



Small Wonders

DUST TO DUST

Lowly "dust" lichens have been dividing to conquer their inhospitable habitat for millions of years

Jesus Christ, in his prime, is said to have once fed 5000 hungry men on five loaves of barley and two fish. This he did simply by causing the loaves and the fish to divide and redivide until his dinner guests were satisfied. *Mirabile dictu.*



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Gold dust, Chrysothrix candelaris, grows best in humid, old-growth forests, the older the forest, the more of it you'll find.

Some lichens are a bit like that in their ability to divide and redivide without diminishment. Uncelebrated and unremarked, they repeat over and over an act of generation at once commonplace and miraculous.

To be a lichen—a fungus with a taste for microscopic algae—is to live perennially on the outer rind of things. Not unrelatedly, it is also to live on the scantiest of economic regimens: a little sunshine, a lit-

tle water, a little atmospheric dust, the air itself. And there you have it.

Some lichens carry their economic asceticism one step further. Consider, for example, the lowly "dust" lichens: an assortment of perhaps 40 species sprinkled out like baby powder in odd locations. If any group of living things deserves the crown as *reductio ad absurdum* of macroscopic life forms, it must surely be these. With only the slightest exaggeration, dust lichens may be said to drink without water, photosynthesize without sunshine, and reproduce, so far as we know, without sex.

In the lingo of the lichenologist, dust lichens are termed "leprose." Here it may help to know that *Lepraria*, the hallmark genus of the group, is named for its quaint resemblance to a scurf of leprosy. Any such similarity, however, is only skin deep. Under the microscope, dust lichen colonies are seen actually to consist of numberless powdery balls, each composed of a few algal cells enmeshed in a few fungal threads. Lichenologists also have a special term for these powdery balls: soredia.

Soredia are a form—some might say the perfect form—of vegetative propagule. It is their function to carry the parent lichen forward to the next generation without bother of sexual recombination. In a novel application of Marshall McLuhan's "the medium is the message," soredia are both the stuff and stuffing of the present lichen generation, and the stuff of the generation to come.

In order to disperse to new horizons,

soredia need only be dislodged from their original address—as by the scurrying feet of squirrels or the lumbering legs of spider mites—and carried to some appropriate surface ripe for colonization. In the case of dust lichens, which typically occupy niches sheltered from wind and rain, invertebrates seem to be especially helpful in the dissemination of soredia. Once an appropriate site has been arrived at by whatever means, the soredia soon initiate their remarkable business of dividing and redividing without diminishment. And voilà: a new colony to all appearances genetically identical with the old is formed.

In general, soredia-bearing species seldom produce other kinds of reproductive structures, whether sexual or asexual; of these there are about a half dozen. Theory has it that the energetic costs involved in producing one form of diaspore (e.g., soredia) are simply too great to allow production of additional forms in the same lichen. Nowhere is this more true than in dust lichens, in which the entire thallus is composed of soredia. Not surprisingly, sexual fruiting bodies, which are borne in every other lichen life form, are entirely unknown among the dusts.

Dust lichens represent one of very few macroscopic frontiers still open to taxonomic pursuit. Only recently have lichenologists, abetted by their studies of lichen chemistry, begun properly to understand the identities and affinities of dust lichens. It turns out the dusts are not, as it would seem, a single group of closely allied species. Rather they would appear to have evolved to their present condition from as many as five unrelated ancestries. This possibility is partly revealed in their different surface colours, which may vary from white to pastel green or baby blue, or from yellow to

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chlorine or even gold.

Varied though the dusts may be in their ancestries, they are virtually unanimous in their choice of habitats. Almost to a species, they colonize inhospitable niches closed to nearly all other lichens: the undersides of overhanging rock faces, the concavities of cut banks, and, especially, the lower, sheltered boles and branches of trees. It is here, out of the way and out of the weather, that most of the dusts find their optimum habitats, and are most at home.

For these are the hygrosopes of the lichen world. Instead of imbibing water in liquid form in the manner of most other living things, dust lichens are able to absorb water vapour directly from the air. What is more, these lichens actually

eschew liquid wetness. After the long habit of not drinking water in the water state, dust lichens are nowadays devoutly hydrophobic. Wet them, and they shed water like the proverbial mallard's back.

What is it about rain-sheltered, sun-sheltered, wind-sheltered habitats that over evolutionary time have teased a leprose life style from several unrelated lineages of non-leprose lichens? To begin with, such habitats require of their prospective colonists a pronounced ability to survive without liquid water. In order to do so, a lichen must be able to "inhale" water vapour directly from the air. Not surprisingly, some dust lichens are able to photosynthesize at relative humidities as low as 80 percent. In this their lack of a hardened outer rind, or

cortex, is obviously a boon. Boonful, too, are the relatively high relative humidities characteristic of the sun-sheltered, wind-sheltered habitats in which they grow.

Reduced to unprepossessing powder, and clinging to surfaces disdained by most other living things, the dust lichens are commonplace beyond redemption. Yet they are also at the same time miraculous. For in their ability to divide and redivide without diminishment, they seem to have attained a degree of immortality quite beyond our understanding. Some of the dust lichens alive today had almost certainly existed, in their earlier incarnations, millions of years prior to Jesus Christ and his one-time miracle with barley loaves. *Mirabile dictu.* ♣

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