

DOWN TO EARTH

By ALAN DEVOE

Consider the Frog

IT is very easy for a man to forget, while he listens to the terrible voice of his radio reciting Europe's destruction or reads in the newspaper the latest manifestation of domestic chicanery, that in this time of blood-spilling and political chaos and despair the elemental life of earth goes on as usual. It is hard to remember that the cumulus clouds still sail high in the sky, unmoved from their course by the thunder of cannon, and that, though peoples be shelled out of existence, the wind still blows and calms in its customary fashion, the maples still thrust their taproots into the earth and raise their leaves to the sun, the hairless luna caterpillar still metamorphoses by its ancient alchemy into an eye-winged moth.

It is good for a man to remind himself of things like this — that there are venerable stabilities which the insanities of dictators are not able to overthrow. It is good for instance, just to shut off the radio for a while, throw away the newspaper, and go out into the warm

darkness of a country night and listen to the frogs. The bullfrogs are breeding now, and in millponds and bayous, in the damp, hot dusk, there is a deep-throated chorus that comes from thousands of resonating vocal sacs. Frogs will be croaking and mating and feeding when Hitler and Mussolini and Stalin have been dust for many a millennium. It is good for a man to shift his attention for a while to something as permanent as a frog.

It is early in spring, when the first bloodroots are blossoming and shadblow has just come into flower, that the frog emerges from its winter torpor. Since early the previous fall it has been hibernating in a hidden place — the leopard frogs and green frogs buried deep in the soft bottom-mud of creek or pond, the wood-frogs concealed in interstices of rotting stumps and lichened fallen logs — and during all the time of cold the sluggish frog-blood has scarcely circulated, the frog scarcely stirred in its deep sleep. In the spring, thawed by the returning sun, it issues forth, ready

once more to hunt the creek banks, done in the shade and breed.

The universe into which the frog comes in the spring is made known to it chiefly in four ways: by sight and sound and smell, and by a subtle sensitivity to light and touch. On either side of the frog's head is a protruding eye, its rotation controlled by six muscles, its lens tremendous and nearly spherical. The eye is so fashioned that the frog's perception of stationary objects is not extremely keen, but there is immediate awareness of any kind of movement. The stir of a cricket, the dart of a dragon-fly, the slow, soundless progress of an earthworm through the grass — these things the frog's great protruding eyes immediately register. So bulbous are the eyes that they would soon suffer accident were it not that the frog can retract them at will into their sockets, and that the two eyelids are supplemented by a third, a nictitating membrane. As the frog hops along a creek-bank in the spring sun, or floats half-submerged in the green-scummed water, the eyes are periodically protruded in search of prey and withdrawn at any passing danger.

The frog has no external ear wherewith to hear the movement of prey or the coming of an enemy, but behind each of its bulging eyes

there is a broad tympanic membrane. Inside the auditory capsule there lies an inner ear, supplied by branches of the auditory nerve. As the tympanic membrane vibrates, waves of sound travel to this inner ear by a rod, the columella, and there is transmitted to the frog's small, convoluted brain an awareness of sound-sensation. Under water, the frog hears much as a fish does: the sound-waves travelling in the water are communicated directly to its inner ear.

By awareness of movement, of tympanic vibration, and of scents received in its nasal cavities and communicated by olfactory nerves, the frog is equipped to apprehend its small, wet universe. Its fourth equipment — a delicate sensitivity to light — is not less important than these. The frog's body, like a garden slug's, is naked. Its cold, green skin is filmed by a thin covering of mucus, which restricts evaporation. It is on this account that frogs must live in damp places or near ponds and streams where they can readily immerse themselves; for without a constantly moist atmosphere or periodical ablution their skins would quickly dry and they would perish. Even the small red-brown wood-frogs that visit streams only in the spring at egg-laying time, and during the

rest of the year are forest-dwellers, pass most of their time in the damp leaf-mold and the humid interior of decaying stumps. A frog's sensitivity to light is as essential to its survival as sight and scent and hearing; it is what impels it to withdraw from summer sunlight into shade or immerse itself in a pool.

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With four major equipments, then — and one cannot say what others, for many an aspect of frogs' lives, such as the function of certain structures in their mouths, is still not surely known — the frog goes forth to pond and creek-bank in the spring. The foods it seeks are such lesser fellow-haunters of watersides and marshes as worms, midges, spiders, and water-skaters; the frog waits immobile, in the shelter of a leaf or tussock, for these to come near. When one does, the frog darts out its tongue. A frog's tongue is not rooted to the back of its mouth, as are most vertebrates', but to the front; the frog can hurl it forth full-length, and the movement is quick as the flutter of a hummingbird's wing. The tongue is sticky; at a touch it adheres firmly to the body of whatever minute creeping or flying creature it has struck. An instant after con-

tact has been made, the frog draws in its tongue again, and squirming prey is gripped by the conical teeth of the frog's upper jaw. In a minute or two, convulsively, the frog swallows. If the prey is large, or kicks, the frog raises its adroit little forelegs and pushes vigorously to stuff the victim in.

