Newsletter

Of the

New York Microscopical Society

1 Prospect Village Plaza
(66F Mt. Prospect Avenue)
Clifton, New Jersey 07013-1918
GPS: Latitude 40.8648N, Longitude 74.1540W

Summer 2014 | **N.Y.M.S. (973) 470-8733** | **Volume 8 (28) Number 6**

Summer Picnic 2014

Where: At the home and Gardens of Jan and Wiebke Hinsch.

6 Willow St, Woodcliff Lake, NJ 07677
Home:201-573-9851
Cell: 201-574-6522

When: Sunday August 17, 2014

Noon to 5:00pm

Cost per person: $35.00

In case of rain, we will move the picnic indoors. In the event of sunshine, we will remain outdoors and have a wonderful time enjoying the gardens and some microscopically interesting subjects. Bring a camera, the flowers and various other plants are stupendous. There will be many things to enjoy.

Invitation Request Form for:
Summer Picnic hosted by Jan & Wiebke Hinsch
Sunday August 17, 2014, Noon to 5:00 pm

Cost $35.00 per person

NYMS Member Name:_____ **bringing a guest?**___**Y/N**

Phone (H)_____ **Email (H)**_____

Complete this form and send with payment to:
NYMS Picnic, c/o Mel Pollinger, 18-04 Hillery Street, Fair Lawn, NJ 07410-5207

Please respond by August 10, 2014

A direction page to the Hinsch's home is enclosed.

Save a Tree: Get The Extended Newsletter: By Email Only

Board of Managers

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For additional information contact the Editor: Mel Pollinger at (201) 791-9826, or pollingmel@optonline.net

Dues and Addresses
Please remember to mail in your Dues to:
Mary McCann,
Membership Chair
30 Spy Pond Parkway
Arlington, MA 02474

Junior (under age 18) $10 Annually
Regular $30
Student (age 18 or above) $20 Annually
Supporting $60 Annually
Corporate (includes one advertisement in NYMS News) $175 Annually
Life $300 (payable within the year)
To avoid missing notices: Notify Mary McCann and Mel Pollinger if you have changed your address, phone or email.

Awards Given by the New York Microscopical Society
The New York microscopical Society takes great pleasure in recognizing and rewarding individuals who have contributed to either the activities of the society or to furthering microscopy. These awards are described in our website and in a pdf file for our email newsletter recipients. All members are eligible to nominate individuals for these various awards, and are encouraged to do so.
John A. Reffner, Awards Committee Chairperson

Awards Committee
Chair: John A. Reffner
Members
Jan Hinsch
Peter Diaczuk
Angela Klaus
John R. Reffner

Mel Pollinger, Editor
18-04 Hillery St.
Fair Lawn, NJ 07410-5207

To Order Your NYMS Lapel Pins
Send a check in the amount of $12.00 per pin to:
New York Microscopical Society
c/o Mel Pollinger, 18-04 Hillery Street, Fair Lawn, NJ 07410. To avoid shipping & handling charges, pins may be purchased directly at any NYMS meeting for $10.00.

The Mission of the New York Microscopical Society is the promotion of theoretical and applied microscopy and the promotion of education and interest in all phases of microscopy.

Alternate Meeting Notifications
Please note that due to time constraints in publishing, some meeting notices may be available by calling Mel Pollinger at 201-791-9826, or by visiting the NYMS website, or emailing: pollingmel@optonline.net

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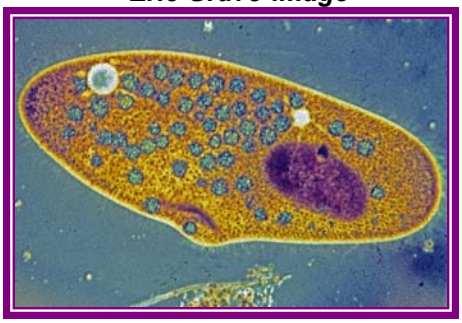
Please remember to pay your dues

Buy and Read a Good Book on Microscopy.

Paramecium caudatum, 133x fr10 a6x4x200

Eric Gravé image



Paramecium caudatum is a species of unicellular organisms belonging to the genus Paramecium of the phylumCiliophora. They can reach 0.25mm in length and are covered with minute hair-like organelles called cilia. The cilia are used in locomotion and feeding. Appearance and physical characteristics Paramecium caudatum is 120-330 micrometres long (usually 200-300 micrometres). The cell body is roughly cigar-shaped, rounded at the front, tapering at the posterior to a blunt point. The pellicle is uniformly covered with cilia, and has a long oral groove, leading to deeply embedded oral cavity, lined with cilia. P. caudatum has two star-shaped contractile vacuoles, and a cellular envelope (cortex) densely studded with spindle-Shaped extrusomes called trichocysts. The species is very common, and widespread in marine, brackish and freshwater environments. P. caudatum feed on bacteria and small eukaryotic cells, such as yeast and flagellate algae. In hypotonic conditions (freshwater), the cell absorbs water by osmosis. It regulates osmotic pressure with the help of bladder-like contractile vacuoles, gathering internal water through its star-shaped radial canals and expelling the excess through the plasma membrane. When moving through the water, they follow a spiral path while rotating on the long axis. (From Wikipedia)

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Upcoming Events in 2014

Dates, Times and Locations to be announced when confirmed:

- Summer Inter-Micro
- Summer pond-life collecting trip
- Summer Picnic August 17 th
- Summer Forensic Course
- NYMS September Meeting lecture
- NYMS October Meeting lecture
- Fall Antique Slide Workshop at Clifton
- Fall Forensic Course
- Eastern Analytical Symposium (November meeting)
- NYMS Annual Banquet (December meeting)

NYMS Receives a Donation of Microscopical Equipment & Specimens from Mr. Walter Aschoff, F.N.Y.M.S.

A long-time Life Member (joined in 1956) and Fellow of NYMS, Mr. Asvhoff recently donated his microscopy-related items to the Society. Included in the inventory is a sand collection of about 300 numbered and labeled vials and as soon as they are catalogued will be accessible for viewing by members. Also included are hundreds of antique prepared slides; We are planning on at least one viewing/imaging workshop in the Fall regarding the slides.

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Robert Santee of North Jersey Mineralogical Society (NoJMS) and Ray Klingler of NYMS at the Micro-mineral workshop at NYMS in Clifton.

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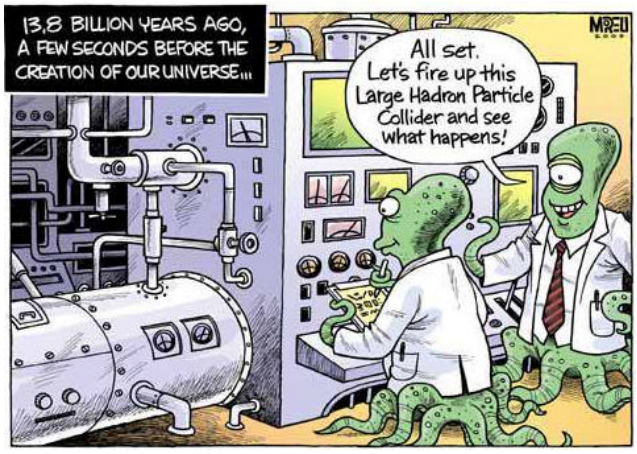


Be A Volunteer – There's *Always* Something to do and see at NYMS.

If you wish to contribute some of your time to NYMS, please contact me at (201) 791-9826 or by email at pollingmel@optonline.net

Visitors Always Welcome to NYMS

Although most of our lecture meetings, workshops and classes are held in the NYMS Clifton facility on the last Sunday of the month, the building may be opened for special purposes at other times, by appointment only. For such an appointment, please contact Mel Pollinger by phone at (201) 791-9826, M-F noon to 9:30pm, or by email at pollingmel@optonline.net.

From The Editor... **if you have email:** Getting the newsletter by email means you can receive an **extended pdf version** that cannot be sent by "snail mail." Even if you only continue your USPS delivery of the newsletter, NYMS needs your email address for reporting priority events and special news. Being able to contact you quickly by email means better communication between you & NYMS■■ Mel

Need to use a Microscope?

The various microscopes that are presently set up on the main floor of the New York Microscopical Society building in Clifton, N.J. are there for the use of its members.

Microscope Cleaning Kit

A complete set of tools and accessories to keep your microscope in optimum operating condition. The kit is put together by our Curator/Educational Chairman and available directly from NYMS for only $35.00 plus shipping & handling, or may be purchased at a meeting. Call or email Mel Pollinger for details (see page two for contact numbers).

For Sale:

Gossen Microsix light meter and Bausch and Lomb dynazoom photomicroscope with accessories.

Contact Greg Argentieri for full details at

H: (973) 764-1875, W: (973)781-8617
Full details also available by email.

NYMS Meeting Dates

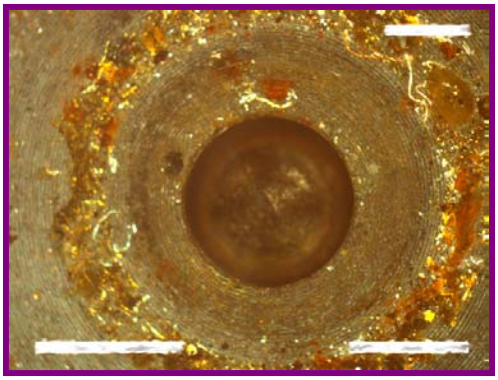
Most meetings of NYMS are usually held in Clifton on the last Sunday of the months of Jan., Feb., Mar., May, Sep., Oct. Exceptions will be noted in the Newsletter.

Please note that our website is presently under repair.

Answer to Mystery Photo for May 2014

Reproductive organs of Red Poppy flower. Correctly identified by Martin Eber and Lidia Brandes.

Mystery Photo for Summer 2014



Want to take a guess? Send it to me by email or call me: pollingmel@optonline.net, (201) 791-9826

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Additional Historical NYMS Supplements

Email Newsletter recipients will also be getting copies of NYMS Newsletter pdf back-Issues from 2007. Copies of older newsletters will be sent as I convert them.

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Attention NYMS Members

Got something to sell? Article to publish? Pictures for the newsletter? Looking to buy something? Want to use the library? Want to use a NYMS microscope?
For any of the above, contact the Editor, Mel Pollinger.

Supporting Member

NYMS Extended Newsletter Section

Directions to NYMS Headquarters

One Prospect Village Plaza
(66F Mount Prospect Avenue)
Clifton, NJ 07013

GPS: Intersection of Colfax & Mt. Prospect:
Latitude 40.8656 N, Longitude 74.1531W,
GPS: Our building: Latitude 40.8648 N,
Longitude 74.1540 W

In This Section:

- **NYMS Summer Picnic**
- **Directions to Picnic**
- **Micro-mineral Workshop**
- **JS Retardation**
- **Jay Holmes Plankton Net**
- **Modern Tricorder article**
- **Member's items for sale**
- **Walter Dioni's online new book**
- **NYMS Items** for Sale
- **Membership Application**
- **Last page images**

From George Washington Bridge:
Take Interstate Route 80 west to Exit 57A, Route 19 South. Take Route 19 to Broad Street and continue two lights to Van Houten Avenue. Turn Left. Go to second light, Mount Prospect Avenue and turn left. Building 66F is on the left side , one and a half blocks from Van Houton.

