Wonderful Things: Don't Eat the Pink Snow

By Jennifer Frazer on July 9, 2013

If you stumbled one midsummer on the melting snow in the image below, what would you imagine produced the strange color?

Translated German caption: "Snow area with Chlamydomonas nivalis (snow blood) near Abisko (Northern Sweden)" Creative Commons Ökologix. Click image for license and source.

Here's another example with a pinker hue, from further out.

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Here's a poorer example that I stumbled on myself on July 4, 2011 on Long's Peak in Colorado:

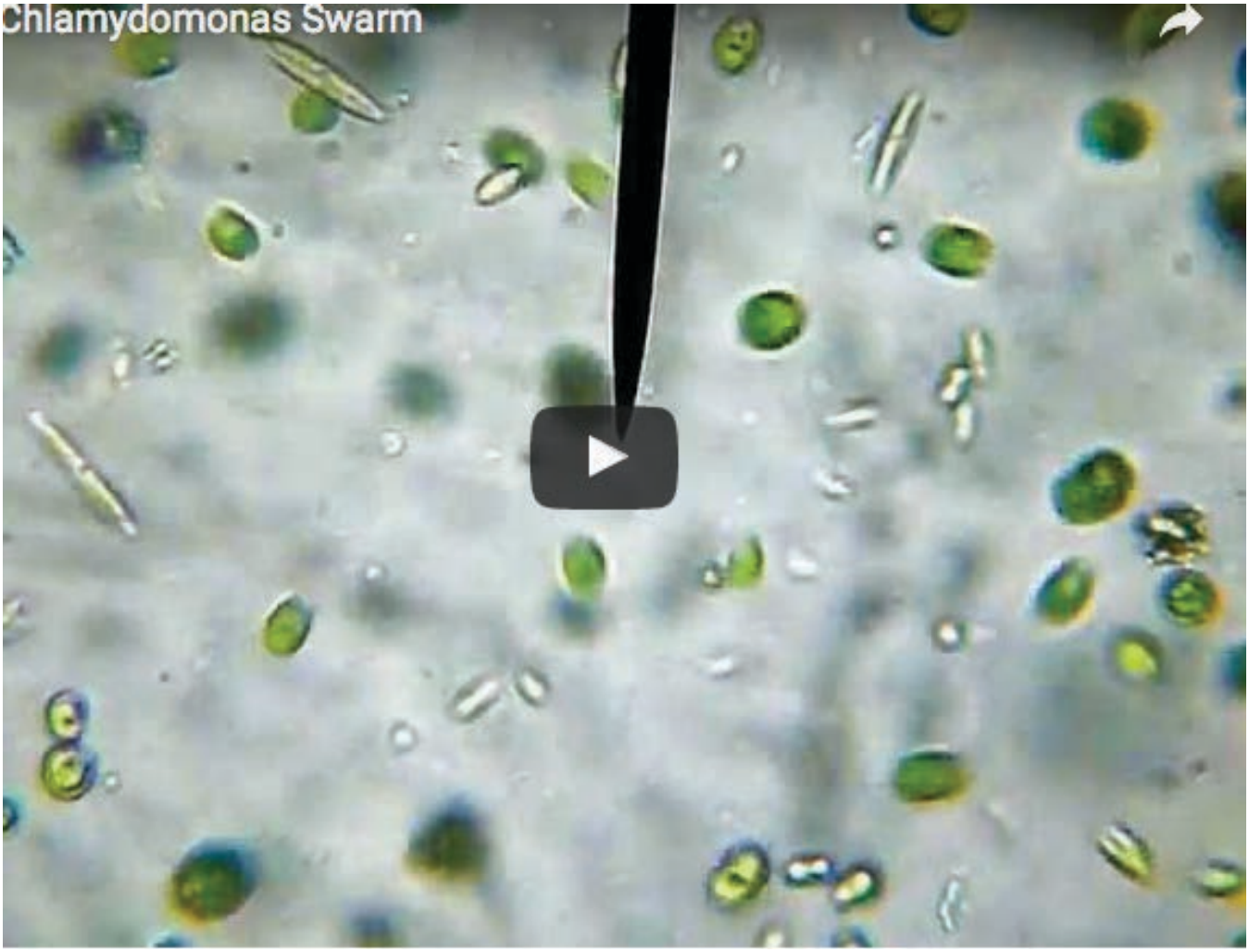
When an 1818 British expedition led by Captain John Ross tasked with finding the Northwest Passage stumbled onto "extensive patches" of this stuff near Greenland's Cape York in Baffin Bay, the *Times* of London confidently declared it to be iron-nickel meteorite detritus. In reality, the Scottish

botanist Robert Brown -- he of Brownian motion fame -- suggested in an appendix to Ross's mission report that same year the color could be due to an alga, a photosynthetic microbe. And it was.

