# Microbe Hunter

## Microscopy Magazine

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The Magazine for the Enthusiast Microscopist

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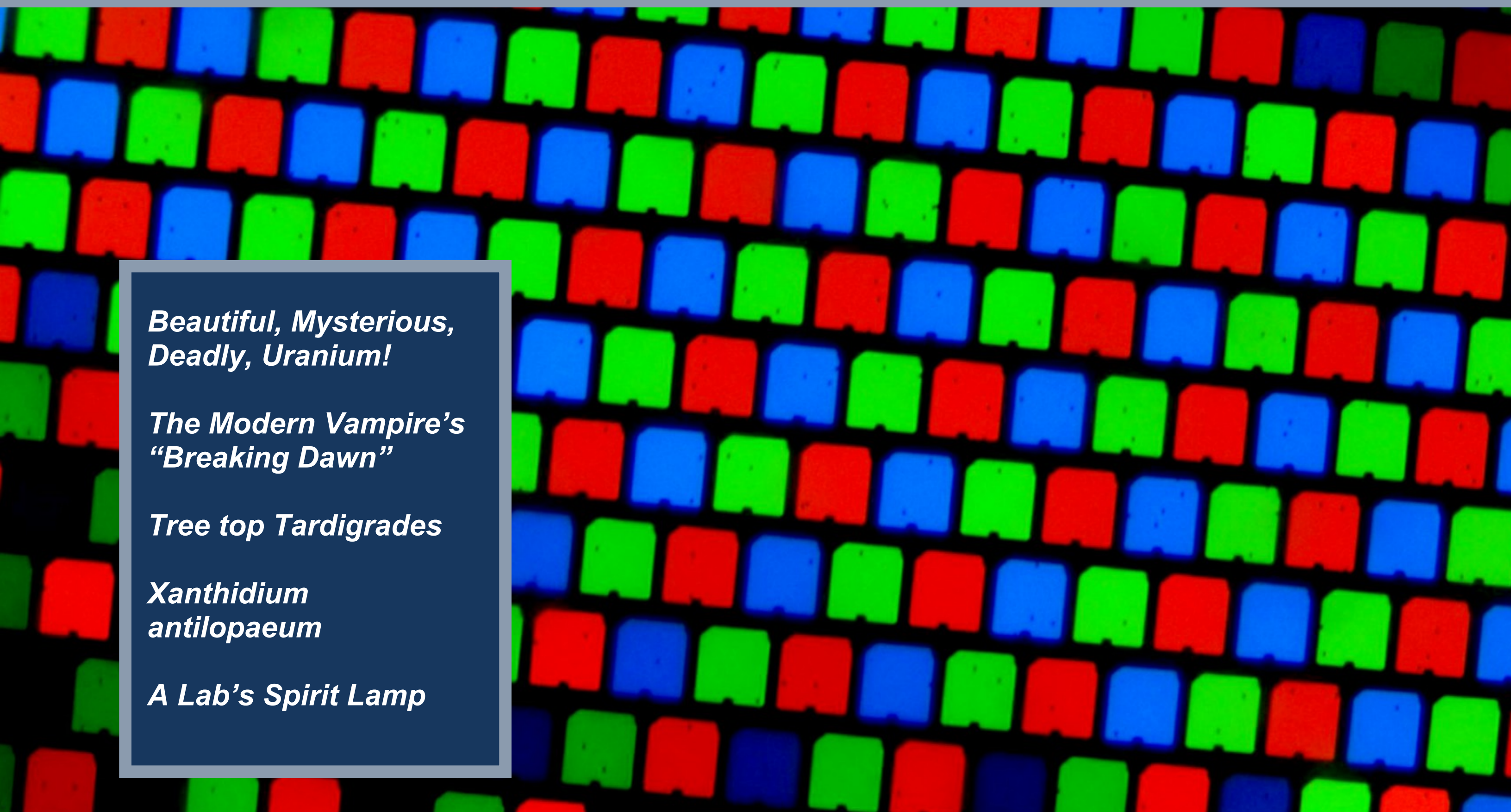

*Beautiful, Mysterious, Deadly, Uranium!*

*The Modern Vampire's "Breaking Dawn"*

*Tree top Tardigrades*

*Xanthidium antilopaeum*

*A Lab's Spirit Lamp*

*Uranium*

*Tardigrades*

*DIY Spirit Lamp*

**Microbehunter Microscopy Magazine**
**The magazine for the enthusiast microscopist**
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Front Cover:
Large image: Oliver Kim (LCD Display)
Left image: Tom Watson
Middle image: Charles E. Guevara
Right image: Michael Race

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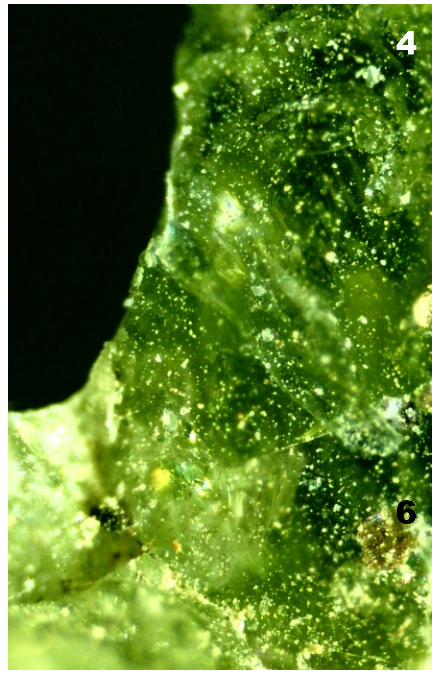
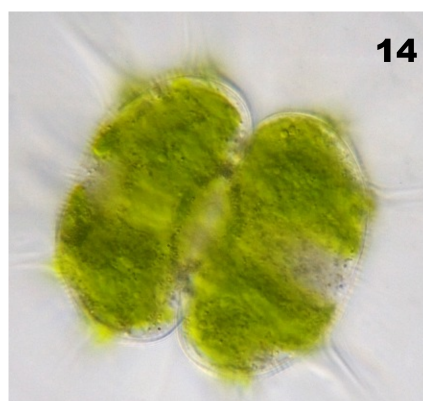







Answer to the puzzle (back cover): LCD display

# Beautiful, Mysterious, Deadly, Uranium!

*Long wave ultra violet light causes uranium to glow bright green making it a beautiful sample for microscopic investigations.*

***Tom Watson***

Uranium is a wondrous, mysterious, powerful, and somewhat dangerous element. For thousands of years humans have used Uranium for colorant and more recently for energy. Uranium is a natural and primordial element which has existed long before the birth of our planet, over 4.5 billion years ago. Uranium 238 is the most common isotope of naturally occurring Uranium, having 92 protons and 146 neutrons. The number following the name, in this case 238, is the total count of protons and neutrons found within this specific isotope of Uranium, forming a unique number which differs between each isotope of Uranium. Uranium 238, in nature, is always found in equilibrium with its counterparts Uranium 235 and Uranium 234. This means that, though the amount of Uranium 238, Uranium 234, and Uranium 235 differ, the ratio of each isotope is nearly always the same.

Uranium is a type of element known as an actinide, it is pyrophoric and burns, and is also electrically conductive. Uranium is a metal which readily oxidizes providing many useful properties to humans, such as its long time use as a colorant. The earliest known use of Uranium oxides as colorants date from