That is the way the frog feeds. The way of perpetuating its kind is this: Down from the female's ovaries, in the spring, there pass through the oviducts a quantity of eggs — as many, it may be, as five or six thousand. The female stores them for a little time in her elastic uterus; and then, when the water of pond or brook is at proper temperature, she voids them. The eggs are in a mass, adherent to vegetation in the water. The male frog comes to this egg-mass and fertilizes it by pouring over it a flood of spermatozoa. After fertilization, the jelly which surrounds the eggs swells and grows in bulk, that the developing embryos may be protected from injury.

Out of an egg, presently, a tadpole comes. It is a long-tailed creature, wholly water-dwelling. It has external gills, vestigial tiny cilia which as an embryo it used for effecting movement within the egg, and fine teeth wherewith it can scrape nourishment from the algae

and water-weeds when it has used up the yolk in its alimentary canal. Fish-like, with wriggings of its long tail, it moves along the mud of the pond or stream which was its birthplace. In time — the period varies among the frog-species — the tadpole forms four pairs of internal gills; the tuft-like outer gills vanish, and the inner ones wholly take their place. The tadpole now takes in water through its mouth and passes it out again through its gill-slits and through the opening, the spiracle, on the left side of its body. Other changes in its habits and appearance quickly take place. On the hind part of its soft, slippery body there appear in miniature the hind-legs of a frog. They grow quickly, developing powerful muscles, and the tadpole acquires the art of swimming with them. A little later forelegs burgeon, the small, delicate forelegs, with feet like little hands, that the adult frog is going to use for stuffing too-active prey into its broad mouth. The tadpole's tail is growing very short now. It is being resorbed into its body. Resorbed, too, are the four pairs of internal gills, and forming in their place are the pear-shaped elastic lungs with which, as well as through its skin, a grown frog breathes. Only a little longer and the metamorphosis is complete;

the tadpole is ready to take its place in the company of frogs. It is ready to sit on the brook-bank in the shade of a skunk-cabbage leaf, hour after hour, watchful for fly or spider to be trapped by its sticky tongue, and — forcing air out of its lungs and into its mouth and back again — to emit the sonorous croaking which is its curious music.

A frog has many enemies. It does not often die of age. The yellow-eyed herons, wading the shallow water, are alert to spear its fat green body with their great beaks. The slow turtles, almost invisible in the bottom-mud, are enemies; so are snakes, and sometimes larger frogs, and of course always man, who devours a quarter-million pounds of frog-legs every year. A frog does not die quietly. When it has been seized by a mottled water-snake, and is kicking and wriggling in the grip of the cold-fleshed jaws, a frog does something that it does at no other time in its life. Shrilly and piercingly, it screams.

Such is the life-story of frogs. It bears no relation, that I can see, to the international situation or the question of fascism. But frogs will be croaking and hunting and dozing in the summer shade long after the present international situation has been succeeded by another and probably a worse one.

THE LIBRARY

Regional Literature

BY BURTON RASCOE

A FEW years ago Donald G. Davidson of Vanderbilt University, Nashville, Tennessee, held up his right hand, for all the world like De Lawd in *Green Pastures*, and commanded: "Let there be some regional! Let there be some Southern agrarian regional literature!" And lo! and behold, and by golly, there came a flood of regional literature, and particularly of Southern agrarian regional literature, upon the land. Publishers, book reviewers, booksellers, rental libraries and the public were up to their eyebrows in it. Several publishing houses sank beneath the waves. The shelves of the circulating libraries were groaning with heavy books which customers said they had been trying every night for a week to read and couldn't get past page five. Many book reviewers, having had an equally hard time to get past page five, had used the descriptives, "saga of the soil," "profoundly moving epic of the frontier" for so many books they

couldn't read that they were beginning to have nightmares and talk in their sleep.

It is significant that by and large the non-fiction books of regional literature have been more entertaining as well as more informative than the regional fiction. The American Rivers series, published by Farrar & Rinehart, first edited by the late Constance Lindsay Skinner and now edited by Stephen Vincent Benét and Carl Carmer, has contained nine books, so far; they are all almost uniformly good — easy to read, carefully documented and combining unusual history of the country with contemporary travel description and observation. Rivers so far treated in the series are: *The Kennebec*, by Robert Tristram Coffin; *Upper Mississippi*, by Walter Havinghurst; *Suwanee*, by Cecile Hulse Matschat; *Powder River* by Struthers Burt; *The James*, by Blair Niles; *The Hudson*, by Carl Carmer; *The Sacramento*, by Julian