

DOWN TO EARTH

By ALAN DEVOE

The World's Smallest Animal

IN a stagnant brook-pool, unruffled by the main current of the rushing stream, an animal rests and waits. The yellow-eyed herons, wading the watercourse and hunting, do not remark its presence. Darting trout and dace and pickerel pay it no heed. It is a very small animal; as it swims and drifts through its dim world of pond scum and floating frog spawn there is hardly any eye of any preying thing that can detect it. It is a protozoon, an animalcule, smallest and simplest of the beasts. Its name is Paramecium.

It is smaller than a grain of brook sand and as transparent as the water. It has no legs or fins; there is no lung in it, no eye, no ear. It is no more than a speck of tissue, a minimum fragment of aliveness. It is only a body and a mouth. But infinitesimal though it is, and colorless and nearly substanceless, it is an animal. It is, that is to say, a living cell — a cell in no way differing from the cells that in various configurations make up a weasel or a crawfish or a man. It is

possessed, after its fashion, of awareness of its world; it is possessed of the power to move, and the power to eat, and the power to perpetuate its kind. It is not so large as the tip of a moss-frond; its bulk is hardly the hundredth part of a plantain-seed. But it is an animal. It has a life to live.

The Paramecium moves, very slowly, through the murk of the stagnant pool. From its tiny ovoid body there project, like the oars of a myriad-oared galley, delicate threadlike filaments, and these beat forward and backward in a gentle rhythm. They are the Paramecium's cilia, its substitute for legs or wings or fins. By their ceaseless rhythmic beating, forward and backward, forward and backward, the Paramecium is propelled through its world. There is no brain to direct the beating of the cilia, to accelerate them or slow them down. Their behavior is like the behavior of oak leaves, thrusting upward toward the sun, or of chokeberry roots, thrusting downward into the sustaining body of

the earth. As unawares — and as precisely — as these, the Paramecium pursues its obscure destiny among the algae and waterweeds.

On one side of the Paramecium's body there is a narrow opening. This is its mouth. There is no tongue, no jaw, no apparatus; the mouth is simply a groove-like orifice in the Paramecium's body wall. And as the Paramecium drifts and swims now through the dim-lit water, this mouth is busy with feeding. The inside of it is equipped with a multitude of waving and pulsing cilia, even as all the rest of the Paramecium's body-surface is, and the movement of these creates a perpetual tiny current in the water. It is a sufficient current to sweep into the gullet an unceasing stream of microscopic particles — particles of minute aquatic plants, bits of algae, protozoic water-creatures even smaller than the Paramecium. Incessantly, as the Paramecium floats and idles through the water, the oral cilia propel these food bits down its maw and into its interior.

Lacking eyes and ears and legs and mind, the Paramecium lacks also a stomach and circulatory system. Digestion and the assimilation of food take place without them. Instead, as the cilia sweep food into its gullet, there forms at

the gullet's end a food vacuole. This breaks loose from the gullet presently and, swirling into the Paramecium's interior, is embedded in the body stuff itself. Acids are secreted on it, and largely dissolve it, and it is then directly absorbed by the surrounding protoplasm and rendered a part of the Paramecium's living flesh. The whole process of feeding, though so mindless and so simplified, demarks the Paramecium's way of life from the life way of a tree or plant. It denotes the Paramecium a member of the tribe of animals. Presently, as the Paramecium swims slowly onward through the water, there is displayed yet another evidence of its kinship with much larger and more complicated beasts. Out from behind its body as it swims, there issues a little jet of matter. The Paramecium has voided its dung.

II

Even the slow drifting progress of the Paramecium through its unapprehended water world requires — as every animal activity must — a certain energy, a constant conversion of food supply into that vitality which keeps the cilia in motion and makes possible the animal's internal economy. Ceaselessly,

therefore, there goes on in the *Paramecium* an oxidation of the molecules of protoplasm, an intricate process of katabolism. Out of this slow continual combustion comes the energy whereby it moves; from this physiological burning of protoplasm are produced heat and strength and the secretions that make possible the sustenance of life.

