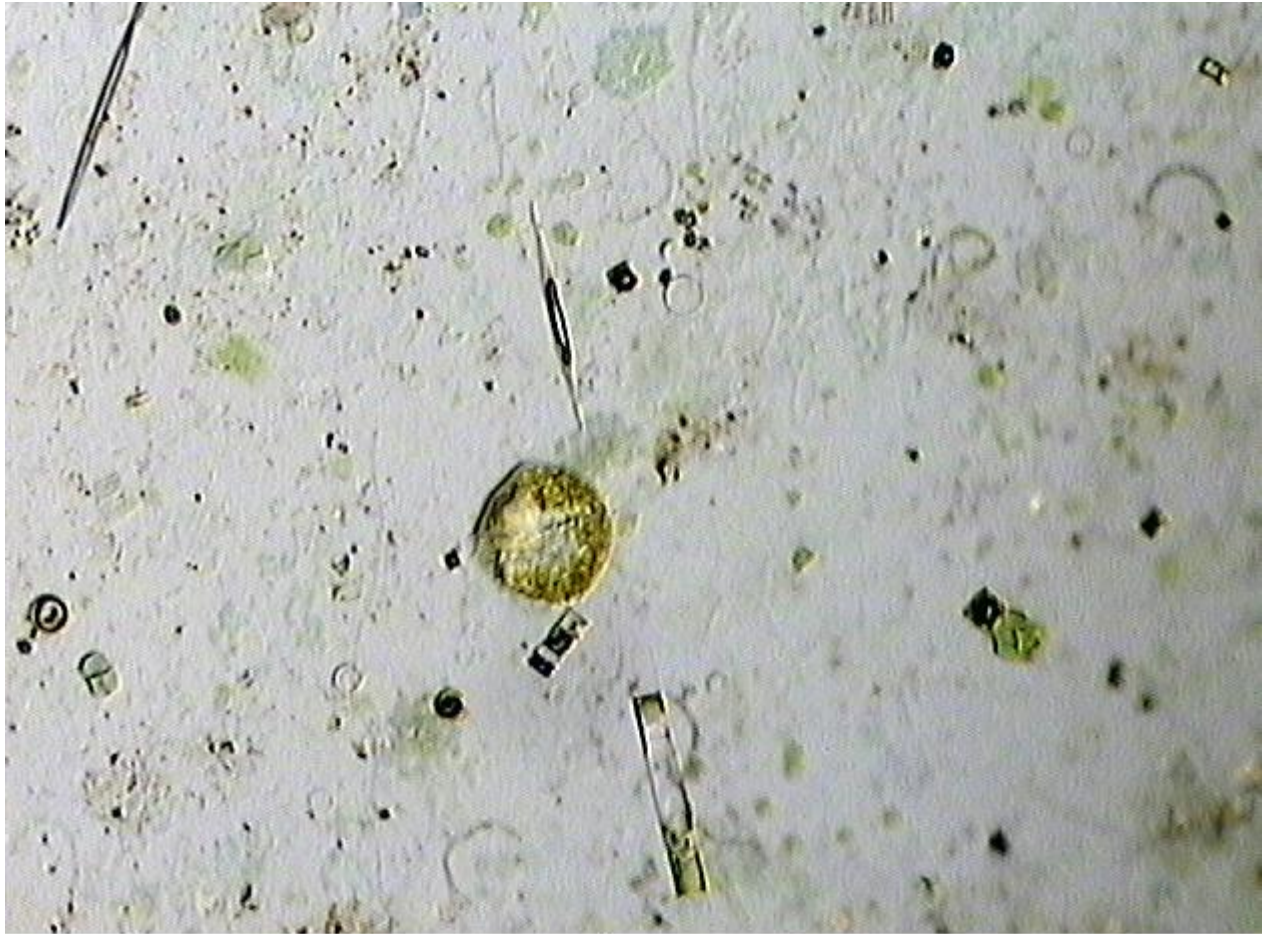
# Dinoflagellates

# Lake Bloomington 200x

A microscopic image of Lake Bloomington at 200x magnification. The image shows a dense population of green filamentous algae, likely Scenedesmus, which appear as long, thin, radiating structures. Interspersed among these algae are numerous small, bright red dots, which are identified as bacterial cells. The background is dark, making the green and red structures stand out.