**Figure 1: Autunite Uranium, 100x, Daybreak Mine of Spokane, Washington.**

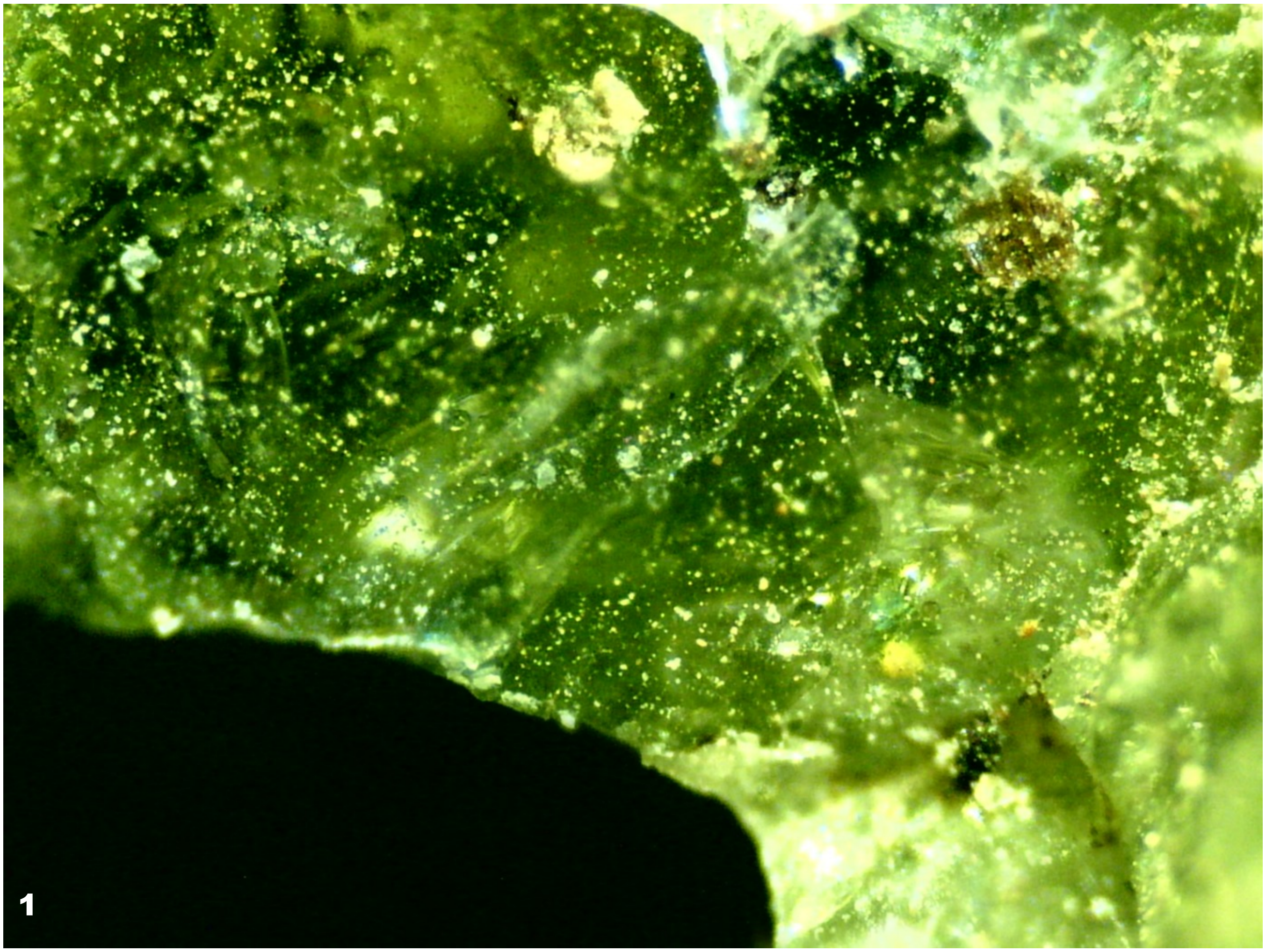



Figure 2: Autunite Uranium, 100x, Daybreak Mine of Spokane, Washington.

the early first century. Of course, using Uranium as a colorant is now considered a poor idea. Many examples of Uranium glass and glazed pottery exist and are very beautiful. Of this glassware, perhaps none was more prominent and arguably beautiful as that of the American economic Depression Era glassware, known as “Depression Glass”. To this day, large amounts of this Uranium colored glassware are available at American antique shops.

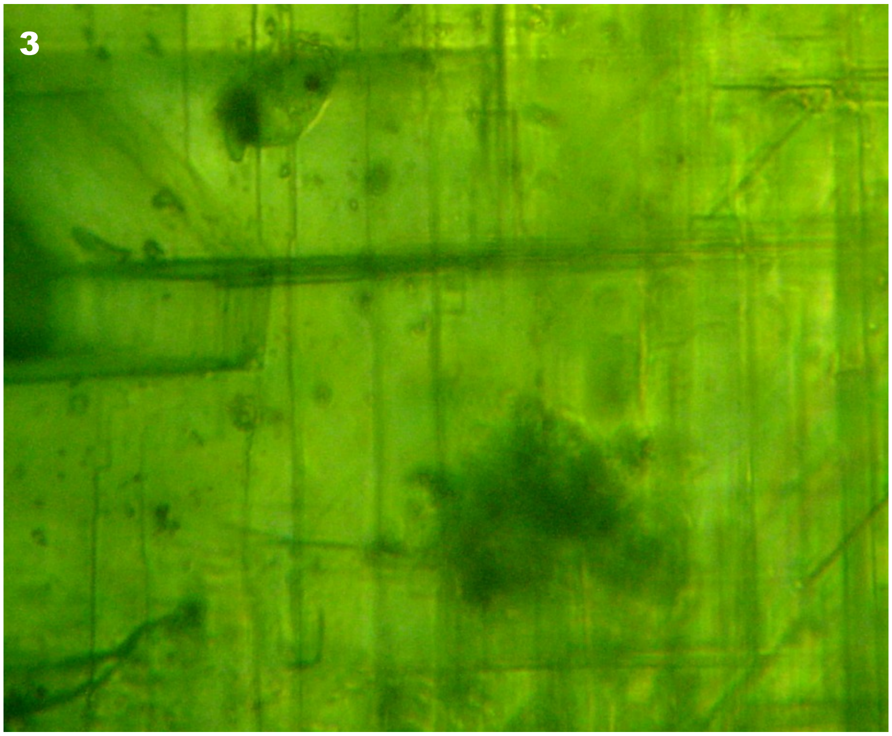
Natural Uranium has existed long before humans walked the earth. Humans have ingested and inhaled Uranium and Uranium progeny for their entire existence. It may very well be possible that some of the very mutations which helped give rise to our very species may have started as radiation from Uranium and Uranium progeny decay, causing DNA mutation. Though this may be a little far fetched, it is a fact that the average human ingests about 474.5 µg (1 µg = 1 micro gram) of natural Uranium per year (Depleted Uranium, IAEA). Though Uranium is present in our bodies in tiny amounts and is extremely common, in microscopic trace quantities, in our foods and soil, the dangers of Uranium cannot be taken lightly. Uranium is radioactive in all forms and very dangerous if inhaled or ingested beyond the extremely microscopic amounts humans naturally intake. Uranium is a heavy metal and builds up in the body, taking years to leave the body in such cases. The use of depleted Uranium, Uranium mining, and nuclear accidents have increased the amounts Uranium exposure to some groups of people.

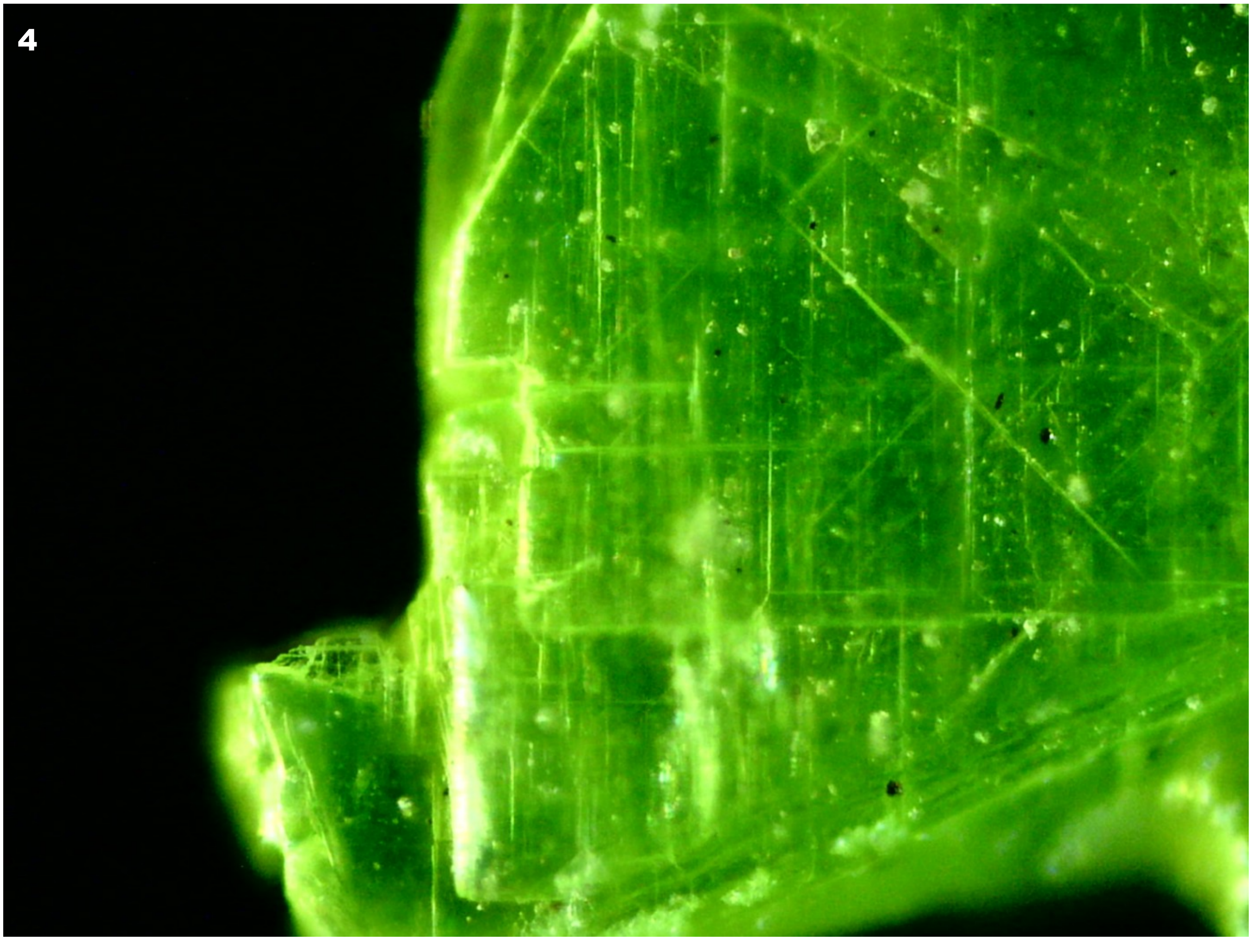
These pictures were taken using a Celestron LCD Deluxe Digital Microscope at magnifications of 40x to 400x. The specimens used were tiny grains of Uranium many times smaller than a grain of salt. As beautiful as these pieces are, breathing a single grain of urani-

**Figure 3: Autunite Uranium, 400x, Daybreak Mine of Spokane, Washington**

**Figure 4: Autunite Uranium, 200x, Daybreak Mine of Spokane, Washington**

um into your lungs could be quite serious! A dust mask, gloves, goggles, and full laboratory safety measures were taken when working with the Uranium samples. A long wave ultra violet light was used to illuminate the Autunite samples allowing them to produce their own illumination. The Autunite Uranium samples were obtained from a friend and originally obtained from the Daybreak Mine of Spokane, Washington. The Pitchblende was purchased from United Nuclear Scientific LLC.