From Lincoln Tunnel:
Follow exit road to NJ route three west. Continue to Bloomfield Avenue exit. Turn right to Circle and go three quarters to Allwood Road West. Mount Prospect Avenue is a few blocks on the right (a small street) Turn right and go to first light (Van Houton) continue. Building 66F is on the left side , one and a half blocks from Van Houton.

From North:
Take Garden state Parkway South to Route 46 Clifton Exit. On 46 Make second exit to Van Houton Ave. Continue to third light Mount Prospect Avenue and turn left. Building 66F is on the left side , one and a half blocks from Van Houten.

From Route 46 coming from west:
Take Broad Street Exit in Clifton and follow Directions above from GW Bridge.

From route 46 coming from East: Take Paulson Avenue Exit in Clifton and follow to Second light, Clifton Ave turn right. Go to next light, Colfax, turn left, go three blocks and turn right on Mount Prospect Ave.. Building 66F is half block on right.

Public transportation from NY:
Take NJ Transit train from Penn Station to Secaucus Transfer Station. Change trains to Bergen Line to Clifton (call NJ Transit for schedules). From Clifton Station cross under tracks to first street and go left one block to Mount
Prospect Street, turn right and Building 66F is one half block on Right.

If you plan to come by bus or train, please copy the links below into your browser:
http://www.njtransit.com/sf/sf_servlet.srv?hdnPageAction=TripPlannerItineraryTo
http://www.njtransit.com/sf/sf_servlet.srv?hdnPageAction=BusSchedulesP2PTo
http://www.njtransit.com/sf/sf_servlet.srv?hdnPageAction=TrainTo

Summer Picnic 2014

Where: At the home and Gardens of Jan and Wiebke Hinsch.

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Home:201-573-9851
Cell: 201-574-6522

When: Sunday August 17, 2014

Noon to 5:00pm

Cost per person: $35.00

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Invitation Request Form for:
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Cost $35.00 per person

NYMS Member Name:_____ bringing a guest?___Y/N

Phone (H)_____ Email (H)_____

Complete this form and send with payment to:
NYMS Picnic, c/o Mel Pollinger, 18-04 Hillery Street, Fair Lawn, NJ 07410-5207

<u>Please respond by August 10, 2014</u>

Directions to The Home of Jan & Wiebke Hinsch

Jan and Wiebke Hinsch, 6 Willow St, Woodcliff Lake, NJ 07677
201-573-9851, cell phone: **201-574-6522**

Coming from NYC via G. Washington Bridge:
Follow Rt 80/95 and make sure to stay on 80w when 95 branches off south. Go to exit 62 (Saddlebrook/Garden State Pkwy) and follow signs to GS Pkwy north. Take exit 168 to Washington/Hohokus. At the end of the ramp turn right on Washington Avenue and proceed to the first traffic light and turn left onto Pascack Rd. Pass through one traffic light and one blinking light. Soon you will see a church on the right (as a landmark) that looks like an upside-down mushroom. Pass it and go through a downhill right curve. At the bottom you have the Woodcliff Lake reservoir on your right. And here the second little street branching off to the left is Willow St with a willow on the corner. Ours is the first house on the right.
Total distance from exit 168 to our house ca. 2.0 miles

Coming from Tappan Zee Bridge:
Follow 87/287 west to exit 14a which is the entrance to the Garden State Pkwy south. Go to first exit (Schoolhouse Rd) and at the end of the ramp turn left into Spring Valley Rd. Take it through two traffic lights and all the way to the end (T) and turn left onto Fremont Rd. Go about ½ mile to the end (T) and turn right into Pascack Rd. After crossing a traffic light you soon see the Woodcliff Lake reservoir on your left. Third street on the right is Willow St. We are the first house on the right.

Coming from South on Garden State Parkway:
Going North on the Garden State Parkway take exit 168 to Washington/Hohokus. At the end of the ramp turn right on Washington Avenue and proceed to the first traffic light and turn left onto Pascack Rd. Pass through one traffic light and one blinking light. Soon you will see a church on the right (as a landmark) that looks like an upside-down mushroom. Pass it and go through a downhill right curve. At the bottom you have the Woodcliff Lake reservoir on your right. And here the second little street branching off to the left is Willow St with a willow on the corner. Ours is the first house on the right.
Total distance from exit 168 to our house ca. 2.0 miles
We don't have air/con but shady places to relax. Please, dress appropriately. For questions email:
wihinsch@optonline.net

Here are directions for public transportation:
At Port Authority bus terminal take the bus # 11A from platform 220.
The bus runs every hour, 10:15; 11:15; 12:15…
The ride is about 55 to 60 minutes to Hillsdale RR-station (maybe little less on Sundays!). From there you have to call us:
201-573-9851 or cell: **201-574-6522** to be picked up. It's a short ride, but too long to walk. At the little light blue railroad building is a public phone.
The ride is half price for seniors if you get a booklet of blue Reduced Fare Coupons issued by NJ Transit (free!) at the information booth inside the terminal. The tickets can be purchased in the bus ~$3.60 one way.

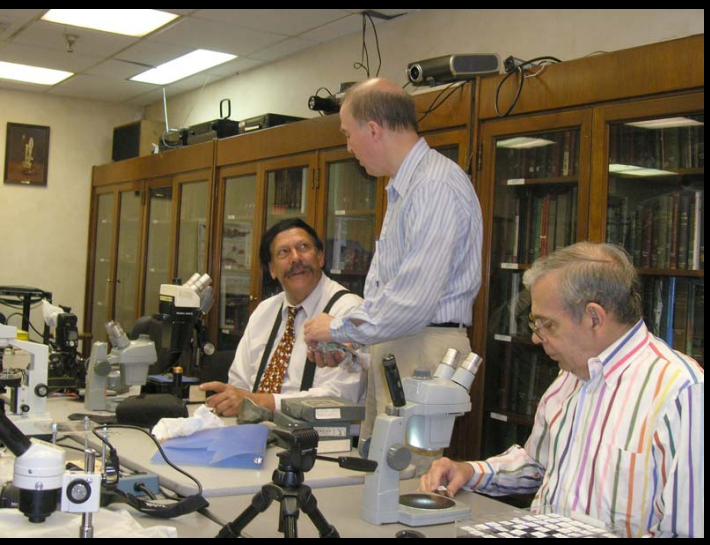
Can't wait to have you here!
Wiebke and Jan

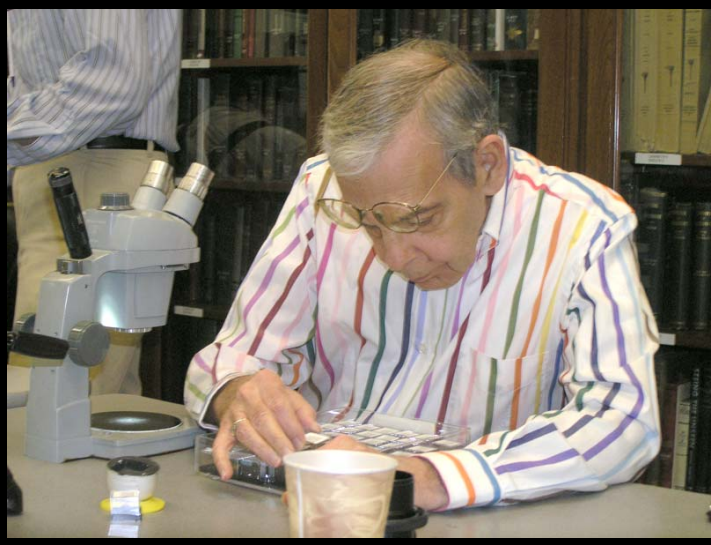
Micro-Mineralogy Workshop at NYMS in Clifton, May 25, 2014

Micro-Mineralogy Workshop

Micro-Mineralogy Workshop

Micro-Mineralogy Workshop





Rotating Variable Retardation Filter: A Modern Version Of The Victorian Selenite Stage

Jay Phillips, Denver Colorado, USA

Polarization colors were popular with 1860s microscopists and 1960s counter culture youth alike. They still grab your attention (Figure 1), and there is no easier way to produce a splash of color than with a Victorian selenite stage, a 19th Century amateur microscopy device consisting of a stack of rotating birefringent filters. A selenite stage dramatically alters polarization images: backgrounds shift from black to the colors of Newton's interference scale, and go through an ever changing series of colors as the filters rotate. To paraphrase Mark Twain, no other apparatus provides such wholesale return of color for such a paltry investment in equipment.

The selenite stage has always had more of art than of science about it. Although it has features in common with rotary compensators, it is uncalibrated, and retardation varies in a complex manner. It is not what you would use to determine birefringence, but not all uses of polarization need to be quantitative. I had some 1/4 wave and full wave retardation film left over after adapting some classroom biological scopes for polarization, and thought a simplified selenite stage would be a fun way to use it. In this article I describe the stage, its range of retardation colors, and show how the 1/4 wave portion can be used for a bonus feature: circular polarization. Examples from my favorite area of study – marine geology and micropaleontology – illustrate the qualitative use of polarization to provide punchy colors, increase contrast, and assist in seeing and understanding structural detail.