**Dots: Bacterial Cells**



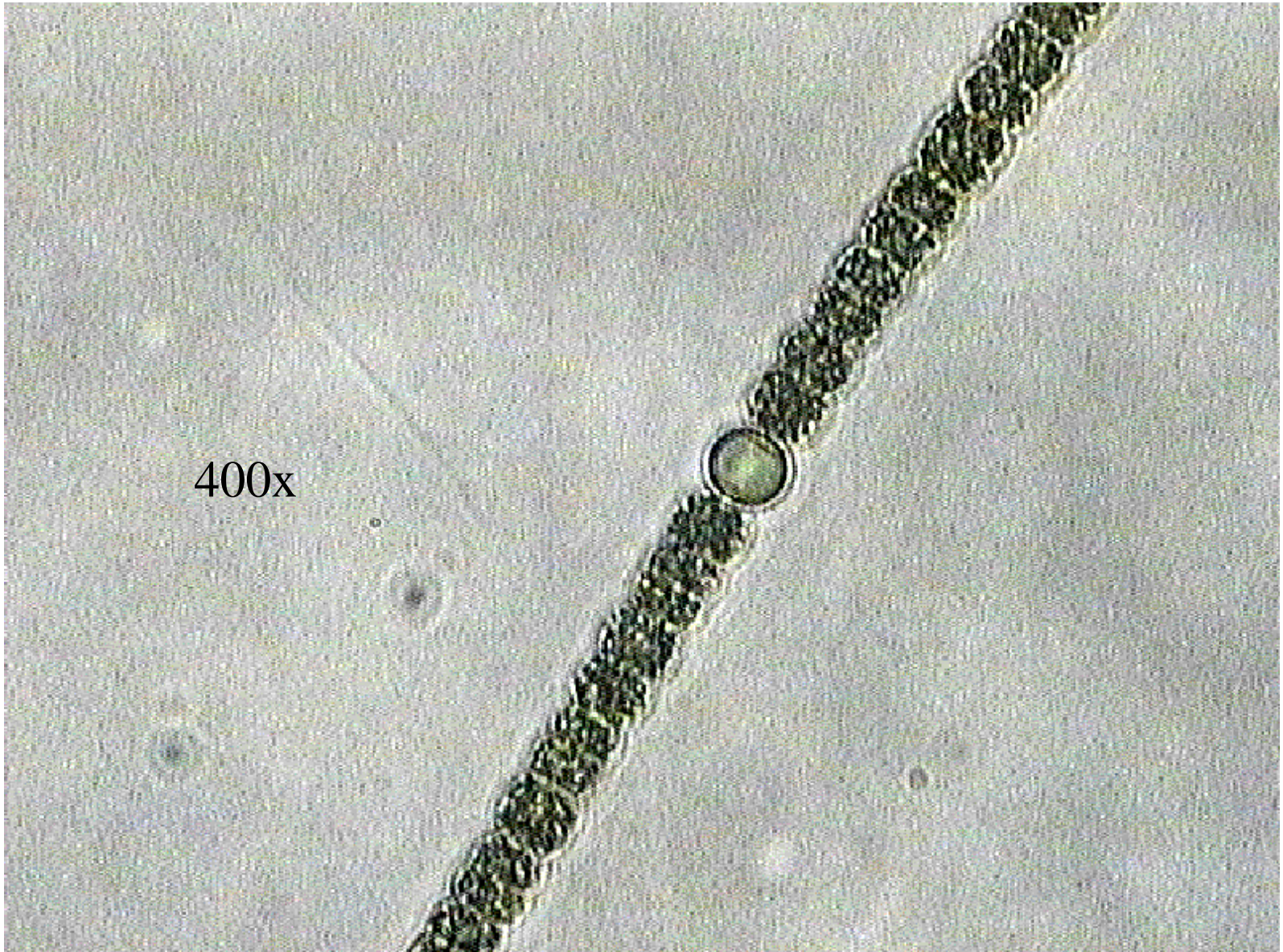


# Cyanobacteria (Bluegreen “Algae”)

# Filamentous Algae (Cyanobacterium) 200x

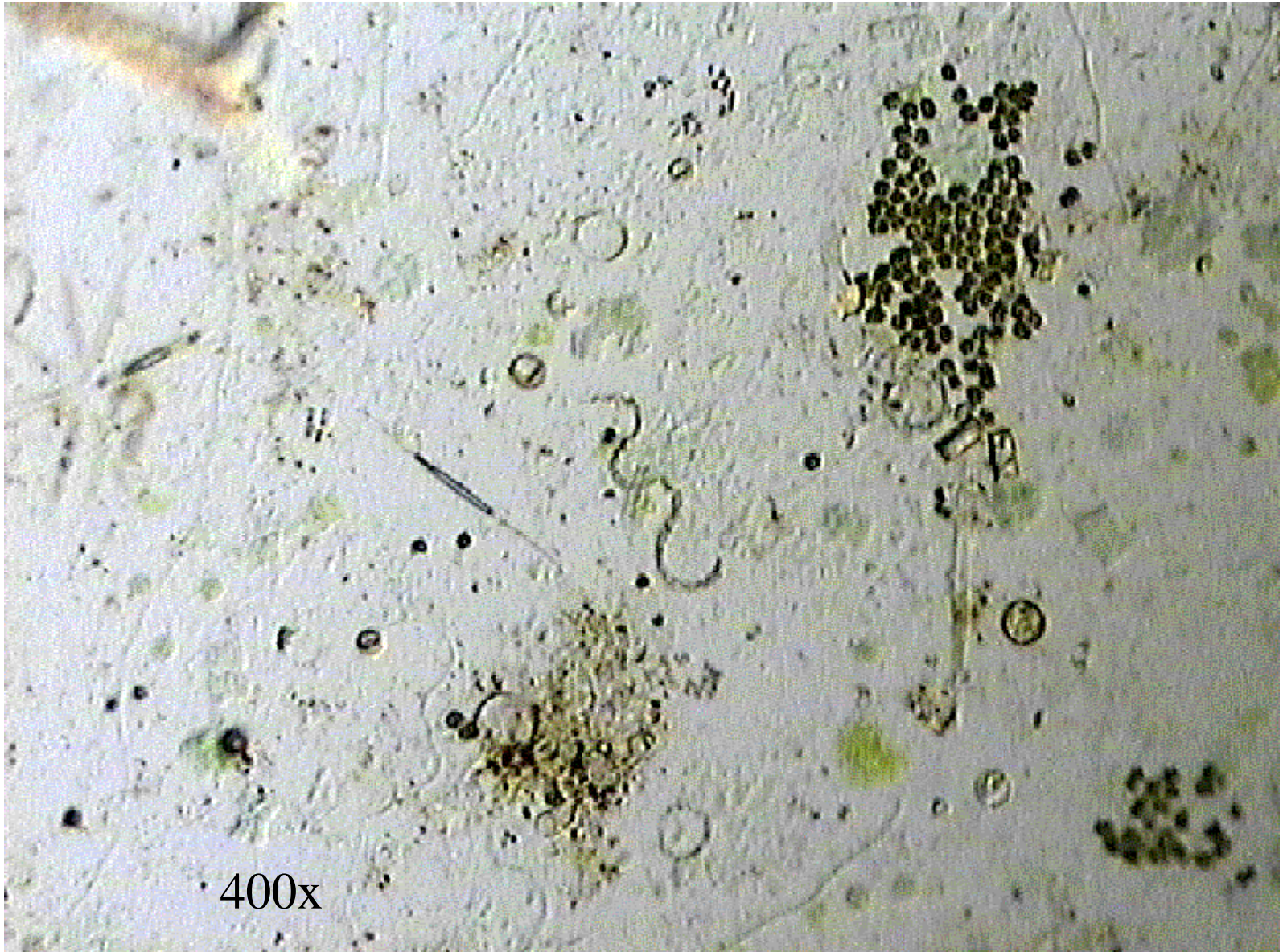






400x



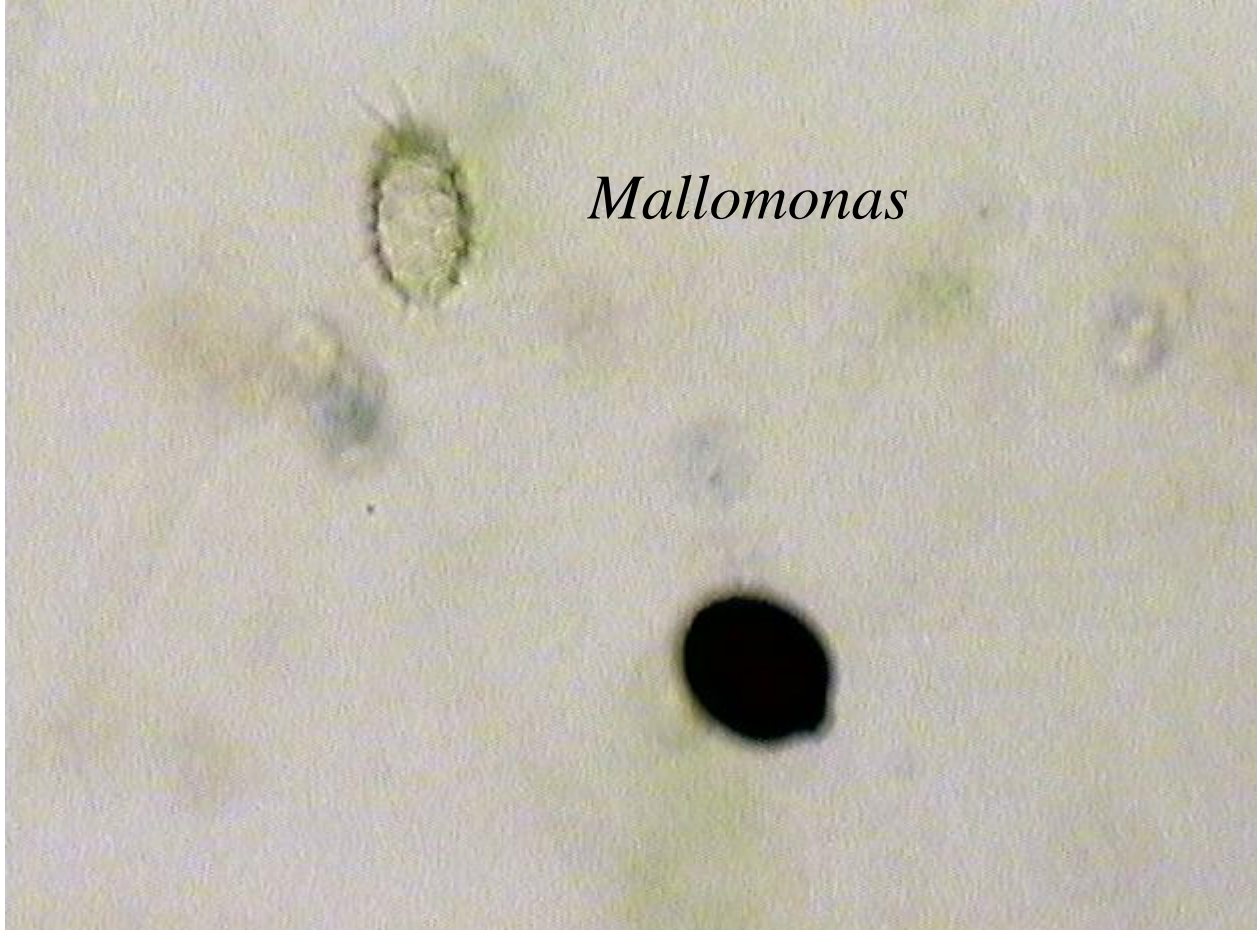


400x



# Other Types

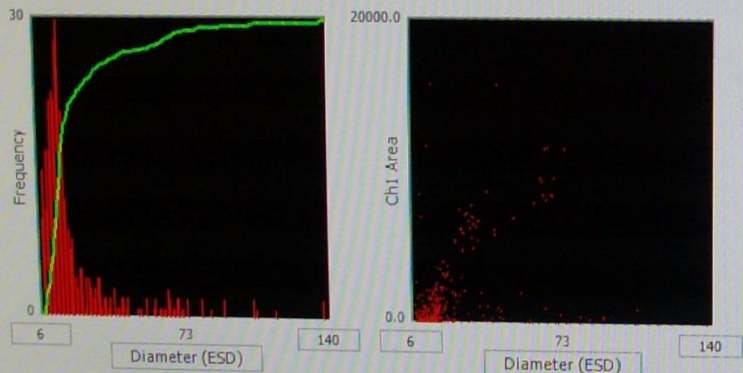
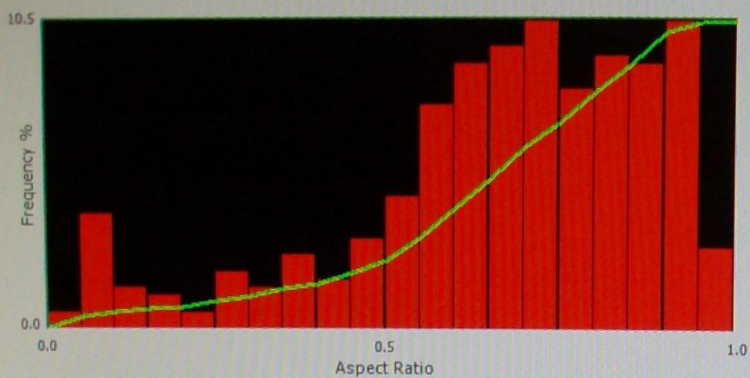
*Mallomonas*