If there's one thing Earth has taught us, it's that if a surface or substrate is *ever* wet, something will grow. And, despite near-zero temperatures, acidity, solar irradiation, and what must be frankly admitted to be minimal nutritional value, snow is no exception. Over 60 species of algae alone dwell there, and no doubt more await discovery. Scientists just announced this May the discovery of a new species from Colorado snow that they suggest could be a source of biofuel feedstock for northern climates where other algae cannot thrive.

By far, the most common species of snow alga is *Chlamydomonas nivalis*, which colors snow red or pink. With their pair of front-mounted flagella, they ply the films of water found in melting snow drifts. Midsummer is the best time of the year to see them, if you live in a high-altitude or Arctic clime with snowbanks that stubbornly refuse to yield to the sun.

Yet surprsingly, active *C. nivalis* cells are *not* pink when you look at them under the microscope. Here's what a different species of *Chlamydomonas* looks like swarming in water to give you the idea.



Heres a closeup alongside a slinky green alga called *Euglena*. The homely, roundish cells are *Chlamydomonas*, and you can see both their paired flagella and the cells' various organelles (aren't you glad *our* bodies aren't transparent?):

The cells know which way to drive in their snowbank because they can see. Most species of *Chlamydomonas* -- and I assume *C. nivalis* is no exception -- possess a light-sensitive eyespot containing rhodopsin. Versions of the same ancient chemical are found (to cite but a few examples) in your own eyes, in sea-faring protists called dinoflagellates, and in salt-loving photosynthetic archaea living in natron flats, who use it not to see but to make supper.

C. nivalis is a green alga -- the group that gave rise to land plants, and includes the desmids I discussed here last month. And as you saw, the vegetative cells of *Chlamydomonas nivalis* are green while growing. So how is it that they color snow pink?

Since, like lichens, these algae must contend with intense UV bombardment, they need sunscreen to protect their light-harvesting molecule chlorophyll, and lots of it. They need it most in their resting stage -- the one that might have to survive for a long time on top of a snow drift or soil prior to next fall's snows. That stage is the zygote. In many species of snow algae, this single-celled, immobile product of mating is packed with carotenoids (click here for some nice images).

Carotenoids are brightly-colored UV-absorbing pigments. This huge class of biochemicals includes beta-carotene. When consumed and transported to your eyes, beta carotene performs a similar job for you by absorbing UV, thereby protecting your retina from diseases like macular degeneration. Like the carotenoids found in fruits and vegetables, the chemicals also lend zygotes an orange, red or rusty hue under the microscope.

Midummer snow reveals its chromatic algal payload most readily on permanent snow fields in sunny, dry areas; rain tends to wash them away. *C. nivalis* zygotes are quite red, so as melting, erosion, or evaporation concentrates algae at the surface, the snow blushes.

Joyce Gellhorn says these self-reinforcing pink pits are called "sun cups". Creative Commons Will Beback. Click image for license and source.

Not all snow algae color snow pink. Green snow can be found in layers below the surface if you shovel into it, usually near tree canopies in alpine forests. One of these algae, *Chloromonas brevispina*, makes green zygotes and usually live in areas exposed to considerably less ultraviolet light than their red kin. More rarely, algae color snow orange, as you can see in the footprint above.

For obvious reasons, pink snow is sometimes called "watermelon snow". Oddly enough, it's even said to smell a bit like watermelon. So why shouldn't you find out if it tastes that way too? According to botanist Joyce Gellhorn's 2002 book *Song of the Alpine*, there's a very good reason: in addition to being a tantalizingly refreshing-looking on a hot day after a long hike where a snow cone would be just the ticket, it's also a laxative.