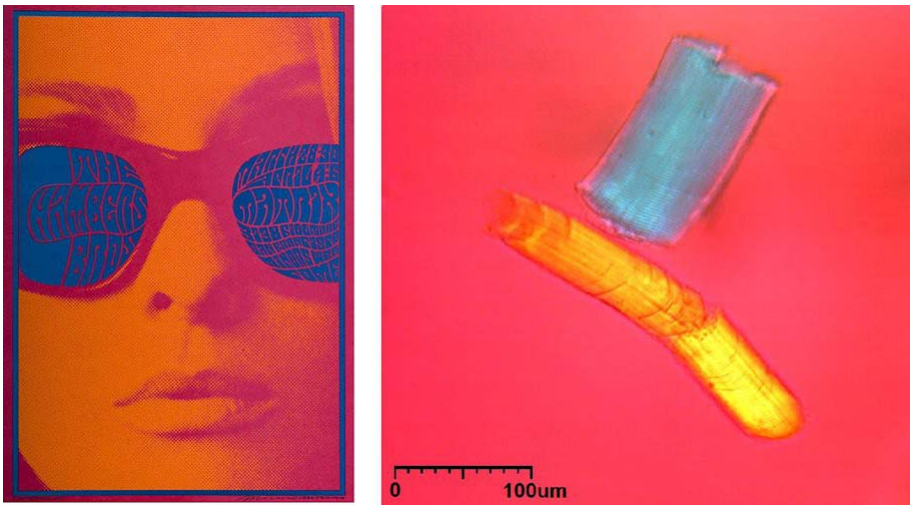
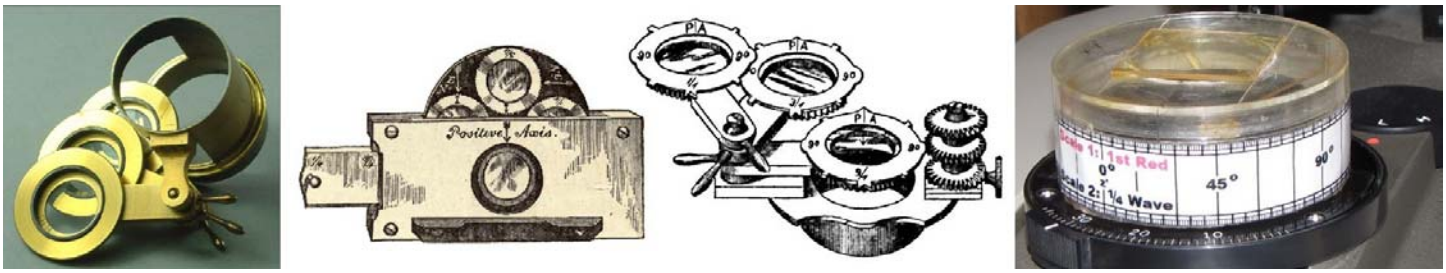


Figure 1. *Polarization colors.* ***A:*** *Sixties psychedelic art. "Neon Rose #12", an iconic 1967 poster by Victor Moscoso that gains impact from its use of polarization 1st order red colors (called "vibrating colors" by the artist). Text reads (in part): "The Chambers Bros. Matrix. San Francisco."* ***B:*** *Fluid whole-mount of striated muscle fiber viewed with the variable retardation filter described in this article. Specimen and background are colorless in normal light; Example 1 explains the optical origin of the colors. Fig. 1A is copyrighted by Victor Moscoso; it is reproduced in accordance with copyright fair use laws for discussion of a work of art. Originals of this poster are available here.*



A B C D

Figure 2. *Selenite stages.* ***A.*** *Victorian selenite stage sold on eBay a few years ago. The filters can be individually inserted in the light path and rotated. This design was called "Darker's selenites".* ***B.*** *Swift's selenite stage was placed on the microscope stage under the specimen.* ***C.*** *A design with gears to rotate the filters. Retardations are 1/4, 3/4, and 9/4 wavelengths (all odd quarters give circular polarization).* ***D*** *is the variable retarder described in this article, shown on the light exit window of an Olympus BH polarizing microscope. It has birefringent plastic filters of 1/4 wavelength and 1 wavelength. Rotation scales allow settings to be repeated. B and C are from Davis (1882).*

Polarized Light Background Information

Many ***Micscape*** readers are familiar with polarized light, so rather than go over familiar ground, I'll refer those who wish a refresher to Davidson and Others on the Molecular Expressions optical microscopy website. The polarization section begins here; the section on retardation plates and variable compensators is here. I also recommend Delly's (2003) article on the Michel-Lévy interference color chart.

Two related terms need to be defined. **Birefringence** is the difference between maximum and minimum index of refraction; it is constant for a given material. **Retardation** is a linear offset; it is the distance two components of a light beam are out of phase due to passing through a birefringent material. Retardation is the product of birefringence and specimen thickness. In a given material, greater thickness gives greater retardation. Retardation is cumulative, and is the algebraic sum of the individual retardations of all the birefringent objects the light beam passes through.

Ian Walker's (2006) ***Micscape*** article on a do-it-yourself Berek tilting compensator covers related ground to this article; Gordon Couger's (2007) follow-up article discusses splitting mica to make retardation filters. Walker's tilting compensator operates on a different principle from the rotating compensator described here, so the devices affect images differently. An advantage of the selenite stage is that it fills the field of view with a uniform color. Brian Johnston's (2005) ***Micscape*** article uses a setup functionally equivalent to this variable retardation filter, although it has fewer adjustments, and with three major brand name retardation plates, it is a lot more expensive (perhaps 50 times the price).

Retardation And The Newton Interference Color Scale

Figure 3 shows the colors obtained with varying amounts of retardation; these are the colors you see in oil slicks, soap bubbles, and polarized light. This scale, when combined with additional data on specimen thickness and birefringence, gives us the Michel-Lévy chart – a graphic solution to a 3-variable equation: know 2 variables, find the third.

The first 2 orders have intense colors; at higher retardations, colors repeat and become increasingly muted. The higher order colors don't make good backgrounds. A variable retardation filter with 2 orders of retardation is sufficient if your main interest is colorful backgrounds and increased specimen contrast.

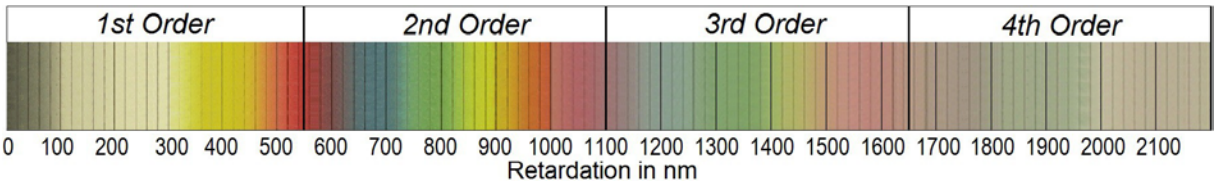


Figure 3. *Newton Interference Color Scale adapted from Michel-Lévy's original color chart of 1888. Boundaries between orders are at intervals of 1 wavelength (550 nm).*

Example 1: Origin of the colors in Figure 1B

Figure 1B is an elementary exercise familiar to everyone who works with the polarizing microscope. You see these colors often – whenever low retardation specimens are combined with a 1st order red plate. In Figure 1B, the filter is set to a little less than 1st order red (about 500 nm, 0.9 wavelength), giving a rose instead of magenta background. This flexibility to pick your retardation (and color) is an advantage of the selenite stage. Figure 4 shows how the blue and yellow colors originate from addition and subtraction of component retardation. The sample is a thick mount of beef muscle fiber in fluid. The sample is colorless; colors in the image are the result of optical interference in the microscope.

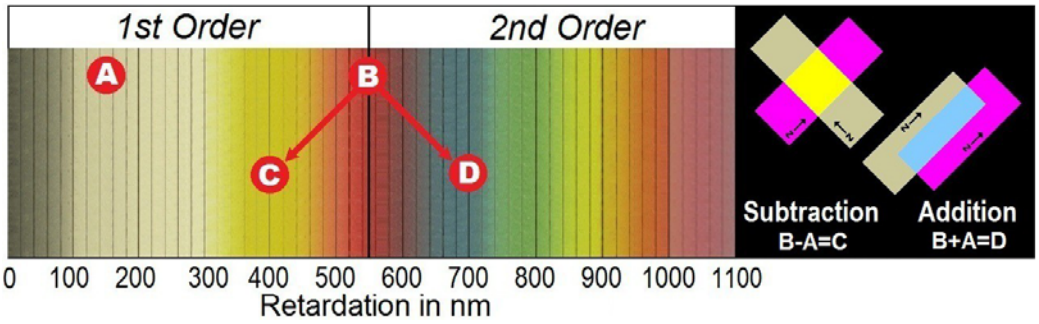


Figure 4. *Action of a 1st Order Red Plate. Under cross-polarized light, the background is black. **A:** a specimen with retardation = 150 nm appears gray. **B:** Overlap the specimen with a second specimen (or retardation plate) having a 1st order red retardation = 550 nm. **C:** If the two specimens have their slow directions (Z ➞) crossed, their retardations **subtract**. 550 – 150 = 400 nm, a 1st Order yellow. **D:** If, on the other hand, the two specimens have their slow directions aligned, their retardations **add**. 550 + 150 = 700 nm, a 2nd Order blue.*

Design Of A Multi-Plate Variable Retarder

Figure 5 is a schematic for the variable retardation filter. There are only two requirements: 1) you need polarized light, and 2) the retardation filter and specimen must both be between the polarizing filters. On-line dealers offer polarizing and retardation plastic film at low cost. The material I purchased is no longer available, but one current source is Knight Optics (link). 25 to 50 dollars/Euros/pounds buys enough polarizing and retardation film to outfit a couple of scopes. Ian Walker's ***Micscape*** article and Gordon Couger's follow up tell you how to split mica to make your own retardation plates.

The body is a circular plastic box selected because it is a good fit for the light exit window of my Olympus BH pol scope (Figure 2D). The box bottom was removed, and a large hole cut in the lid, so the plastic box doesn't affect the light path. The base and lid freely rotate 360°; the retardation plates can be rotated independently or together. A computer-printed scale shows degrees of rotation, and allows settings to be repeated; placing both scales at 0° puts each filter's z-direction North-South.

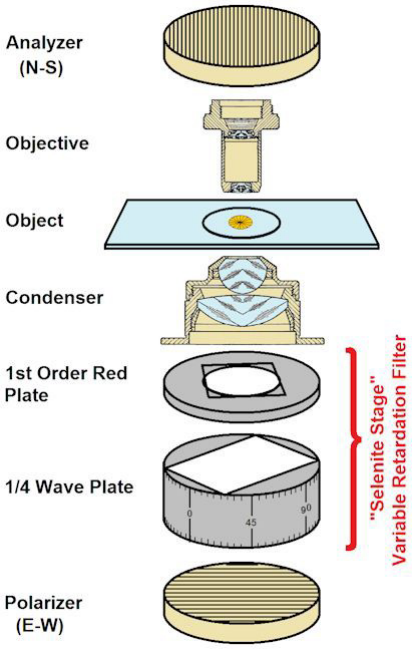


Figure 5. *Schematic diagram of variable retardation filter.*

Determining The Value Of Retardation Film. Inexpensive or home made films have a degree of latitude, and you don't always know just what you have. Use the colors to determine values. For example, my retardation film was sold as "**1/4 wave (140 ± 20 nm)**" and "**full wave (560 ± 25 nm)**". You expect the combined filters to have about 700 nm retardation (140+560). This is a 2nd Order blue (Figure 3), but the filters actually reach a higher retardation 2nd Order green. By observation, the minimum subtractive retardation is about 420 nm (1st Order yellow), and the maximum additive retardation is about 740 nm (2nd Order green). A little algebra gives the values of the filters:

$$x - y = 420$$
$$x + y = 740$$

These equations solve to give retardations of 160 nm and 580 nm. These values are the high end of the factory specification, but in this case, that is a good thing; it adds an additional color (green) to the variable retardation filter's range.

Colors Produced By The Filter. Figure 6 shows examples of the colors available from superimposing 1/4 wave and full wave rotating filters. Some images have subtractive retardation (yellow specimen); others have additive retardation (blue or green specimen). For higher retardation values (and additional colors), add a third filter to the optical system. I put a 1st order red plate in the accessory slot of my polarizing scope, but you could also lay another retardation film on top of the variable retardation filter stack.