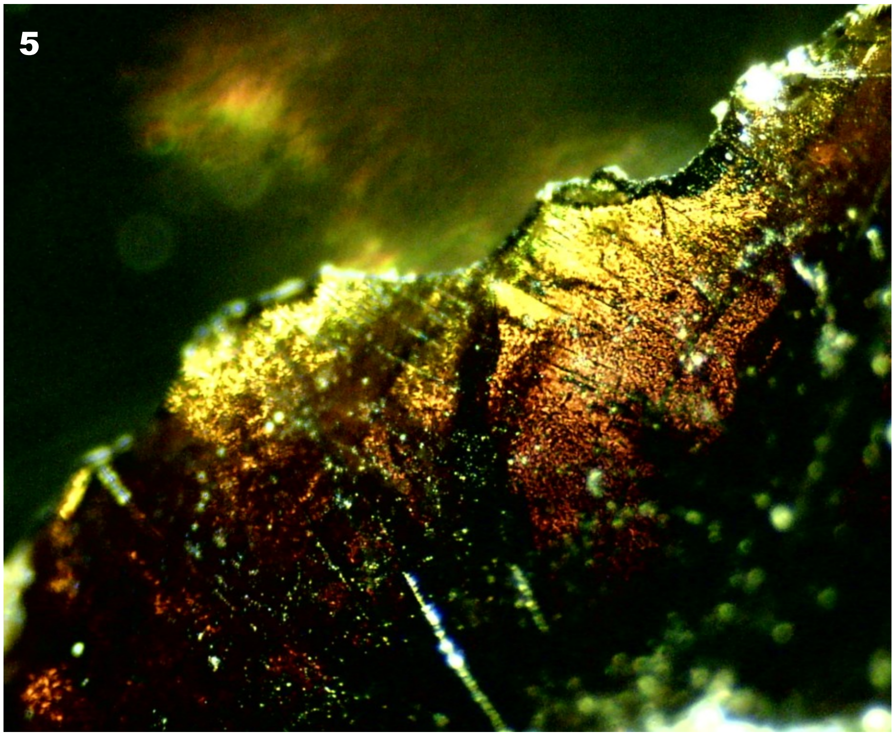



Figure 5: Pitchblende Uranium, 200x, Moab Mine, Utah

Figure 6: Pitchblende Uranium, 200x, Moab Mine, Utah

### References

IAEA. Features: Depleted Uranium. Retrieved August 10, 2012, from http://www.iaea.org/newscenter/features/du/du_qaa.shtml

*Tom Watson,*
*Computer Scientist, Virginia, USA*
*http://www.naturaluranium.com*

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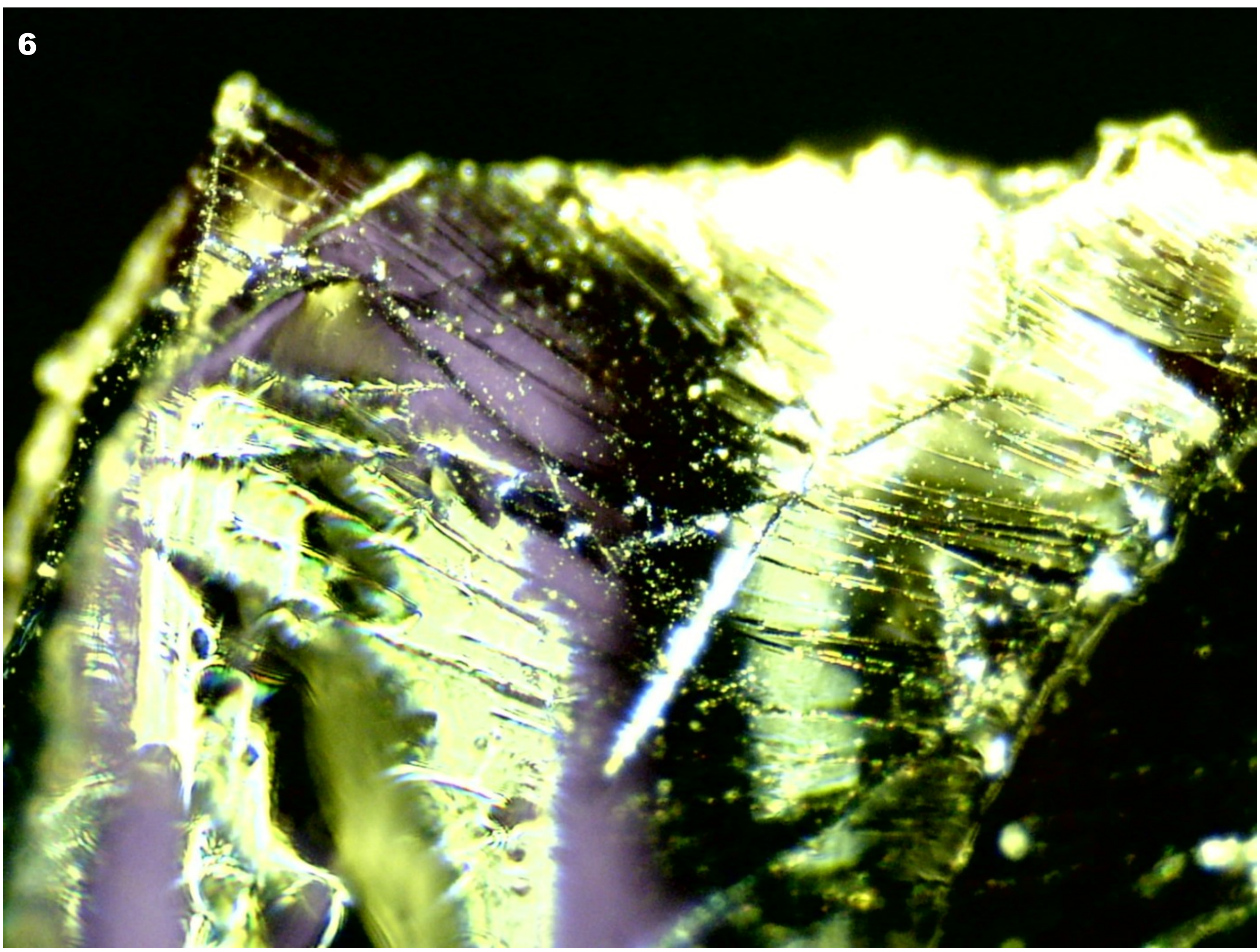

# The Modern Vampire's "Breaking Dawn":

*How the Rabies Epidemic of the 18th Century Created a Paradigm Shift in Vampirism.*

**Opal Tang**

It all starts like this: a clique of vapid, blonde girls wander into the dark. Cheap, manufactured fog rolls in. Eerie music begins to play. From nowhere, fangs burst out of the darkness. Swifter than wind, a single vampire yearning for bloodshed bites the girls' necks and drains them of life.

Except this vampire hasn't been recognized as a "vampire" for most of history. In ancient history, vampires merely were the lost shades of the dead, briefly experiencing life again when he or she consumed blood left out for them. The Odyssey's Tiresias is one such example of a vampire of antiquity. Before the nineteenth century, vampires were not depicted as having fangs or fearing water. Something changed in the 1800s, during the Age of Enlightenment, and the myth of the vampire survived and evolved into a violent, gruesome serial killer: rabies. The rabies pandemic of the 18th and 19th century was the catalyst for the modern vampire.

Between 1700 and 1881, rabies became a pandemic, infecting our canine companions by the boatload. There had been previous cases of rabies, yet they were scattered throughout time and across civilizations. There had never been any substantive outbreaks prior to the 18th century. Rabies had never been seen before on such large a scale.

Rabies is a viral disease passed not through the bloodstream, as most others are, but through the peripheral nerves. In other words, rabies attacks the brain. The brain shields itself from most diseases because it is covered in a layer of special capillaries. These capillaries use endothelial cells to allow the diffusion of oxygen, carbon dioxide, and hormones in and out of the brain, but block anything else. However, rabies circumvents this protective layer by traveling through the peripheral nerves. The barrier then becomes a chokehold, not allowing any immune responses to slip into the brain.

