

Snow Blooms Encyclopedia Article

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Snow Blooms

Snow bloom refers to the rapid growth and increase in numbers of so-called snow algae on the surface and interior of snow fields. Typically occurring as the surface of the snow warms in the springtime sun, the algal growth confers various colors to the snow. Colors of different algal species include yellow, red, green, and orange.

Blooms occur when nutrients are abundant and conditions such as temperature are conducive to rapid growth. "Red tide," due to the growth of a **diatoms** in salt water, is another example of a bloom.

There are some 350 species of snow algae. A common species is *Chlamydomonas nivalis*.

Snow algae have been known for millennia. The Greek philosopher Aristotle described red snow over 2,000 years ago. The algal basis for the blooms was determined in the early nineteenth century, when some red-colored snow obtained by a British expedition near Greenland was analyzed.

Snow blooms occur most frequently in high altitude areas where snow persists over a long time and accumulates to great depths. Examples include the Sierra Nevada range in California and the Rocky Mountains of North America.

The various colors of snow blooms reflect the presence of various pigmented compounds in the algae. These compounds, which are called carotenoids, confer protection against the sunlight, particularly against the ultraviolet portion of the spectrum. Red algae are more sunlight tolerant than are green, orange, and yellow-pigmented algae. Non-red algae tend to shield themselves from the sunlight by growing beneath the snow's surface.

In another adaptation, the algal membrane is adapted for cold, in much the same way that cold-loving **bacteria** are, via the presence of lipids that remain pliable at low temperatures.

Another feature of snow algae that contributes to their tolerance is their ability to form cysts. These are analogous to bacterial spores, in that they provide the algae with a means of becoming metabolically dormant during inhospitable periods. During the winter, the cysts remain encased in snow. Indeed, experiments have determined that cysts are not inactivated even after a prolonged storage at -94° F (-70° C). As the snow melts in the springtime, resuscitation of the cysts occurs. The algal cells migrate to the surface of the snow in order to reproduce. After reproducing the cells drift down into the nutritionally poor subsurface, where their **transformation** into cyst form is again stimulated. The following spring the cycle is repeated.