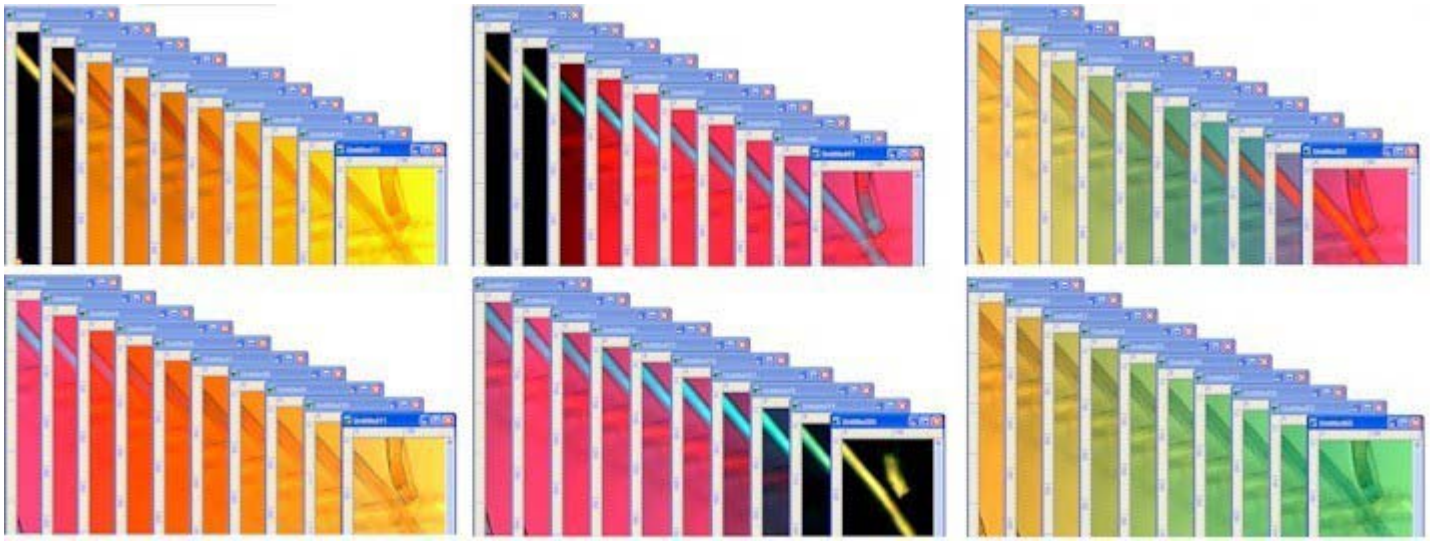


Figure 6. *Examples of colors produced by the variable retardation filter when one component is stationary, and the other component is rotated in 5° steps.*

Circular Polarized Light (Benford Plate)

Setup (see Craig, 1961). The 1/4 wave portion of the variable retardation filter is set at 45º; this changes linear polarized light to circular polarized, and is known as a Benford Plate. A matching 1/4 wave plate above the specimen is set at right angles to the first filter; this changes circular polarized light back to linear polarized (Figure 7). The background remains black, but the light beam in the vicinity of the specimen has circular polarization.

Benefit 1: Increased Contrast. Colorless particles with an index of refraction close to the mounting medium are nearly invisible in plain light. This examination method uses polarization to add contrast to particles that also happen to be birefringent.

Benefit 2: No Extinct Particles. A birefringent particle rotated in polarized light usually goes extinct (that is: dark) once every 90°. An extinct particle is invisible – not a good situation if you're counting particles. Without going into detail, the configuration in Figure 7 is a special case where extinction does not occur; the background is dark and birefringent particles remain bright as they rotate. In a strew of randomly oriented birefringent particles, all are visible (except for the rare case where a birefringent object appears to be isotropic due to its optic axis orientation).

Benefit 3: No Pseudo-Extinction Crosses. Foraminifera with radial calcite walls have pseudo-extinction crosses that look like the interference figures seen on the back of the objective with a Bertrand lens, but they are on the specimen itself (Examples 3 and 6). Coccoliths show related effects because they are formed from overlapping components, each of which is a calcite crystal (Example 4). Extinction and pseudo-extinction effects provide useful information, but they can obscure surface detail. Circular polarization with a Benford Plate removes these effects.

Benefit 4: Simplified Interference Figures. This is the purpose for which the Benford Plate was originally designed (Craig, 1961).

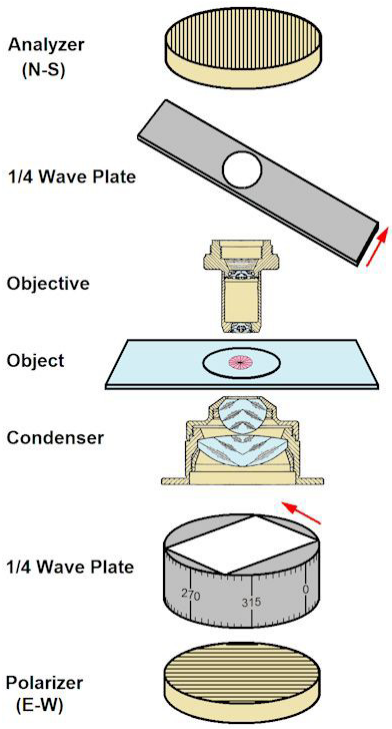


Figure 7. *Circular polarized light.*

Example 2: Cambrian siliceous oölite from Centre County, Pennsylvania, U.S.A.

Figure 8. *"State College" siliceous oölite from the Mines Member of the Gates Formation (Late Cambrian, about 500 million years before Present).* ***A.*** *slide.* ***B, C,*** *and* ***D****. Three fields of view through a 2.5x plan objective. The top row is plane-polarized; the middle row is cross-polarized; the lower row uses the variable retardation filter.*

Figure 8 is a British Victorian mount I purchased on eBay. It probably dates from around 1890-1900, because "Trenton Period" was out-of-date terminology for this sample shortly after that time. The preparer is unknown, but another example of his/her work is this zircon syenite slide on the Victorian Microscope Slides website. The oölite is from a well-known collecting locality now lost to urbanization in the town of State College, Pennsylvania.

This siliceous oölite is a 500 million year old sample from a world strangely different from today. There was no Atlantic Ocean; State College, PA was next door to Scotland, and both were south of the equator in a tropical carbonate bank similar to the present day Bahamas (but without the palm trees; life on land had not yet evolved). Hugh Mitchell-Tapping's (2010) ***Micscape*** article shows modern Bahaman oöids, complete with palm trees.

For years, the "State College" siliceous oölite was one of the interesting little puzzles of geology. Present-day oölites develop in carbonate environments. Did a different chemical environment in the ancient sea allow primary deposition of siliceous oölites? At first, the majority opinion was "yes", but geologists now believe this is an ordinary carbonate oölite that was replaced by silica at some later time. Moore (1912) and Choquette (1955) discuss this oölite.

Figure 8B is a typical oöid with concentric laminated shells surrounding a core seed particle. In this case, the core is a sand grain weathered from a multi-crystalline quartz rock. The concentric shells formed as carbonate, but were replaced by silica. Figure 8C shows two oöids, each with a weathered and rounded single quartz crystal as its core. Figure 8D shows an interesting phenomenon: regeneration of lost crystal shape. Sand-size quartz crystals were rounded by water action before being incorporated into oöids. Later, at the time of silica replacement, newly precipitated silica followed the existing crystal lattice of the rounded sand grains, and rebuilt well-formed crystal shapes, seen as dark hexagonal outlines. Henbest (1945) first published on this process.

Example 3: Foraminiferal Wall Composition, Mineralogy, And Structure

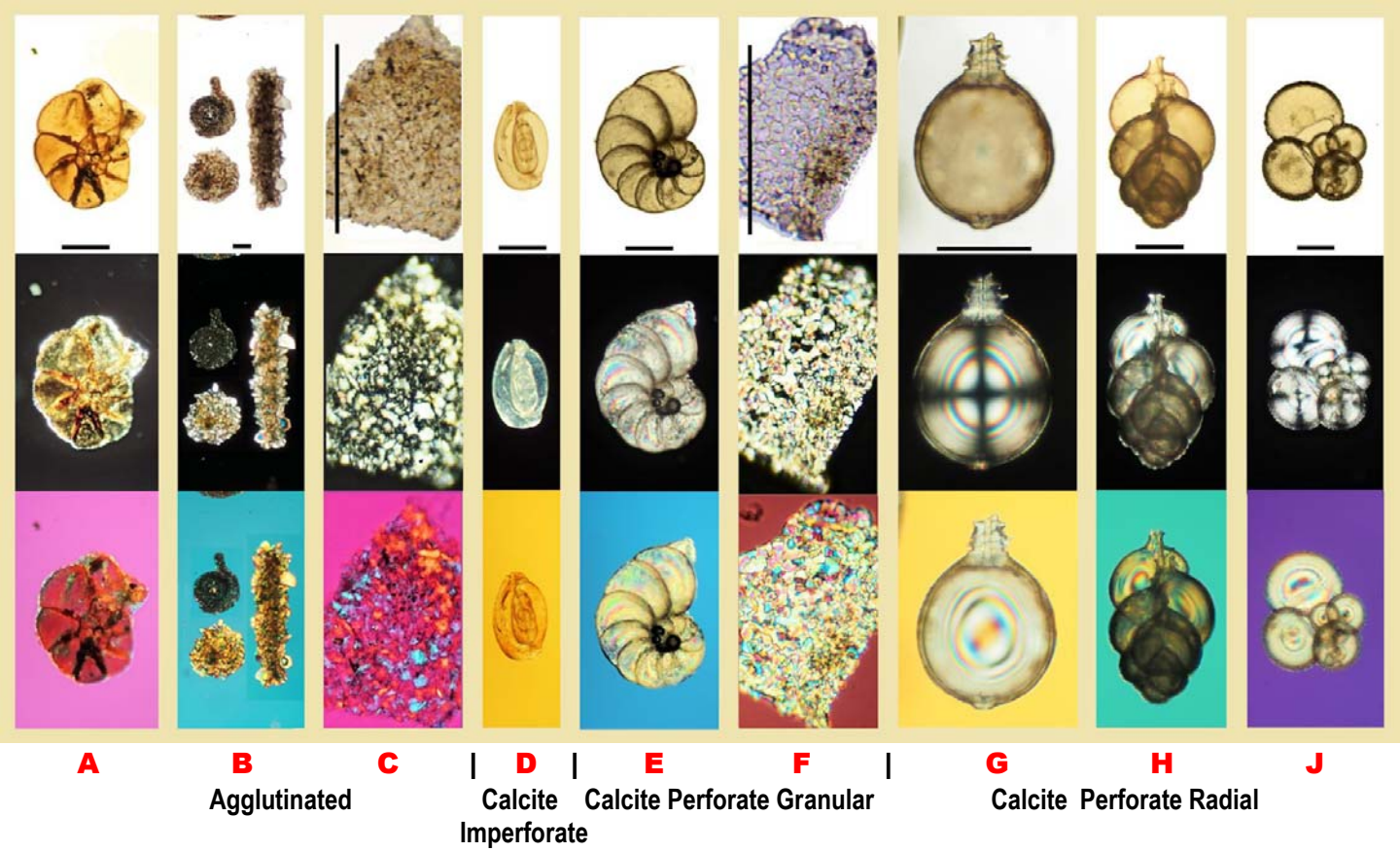


Figure 9. *Foram wall structure. The top row is plane-polarized; the middle row is cross-polarized; the lower row uses the variable retardation filter. Images were taken with 4x, 10x, or 20x objectives; bar scales are 0.1 mm (100 µm). Specimens are from a wide range of sample locations and ages.* ***A.*** *Jadammina.* ***B.*** *Late Devonian (360 million years before Present) agglutinated forams.* ***C.*** *close-up of Textularia wall fragment.* ***D.*** *Spiroloculina.* ***E.*** *Nonion.* ***F.*** *close-up of Chilostomella wall fragment.* ***G.*** *Lagena.* ***H.*** *Uvigerina.* ***J.*** *Globigerina.*

The polarizing microscope highlights differences in foram wall structure, an important attribute used in classification. Figure 9 shows the common wall types; there are a few others including organic, micro-granular (fusulinids), aragonitic, and siliceous.

