MY (ONGOING) BALCONY EXPERIMENT

I live in a big metropolis, Montreal, in a third floor apartment. On the south side there is a balcony, about 3 by 1.5 meters. It is far from a wild environment, but it may not be as sterile as it may seem.

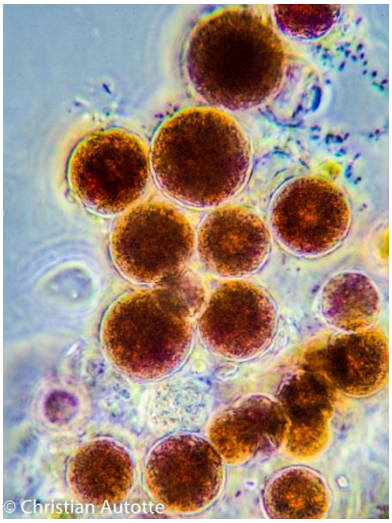
Four planters and a bucket at the end of my balcony. The metal mesh is to prevent urban squirrels from stealing my crops!

For starter, I do have a few planters in which grow some salad and fine herbs. The soil has been there for a few years and one of the four planters is even covered with some fine moss. In that one grow chive year after year; I haven't replanted it for many years now. We will see in a moment that these planters are full of life beside those plants that are meant for my table.

When cleaning the planters, I use a big plastic pail that is normally left upside-down on the balcony. To increase the variety and the possibility of micro-organism to collect and study I had the idea of using such a pail right side up to collect rain water and whatever would fall in it. For a while, I even thought of placing an aquarium on the balcony, but decided that a second pail would be more than enough, not to mention less fragile.

Actually, about a year before the beginning of my experiment I was intrigued by some red "dirt" on top of the big pail. I picked up some samples and was delighted to discover that these were algae. Bright RED algae! They are called *Haematococcus*, which in Greek means literally *blood berry* in reference to its blood-red color. A quick search on the internet found this information on Wikipedia: "Their resting cysts are often responsible for the blood-red color seen in the bottom of dried out rock pools and bird baths. This color is caused by astaxanthin which is believed to protect the resting cysts from the detrimental effect of UV-radiation, when exposed to direct sunlight." That is exactly what I found on my balcony: there was only a thin layer of water in the overturned pail, and it was exposed to bright sunshine. As we will see later, these same algae were found in the bucked full of water.

Stain of *Haematococcus* on a bucket



***Haematococcus*, 400x**

One of my earliest investigation was to collect some soil from one of the planters and place it in a Baermann Funnel apparatus (now, doesn't that sound seriously scientific!). In spite of the pompous name, this is made of a simple funnel in which a piece of nylon stocking is used as a filter to prevent soil from falling down. Under the funnel is fixed a syringe without its piston, followed by a short length of flexible tubing. That tube is bent and held in place with a clip. The whole thing is held in place by a plastic lid from an old jar in which a hole was drilled for the funnel and a second hole was tapped to mount it on a stand. Soil is placed in the funnel and water is added. After a day or two, living organisms find their way through the soil and through the mesh of the nylon stocking to accumulate in the plastic tubing at the bottom of the assembly. Simply remove the clip and water flow out to be collected, hopefully with plenty of beasties to study.

Nematode, 400x, phase contrast

I was specifically looking for nematodes, and I was not disappointed. The moment I put a slide under the microscope there they were, too many to count. And that was fairly early in the year, still with plenty of frosty nights. But that didn't seem to deter the small round worms; they were just as active as could be expected. I had to use a flash to stop their motions and get some decent pictures.

Here and there among the nematodes could be seen some ciliates. They were my next target.