# The Rise and Fall of Algal Types

- Predominance of species and population size can vary with lake conditions
  - Temperature
  - Nutrient levels (both N and P)
  - Grazing pressure
  - Light penetration and Water clarity



Count 352 of 352 Efficiency 1.0% Start Time 2016-09-21 14:26:09  
 Particles / ml 3609 PPU 1.45 Sampling Time 12 min 9 sec

Summary Stats	Filters	Cumulative Stats	Context Summary			
Summary Stats	Mean	Min	Max	StdDev	% CV	
Aspect Ratio	0.66	0.03	0.98	0.23	34.56	
Average Green	122.24	66.44	171.04	24.89	20.36	
Circle Fit	0.60	0.00	0.94	0.28	46.68	
Compactness	2.09	1.02	32.36	2.98	142.85	
Diameter (ABD)	17.86	6.00	69.32	10.17	56.92	
Intensity	124.60	67.84	172.77	24.99	20.05	
Length	30.76	7.62	214.31	32.02	104.07	
Perimeter	91.43	29.71	526.60	76.33	83.49	
Roughness	1.12	1.04	2.04	0.09	7.94	
Width	14.54	3.91	49.58	8.08	55.57	

Objective 10X, Flowcell FC90FV, Trigger, Diluted

1 of 7 Z+ Z- Z1 Show Selected



50 um



# Seasonal Succession of Phytoplankton

From: The Lake and Reservoir Restoration Guidance Manual, 2<sup>nd</sup> Edition, 1990

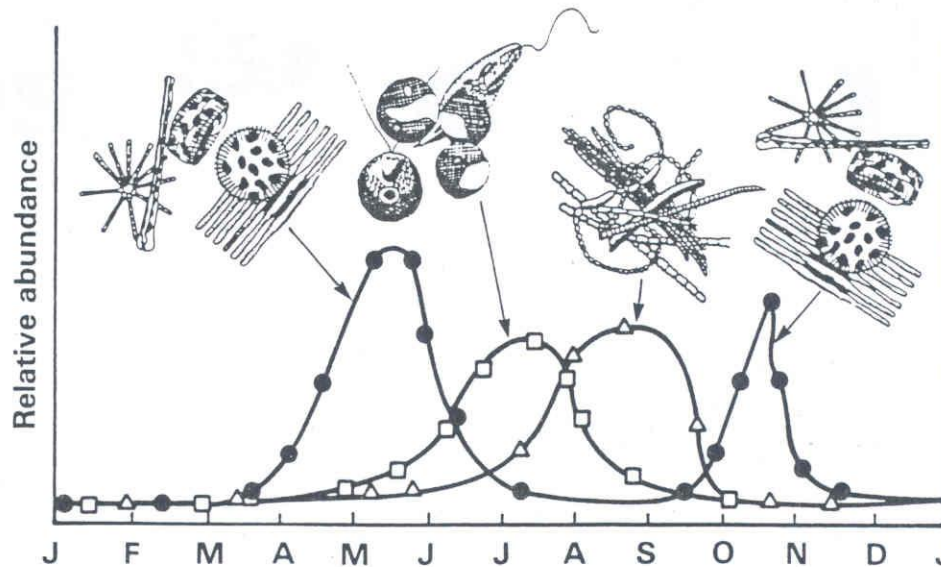
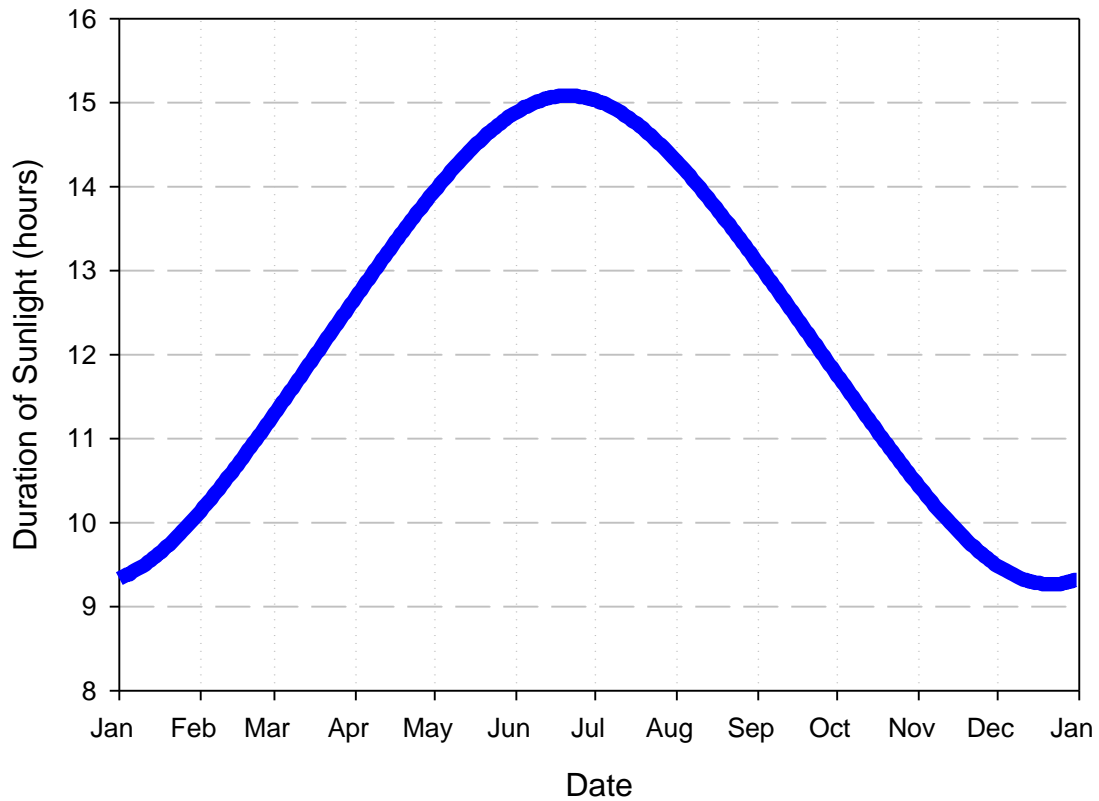


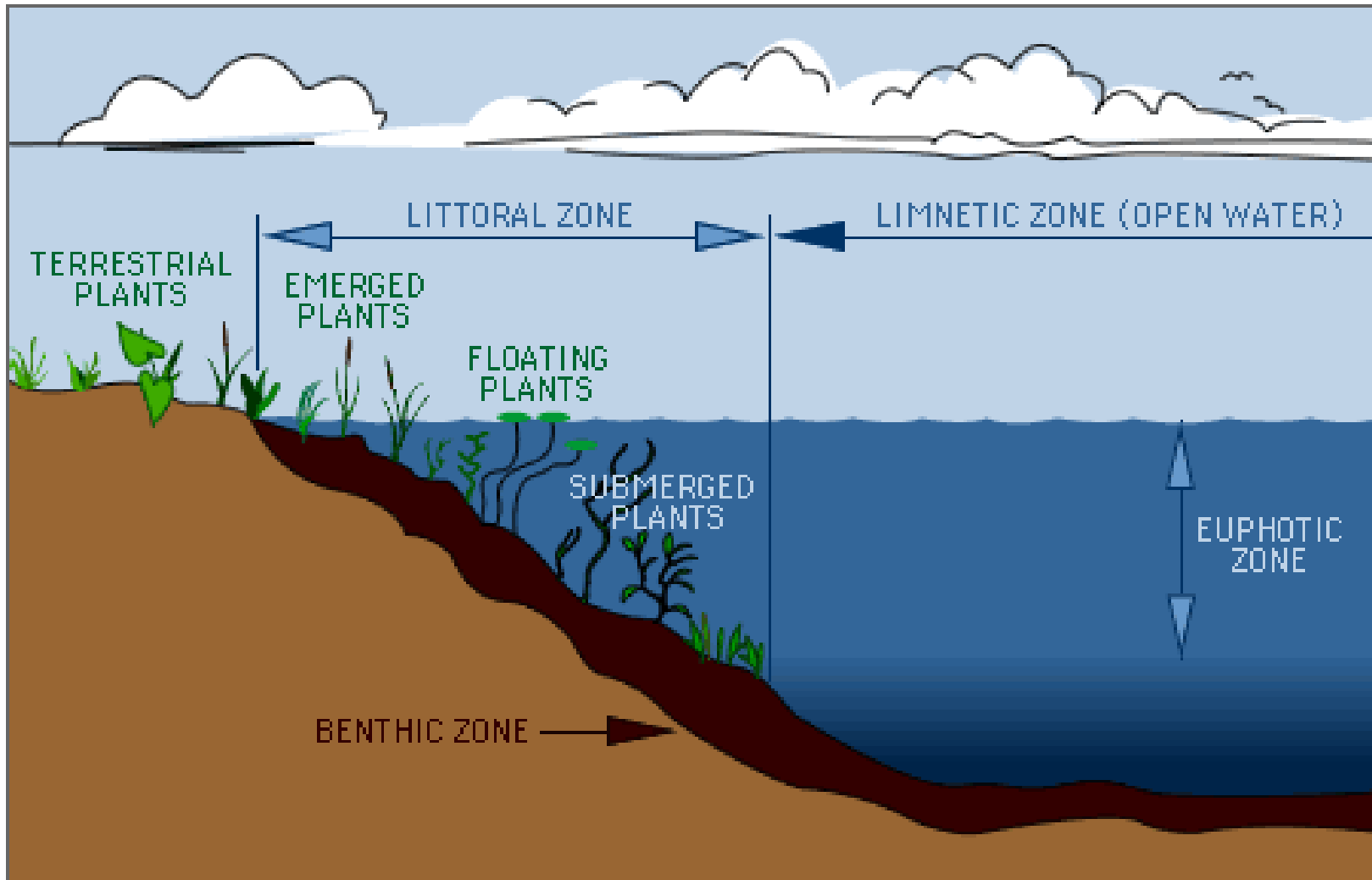
Figure 2-8.—A typical seasonal succession of lake phytoplankton communities. Diatoms dominate the phytoplankton in the spring and the autumn, green algae in midsummer, and blue-green algae (cyanobacteria) in late summer.