The **agglutinated** (also called **arenaceous)** wall consists of particles gathered from the environment and bound together in an organic matrix. Figure 9A is a weakly agglutinated species whose test (shell) is mostly organic. The high magnification view in Figure 9C shows that the wall components are separate from one another and are bound together by a matrix, making this wall structure analogous to a sedimentary rock.

The **imperforate calcite** (also called **porcelaneous**) wall consists of secreted small calcite spicules randomly packed at various orientations. This randomness scatters polarized light, giving the dark gray color seen in Figure 9D.

The **granular calcite** wall is secreted by the organism. It has clusters of crystals at different orientations, giving an overall granular appearance. The high magnification view in Figure 9F shows that the crystals grew in place, interlocking with one another, making this wall structure analogous to an igneous rock.

The **radial calcite** wall is secreted by the organism, but in this case, crystals in a chamber are arranged radially so they act as a unit and produce distinctive pseudo-extinction crosses. The more spherical the chamber, the more perfect the cross.

Example 4: Nannofossil In Circular Polarized Light

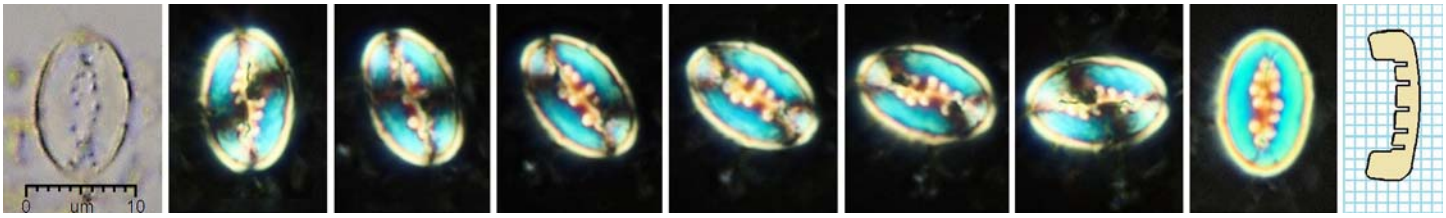


Figure 10. *Nannoplankton* Pontosphaera distincta*. 100X oil immersion objective; bar scale is 10 µm.* ***A.*** *plane polarized.* ***B-G.*** *Cross-polarized at various angles of rotation showing movement of the extinction lines.* ***H.*** *circular polarization, which removes the extinction lines.* ***J.*** *Schematic using thicknesses from retardation color. Grid is 1 µm squares.*

Figure 10 is the calcareous nannoplankton genus *Pontosphaera* (called *Discolithus* in some older publications). This specimen has just the right thickness to develop good retardation color – not too thin, and not too thick. Most small calcareous nannoplankton have low 1st order gray retardation because they are so thin. But if too thick, the high birefringence of calcite quickly pushes retardation color off the chart into the "high order whites". It takes a thin piece of calcite to drop retardation to the 1st and 2nd orders, and that is what we have with this nannofossil. It is from the Alhambra Shale near Martinez, California; its age is Middle Eocene (about 40 million years before Present).

Figures 10B-G show the specimen in cross-polarized light at various angles of rotation. A single crystal would go extinct somewhere in this 90° rotation, but that doesn't happen. The scanning electron microscope image in Figure 11 of a related species shows why: this is not a single crystal, but a large number of oriented overlapping crystals whose dimensions are below the light microscope's resolution. Crystal orientation follows the periphery of the specimen; there is always a group of crystals at extinction position. As the specimen rotates, a different group comes into extinction, causing the dark extinction lines to move, but not to go away.

Figure 10H uses the setup of Figure 7 to obtain **circular polarized light**. This removes the extinction lines and makes it easier to see what is structural on the surface of the specimen. The extinction lines are diagnostic and need to be seen; the circular polarized view is a useful supplemental image. At these high magnifications, diffraction is taking over the light microscope image; we have the same effect you see when viewing diatom punctae. A slight focus change moves from "white dot focus" to "black dot focus", and it is difficult to know if you are looking at a bump or a pit.

Retardation colors were converted to thickness with the Michel-Lévy chart. Values for calcite are:

2nd order blue = 4 µm thick
1st order red = 3 µm thick
1st order yellow = 2 µm thick

These values were used to sketch the approximate cross-section shown in Figure 10J. If you want to know what this nannofossil really looks like, the scanning electron microscope reveals all.

Figure 11. *Scanning electron micrograph of a related species,* Pontosphaera multipora*. Photo by Jeremy R. Young, Natural History Museum, London. From Nannotax on-line database.*

Example 5: *Braarudosphaera bigelowii*

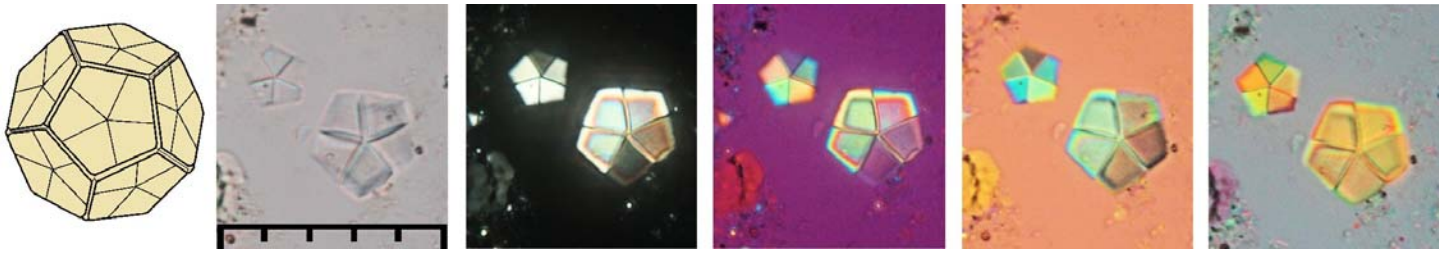


Figure 12. *Braarudosphaera bigelowii. Pentaliths from two individuals, one large, one small. 40X high dry objective; bar scale is 50 µm.* ***A.*** *Schematic of an entire algal cell.* ***B.*** *Plane-polarized light.* ***C.*** *Cross-polarized light.* ***D.*** *Cross-polarized with variable retardation filter at 1st order red.* ***E.*** *and* ***F.*** *Other settings of the variable retardation filter.*

Braarudosphaera bigelowii is a calcareous phytoplankton species that is interesting on several points. First of all, it has an unusual shape for a living organism (Figure 12A). It secretes a protective casing of 12 calcite pentagons (called pentaliths) that join along their edges to form a regular dodecahedron. It looks as much like a crystal as a living organism.

Secondly, it has a very long geologic range from the Late Cretaceous to the Present. Can a species from the time of the dinosaurs still be living? Maybe, but probably not. The fossilized hard parts haven't changed through more than 70 million years, but one suspects the soft parts and DNA probably have changed. So, if our present-day *B. bigelowii* species didn't swim with the dinosaurs, its ancestor species – which looks just like it – did.

Another interesting point: *B. bigelowii* algal blooms can be a sign of ecological hard times. *B. bigelowii* tolerates degraded marine conditions such as low salinity better than most other calcareous phytoplankton. When stressful conditions cause a local die-off of other species, *B. bigelowii* can increase dramatically in numbers. One instance is the terminal Cretaceous event 65 million years ago that exterminated the dinosaurs and most of the calcareous nannoplankton. *B. bigelowii* survived, and is often present in large numbers above the Cretaceous-Paleocene boundary. This sample from the Lodo Formation of central California is Late Paleocene (about 57 million years before Present).

What can our various illumination methods tell us about the structure of *B. bigelowii's* pentaliths? In this example, I used a dry 40x objective with high-aperture and correction collar instead of oil immersion. This gained a little depth of field at the cost of a little resolution. Even so, the large and small specimens have their best focus in different planes.

Figure 12B. The plane-polarized view shows pentaliths are divided into 5 segments with boundaries midway along faces.

Figure 12C. Cross-polarized light shows that each segment is a separate calcite crystal. The small pentalith is thin and has low 1st order retardation where the grays are difficult to tell apart (see the retardation scale in Figure 3). Uniform color indicates uniform thickness (about 1 µm). The large pentalith, on the other hand, has a color topographic map on its surface, showing it is thick enough to build up retardation, and thickness varies across the specimen. Areas with the same color have the same thickness; the Michel-Lévy chart tells us that for calcite, the 1st order red color is 3 µm thick.

Figure 12D. With the variable retardation filter at 1st order red, each segment crystal has a different retardation color. This tells us each segment crystal is rotated with respect to adjacent segments. In fact, the crystallographic C-axes are tangential to the pentalith outline. The segments blink off, then on again, as they rotate past their extinction positions.

Figures 12E and F. The variable retardation filter allows us to be artistic and pick different background colors, as well as select a retardation that highlights points of interest on the specimen.