As the *Paramecium* moves slowly through the water, sweeping its food into its maw and excreting its feces, it excretes too the end-products of katabolism. These do not pass through an anus, as the waste products of digestion do, but are largely exuded directly through the surface of the body-wall. They are excreted, also, by the contractile vacuoles near either end of the *Paramecium*'s body. A network of infinitesimal canals, radiating from these vacuoles throughout the body, collect the fluids from the protoplasm; the vacuoles, working in alternation, contract spasmodically every fifteen seconds or so, and thus discharge the waste. They are at once a bowel and a lung, for a part of the matter they expel is carbon dioxide. The *Paramecium*, like every other animal on earth, is a consumer of oxygen. It takes it in directly, by absorption through the surface of its body, and the expul-

sive contractions of the vacuoles are, as it were, the *Paramecium*'s outbreathings.

After its fashion, then, the slow-drifting *Paramecium* follows the life pattern of its greater brother beasts. It feeds, breathes, voids its droppings. And it has, as well, certain adventures and experiences. Occasionally, as it glides purposelessly and without direction among the stones and brook plants, it is sensible of the impact of a current against its flesh. When this happens, the *Paramecium* turns its course and swims counter to the current's flow. Again, sometimes, the *Paramecium* approaches a part of the water where there is a concentration of salt. As quickly, then, as the recoil of certain vine tendrils when they encounter a hostile touch, the *Paramecium* retreats. It retreats, too, from those places where the water has been too greatly warmed by the sun, and seeks out instead a locality with a temperature of about 70°.

The force that guides the *Paramecium* in these affairs — that subtly directs it to flee, for instance, from water tainted with acetic acid, that moves it, when attacked by another protozoon, to explode its minute organs called trichocysts and to hurl out from them a mass of grappling-threads

— that force must perennially remain unnamed. It is what animates the pupa of a promethea moth, when it wriggles responsively inside its horny capsule. It is what pervades a hairy-stemmed fly-trap plant as it closes its cold green leaf jaws on the struggling body of a gnat.

The Paramecium has no reproductive organs. But now and again its slow drifting and floating are interrupted, and it lies tight coupled with another Paramecium, forming between the surfaces of the two bodies a protoplasmic bridge. A part of the nucleus of the one animal flows forth and fuses with the nucleus of the other; there takes place a mutual blending of living flesh. This is the creatures' fertilization rite, akin to the matings of sparrows and moles and deer. It is the preface to that phenomenon which is the climax of the Paramecium's life and which is called binary fission.

The Paramecium, when its time for reproduction comes, does not perpetuate its kind by giving birth. Instead it contrives pos-

terity by the division of itself. There comes a moment when its nucleus — the innermost core of its being — splits and separates into two parts. At once the Paramecium's whole body quickly narrows at the center, like a seed-pod pinched between fingers, and the narrowness rapidly increases until the two body halves are joined only by a flimsy link of tissue. Presently that last link is wholly severed, and in that instant what formerly was a single Paramecium has become a pair. Volitionless and uncognizant as their forerunner, they glide away now through the murky water to travel wherever their waving cilia may carry them, to feed and drift unknowingly and void their excrement, and presently, within a day or so, to divide themselves and become not two Paramecia but four.

The Paramecium has no consciousness, no knowing, hardly more aliveness than a burdock root. But in a quite real sense it does have — what is far stranger than these commonest animal endowments — the gift of immortality.





POETRY

UNGATHERED GRAPES

BY ROBERT P. TRISTRAM COFFIN

THE bunch of grapes my pickers did not find
Hangs here with autumn moonlight on its rind;
The color that hid it well from thrifty eyes
Betrays it to the moon a larger size.

It shall hang there safe for all of me,
It would be wrong to touch what seems to be
A free-will offering, though made against the grain,
To brief northern sunshine and the rain.

I wonder who will win this bag of booty
When frost will thin these leaves and bare its beauty?
Maybe the crow in glossy winter cloak
Who comes to call when chimneys do not smoke.

Or it may be that master-thief, the jay,
The curious, nervous squirrel, red or gray,
Or on a night of frost the sharp raccoon's
Frosty eyes may spy these clustered moons.

Or they may fall before the fieldmouse's nose
Where he walks moonlight on his careful toes.
But whatsoever creature is the one,
These grapes will bring him back the summer sun.

It is a lovely thought to leave behind:
These grapes that have the moonlight for their rind,
Fruit for the wild and not for lips of mine,
Mean more than all I harvested from the vine.