## Duration of Sunlight vs Date Hudson, IL



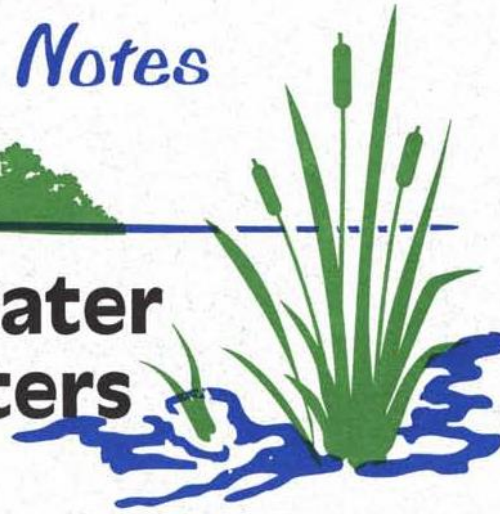
Source: United States Naval Observatory





Zones of a Lake (Source: Minnesota DNR)

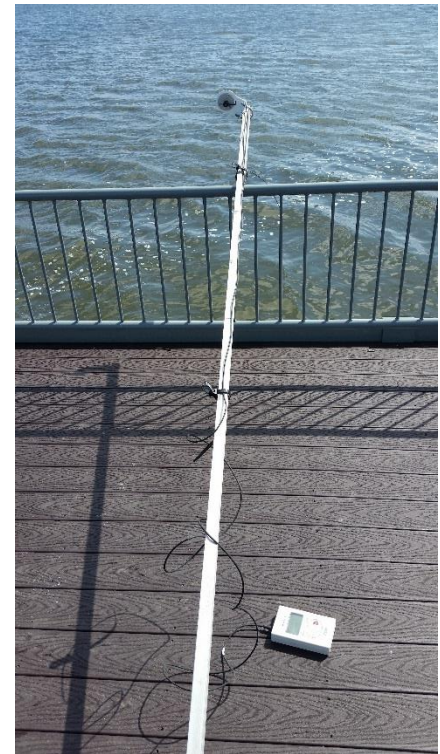
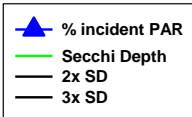
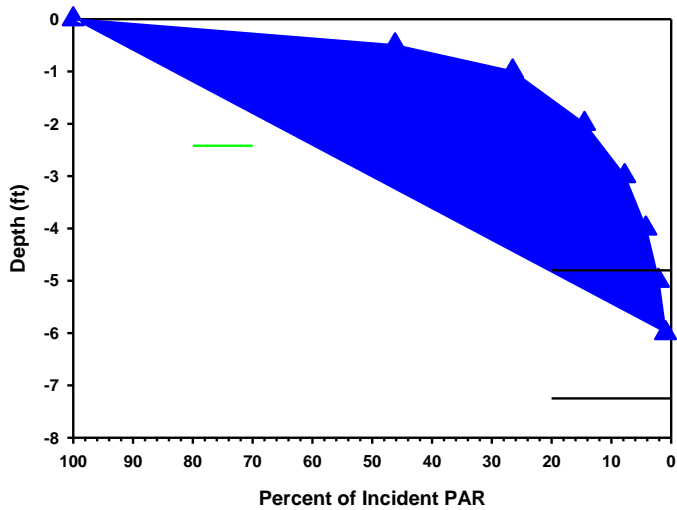
# Lake Notes



## Common Lake Water Quality Parameters

1	11	
2	12	
3	13	
4	14	
5	15	
6	16	
7	17	
8	18	
9	19	
10	20	No Match

Photosynthetically Active Radiation vs Depth  
Lake Bloomington Launch Ramp Dock  
03/21/2018