Example 6: Deep Sea Sediment Strew

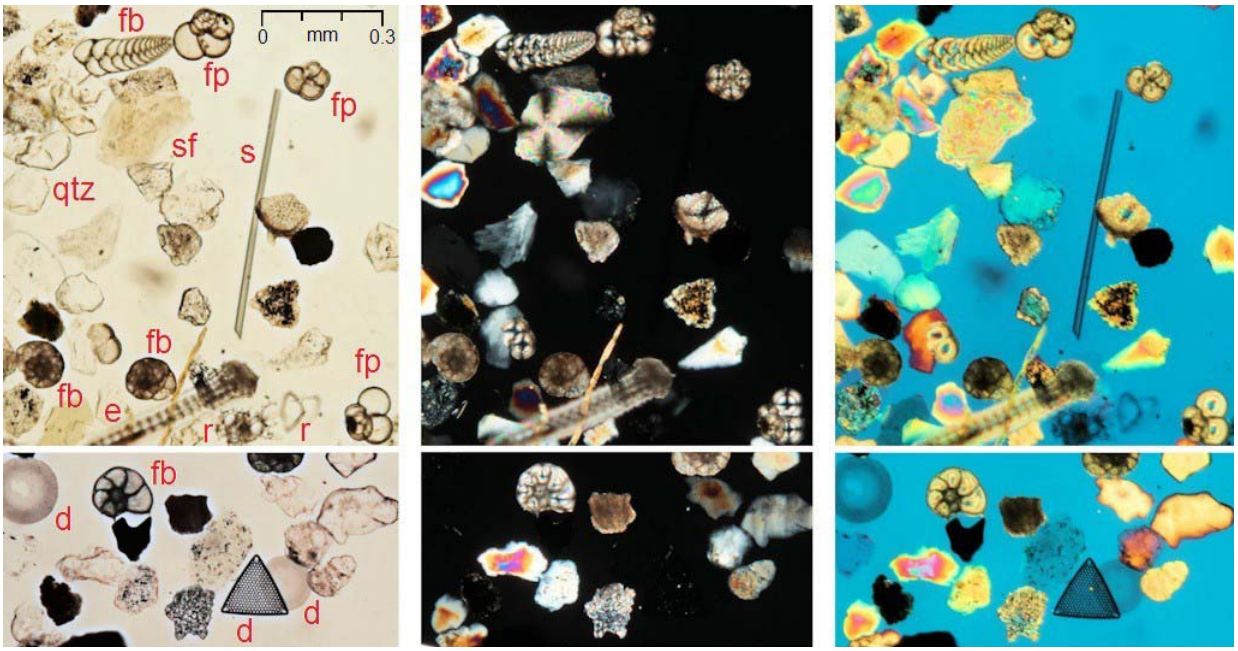


Figure 13. *Grain mount of Atlantic Ocean deep sea sediment. 4X objective; bar scale is 0.3 mm (300 µm).* ***A.*** *plane-polarized.* ***B.*** *cross-polarized.* ***C.*** *cross-polarized with the variable retardation filter. Key to objects:* ***d****=diatom;* ***e****=echinoderm spine (out of focal plane);* ***fb****=benthic foram;* ***fp****=planktic foram;* ***qtz****=quartz grain;* ***r****=radiolarian;* ***s****=sponge spicule;* ***sf****=shell fragment of larger organism.*

This last example is a random strew of particles from an Atlantic deep sea sample collected off North Carolina. The sample was washed through sieves to select fine sand and very fine sand (1/4 to 1/16 mm; 250 – 63 µm); other size fractions were prepared separately. The age of the sediment is possibly a few thousand years.

Biological calcite in this size fraction is mostly foraminifera, with some echinoderm spines, and an occasional shell fragment of a larger organism. The biological calcite is birefringent and is visible in cross-polarized light.

Biological silica takes the form of amorphous opal; it is isotropic. In this sample we have diatoms, radiolarians, and sponge spicules; these all disappear in cross-polarized light.

Compare Figures 13A and 13B. One third of the particles disappear in cross-polarized light. In addition to losing the biological silica, some minerals also go dark. The minerals might be isotropic, opaque, at extinction, or aligned along an optic axis so they are apparently isotropic.

In Figure 13C, the variable retardation filter adds retardation, which makes the background brighter, and all particles are visible again.

By using the variable retardation filter, we have the benefit of some polarization information, but at the same time, we have not caused a significant portion of the sample to become invisible. And, as an 1860s microscopist or a 1960s hippie would tell you, we have a flashy image with more visual impact than the original. “Far out, man!” “Indubitably!”

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For comments or questions, the author can be contacted at JPCHECKLST AT AOL DOT COM.

A Home-Made Darwinian Plankton Net

by Jay Holmes, AMNH

Over the weekend Mom and I worked on a plankton net similar to the one that Darwin made on the Beagle, and I had a water test of it today in the Hudson at 125th Street and had success! I caught some copepods and diatoms and at least one foraminifera, the little coiled thing in the last photo (those last two photos were taken with a hand held iPod so… low resolution and a little motion blur). The photos were taken through the Bancks microscope from 1825 which does produce a nice sharp image in spite of what my shaky hand took.
The net is made worsted wool and about 2 feet long and 18 inches wide at the open end (Darwin's was 4 feet long and probably a little wider at the opening than ours). There is a note and illustration from Darwin's diary at this link:

I let the sample settle a little and it cleared nicely. I had a lamp near the sample, and I noticed near the top, closer to the lamp, there were many little specks jumping about, smaller than the ones that I had noticed earlier. I think they were visible now because of their concentration and the increased clarity of the water. I used a dropper to suck up a few drops from that area and placed them on the stage. It was really jumping! There were at least 20 each of young (nauplii) copepods and barnacles. They have very different motions. The copepods buzz or go in big jumps often totally out of the field of view in one twitch, seeming to disappear right before your eyes. The barnacles on the other hand are just about in a constant state of motion, flailing away with longer appendages. The barnacles have little "horns" or spines on either side of their heads (carapace) and a single long spine out the posterior.

I had a good time watching through the Bancks single lens microscope, but was having trouble getting some good photos, so I switched to a "Brown" portable compound microscope from the late 1800s and used an AmScope ocular attachment to mount my Nikon D5100 onto the microscope. This made the photography much easier and I was able to capture the attached stills as well as some fun video.

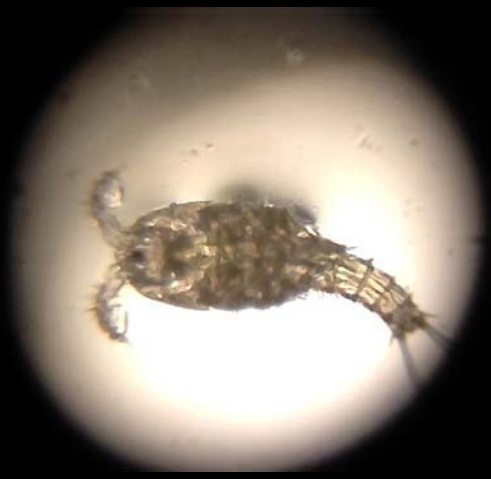
The Robert Bancks 1825 single lens microscope, and an unsigned folding compound microscope, almost surely a Brown from about 1890. The camera adaptor is a AmScope 2x nikon adaptor which I use with my Nikon D5100. The lamp for the compound scope is an American Optics.

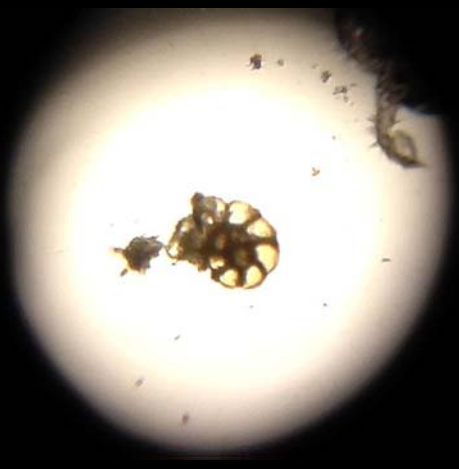
http://darwin-online.org.uk/content/frameset?pageseq=53&itemID=F1925&viewtype=side
This (Darwin's) is the second documented use of plankton net, the first is by John Vaughan Thompson. There is a nice little blurb about him at the Oxford Dictionary of National Biography

(http://www.oxforddnb.com/view/printable/27273).

Russian-made
http://www.arctic.noaa.gov/aro/russian-american/photo-gallery/Plankton-Nets-Photo-K-Iken.JPG

