2000x Microscope

Posted by wickededge - 30 Jun 2012 08:28

The new scope came in Wednesday and I'd hoped to kick off this category with some great hi-res pics, but then was out sick on Thursday and wrapped up in meetings on Friday so I didn't get a really good chance to play with it. I also still need to get a NIST traceable micro-ruler to calibrate it. If anyone knows of one for under $1200, I'd love to hear about it. Even without calibration though, I should be able to start posting some of the pics. At first glance, it looks pretty exciting. I can see the tiniest of scratches from our micro-abrasives really clearly, so with some luck and work, we should be able to learn a whole lot about all the stones and strops.

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Re: 2000x Microscope

Posted by ChristopherStaples - 03 Jul 2012 03:03

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www.anago.co.nz/

unsure what they use but they test our knifes @ work

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Re: 2000x Microscope

Posted by wickededge - 19 Jul 2012 18:58

Starting to have some fun with the new scope.
The stage micrometer came in and I've calibrated it at 800x. I had to send the 100x objective lens back as it was defective, so I can't get up to 2000x yet... So far, the images I'm getting at 800x are great and I'm learning a lot in a short amount of time. I can't wait to share what I'm learning with you guys, just need more hours in the day!

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Re: 2000x Microscope

Posted by AnthonyYan - 19 Jul 2012 22:26

Hi Clay,

Sounds exciting!

I'm curious... which stage micrometer did you end up getting?

Sincerely,

--Lagrangian

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Re: 2000x Microscope

Posted by BassLakeDan - 20 Jul 2012 00:08

AnthonyYan wrote:

Hi Clay,

Sounds exciting!

I'm curious... which stage micrometer did you end up getting?

Sincerely,

--Lagrangian

hey Anthony, help me out here. .. I will differ here to what you tell me: I seem to recall, from many many years past when sleeping through one my physics classes that there was some professor droning on about nanometers, and the wavelength of (human) visiable light and 1/2 a micron and, well anyway,, 2000X? optical?? I am a bit lost here...

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Re: 2000x Microscope

Posted by wickededge - 20 Jul 2012 08:56

Hey Lagrangian,

I ended up with one from Ted Pella, Inc. It is: "Micrometer Scale-Reflected Light 2mm in .01mm divisions" It's probably not ready for NASA, but I think it is good enough for the kind of work I'm doing. The microscope stage has built in axis control with pretty fine adjustments, so I didn't need that feature - I can easily scroll along the length of the blade or from shoulder to edge which is good enough for me. Next I need to design and build a stage that will hold my blades so I can take the samples in and out quickly without a lot of fiddling.

-Clay

AnthonyYan wrote:

Hi Clay,

Sounds exciting!

I'm curious... which stage micrometer did you end up getting?

Sincerely,

--Lagrangian

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Re: 2000x Microscope

Posted by AnthonyYan - 20 Jul 2012 17:01

Hi Clay:

Thanks!

Hi BassLakeDan:

For a variety of reasons, visible wavelength is often discussed in terms of nanometers, and sometimes in angstroms. But it's just all unit conversions by factors of ten.

Visible light is approximately in the range of 0.4 to 0.7 microns (okay, if you are really picky, the 0.38 to 0.74 microns). If you want, that's 400 to 700 nanometers, or 4000 to 7000 angstroms.

en.wikipedia.org/wiki/Visible_light

Optical microscopes use visible light to image stuff, so they're pretty good until you start getting down to sub-wavelength features. Below about half a wavelength, you will probably not see anything. Current high-end optical microscopes have a resolution of about 0.2 microns. You can get better than this optically, but doing so requires extremely fancy and high-tech methods. So it's only in a research lab that you would be likely to see an optical microscope with better than 0.2 micron resolution.

A ton of really good microscope information can be found here, on Nikon's microscope web page:

microscopyu.com/

To get to higher resolutions, one can use non-optical methods, such as using light outside of the visibel spectrum, or things like electron-microscopes, atomic-force microscopes, and scanning-tunnelling-electron micrscopes.

