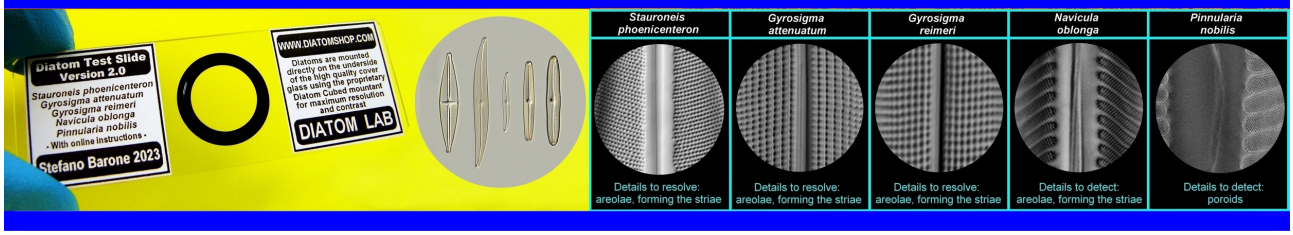
Diatom Test Slide version 2.0 Instruction Manual

(Updated edition)

Venture into the Micro and Nano structures

www.diatomshop.com www.testslides.com www.diatomlab.com



Since the appearance of the microscope, some Diatom species (called Test Diatoms by microscopists) have been and still are used to test optics, because striae and areolae distances in a same species collected in a same area are constant regardless the size of the Diatom frustule (an areola is one of the pores in a row that forms a stria on a valve. The plural is areolae. A stria is a row of areolae. The plural is striae).

In other words Test Diatoms are extremely valid and accurate to quantify resolution of optical microscopes (defined as the smallest distance between two points on a specimen that can still be distinguished by the observer or camera system as two separate entities).

It follows that Test Diatoms are also the elite tools to evaluate and compare microscope models, objectives, eyepieces, condensers, light sources, optical filters, microscope cameras and contrast techniques with each other. They can be considered as extremely accurate and "merciless" tests for the microscope and its accessories.

Test Diatoms are always available at www.diatomshop.com, the online store of Diatom Lab (Stefano Barone, founder & owner of Diatom Lab).

PREMISE:

A) This microscope test slide contains 5 cleaned, selected and micromanipulated Diatom species with areolae (an areola is one of the pores in a row that forms a stria on a valve. The plural is areolae), striae (a stria is a row of areolae. The plural is striae) and poroids (small holes on the diatom valve) that can be resolved or detected through a light microscope. The resolving power of a microscope is measured by its ability to differentiate two lines or points in an object.

This microscope test slide is excellent to EVALUATE and COMPARE microscope models, objectives, eyepieces, condensers, light sources, optical filters, microscope cameras and contrast techniques with each other. It can also be used as a TRAINING TOOL or a TEACHING TOOL, for example it is possible to:

- practice using your microscopes at their highest levels!
- examine the variations in contrast and resolution by regulating the condenser aperture diaphragm
- understand the importance of correction collar for minimazing spherical aberration
- examine the variations in resolution by using different wavelengths of light

B) It is a **STANDARDIZED microscope test slide, so different laboratories and microscopists who own this product can compare their results from different places**, in fact each microscope slide has the same production characteristics:

- Each Diatom species belongs to a sample collected in the same place / depth / time;
- In order to give you the best conditions for resolution and contrast, Diatoms are attached / fixed to the **UNDERSIDE** of a properly thick cover glass (and not commonly on the microscope slide!), so there is no space between Diatom frustules and cover glass (although this procedure requires several special manufacturing precautions). Furthermore, the mounting to the underside of the cover glass allows to easily use all oil immersion objectives (even those with very short working distance, such as plan-apochromat 63x/1,4 or 100x/1,4);
- **Diatom Cubed, the PROPRIETARY MICROFILTERED HIGH REFRACTIVE INDEX MOUNTANT** belongs to the same production lot;
- **The CUSTOMIZED cover glass with HIGH OPTICAL QUALITY has been manufactured in Germany specifically for Diatom Lab**.

C) **NOT ALL *Pinnularia nobilis*** (Ehrenberg) Ehrenberg **ARE THE SAME! The MOST DIFFICULT *Pinnularia nobilis*** (Ehrenberg) Ehrenberg **sample among all the others we keep was chosen for the Diatom Test Slide version 2.0 (measurements were performed using a scanning electron microscope or SEM), in fact not all *Pinnularia nobilis*** (Ehrenberg) Ehrenberg **in the world have the same poroids measurements!**

D) **Since its appearance, hundreds of laboratories, microscope companies and microscopists from all over the world use this slide with profit and satisfaction!**