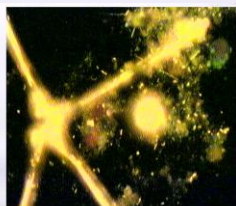




Light Bottle :  
Photosynthesis  
+  
Respiration

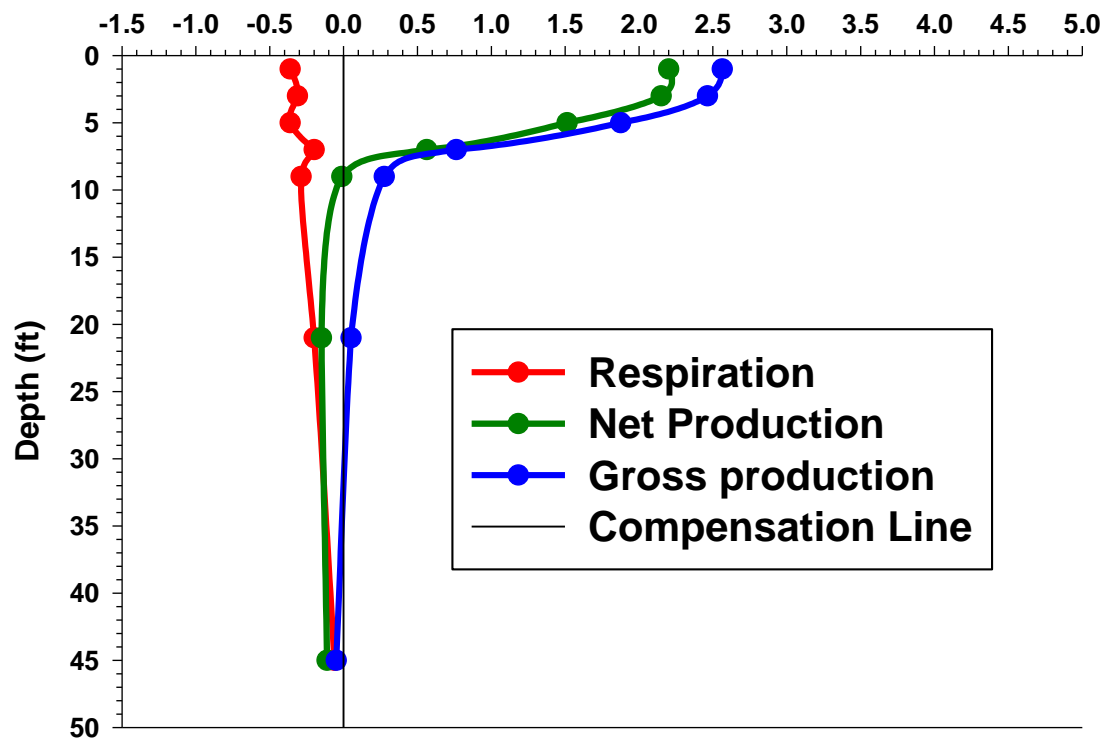


Dark Bottle :  
Respiration Only

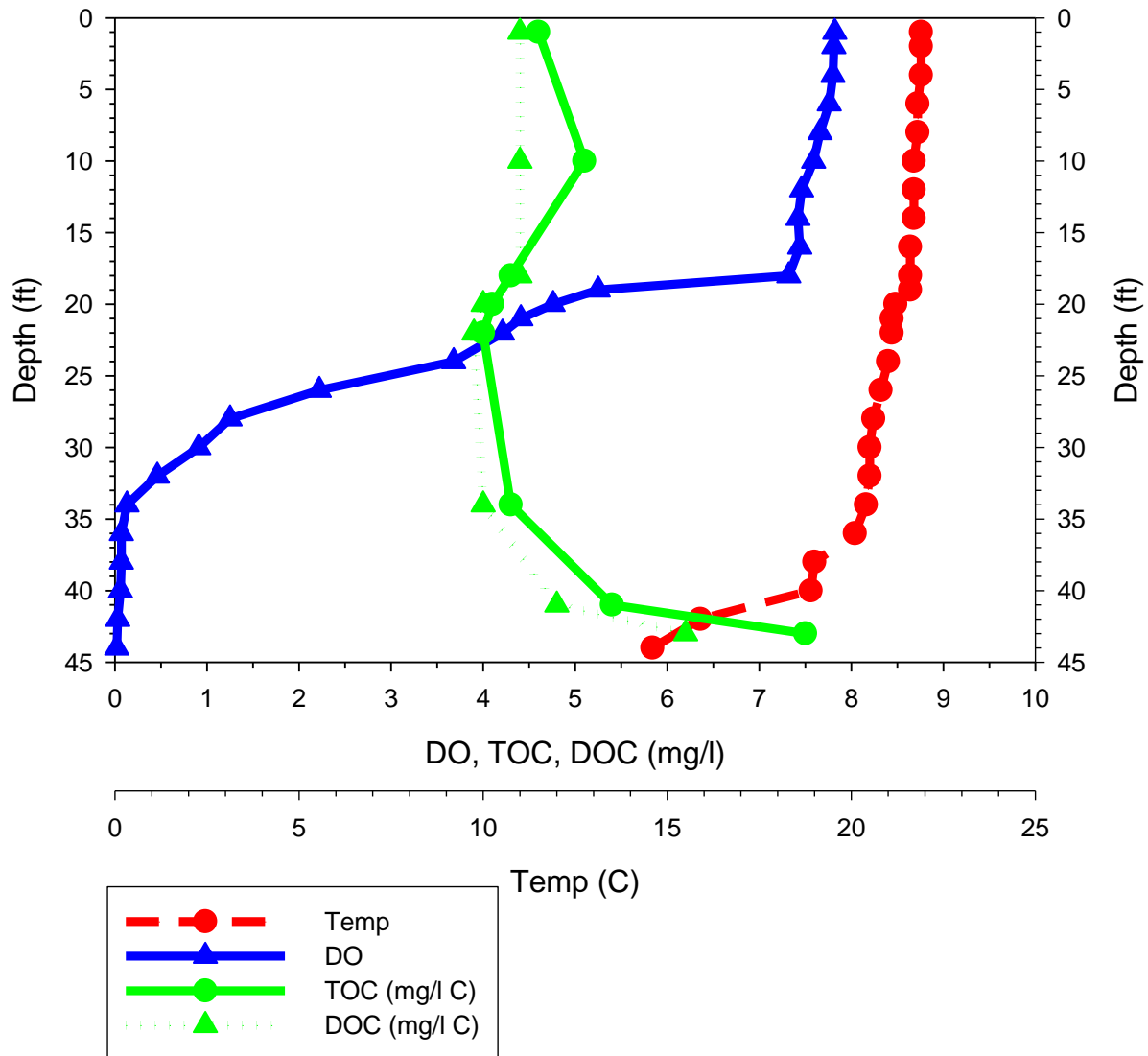


## Evergreen Lake Light & Dark Bottle D.O. Study 7/22/99

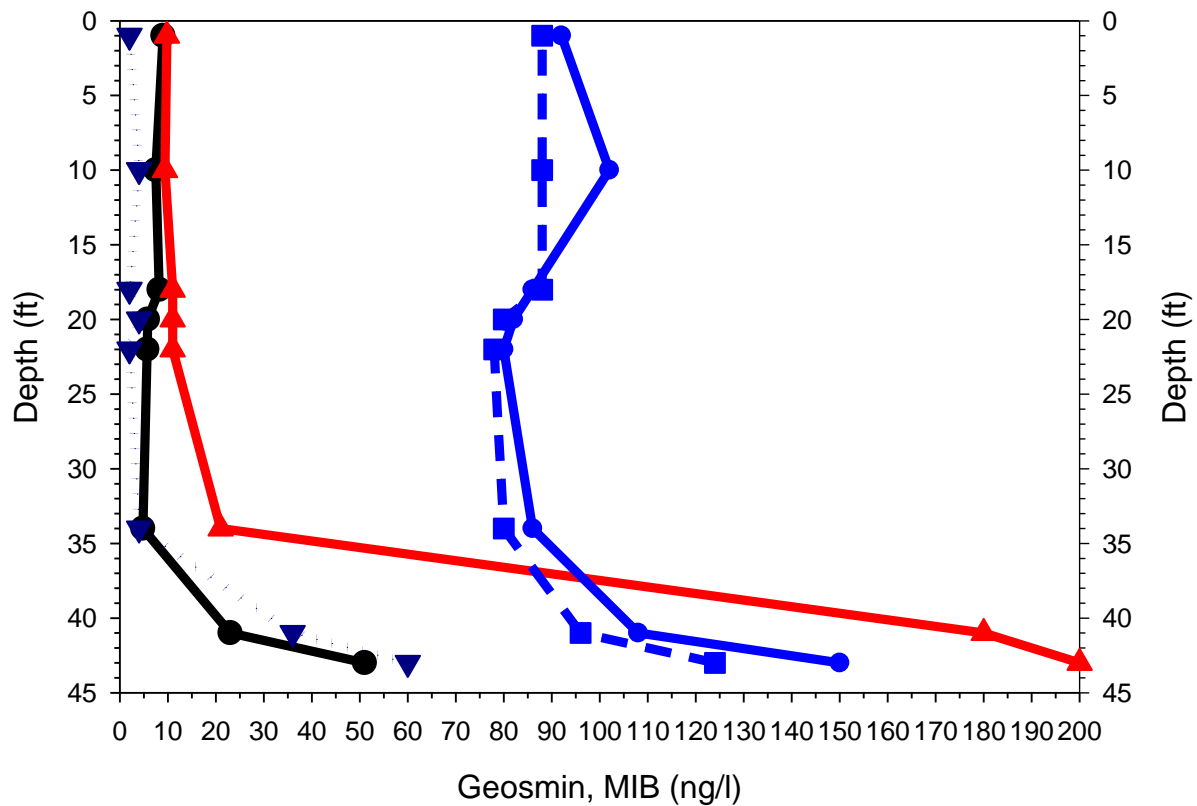
Change in Dissolved Oxygen (mg/L)



# Evergreen Lake Deep Station 10/04/2005

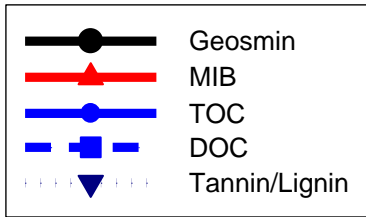


Evergreen Lake Deep Station  
10/04/2005



Geosmin, MIB (ng/l)

TOC, DOC (mg/l)





# Bloom Photos







07/01/2015 08:52 AM


Evergreen Lake at spillway showing attached mats of *chladophora* and *spirogyra*



A microscopic image showing several parallel filaments of the green alga Spirogyra. The filaments are composed of individual cells, each containing a large, central chloroplast with a characteristic spiral arrangement of chlorophyll granules. The cells are rectangular and arranged in a regular, repeating pattern. The background is a light, pale blue color, likely due to the mounting medium or the lighting used during microscopy. The text 'spirogyra' is written in a black, italicized font in the center of the image.

*spirogyra*



A microscopic view of Spirogyra filaments. The image shows several parallel, elongated filaments of green, spiral-shaped cells. Each cell contains a prominent, circular chloroplast with a distinct spiral pattern. The filaments are arranged in a somewhat regular, parallel fashion, and the overall appearance is that of a dense, green, fibrous structure. The background is a light, slightly hazy grey.