Because rabies is a viral disease and so requires electron microscopy, even the greatest scientists at the time could not begin to understand rabies. Bereft of any explanation, the populace began to panic and create wild, unsubstantiated theories. One of these theories was vampirism. During the rabies pandemic, there was also a pandemic of vampire sightings. Voltaire noted, "Nothing was spoken of but vampires." These incidents often involved the death of one supposedly-suspicious citizen and the subsequent deaths of many more in the surrounding villages. In the minds of the newly-formed "vampire inspectors" instated by Habsburg Empress Maria Theresa, there was only possible reason for these deaths: the existence of vampires. Their hypothesis: the first corpse awakens in the middle of the night, climbs out of the coffin, and commences chomping on innocent farmers' necks. The non-paranormal explanation is the ease of transmission of the rabies virus would allow the spread of the virus to a huge population. Rabies' one-hundred percent death rate would then decimate the population to snarling insanity.

Many other symptoms of modern vampirism have their roots in rabies. One indicator of rabies is hypersensitivity of the senses. A rabid person might be susceptible to the strong stench of garlic or the brightness of light. As it is a neurological disorder, rabies can also tinker with the part of the brain that controls sleep patterns. This manipulation of the brain could result in a nocturnal human being. A main characteristic of rabies is hydrophobia, or fear of water. A rabies victim suffering hydrophobia cannot drink water, no matter how much he or she thirsts. This may have contributed to the 19th century belief that vampires cannot cross bodies of water or drink holy water. The method of transmission for rabies is the same for that of modern vampirism: biting. The ancient vampires lacked the sharp teeth and strong jaws necessary to rip out a living human's neck. However, during the rabies pandemic of the

People chasing a rabid dog (woodcut from the Middle Ages). Image: Public Domain

1800s, the vampire species coincidentally developed fangs. None of these characteristics of the modern vampire existed prior to the rabies epidemic.

Finally, there is a socioeconomic parallel between vampires and rabies victims. Rabies, in the 19th century, disproportionately affected city dwelling, middle-to-upper class families that could afford to own a dog. One of the most famous rabies cases was that of Maria Caroline Manners, wife of the Earl of Fife. She died from an "innocuous" nip given on her nose by a fluffy French poodle she loved. In the Bronte sisters' novels of the same time-period, over half use rabies as some sort of plot device. The best example of this is Jane Eyre, after Jane discovers Bertha Rochester in the attic.

"It was a discolored face --- it was a savage face. I wish I could forget the roll of the red eyes and the fearful blackened lineaments! . . . The lips were swelled and dark; the brow furrowed; the black eyebrows widely raised over the bloodshot eyes. Shall I tell you what it reminded me of?"

"You may."

"Of the foul German spectre --- the Vampyre."

Though Bertha is not shown to be a vampire throughout the course of the novel, Bronte uses Bertha's case of rabies to demonstrate that one bite -- from either a vampire or a rabid animal -- can turn even the most proper upper class Englishman into a snarling and insensate subhuman. These parallels of social prestige and bloodlust are integral to both rabies and vampirism.

The modern vampire, with his mouth of viciously sharp fangs, is a mindless and ruthless killer that will stop at nothing to spread the plague of vampirism. He can transform into an intelligent, arrogant gentleman in moments of lucidity. His "familiars" include a covey of feared rabies vectors, such as the bat and the wolf. He fears nothing but garlic, sunlight, and water. He appears to be a normal, human, member of society until you feel his teeth against your neck.

To conclude, today's werewolves (like Jacob Black) had better watch out, because the modern vampire is nothing short of rabies' physical manifestation: the apex predator.

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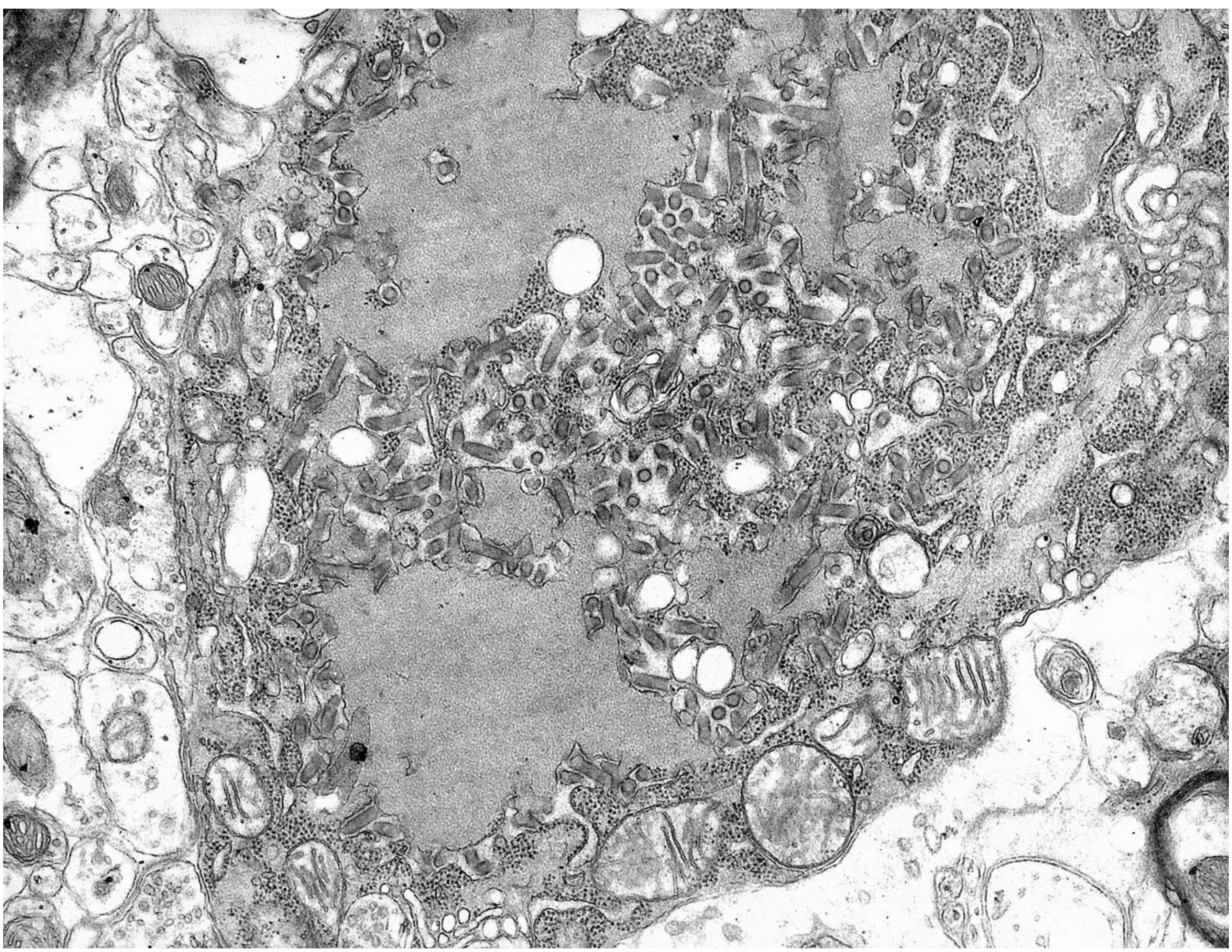
**A transmission electron micrograph of the Rabies Virus. This image shows both the rabies virus, as well as cellular inclusions (Negri bodies). Image: Public domain by CDC / Dr. Fred Murphy (1975)**



# Tree top Tardigrades

*Tardigrades (moss piglets or water bears) are small animals with eight legs. They can be commonly found in moss, and "like spiders, they cast their skins".*

**Charles E. Guevara**

At the woodland border with a meadow, I needed to drop some crowded trees. About forty-five feet up, a knot of entwined stout tree limbs sported a plush jacket of moss and lichens. These woodland border trees had an open meadow due north resulting in sunlight exposure. Thankfully we have had good rainfall the past few weeks. It has been a very hot, and a very dry summer season here in Fingerlakes, US.

I sectioned a chunk of the moss and lichen-draped tree limbs. I noticed that the limb's bark, its cambium, its sapwood layers, the wood's tissue layers, all seemed totally unaffected by the tree limb's dense cover of epiphytes. I and the puppies brought the limb section home to my microscopy bench.

A simple flush of the moss with a glass pipette and the immediate reuptake of the water, produced wetmount slide after slide - of water bears. I encountered active water bears, water bear eggs with their complex surface hold-fast structures, gastrotrichs, nematodes, bdelloid rotifers, and many large ciliates.

Please enjoy a visit with these 'moss-piglets', these water bears, these tardigrades.

Tardigrades have only longitudinal muscles which attach to their soft cuticle. Their unjointed yet flexible limbs, the lobopods, therefore have a charming plodding gait cycle. Be careful, these lobopods have fierce claws.

Repeated observations of trudging water bears, their cherubic personas, made me think of deep time spans, of the Cambrian explosion of phyla, of experimental models of body design… water bears… yes, yes!