Sincerely,

--Lagrangian

P.S. btw, as a knife and sharpening enthusiast, I'm conceptually anchored at 0.5 microns because the sharpness of a modern razor is about 0.4 microns (according to Prof. John D. Verhoeven), and visible light is around 0.4 to 0.7 microns. So whenever I think about knife edges, microscope pictures, and the size of abrasive particles, I'm thinking in terms of 0.5 microns. This is why I think it's cool that Clay got a stage micrometer... because in any photos he shows, we will be able to have some idea of the width of scratches in comparison to edge sharpness and abrasive grits.

P.P.S. I've only been a knife enthusiast for about a year, but over that time I've collected a short list of "length-scales" related to knives. It is kind of like a time-line, but instead of time, the axis is length (microns). Here's a partial list:

50-100 microns = Approximate diameter of human hair (varies hugely; this is only part of the range)

25.4 microns = 0.001 inches (1 mil). Standard resolution for an imperial caliper

2.54 microns = 0.0001 inches (0.1 mil). Standard resolution for an imperial micrometer.

0.36-0.74 microns = Wavelength of visible light

0.4 microns = Sharpness of a modern razor blade.

0.2 microns = resolution limit of optical microscopes

0.05 microns = Sharpness of diamond coated razors.

0.005 microns = Sharpness of a diamond microtome knife.

0.003 microns = Sharpness of concoidally fractured obsidian.

0.00034 microns = van der Waals diameter of a carbon atom.

Atomic-force microscopes (AFM) and scanning-tunneling-electron-microscopes (STEM) use needles which are atomically sharp; they literally have a single atom at the tip.

Sources:

en.wikipedia.org/wiki/Hair#Description

en.wikipedia.org/wiki/Visible_light

www-archive.mse.iastate.edu/fileadmin/ww...even/KnifeShExps.pdf

microscopyu.com/articles/optics/index.html

www.technologyreview.com/computing/25988/

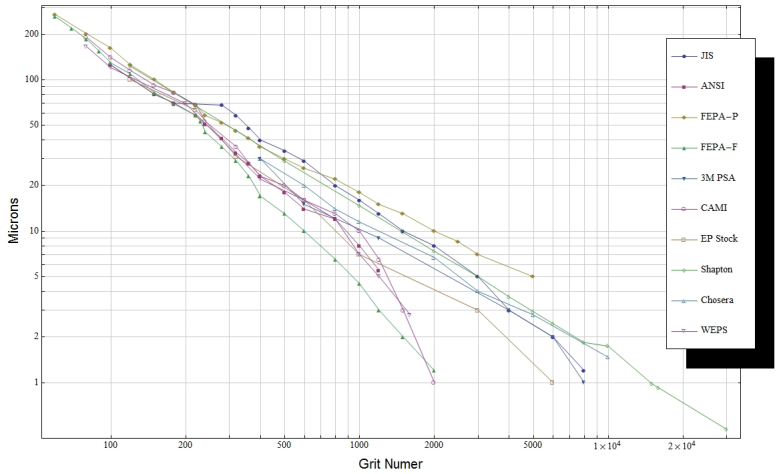
www.tedpella.com/diamond_html/diamondk.htm

en.wikipedia.org/wiki/Obsidian

en.wikipedia.org/wiki/Van_der_Waals_radius

P.P.P.S. If you are interested in the conversion between grit numbers and microns, then have a look at Komitadjie's Grand Unified Grit Chart. Here are some plots by Mr. Wizard using the data that Komitadjie has compiled:

www.knifeforums.com/forums/showpost.php?post/2387907/


Microns
200
100
50
20
10
5
2
1
100
200
500
1000
2000
5000
1 × 10⁴
2 × 10⁴
Grit Numer
JIS
ANSI
FEPA−P
FEPA−F
3M PSA
CAMI
EP Stock
Shapton
Chosera
WEPS

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