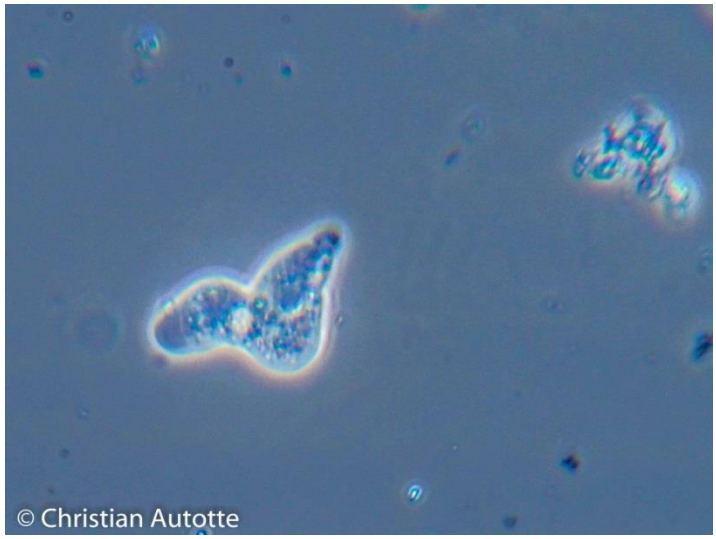
I first tried spreading some soil in a petri dish and looking at it with my inverted microscope. Curiously, all I could find was a lone nematode among the soil particles. So I turned to the "pond"…

Nematode and soild particles, 200x phase contrast

Less than a month had passed after I set the empty pail on the balcony. A bit of water was added from the tap and it rained a few times. The bottom looked a bit dirty, greenish. Using a cotton swab, I picked up a bit of the bottom dirt and transferred it on a slide. It looked promising…

The moment I put it under the microscope I was dazzled by a multitude of protozoa zooming by my field of view at high speed. And then something caught my eye because it was moving very slowly compared to the rest of the fauna. It was an amoeba.

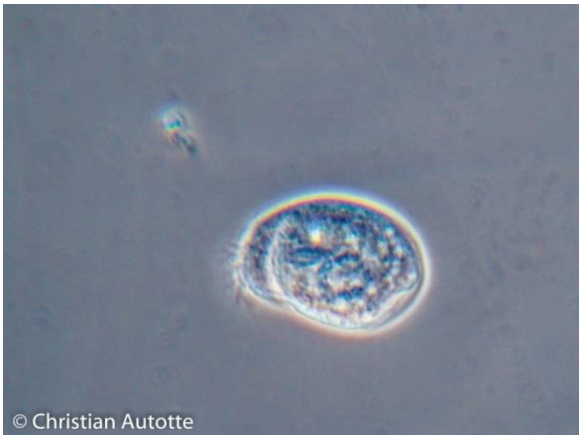
I find the motion of amoeba fascinating. Their slow stretching and crawling are already interesting, and if they find something to eat it's amazing to see how they surround the morsel and "swallow" it.



Amoeba, 400x with digital converter and a fair amount of cropping.

Later on, as the water began to evaporate, I spotted what may be a cyst, possibly from one of the amoeba. The cell wall is obvious, and I can distinguish a nuclei. But then, it may just be a resting ciliate.

A cyst? 400x with digital converter.



Ciliate, 400x with digital converter

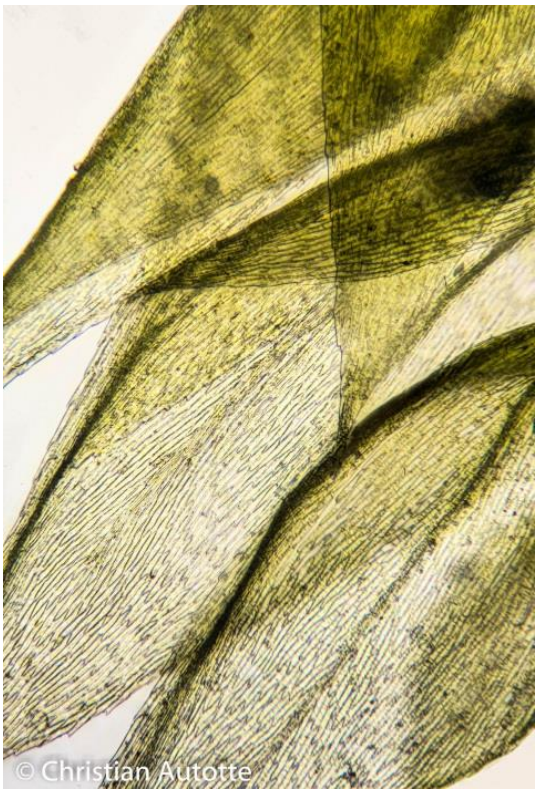
Amoebas are not limited to the classic blob of cytoplasm we all study in biology class and I found what I identified as an *Amoeba radiosa*, an amoeba with what look like spines. They were nice to look at but very difficult to photograph properly.