In an 1880 book in my cluttered study, water bears are placed phylogenically as: "second cousins to mites and spiders". The text continues with: "Like the spiders, they [water bears] cast their skins."

A 1948 text I have (Animals Without Backbones, 2nd edition, Dr. Ralph Buchsbaum), is based upon the logical sense of "phyla of importance to man". Phyla such as tardigrades (no mention of dear water bears in this 1948 text!!?) are referred to as "lesser lights".

More recent online readings I have enjoyed give tardigrades more respect. They are termed a part of "the lesser protostomes", a collection of six small phyla.

**Figure 1: A moss and lichen jacketed tree limb from forty feet above ground.**

Most current readings I encounter online are neutral on the dignity of water bears. Water bears now are often noted as a part of the group of the lesser known invertebrate taxa. And for me to think… tardigrade's incredible cryptobiotic adaptions… resitance to lack of oxygen… resitance to deep cold, resitance to no water. Tardigrages were even transported up to high earth orbit for studies. These deep time key-stone species may cradle our biosphere's crucial gambit - should earth really become "altered".

It gives me terrific pleasure that both keen morphological studies, and 18S rRNA molecular studies, both independently agree to categorize Tardigrades as members of the huge invertebrate group: the Ecdysozoa, the molting animals. This is a huge group of invertebrates which regularly shed their

**Figure 2: Sectioned chunk of this tree limb, puppy presents for size scale.**

**Figure 3: This stout tree limb is healthy wood, despite thick lichen and moss epiphytes.**

**Figure 4: Tree limb sample at the bench.**

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cuticles. So far things may defeat this current understanding. So far the utilization of ecdysis is the achievement of a single ancestor. Our dear water bears are close to this profound skill's first awakening and usage in our dear earth's journey. As M. C. Cooke stated in 1880: "like the spiders, they cast their skins".

### Sources


Natural History Rambles, Ponds and Ditches, M. C. Cooke. MA, LLD, London, Society For Promoting Christian Knowledge, 1880. Pages: 190-191.

"Introduction to the Ecdysozoa." University of California Museum of Paleontology. N.p., n.d. Web. 22 Sept. 2012.
www.ucmp.berkeley.edu/phyla/ecdysozoa.html

"Tardigrades (Tardigrada): images, video clips, text and monthly magazine.". Martin Mach.
http://www.tardigrades.com

Martin Machs website and portal to videos, a monthly tardigrade news letter and more! please visit issue #10: "Mrs Wards tardigrades", please visit issue #44 "fine structures", and acquaint yourself with an 1800's NA 1.6 microscope objective and it's application, including a capture image using this awsome optical tool!


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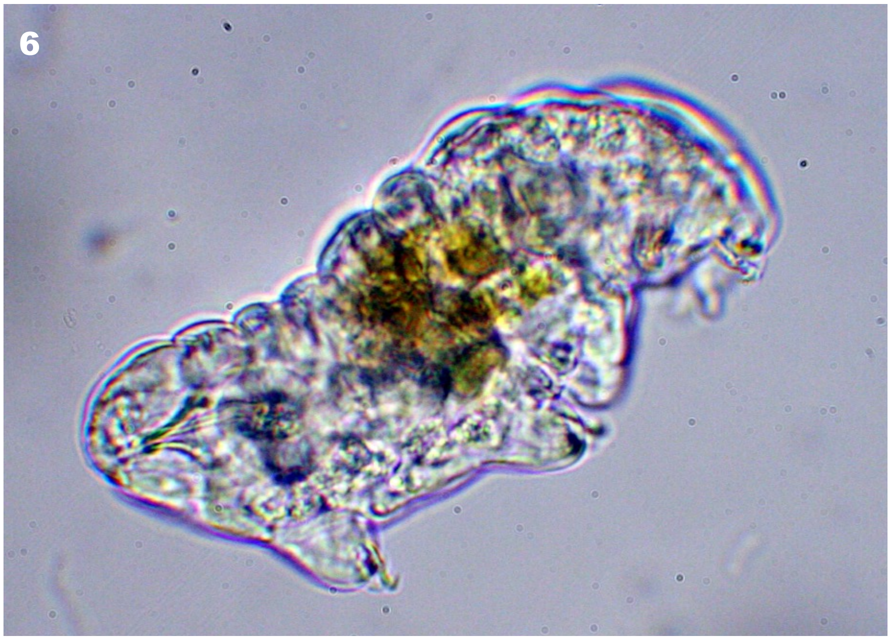

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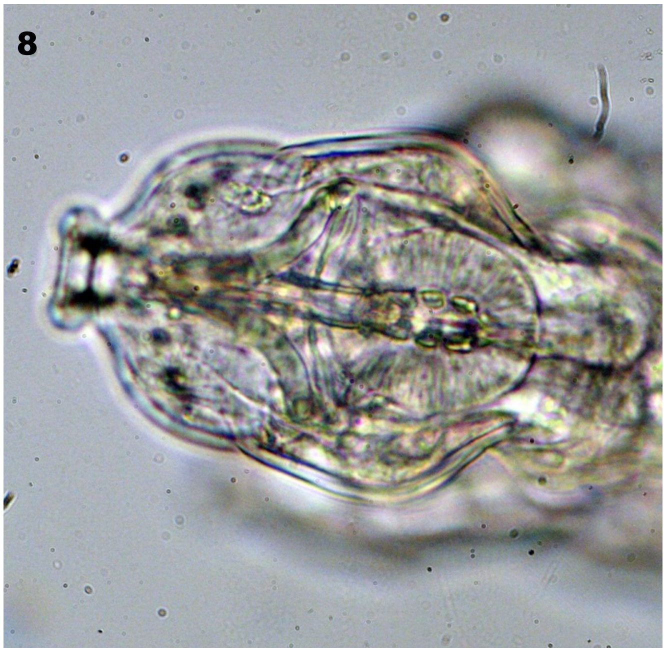
**Figure 5: Glass pipette flush and immediate re-uptake of fluid for a wet-mount slide sample.**

**Figure 6: Moss piglets or Tardigrades... yes, yes!**

**Figure 7: Lateral view, please note ventral nerve-cord.**



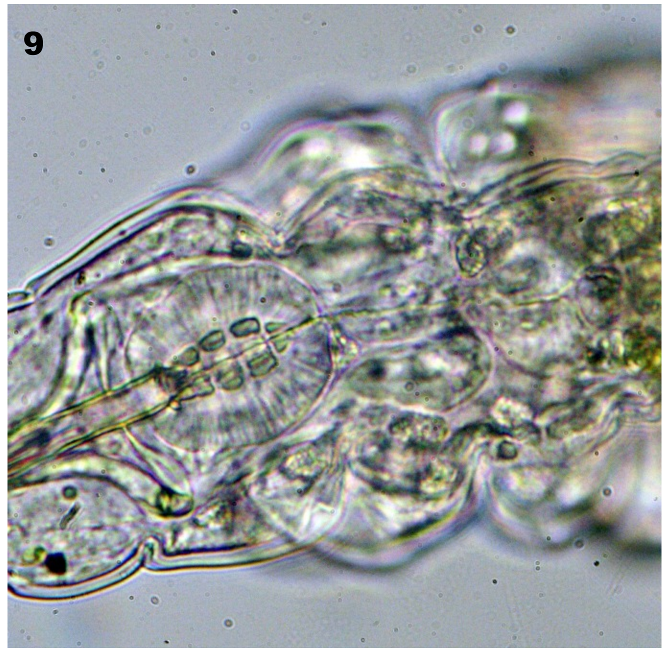
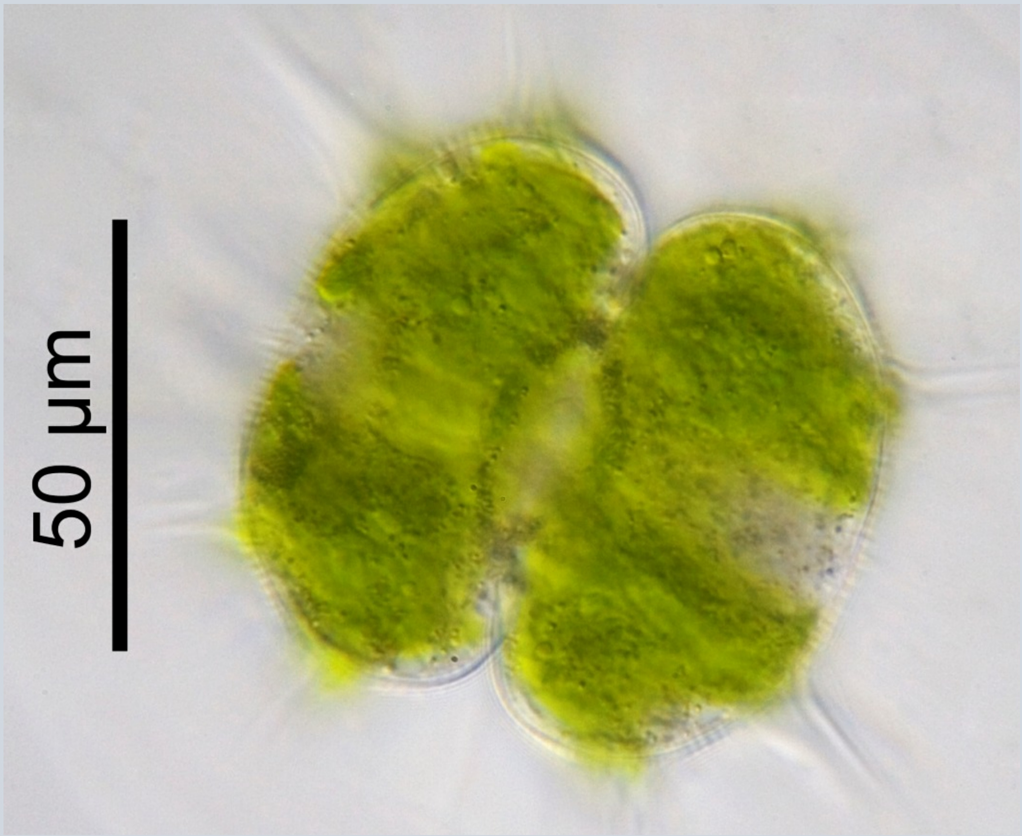