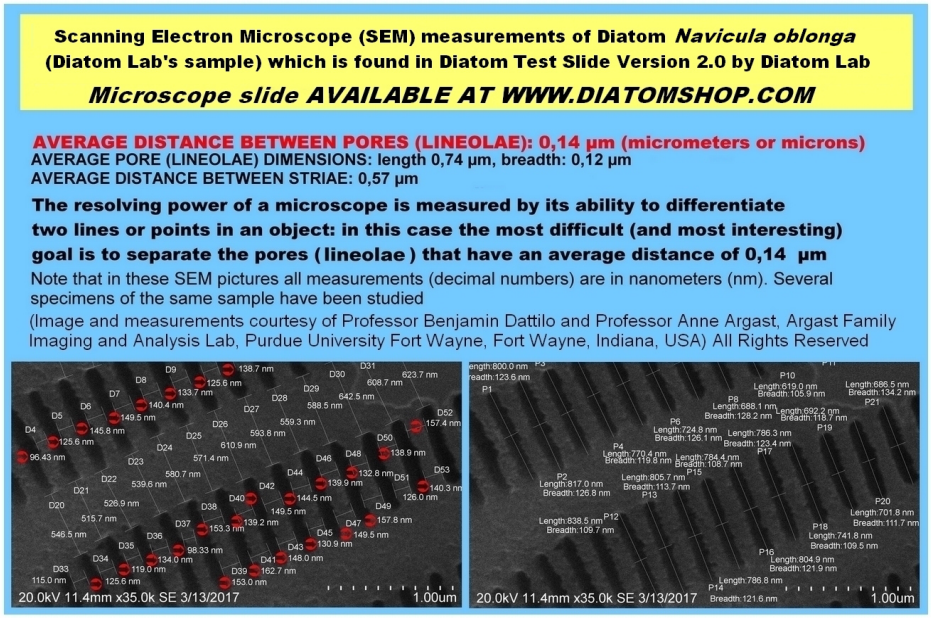
TECHNICAL SUGGESTIONS:

Diatom number 1
Species: *Stauroneis phoenicenteron* (Nitzsch) Ehrenberg
Striae in 10 µm: 12-15 longitudinal
Details to resolve: striae and areolae
Suggested techniques: dry objectives in Bright field, Oblique illumination, Darkfield illumination, Phase contrast, Differential interference contrast (DIC)

Diatom number 2
Species: *Gyrosigma attenuatum* (Kützing) Rabenhorst
Striae in 10 µm: 13-17 longitudinal
Details to resolve: areolae, forming the striae
Suggested techniques: dry or oil immersion objectives in Bright field, Oblique illumination, Darkfield illumination, Phase contrast, Differential interference contrast (DIC)

Diatom number 3
Species: *Gyrosigma reimeri* Sterrenburg
Striae in 10 µm: 18-22 longitudinal
Details to resolve: areolae, forming the striae
Suggested techniques: oil immersion objectives in Bright field, Oblique illumination, Darkfield illumination, Phase contrast, Differential interference contrast (DIC)

Diatom number 4
Species: *Navicula oblonga* (Kützing) Kützing
Details to detect: areolae (lineolae), forming the striae
Areolae (lineolae) in 10 µm: 48-50, see Scanning Electron Microscope (SEM) measurements below
AVERAGE DISTANCE BETWEEN areolae (lineolae): 0,14 µm, see Scanning Electron Microscope (SEM) measurements below
The theoretical limit of resolution of most light microscopes is ~ 0.2 µm, but these areolae (lineolae) can be detected and imaged by the techniques below, thanks to Diatom Cubed high refractive index mountant.
Recommended microscope objectives: Oil-immersion 63 or 100x objectives having a good or excellent numerical aperture (starting from 1,2; better: 1,3 or 1,4)
Suggested techniques: Double immersion (= Oil immersion objective and Oil immersion condenser) and:
Polarized light (the polarizers should be oriented perpendicular to each other = maximum level of extinction);
or Circular oblique illumination (C.O.L.) with polarized light;
or Darkfield illumination using an immersion dark field condenser (better 1,2/1,4);
or Differential interference contrast (DIC);
or UV illumination: in this case highly specialized laboratory facilities are required (it is dangerous for the eyes, it requires the use of special protection devices, accessories and cameras. Please refer to the operating manual of your instruments);
or some variants of the Differential interference contrast (such as AVEC-DIC, the Allen Video-enhanced Contrast);
or IRC (Interference reflection contrast technique



Diatom number 5
Species: *Pinnularia nobilis* (Ehrenberg) Ehrenberg
NOT ALL *Pinnularia nobilis* (Ehrenberg) Ehrenberg **ARE THE SAME! The MOST DIFFICULT *Pinnularia nobilis*** (Ehrenberg) Ehrenberg **sample among all the others we keep was chosen for the**

Diatom Test Slide version 2.0 (measurements were performed using a scanning electron microscope or SEM), in fact not all *Pinnularia nobilis* (Ehrenberg) Ehrenberg **in the world have the same poroids measurements!**

Details to detect: Poroids

AVERAGE DISTANCE BETWEEN POROIDS: 0,11 µm

Again, the theoretical limit of resolution of most light microscopes is ~0.2 µm, but these POROIDS can be detected and imaged by the techniques below, thanks to Diatom Cubed high refractive index mountant.

Recommended microscope objectives: oil-immersion 63 or 100x objectives having a very good or excellent numerical aperture (1,3 or 1,4)

Suggested techniques: Double immersion (= Oil immersion objective and Oil immersion condenser) and:

Polarized light (the polarizers should be oriented perpendicular to each other = maximum level of extinction) with possibly oblique illumination;

or Immersion dark field condenser (better 1,2/1,4) with Polarized light (the polarizers should be oriented perpendicular to each other = maximum level of extinction)