Nature Notes

By Marjorie Richman

Slave Labor Camp or Best Friends?

It took a long time for scientists to accept the fact that members of two different species could join together to form a new organism capable of carrying out a distinct and robust life style. When Simon Schwendener, a Swiss botanist, proposed this concept to explain the composition of lichens in 1867, his ideas were dismissed by the scientific community. It was a difficult theory to accept at that time, since a lichen

looks nothing like either of its components, fungi and algae, and it was hard to prove with the limited technology available at that time. Much later, in 1939, mycologists and biologists studying plant pathology began publishing experimental proof of the dual nature of lichens. We now accept the fact that a lichen is a unique organism composed of a partnership between a fungus and algae living together in a mutually beneficial relationship.

That is, the relationship appears to be beneficial since both the fungus and the algae contribute different benefits to the lichen. However, being the philosophical creatures that we are, people began to question whether all partners equally benefit, or if algae are in fact prisoners being exploited. This might seem like an unscientific rather anthropomorphic question, but the pursuit of an answer has led to interesting research into the nature of lichens.

Fungi do not create their own food, as do organisms that are able to photosynthesize. Different fungi have found solutions to finding food; some form mycorrhizal relationships with plants, others feed on organic matter and are valuable recycling agents. About 20% of fungi species form relationships with photosynthesizing algae that result in the formation of lichens. In these relationships, the fungus is dependent on the photosynthesizing partner. Separated in the laboratory, the fungus dies or sickens with no adverse effect on the algae.

Yet, in a lichen body the fungus appears to be in control. The fungus seems to capture the algae. It surrounds an algal body with hyphae, sometimes actually enclosing it. The fungus may also penetrate the cell walls with fungal tissue. A lichen body may contain one or more fungal partners and one or multiple algal partners. The algae provide the food via photosynthesis. Scientists have found that some algal partners give 80% of their sugar manufacture to the fungus.

> So far it sounds like a prison camp: the algal partner is trapped and must feed at least one or more hungry fungi. There is another side to the story.

> Algae alone are actually quite fragile. They cannot take a great deal of sunlight and they need plenty of moisture in order to photosynthesize. Lichen, on the other hand, live in almost every environment on earth, in moist and dry climates. They are found in Arctic tundra, in deserts, and along rocky coasts. They are wide spread here in the mid-Atlantic. This wide distribution is only possible because of the benefits each species is able to contribute to the partnership.

Lichens seem almost indestructible. In dry habitats, or habitats with wet and dry seasons, the fungal partner can send out filaments to gather water from dew and fog. In times of low photosynthesis, the lichen body is able to absorb nutrients and moisture from whatever substrate it is anchored on. A lichen can thrive on a wide variety of materials, such as bark, rock, leaves, mosses, gravestones, buildings, in fact almost any exposed surface. The fungus also provides sun screen for the algal partners. As a member of a lichen body, algae are able to live in areas that would be impossible otherwise.



Above and below – lichens. Photos by Marjorie Richman.



Volunteers in Parks

By Jim Heins

The VIP Team's 2021 Efforts and Results

Those hardy souls who participated in the various projects this year must have contributed at least 2021 hours of effort on behalf of our beautiful park. As reported in the last issue of this newsletter, these intrepid workers provided the leadership and organization for eight cleanup sites along the canal for the Potomac River Watershed Cleanup early in the year.

The Swains Lock area was well maintained by the stewards of Swains Lock. A fairly large amount of garlic mustard was removed from the park. New wayside panels were swapped out for old ones on the Paw Paw Tunnel Hill trail. As a result of a couple of cleanup projects, the Goose Creek River Lock, Rileys Lock and the Seneca Aqueduct are now looking better than they have for quite a while. Almost all of the parks approximately 60 bulletin boards were refurbished. A number of picnic tables throughout the park were attended to, with replacement of damaged or rotting boards and the repainting of others. This fall, 16 more benches were installed in the park, many of them in the western section of the park necessitating a great deal of travel time in addition to the long and hard work of the actual installations. There is still some ongoing effort to finish up loose ends of some of these projects.

All in all, 25 members contributed to the efforts mentioned. Much of it was physically demanding and was met

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Lichen can survive even in the hostile environment of outer space. In 2005 two different species of lichens were placed in a sealed container and sent aboard a manned space mission. Once in orbit, the container was opened and the lichens were directly exposed, unprotected, to the varying temperatures and cosmic radiation found far above earth's atmosphere. Fifteen days later, upon return to earth, the lichens were unharmed and still able to photosynthesize.

Lichen seem to be able to break down any surface they attach themselves to. Over a long period of time, lichen activity gradually turns rocks into soil and degrades concrete. This type of weathering proves costly when a lichen chooses a man-made structure as a substrate, as they often do. Two examples are the Mt. Rushmore sculptures and the façade of the National Museum of the American Indian building on the Mall. Both require constant maintenance because of lichen. with enthusiasm and a great deal of energy. I extend, on behalf of our association, many thanks and congratulations to all for providing a tremendous support to the C&O Canal NHP in 2021.



The fruits of our labor. In early October, the bench bunch was just finishing up the installation of one of the 16 new benches we put in this year, when a couple of visitors to the park came strolling by. We invited them to have a seat and be the first ones to sit on this latest addition to our park's bench program. This couple explained that in their retirement, they had very recently moved to the Frederick area to be closer to their daughter. They were very appreciative of the opportunity to "sit a spell" and said their daughter warned them that there wasn't any place to sit along the towpath so this was a pleasant surprise. No sooner had they mentioned this, their daughter and son-in-law came riding by on their bikes and we all had a good laugh at the surprised look on their faces when they saw Ira and Elizabeth sitting there. This experience made our day, as well. They continue to enjoy walking on the towpath and "sitting a spell." Photo by Doug Zveare.

Unfortunately we will never resolve the question of how algae "feel" about being a part of a lichen body. Maybe it isn't important considering the advantages of the partnership. Perhaps these two organisms, fungi and algae, have found an extraordinarily successful formula for survival. By joining together to form a completely new creature that can live anywhere, they have found a solution to the evolutionary arms race.

Lichens are everywhere in the Washington area. The towpath is a particularly good habitat since they thrive in open, sunny places. They can be found on rocks and trees along the towpath and on trees close to your car in towpath parking lots. Although they appear colorless, a magnifying glass will introduce you to a world of lichen color. And best of all, there is no preferred season for viewing lichens. You can see them anytime, all year.