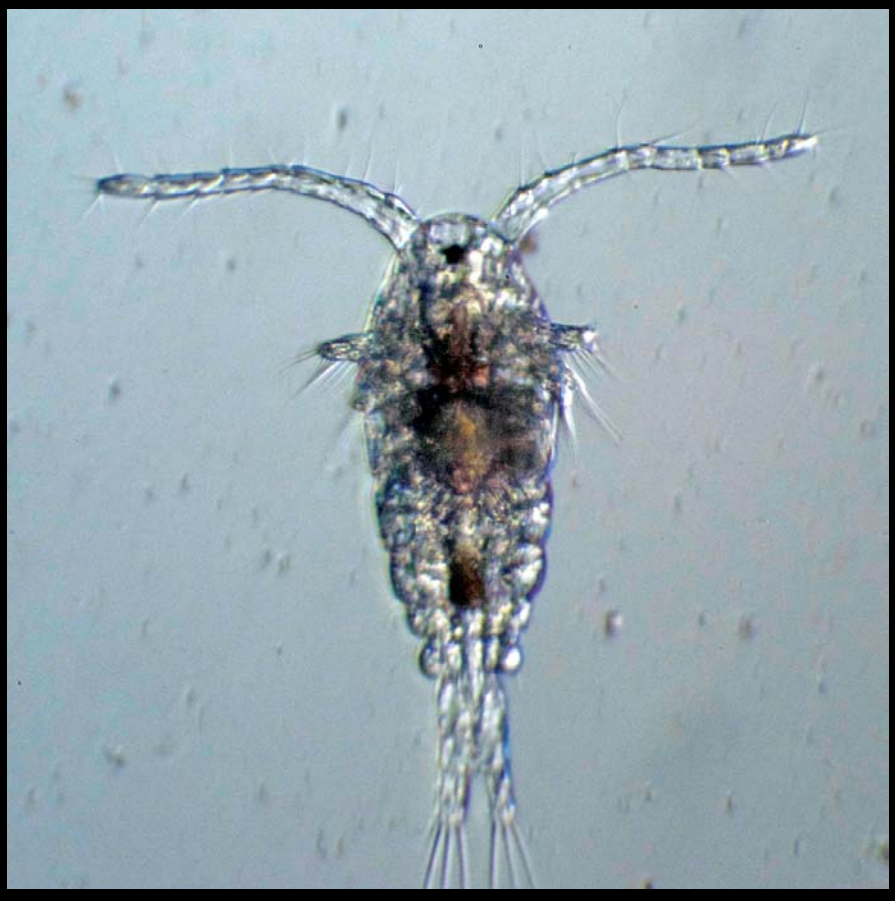
Plankton Net

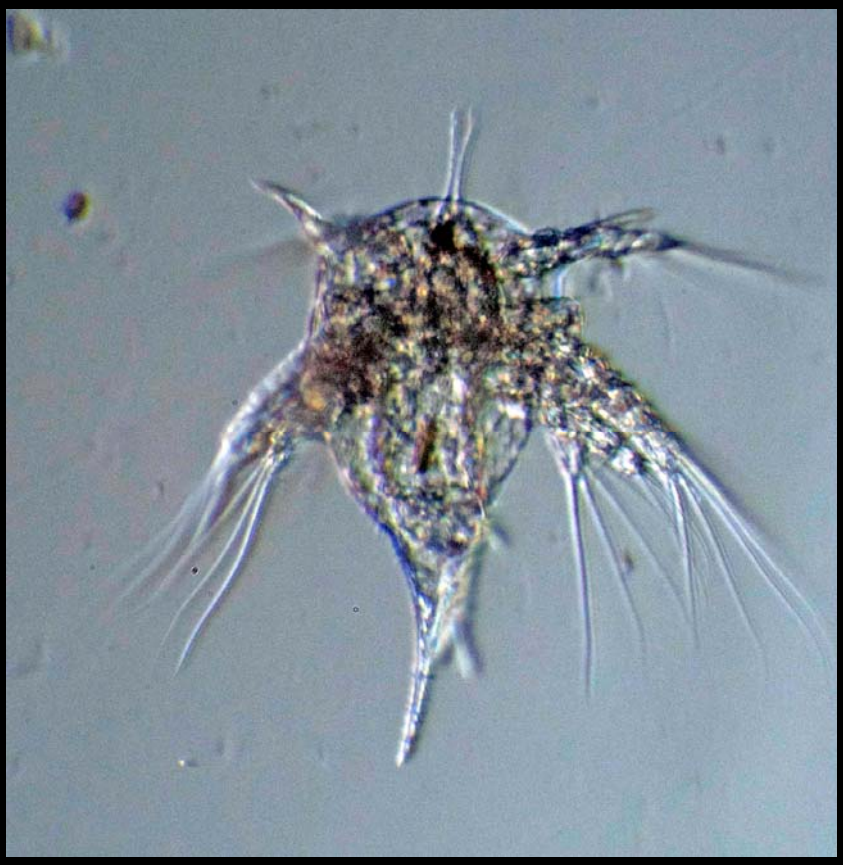




Plankton Net

Plankton Net





Excerpted from an article by Ariel Sabar

EPISODE ONE OF "STAR TREK," STARDATE 1513.1. CHIEF MEDICAL OFFICER

Leonard "Bones" McCoy beams onto a desolate planet, M-113, with orders to perform a routine physical on Prof. Robert Crater, an ill-tempered archaeologist who wishes McCoy would just go away.

"Doubtless the good surgeon will enjoy prodding and poking us with his arcane machinery," Crater snipes.

Think again, Crater: Prodding and poking is so last millennium.

Dr. McCoy packs a medical "tricorder." Wand the body with this hand-held computer, and seconds later it coughs up the particulars of a patient's condition.

"The machine is capable of almost anything," McCoy says. As he sweeps the device across Crater's chest and back, it purrs like a blissed-out electronic cat. In the 23rd century—as pictured by television writers in the late 1960s—that purr was a sign that a very sophisticated machine was working.

The tricorder-like devices in the UCLA engineering labs of Aydogan Ozcan don't purr. Nor do they cause the shoulder strain of the cassette recorder-size clunkers of Trekkie lore. But in other respects, they're the closest thing yet to the real McCoy.

Ozcan's sleek gizmos, which fit onto the back of a smartphone, count thousands of red and white blood cells in seconds; screen urine for signs of kidney disease; spot viruses like HIV and influenza in a smear of blood; and test water for bacteria, parasites and toxic chemicals. Another phone attachment, the iTube, scanned for microscopic specks of allergy-causing peanut in what one of Ozcan's journal articles last year described as "3 different kinds of Mrs. Fields Cookies."

When I visited Ozcan on the UCLA campus, a dozen of the devices were arrayed like museum pieces in an illuminated glass display case in a corner of his laboratory. The ones in the original "Star Trek" series resembled antediluvian Walkmen. Ozcan's devices are the size of a lipstick case or matchbox.

"This is honestly one of our first hacks," he told me with a touch of nostalgia, pulling out a six-year-old Nokia phone that he'd somehow retooled into a lens-free digital microscope. He says "hack" because he takes technology already in our pockets—the smartphone, another gadget anticipated by "Star Trek's" inaugural episode—and cheaply reworks it into lightweight, automated versions of the bulky instruments found in medical laboratories.

At the rate he's going, Ozcan, who at 35 already holds the title of UCLA chancellor's professor, may soon hack the whole clinical lab. He wants nothing less than to make it small and cheap enough—and so idiot- and klutz-proof—that we can carry it in our pocket like loose change.

I'd visited Ozcan during a week in January when temperatures tripped into the 80s. So when one of his postdocs, Qingshan Wei, a 32-year-old with stylish clip-on shades, asked if I wanted to scope out the waves in Marina del Rey, I raised no objection.

Our "scope" was a Samsung Galaxy with an attachment that turned the phone's camera into a mercury detection system. The toxic metal can build up in fish, and water tests can serve as an early warning system. "We want to detect mercury in water before it goes into the food chain," Wei told me.

We splashed barefoot into shin-deep surf, and Wei pipetted seawater into a small plastic box on the back of the phone. Inside were a pair of LEDs that fired red and green beams of light through the water sample and onto the phone's camera chip. An app scrutinized the subtle shifts in color intensity, and four seconds later, results flashed on the screen.

Two months earlier, mercury levels at this very spot had been worrisome. Today, the phone told us, the water was safe.

Similar tests performed by a full-scale environmental laboratory are very expensive, Wei told me. They also require schlepping the sample to the lab, for a complicated analysis called inductively coupled plasma-mass spectrometry. "For this," Wei said, nodding at the mercury tester, which cost $37 and was made by a 3-D printer, "we write a smart application. You just sample, click open the

Ozcan (in his UCLA lab) started a company, Holomic, to market microscope-outfitted smartphones, which he calls "a telemedicine tool" for improving health care in the developing world.

Gregory Argentieri
Trying to find a good home for:
A Gossen/ Leica Microsix-L exposure meter and a
Bausch and Lomb Dynazoom Trinocular Photographic Microscope

Gossen/ Leica MICROSIX-L
Exposure Meter
Description
Gossen/ Leica Microsix-L exposure meter for photo microphotography
THIS LIGHTMETER IS FULLY TESTED AND IN EXCELLENT COSMETIC CONDITION
FOR USE WITH MICROSCOPES-
Gossen Microsix-L exposure meter
The Gossen Microsix-L exposure meter is a meter specially designed to be used with a microscope. The special attachment containing the measuring element is mounted on a microscope and with a connector plugged into the meter. The Microsix-L is made for Ernst Leitz (Wetzlar) and looks very close to the regular Lunasix except that the scale are reversed and the knob on the right side of the Lunasix is removed. The Microsix-L is sold in the world of microscopes as the Leitz Microsix-L. Microsix-L has been designed especially for photomicrography, however, it can also be used for all other photographic purposes.
While the Microsix-L is a highly sensitive exposure meter designed especially for photomicrography. However it can also be used for all other photographic purposes. Its large measuring range accommodates any exposure times likely to be required in photomicrography from instantaneous shutter speeds to long time exposures (e.g. weakly fluorescing specimens).
The measuring eye accepts an angle of 30 degrees which is comparable with that of popular camera lenses e.g. 90 mm for the 35mm format. The microsix-L is simply mounted and clamped onto the microscope like a camera attachment. Only a few manipulations are required for exposure measurements the user reads the measurement off the scale of the exposure meter to determine the correct exposure time within a few seconds. The meter has two measuring ranges for high to medium and for medium to low light intensities. Exposure range is from 1/4000 sec to 8 hours. Suitable for all photomicrographic apparatus.

Operation:

Set the ASA speed of the chosen film or digital equivalent and place the measuring head against one of the measuring sites. e.g. through the eyepiece, camera port, on ground glass screen of the bellows camera, or on an empty eyepiece tube for example. The pointer reads a value. Set this value on the yellow scale on the meter, the correct exposure time appears on the time scale opposite the calibration value. The exposure meter comes in its own plastic container. Instrument comes with a user's guide.
Asking $250 or best offer

Bausch and Lomb Dynazoom Trinocular Photographic Microscope

This is a Vintage collectable in excellent condition that can still be used as a working or serious hobbyist microscope. This microscope is in good working and good cosmetic condition. I used this microscope to photograph protozoans in collage and in my early NYMS days. Since then it has been locked in my cabinet collecting dust.

The Dynazoom contains a power changer knob engraved in 0.1x intervals from 1 - 2 magnification Permitting changing magnification continuously from 1x to 2x without changing eyepieces. The microscope body can rotate a full 360 degrees in a stand of permanently fixed height. Focusing is with a clutch protected movable stage on ball bearing slides. Coaxial coarse and fine adjustment knobs are on both sides of the instrument. One of the fine adjustment knobs is graduated in microns. The x-y Axis mechanical stage is capable of holding a 2x3inch slide.

• Objectives include standard achromat 3.5x (0.09 N.A.), 10x (0.25 N.A.), 45x (0.85 N.A.), 97X (1.30 N.A.)and 100x Oil (1.25 N.A.).

• Two (2) 10x WF-22 eyepieces. • X-Y axis Mechanical stage can accommodate 2x3inch slides. • Power Changer knob for variable 1-2x magnification without changing objective. • Prism control knob • Abbe 1.30 N.A. Bright field Condenser with an auxiliary lens and slide in lens assembly that can accept 31.5 mm glass filters or darkfield stop. • High intensity illuminator with field iris. • Power transformer has five click positions to control intensity. • Additional Optilume light source with blue glass filter included.

Key Features:

• Dynazoom Trinocular Microscope with X-Y Mechanical Stage
• Ability to attach a variety of microscope cameras or digital imagers
• Five Standard Achromat Objectives, 3.5X, 10X, 45X, 97X, 100X (oil) with 1-2X variable magnification
• One pair of wide field eyepieces: WF10X
• Prism control (switch between camera and eyepiece)
• Variable Power knob for 1-2X Magnification, sort of like an optivar
• Camera Port
• Adjustable interpupillary distance eyepiece
• Adjustable ocular diopter
• Coaxial coarse and fine focus adjustment
• Focusing knobs are on both sides
• X-Y Mechanical stage
• N.A 1.30 Abbe Condenser with iris diaphragm & filters
• Auxiliary Lens with slide in lens assembly
• Rack and pinion adjustment condenser
• Variable High Intensity illuminator with field iris
• Illuminator power transformer
• extra optilume light source with blue glass filter A lens hood for photography through the eye piece.

Photo microphotography attachments:

• Nikon 35mm camera body adapter with tube
• Canon 35mm camera body adapter with tube
• Canon Lens hood for through eyepiece photography
• 4X5 Camera System
• Polaroid 4x5 land film holder
• Two 4X5 sheet film holders
• One 35MM camera back for 4x5 camera system
• 4X5 Matte view screen
• Dust Cover
• Operators Manual with catalog part numbers

All items are working and sold as is.

Local Pickup, or can bring to NYMS in Clifton. Items are located in Vernon, NJ. Asking $500 or best offer.