Amoeba radiosa, 800x

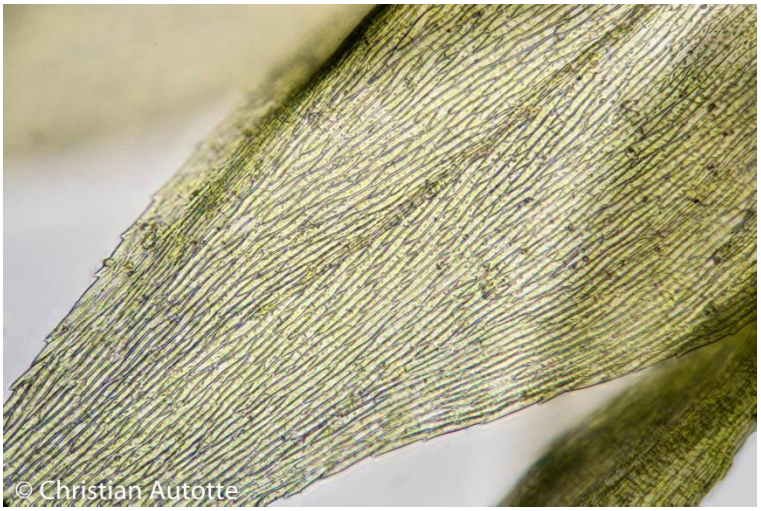
Back to the planters. The chive has grown and I have been adding some to soups and salads for a few weeks. When they started to bloom I took a closer look at their flowers.

Blooming chive

Chive pistil, 40x

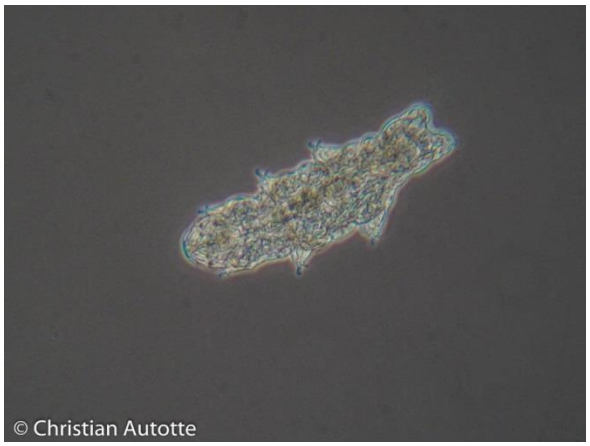


Moss leaves, 100x, stack of 14 pictures



Moss, details of one leaf, 200x, stack of 7 pictures

And then I took a look at the very fine moss that has grown in the same planter. Their leaves are amazing and the pictures I shot were very satisfying.



Tardigrade, about 200x, phase contrast

And then, a friend of mine gave me a challenge: he wanted to see some tardigrades. So did I for that matter: I had been looking for them without success on a few occasions. So I plucked a few strands of moss from the planter, placed it in a petri dish with a thin layer of water, and waited. The next day I placed the dish under a stereo microscope with a 30x magnification. And there they were…

It is one thing to see a tardigrade in a petri dish, it is quite another to catch it and transfer it to a microscope slide…

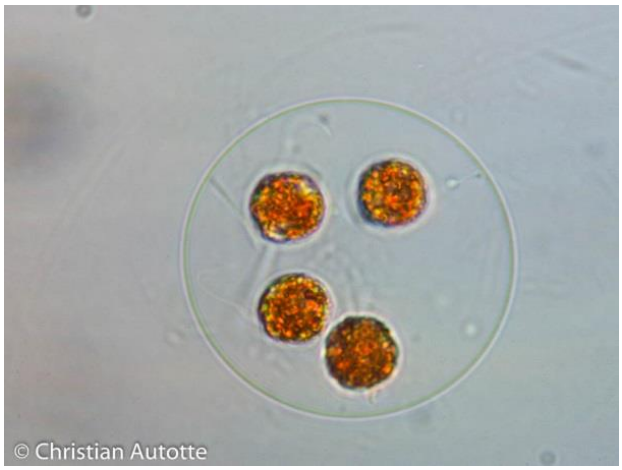
My first attempts did not work so well; I squashed the first one under the cover slide… But eventually I did manage to transfer and then photograph a few of the beasties. They move a lot and getting a good picture is often a game of patience until the legs get in such a position that the tardigrade becomes recognizable.