*spirogyra*





*chlamydomonas*



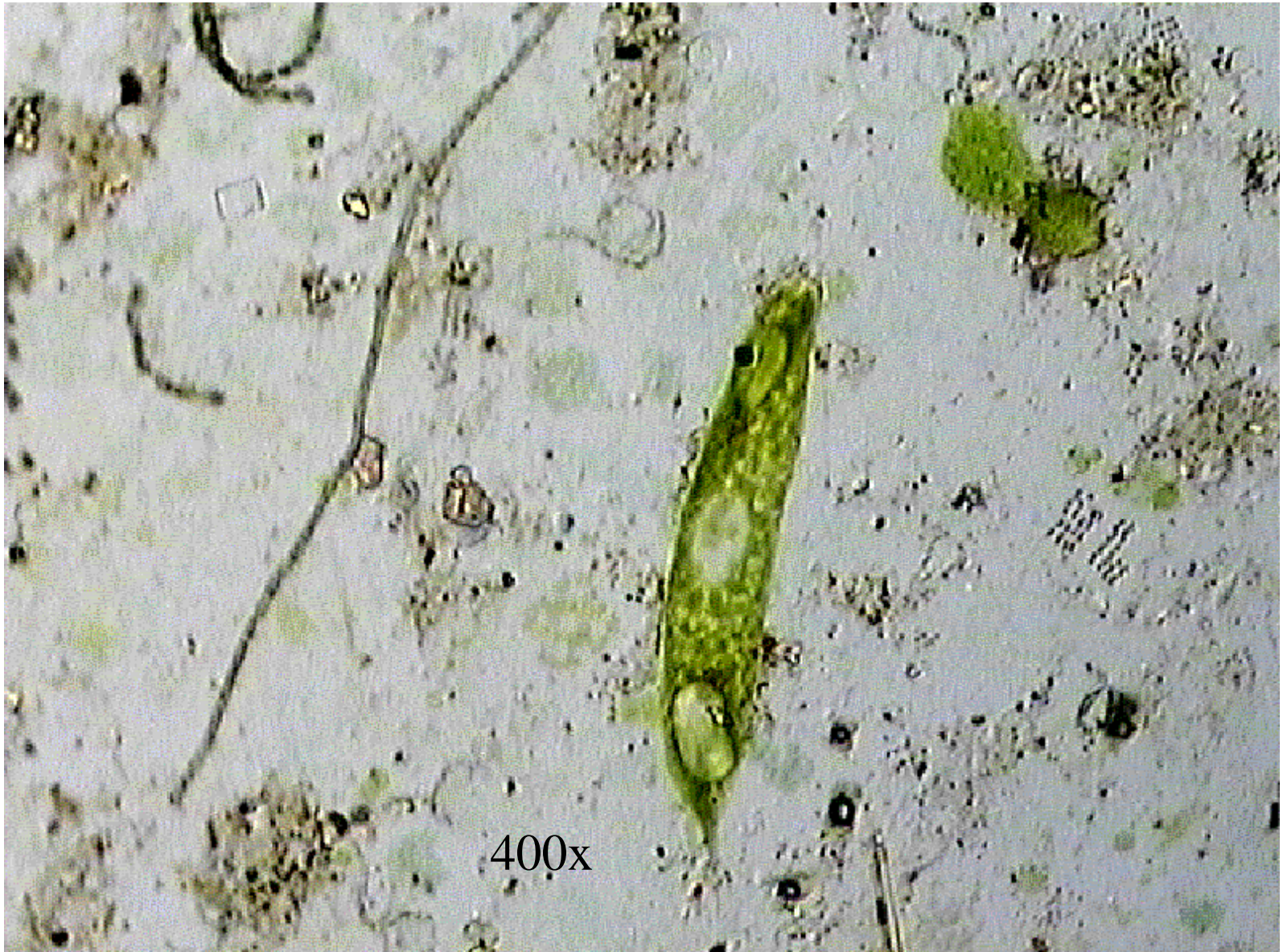












400x





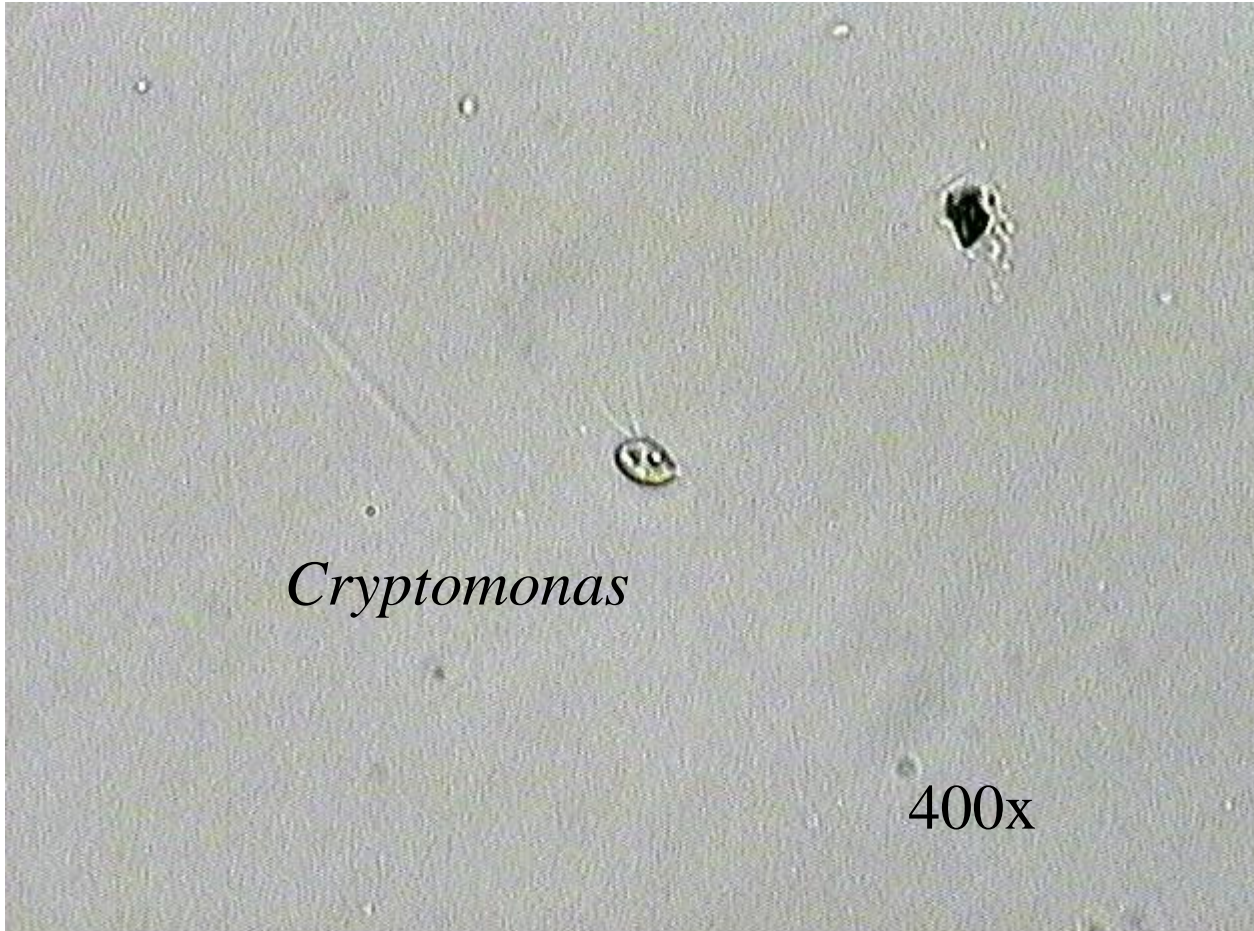






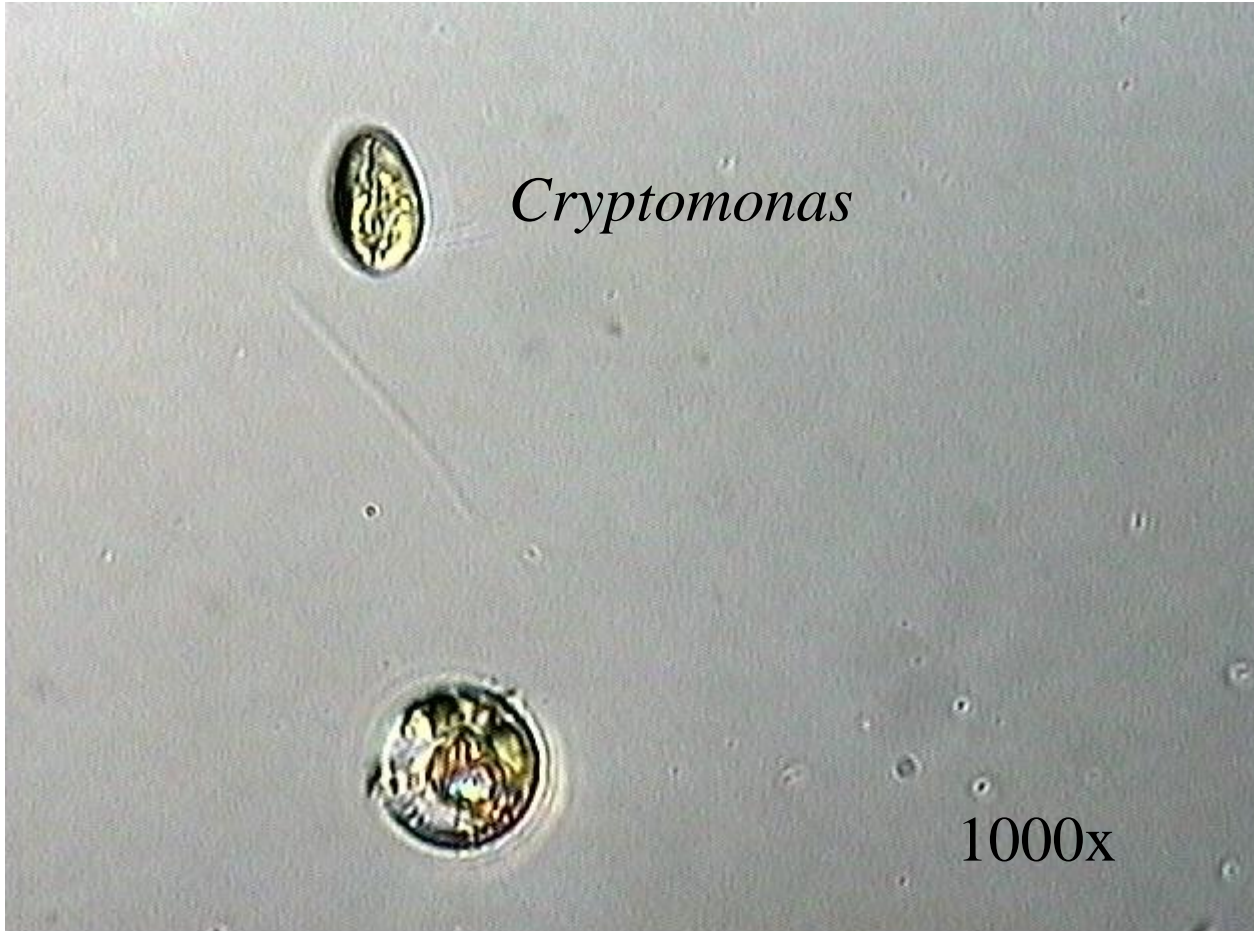






*Cryptomonas*

400x



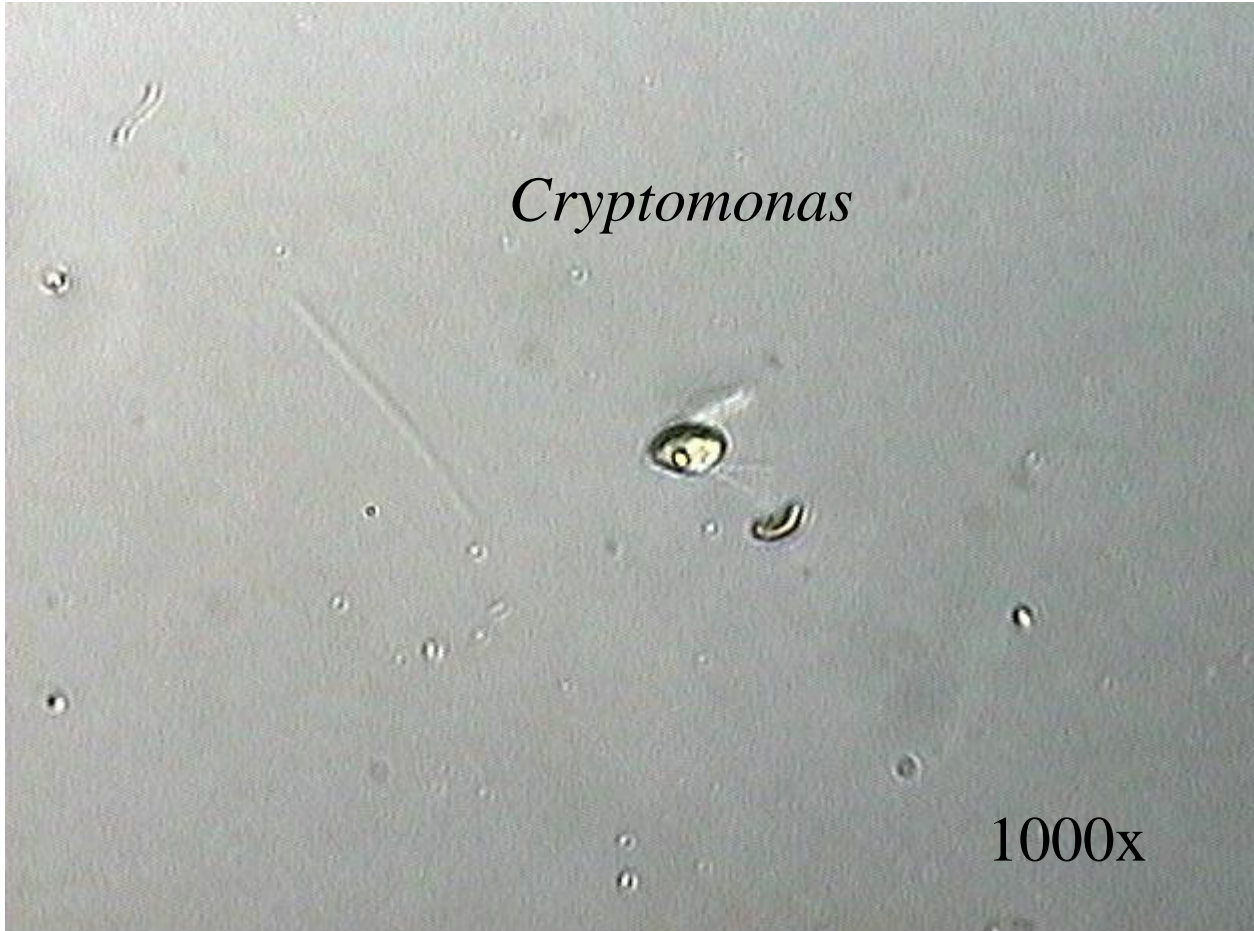
*Cryptomonas*

1000x



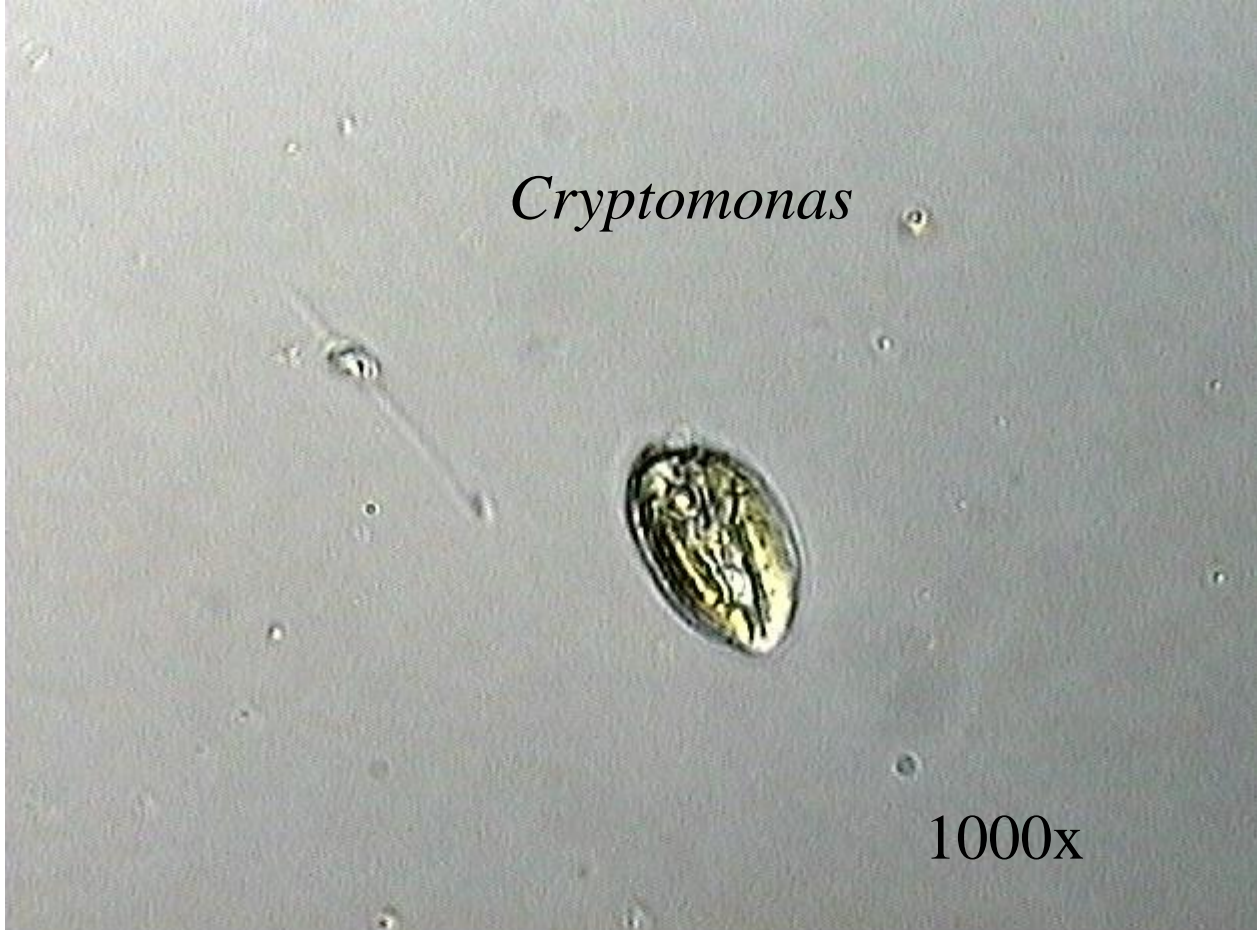
*Cryptomonas*

1000x



*Cryptomonas*

1000x

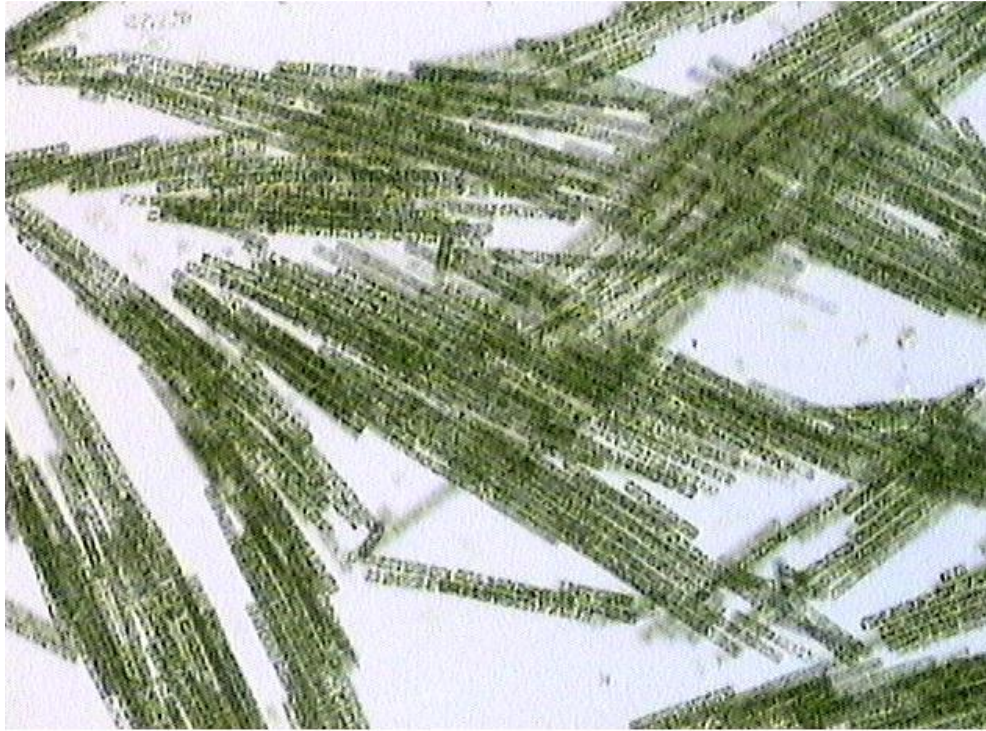