Figure 8: Anatomy of stylets and feeding tube.
Figure 9: Further anatomy is here: oral cavity, buccal tube, stylet, stylet support, pharynx, macroplacoids, microplacoid, etc.
Figure 10: Lobopod motions.
Figure 11: Lobopods have fierce claws.
Figure 12: No swimming… but terrific traction!

# *Xanthidium antilopaeum*

***Mike Guwak***

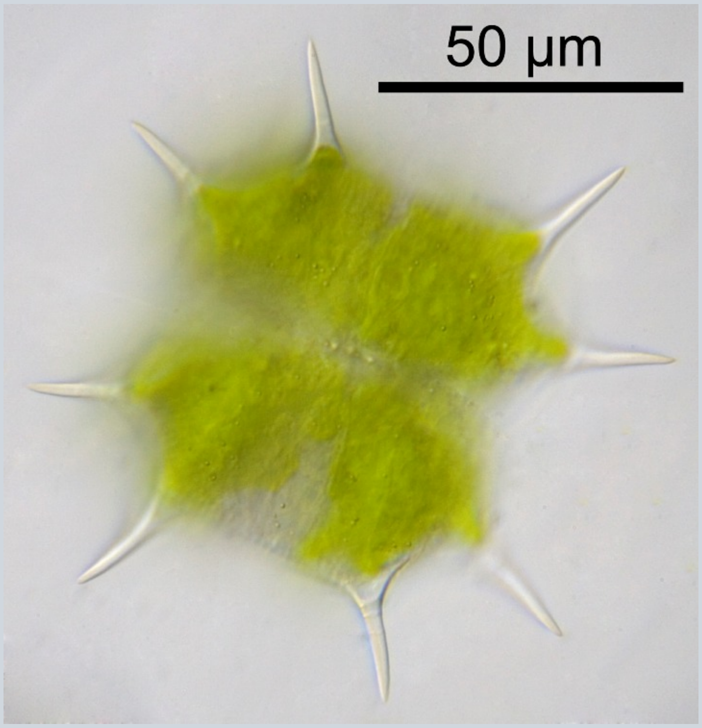



**Full name:** *Xanthidium antilopaeum* (Brébisson) Kützing 1849: 177

**Size:** Cell body is approx 45-72 µm long, and 43-71 µm wide.

**Shape:** The cells are roughly oval to octagonal. The cells have 4 pairs of spines of varying length. The center of the semicalls is variable. It is sculptured with granules or scrobicles (punctation of the cell wall). The remaining cell wall contains densely packed pores.

**Occurrence:** Waters of moors of a low pH.




## References

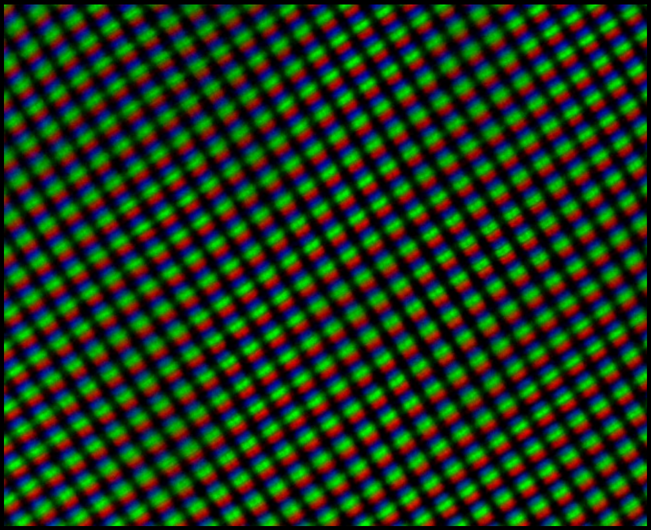
"Xanthidium antilopaeum (Brébisson) Kützing :: Algaebase." Algaebase :: Listing the World's Algae. N.p., n.d. Web. 3 Oct. 2012. <http://www.algaebase.org/search/species/detail

"Protist Images: Xanthidium antilopaeum." Protist Information Server. N.p., n.d. Web. 3 Oct. 2012. <http://protist.i.hosei.ac.jp/pdb/Images/Chlorophyta/Xanthidium/antilopaeum/index.html>.

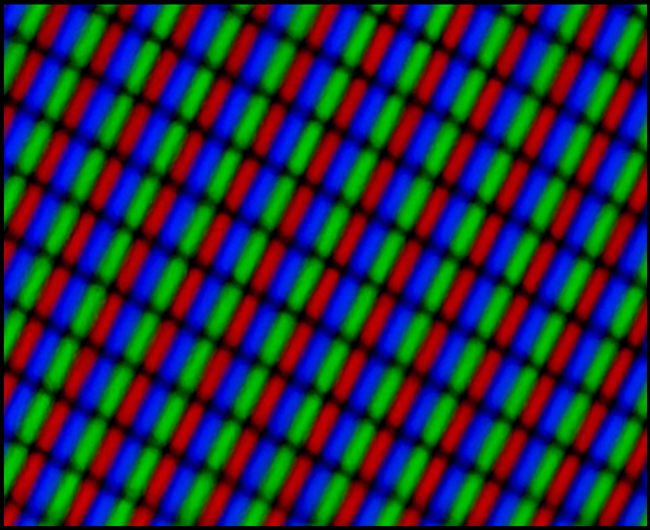
Original publication: Kützing, F.T. (1849). Species algarum. pp. [i]-vi, [1]-922. Lipsiae [Leipzig]: F.A. Brockhaus.

## Image Credit

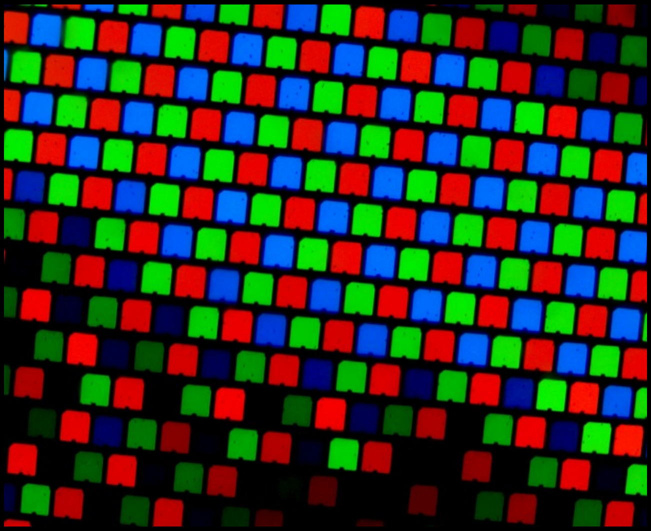

http://www.mikroskopie-main-taunus.de
mike.guwak@mikroskopie-main-taunus.de



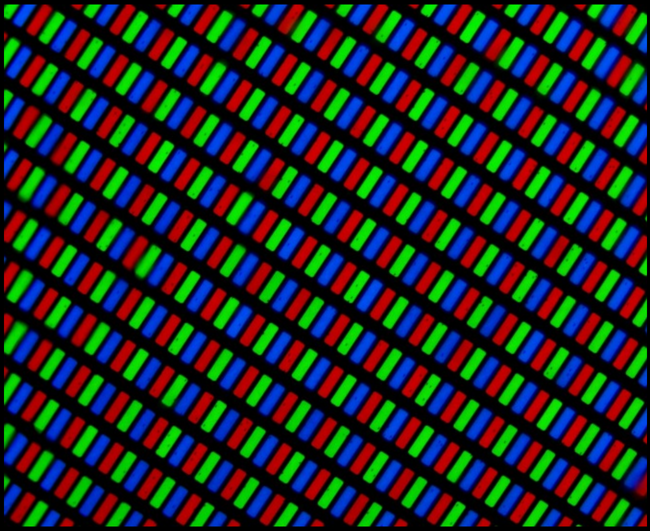
iPad 3 (retina display), with protective foil