Tardigrade, about 200x, phase contrast

Unidentified, about 400x

While I was looking for the tardigrades I also came upon something else with a few legs. Not sure what it is; it can't be a mite because it only has six legs. On top, apparently just behind its head, there are two little "flaps" which are not antennas. I am still trying to figure out what it is.

***Haematococcus*, about 800x**



***Haematococcus*, about 800x**

Rotifers, about 200x

Rotifer, about 200x

A well filled bucket…

Rotifer in his lunch, about 200x

By late summer, the bucket had filled with water and the water was full of algae. It was more than time to have another look… A sample from the surface was filled with small algae. They were the same ones that I saw years ago, *Haematococcus*, but since they had plenty of water they were not as red as when their habitat is drying out. Hundreds of rotifers were happily gorging on the algae and this is another spectacle which I never find tiresome. I even made a few videos to show how those microscopic vacuums create a vortex to suck in their food.

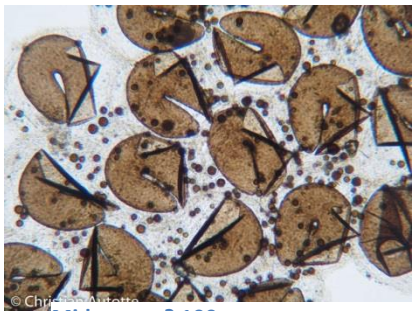
Midge larva, assembled with two pictures shot at 30x

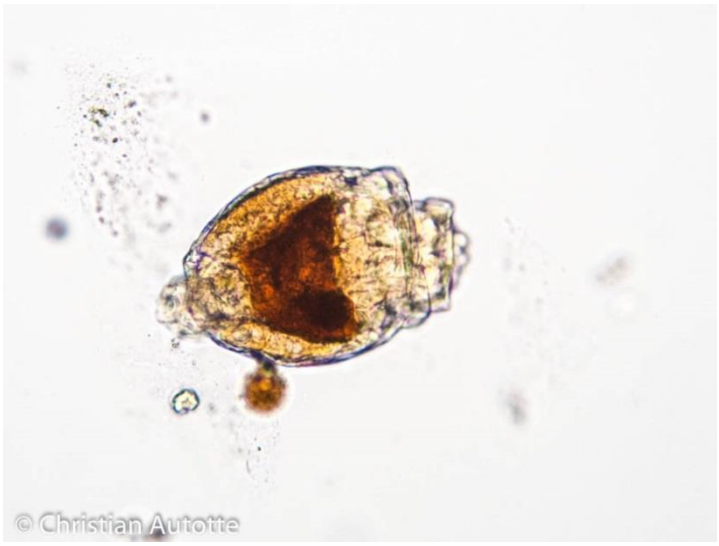
Head of midge larva, 200x, stack of 17 pictures

Tail end of midge larva, 200x, stack of 28 pictures

Early November. The water has cleared somewhat and I can see the bottom of the bucket. There are small wriggly things down there; they turned out to be midge larvae. I made permanent mounts of a few of them. Their heads are interesting, but then, so is the opposite end, with what looks like vicious hooks.

While looking at some samples taken from the bottom, I even saw what may very well be a clutch of midge eggs.