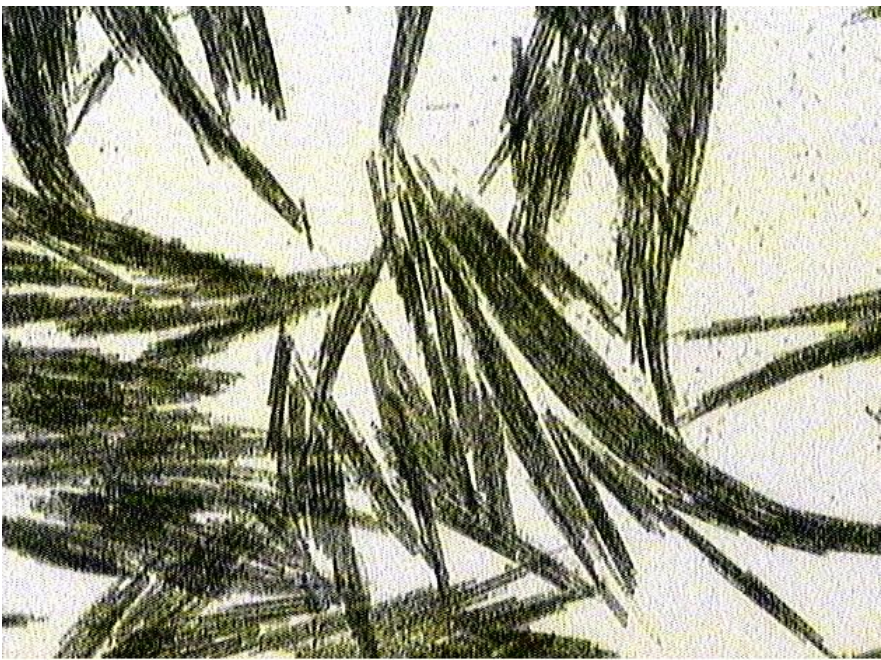




Evergreen Lake at Spillway showing green color of water due to *aphanizomenon flos aquae* bloom. July 06, 2015

07/06/2015 08:18 AM

























05/23/2014 T3 wet land  
"whiting"





05/23/2014

T3  
Wetland

"Whiting"

134 NTU





T3  
Wetland

"Whiting"

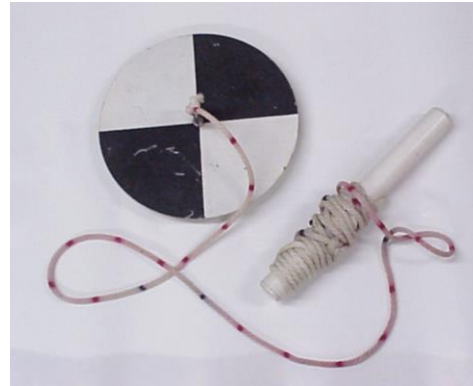
134 NTU

6.02 NTU  
after acidification