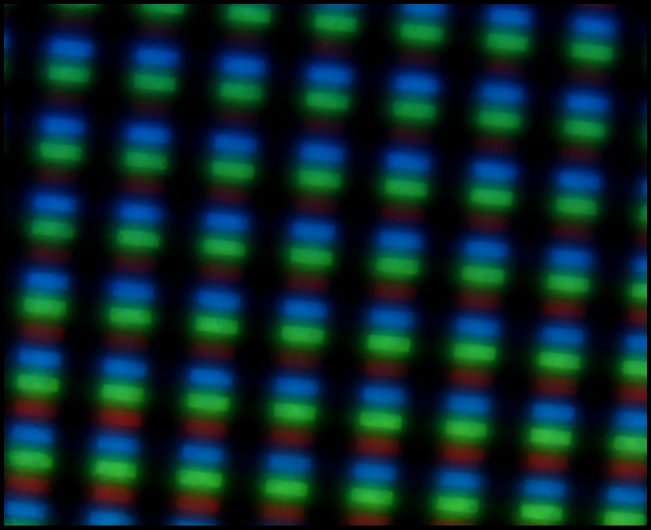
Medion Navigator, with touch sensitive foil



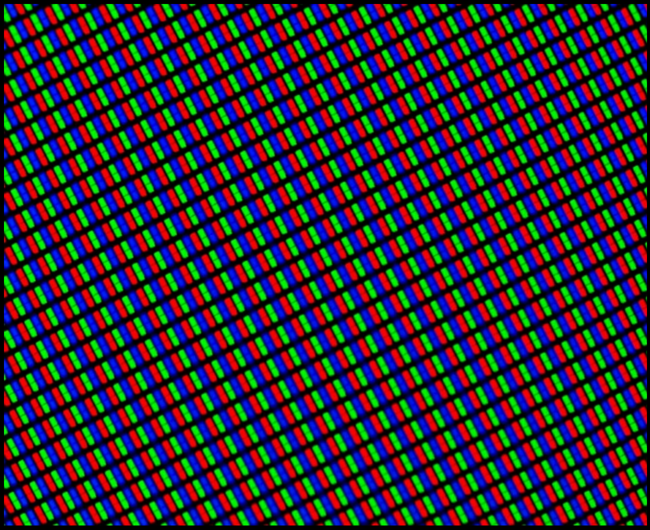
JVC Everio Camcorder



Panasonic Lumix DMC-FS16 camera



Nokia 1208 mobile phone (display behind plastic screen)



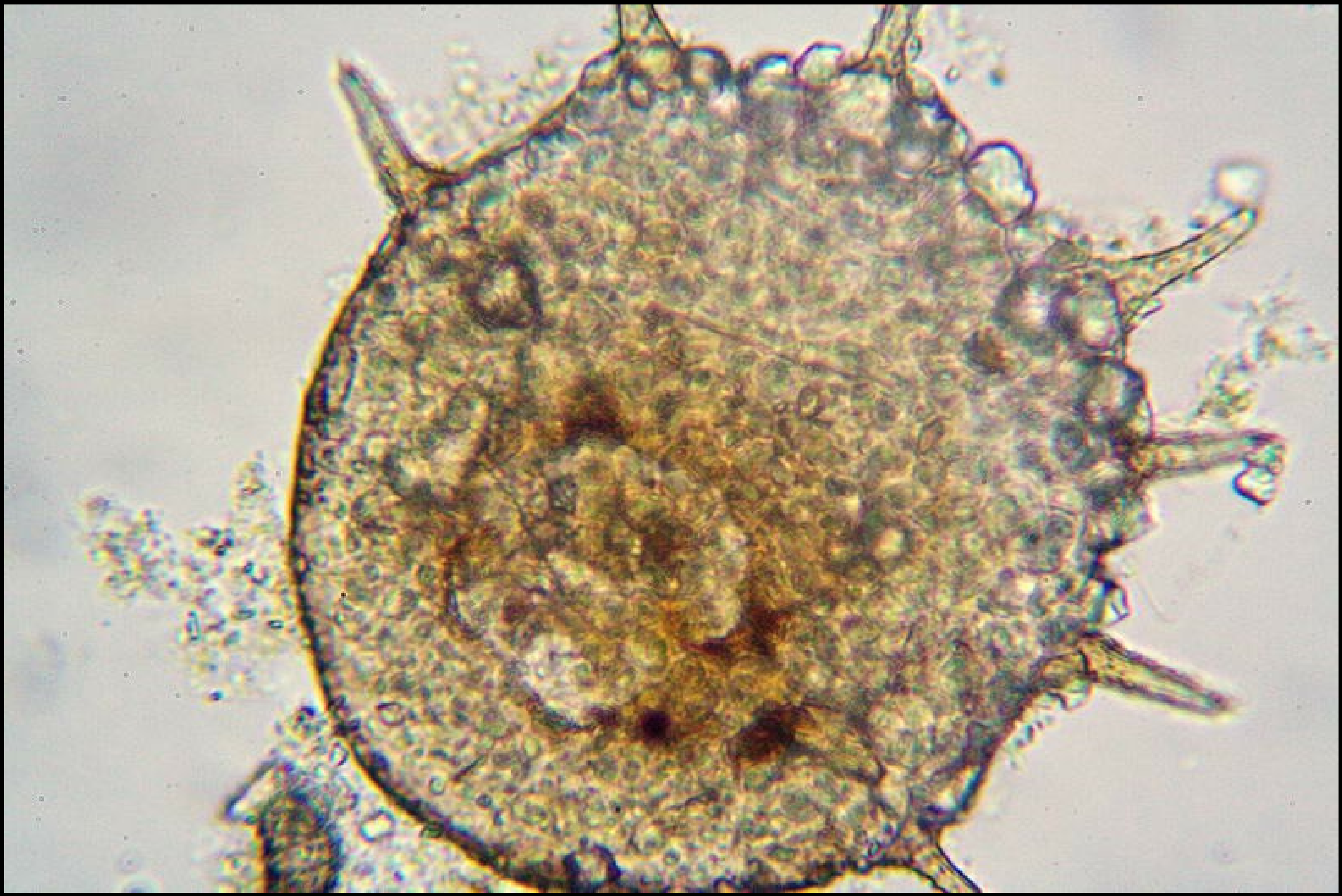
Canon EOS 600D digital camera

All pictures taken at the same magnification. By Oliver Kim

# Pond images

Top: Nauplius larva
Bottom: Testate amoeba

Images by Luca Monzo



***Stentor coeruleus*** is a protist of the Stentor genus. It belongs to the Stentoridae family which is characterized by being a very large ciliate that measures 0.5 to 2 millimetres when fully extended.

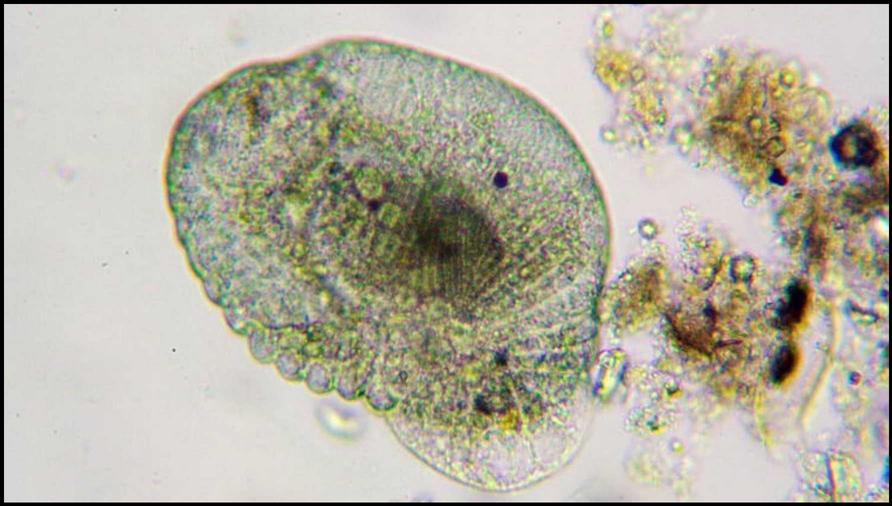
*Stentor coeruleus* specifically appears as a very large trumpet. It contains a macronucleus that looks like a string of beads that are contained within a ciliate that is blue to blue-green in color. Being that it has many myonemes, it has the ability to contract into a ball. It has the ability to swim while both fully extended or contracted.

Eating is accomplished using cilia that carry food into the ciliate's gullet.

Source:

http://en.wikipedia.org/wiki/Stentor_Coeruleus

Images by Luca Monzo



**Conodont**

Conodonts are extinct chordates resembling eels, classified in the class *Conodonta*. For many years, they were known only from tooth-like microfossils now called conodont elements, found in isolation. Knowledge about soft tissues remains relatively sparse to this day. The animals are also called Conodontophora (conodont bearers) to avoid ambiguity.

The eleven known fossil imprints of conodont animals depict an eel-like creature with 15 or, more rarely, 19 elements forming a bilaterally symmetrical array in the head. This array constituted a feeding apparatus radically different from the jaws of modern animals. There are three forms of teeth, coniform cones, ramiform bars, and pectiniform platforms, which may have performed different roles.