Contact:

Greg Argentieri :
Comotion64@gmail.com
973-764-1875 Hm Prefer email contact if possible


Nikon


Canon
PHOTOMICRO UNIT-F


POLAROID 545 LAND FILM HOLDER
INSTRUCTIONS
TO LOAD
TO PROCESS
TO REMOVE PACKET WITHOUT PROCESSING
TO CLEAN ROLLERS
STORE HOLDER WITH CONTROL ARM AT P.
POLAROID
P


GRAFLEX


Canon LENS MOUNT CONVERTER A Japan


BAUSCH & LOMB
TURN OFF LIGHT
OFF
1 2 3 4 5
BAUSCH & LOMB
BAUSCH & LOMB

Main Identity

From: "David Walker" <micscape@ntlworld.com>
To: <pollingmel@optonline.net>
Sent: Monday, June 02, 2014 8:09 AM
Subject: New book: 'Safe Microscopic Techniques for Amateurs. Slide Mounting.' by Walter Dioni

Hello Mel

A print on demand book announcement is below in case of interest to NYMS members.

Thanks.
with regards
David walker
Voluntary Micscape Editor

Walter Dioni's nine web article suite 'Safe Microscopic Techniques for Amateurs. Slide Mounting.' originally published on the 'Micscape eZine, has been
compiled into a paperback by Microscopy UK's founder Maurice Smith. Modified classic microtechnique protocols or new ones are suggested using chemicals readily available to most. Contents below.

It is now available on a local Amazon (e.g. US / UK / FR / DE) for ca. $17 or local equivalent (102 pp., A5, B/W images). A cheaper Kindle version also but the auto-convert software to keep costs down doesn't retain all the book format.

Links to Amazon purchasing details are at http://www.microscopy-uk.org.uk/wd/ where a free eBook and links to Walter's suite of web articles are also offered.

As remarked in a recent Yahoo Microscopes Forum item, Walter aged 86 has advanced lung cancer and wished to present him with a physical archive of part of his large output as well as hopefully providing a more convenient paper form for the many microtechnique protocols that he shares in the book.

The book is being sold just above cost price, the small profit will go to Walter's family to help pay for his treatment.

Thank you.
regards
David Walker pp Microscopy-UK / Micscape

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New York Microscopical Society Items For Sale

N.Y.M.S. Microscope Covers

Item #	Size	Member Price	List Price
MT-003	Small Microscope or Stereo	$18.00	$20.00
MT-004	Lab Microscope or Large Stereo	$23.00	$25.00
MT-005	Large Lab Scope	$28.00	$30.00
MT-009	Large Lab Scope with Camera	$31.00	$33.00
MT-010	Universal Scope with Camera	$36.00	$40.00
MT-012	X-large Scope	$45.00	$50.00

N.Y.M.S. Microscopes

185	Monocular Dissecting Microscope	$85.00	$99.00
131	H.S. Student Microscope	$190.00	$245.00
131-FLU	H.S. Student Microscope (Fluorescent)	$200.00	$255.00
125-LED	H.S. Student Microscope (LED)	$240.00	$309.00

Other Items

NYMS Glossary of Microscopical Terms	$20.00
NYMS Patch	$5.00
Microscope Cleaning Kit	$35.00
NYMS Lapel Pin	$10.00

Model 131: Tungsten

Model 131-FLU: Fluorescent

Model 185: 20x

Model 125-LED Cordless

New York Microscopical Society

Return to: ***Mary McCann***
30 Spy Pond Parkway
Arlington, MA 02474

Please Print

I hereby apply for membership in the New York Microscopical Society.

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Work: Company.....*Address*.....
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On what topic are you available as a speaker? .....
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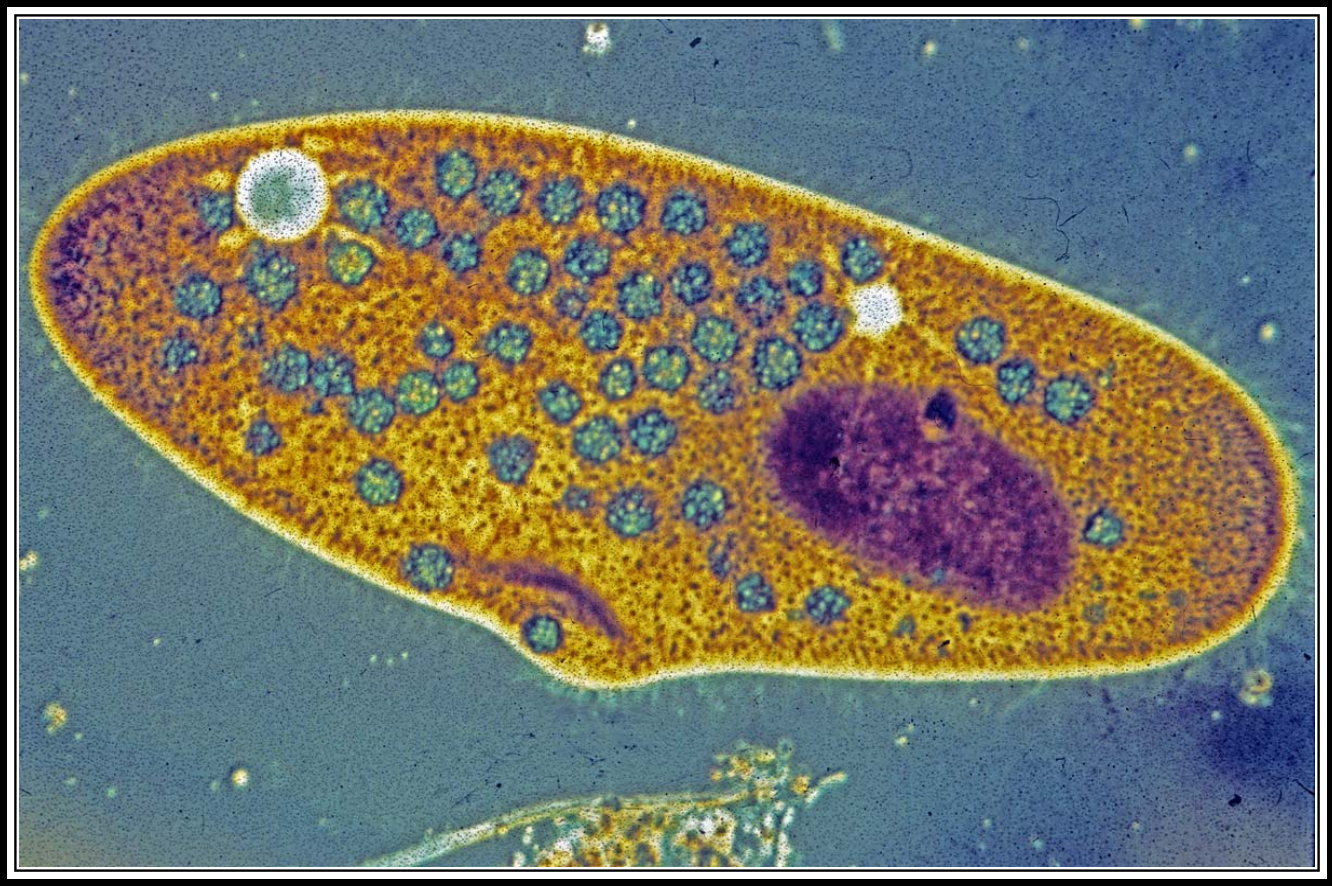
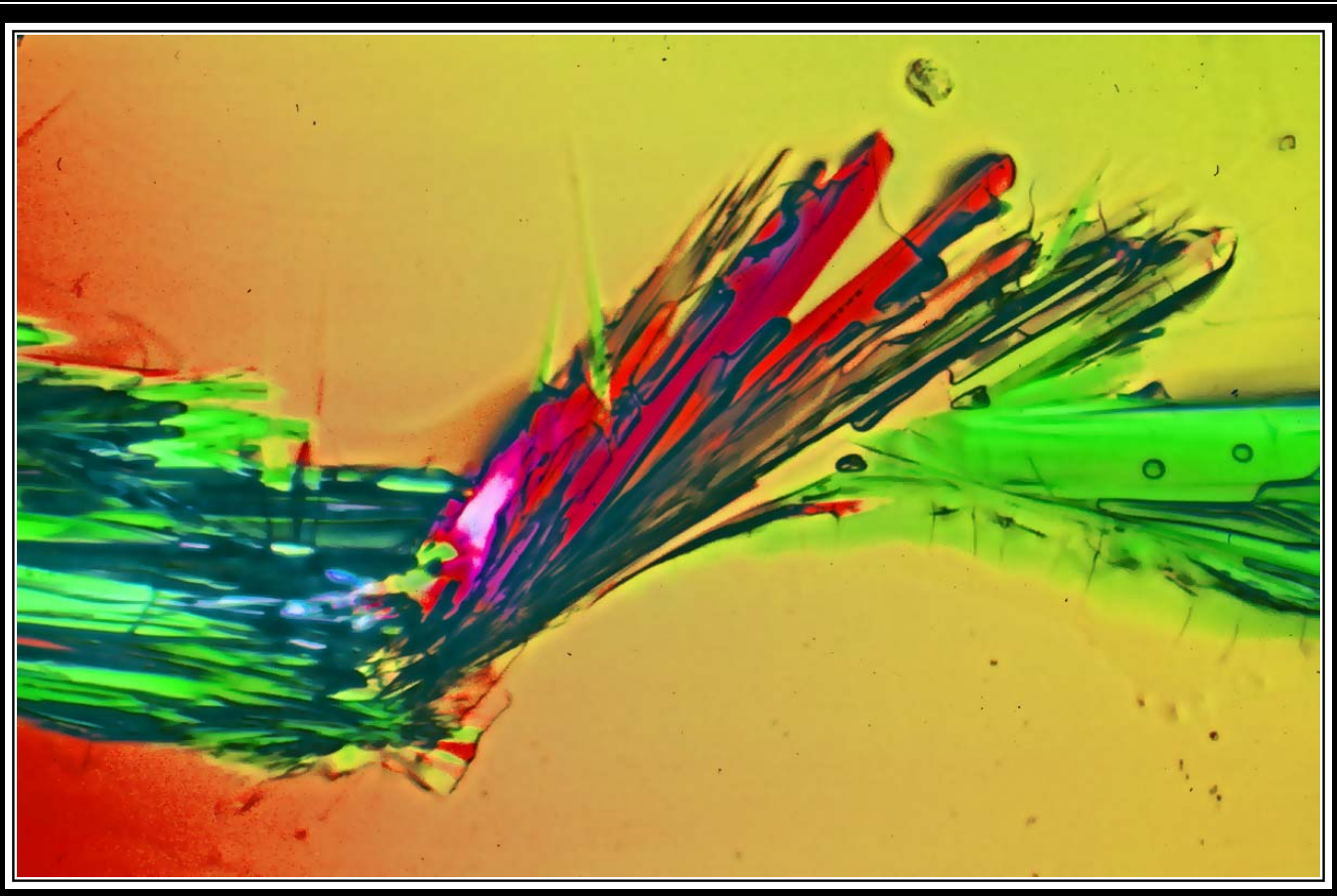
Signature.....Date.....
NYMS Headquarters: One Prospect Village Plaza, Clifton, NJ 07013 Telephone (973) 470-8733



Paramecium caudatum, 133x fr10 a6x4x200: Image by Eric Gravé (see page 3 of 4)



Amoxicillin trihydrate, 100x (P1261529)a6x4x200: Image by Mel Pollinger