# Tools you can use

- Secchi disk
- Color strip
- Digital camera
- Deer cam
- Digital microscope
- Lake Notes

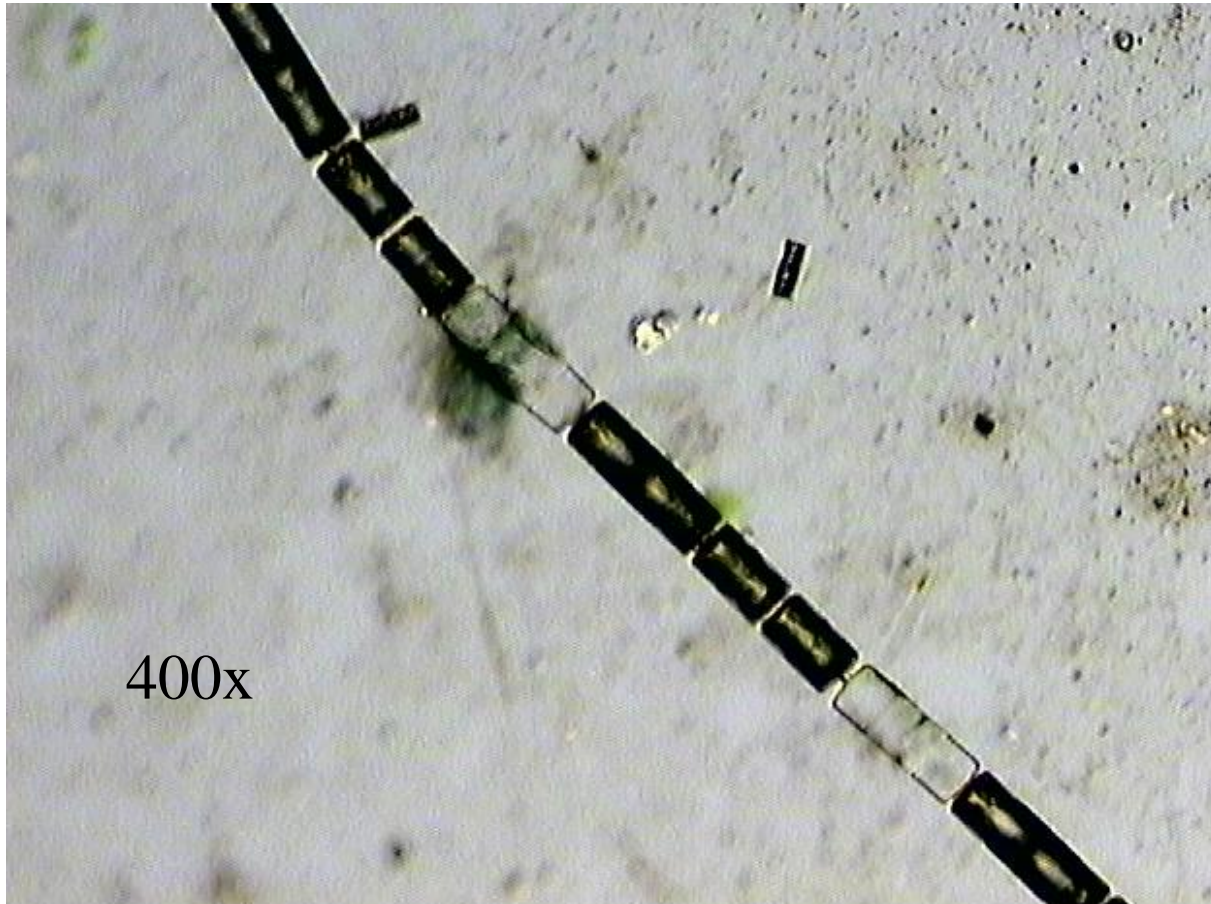


1	11	
2	12	
3	13	
4	14	
5	15	
6	16	
7	17	
8	18	
9	19	
10	20	No Match





# Questions?





# Acknowledgements



City of Bloomington Water Department Staff

Bob Yehl, Water Director

Illinois EPA Lakes Unit

Our Water Customers

07/02/2015 08:29 AM



# Thank You