Midge eggs? 100x



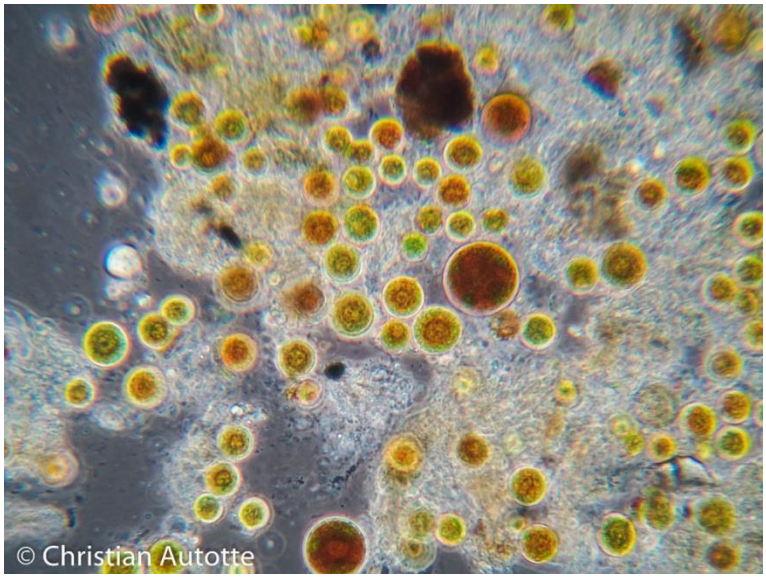
Rotifer, 200x

Christmas Day, 2020, we were right in the middle of the pandemic. Montreal was starting its second period of confinement. Alone in my apartment I kept busy any way I could, which included playing with the microscopes. The weather also happened to get very warm that day, record breaking warm after a few weeks of below freezing temperatures. The block of ice in my bucket had melted, so I decided to take a look…

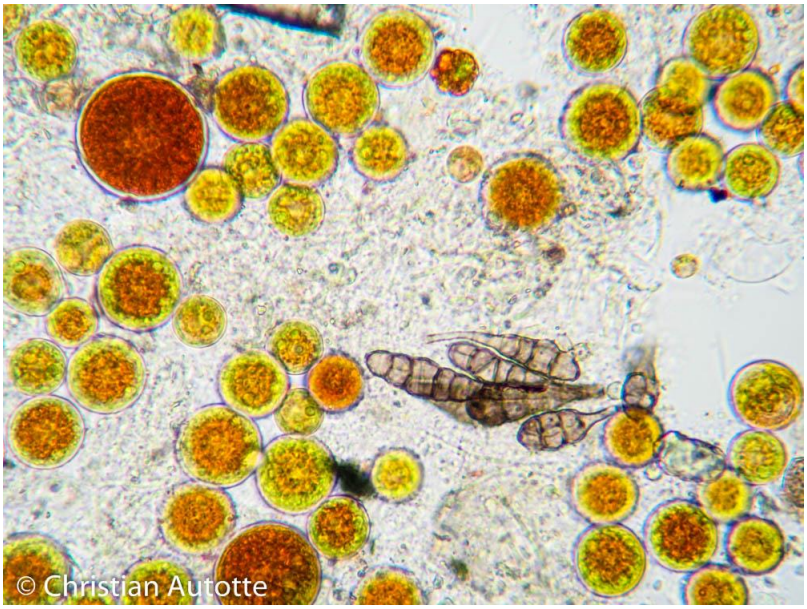
Dead rotifer, 200x

A sample picked up at the bottom revealed a few moving but very small ciliates. Also moving were a few rotifer. The one seen here first appeared contracted and barely moving, but it quickly thawed out started to filter water only the way rotifer can do. A few others appeared to be dead.

There were also many *Haematococcus* cells, often clumped together.



***Haematococcus,* 400x**



***Haematococcus* and pupae? 400x**

And among the algae I also saw some things I can't identify, like these strange "shells" which could be the pupae of some insects. Another one is the long haired ciliate seen below; one more thing I'm still trying to identify.

Many people have conducted similar experiments in the past. It only goes to show that a minimum of imagination and a desire to explore what is close at hand can produce some interesting results. I may not live in the country (yet!) but my third floor balcony can offer some interesting opportunities.

In retrospect, I must admit that I should have been more systematic in my studies, especially when it comes to that bucket. There seem to have been quite a succession of organisms that took place in there. I should pay closer attention to it next year. I might even put some soil at the bottom and see what happens in that little pond…

Ciliate, about 800x

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