The organisms range from a centimeter or so[verification needed] to the giant Promissum, 40 cm in length. It is now widely agreed that conodonts had large eyes, fins with fin rays, chevron-shaped muscles and a notochord.

The entire class of Conodonts are postulated to have been wiped out by the Triassic–Jurassic extinction event, which occurred roughly 200 million years ago.

The "teeth" of some conodonts have been interpreted as filter-feeding apparatuses, filtering out plankton from the water and passing it down the throat.[citation needed] Others have been interpreted as a "grasping and crushing array".

The lateral position of the eyes makes a predatory role unlikely. The preserved musculature hints that some conodonts (Promissum at least) were efficient cruisers but incapable of bursts of speed.

As of 2012 scientists classify the conodonts in the phylum Chordata on the basis of their fins with fin rays, chevron-shaped muscles and notochord.

Milsom and Rigby envision them as vertebrates similar in appearance to modern hagfish and lampreys, and phylogenetic analysis suggests that they are more derived than either of these groups.This analysis, however, comes with one caveat: early forms of conodonts, the protoconodonts, appear to form a distinct clade from the later paraconodonts and euconodonts. It appears likely that the protoconodonts represent a stem group to the phylum containing chaetognath worms, indicating that they are not close relatives of true conodonts. More-

The Conodont on page 18 is *Hiberella sp.* and the conodont on page 19 is *Hindeodella sp.*

Microscope: Leitz Ortholux.
Camera: Pro-Microscan DCM130.
Optical Magnification: 110x.
Illumination: top oblique.

By Michael Race

over, some analyses do not regard Conodonts as either vertebrates or craniates, because they lack the main characteristics of these groups.

For many years, conodonts were known only from enigmatic tooth-like microfossils, which occur commonly but not always in isolation, and were not associated with any other fossil. These phosphatic microfossils are now termed "conodont elements" to avoid confusion. This confusion is apparent for the non-specialist in the book "Your Inner Fish", by Neil Shubin, who describes the origin of teeth in chapter 4. In this chapter, the author attaches the name "conodont" to both the "conodont bearer" (the animal) and the "conodont elements" (the teeth), and the reader may have a hard time to make sense of the concept of "animals living in the mouths of animals".

They are widely used in biostratigraphy. Conodont elements are also used as paleothermometers, a proxy for thermal alteration in the host rock. This is because under higher temperatures the phosphate undergoes predictable and permanent color changes, measured with the conodont alteration index. This has made them useful for petroleum exploration where they are known, in rocks dating from the Cambrian to the Late Triassic.

It was not until early 1980s that the conodont teeth were found in association with fossils of the host organism, in a konservat lagerstätte. This is because most of the conodont animal was soft-bodied, thus everything but the teeth were not suited for preservation under normal circumstances.

The conodont apparatus may comprise a number of discrete elements, including the spathognathiform, ozarkodiniform, trichonodelliform, neoprioniodiform, and other forms.

**Source**

The text was taken from Wikipedia: http://en.wikipedia.org/wiki/Conodont

Conodont drawing: Public domain image by Mateus Zica.



Rotifers

By Rashid Nassar

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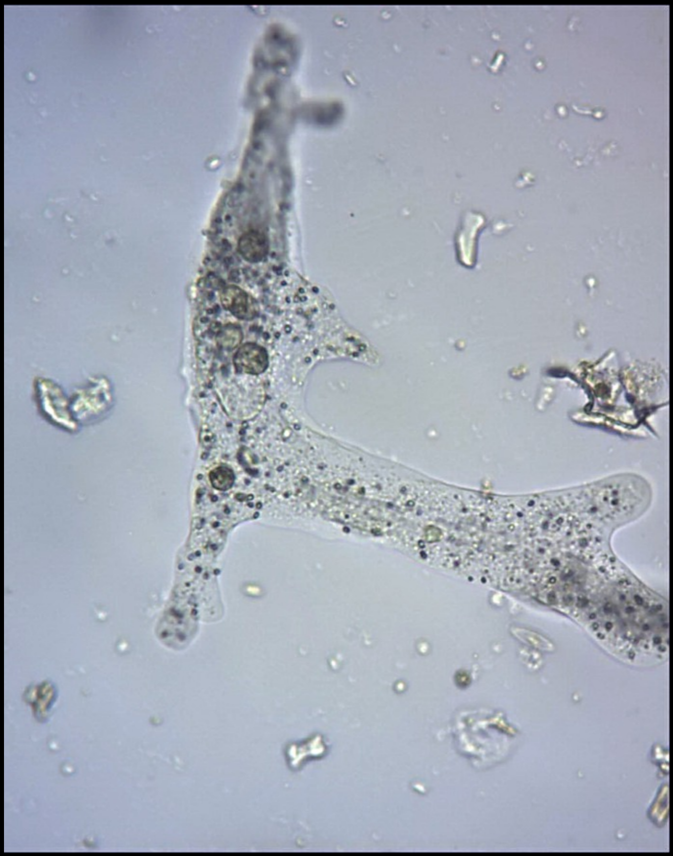


Amoeba taken with a microscope camera "Optikam B1" at 1,3M

By Luca Monzo

# A Lab's Spirit Lamp

*A spirit lamp can be a versatile addition to a microscopy laboratory.*

**Michael Race**

The classic glass bowl spirit lamp can be a very useful tool on the lab' bench, but in my experience often produced a rather large flame for warming microscope slides, preparations or just awakening sleepy protozoa on cold days. I decided to make one which would suit my personal requirements better, and in any case should only take a couple of hours in the workshop (kitchen).

I usually save any small glass containers from the kitchen, and indeed I had several very small glass jam jars. These little jars are about 1½ inches diameter and often found in hotels with breakfast jams and marmalades; awfully useful for specimen storage. Next item would be a wick and some thin walled brass tube; this latter bought from a model shop, although I did have several pieces in the workshop (garage).

Making up the lamp needs few tools other than a drill, 60 watt soldering iron and fine toothed metal saw. I cleaned the makers label from the lid of the jar making it nice and shiny since I'll be soldering onto this surface. One piece of brass tubing (the wick holder) is ¼ inch in diameter, and the other piece just slightly larger in order to be a sliding fit over the wick tube. The centre of the jar lid is pierced and the wick tube fitted through the hole and soldered in place. The larger tube becomes the snuffer,

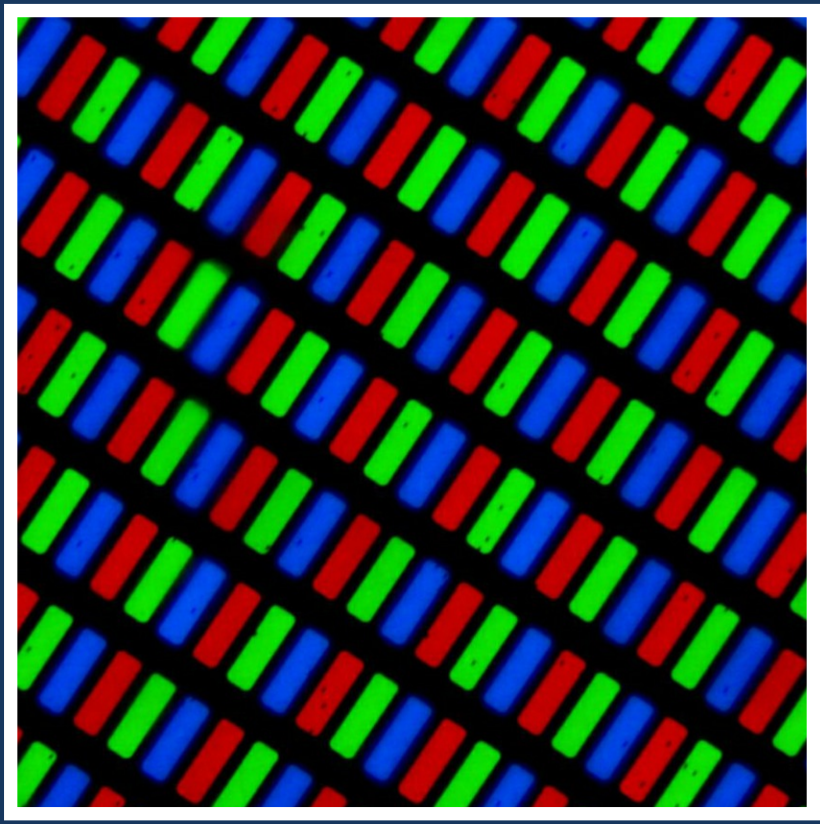
**Figure 1: Parts for the lamp.**

with one open end closed off by a small brass screw, also soldered in place.

From the picture of the completed lamp, it should be noticed than I have added a heat shunt to the wick tube, in order to reduce the heat traveling from the flame down into the spirit reservoir (jar). I use methylated spirit and find this little lamp now most useful. The snuffer is important, because apart from extinguishing the flame, it also reduces evaporation of the spirit; I only need to top up either lamp every month or so.

**Figure 2: The completed lamp.**

**Figure 3: Two of my lamps with snuffers complete.**



What’s this? Answer on page 3.