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Concerning Cottontails

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ing out of a chemical method to store up solar energy by the synthesis of organic matter is one of the great problems in plant physiology and biochemistry. It offers a challenge to every research worker in these fields. It is evident that new sources of power must be found in the future if the world continues to advance along present lines. The sun has an unlimited supply of energy if it can be utilized. Will this supply be made available by a chemical method similar to the method of the plant? The question cannot be answered at present, but here lies a tremendously important field of research.

One can hardly estimate the effect of an industrial method of synthesizing organic matter from inorganic by utilizing the light energy of the sun. Such a method put on an economic basis would have the most profound biologic, industrial, and social effects. Plant production would not be so important. Agriculture would not be a basic occupation. One can only speculate upon the changes that would take place. It might change the whole economic order of things.

(1) Spoehr, H. A. Photosynthesis, Chap. 1 (1926).

(2) Lane, F. W. and Bauer, A. D. Ind. and Eng. Chem., 15, 479 (1923).

(3) Baly, E. C. C. Photosynthesis, Science 68: 364-367 (1928).

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CONCERNING COTTONTAILS

The cornfield lay above a low bluff overlooking a swamp, and for half an hour I had tracked that cottontail through a perfect maze of weeds and cornstalks. Warming with the chase, I was determined to have that particular bunny if it took me all morning. If I had not known better, I would have thought he was teasing me. Time and again, his tracks led into a bunch of grass with every indication that he was there for the day, but always they led out on the other side. Seton says that unless disturbed by dogs or other enemies, a cottontail probably spends its whole life within the limits of an acre. But he hadn't met this cottontail, or many others that I have seen. True it is that during the summertime, a rabbit may spend most of his time in a very small area, in a garden, for example, but in winter, when hunger calls, he thinks nothing of hopping over most of a forty acre field, and it's easy to see by his tracks that he is doing it leisurely—is undisturbed. To return to this particular fellow. Finally his tracks led straight over the bluff into the swamp, and I was certain of him now; he was squatting somewhere out there among the tussocks. No other tracks were near to bother me; he was making easy leaps of about a yard, and I was following them at a rapid walk. Then I saw a strange thing—the tracks suddenly ended. I stopped and stared in open-mouthed astonishment. I looked right and left, for the canny cottontail, either to throw a possible enemy off the trail or for just no particular reason that I know of, sometimes jumps far to one side with one tremendous hop, and then goes on his way is if nothing had happened. But such was not the case here. I went back a bit along the trail, thinking perhaps I had overlooked a "Back track" in my hurry. But no! The tracks had simply ended. There could be no question of doubt. Then I stooped and examined the last track minutely, and saw clearly what I believe had happened. On each side of the tracks, and parallel with them were a number of long shallow marks in the snow—the imprint of stiff wing feathers.

I turned and glanced back at some huge burr oaks along the bluff. The great horned-owl had beaten me to the prey. I had seen him not an hour ago down the bluff. From his vantage point on the old oak, or perhaps while only just cruising about in search of a possible kill, he had seen the cottontail, a conspicuous mark against the white carpet. Volplaning soundlessly down, his loosely hanging legs with their terrible grappling hooks, had picked the rabbit from the snow as easily as one could stoop and pick a flower. Even now, all that remained of him might be picked up as owl pellets, two or three pathetic balls of bones and hair at the foot of yonder tree. A tragedy in cottontail land!

Burroughs remarks that field mice, those short-tailed, chuckle-headed, omnipresent tunnellers of marsh and field and meadow, seem to have been created solely for the purpose of being transformed into the bodies of other animals. But if they can boast more in this respect than cottontails their lives must epitomize tragedy, indeed!

For the cottontail has most of the enemies of the field mouse, and man in addition. Owls, hawks, eagles, wolves, dogs, minks, skunks, weasels, foxes, bullsnakes, rattlesnakes, each and all attack and eat him upon all possible occasions. That half-domesticated pest of the country, the common house cat, is a notorious destroyer, particularly of young cottontails. In short, I might have said that every killer of every kind big enough to destroy him does so. He is plagued by fleas and ticks; certain flies lay eggs upon him and produce grubs in his skin—he is a common host for tapeworms. He is hunted and eaten as game over most of the United States, and Pennsylvania, alone, reports nearly four million cottontails killed in 1924. To say nothing of his being the legitimate prey of every small boy with trap, b-b gun, or 22 rifle, in season and out of season. The tragedy of the cottontail and the owl just described, happens, because of some predator or another, to an hundred thousand of his kind daily, rain or shine. A new cottontail casualty list is daily on file.

He has no wit for a trap; the very sight of one seems to be an invitation for him to put his foot in it, and any one who had ever run a trap line, knows of countless rabbits that have left their legs in traps not intended for them.

He will not fight back when seized or attacked; I have captured scores of his kind with my bare hands, and never has one made the slightest attempt to bite me. The males fight among themselves, chiefly by kicking with their powerful hind legs, and several writers have reported that a female cottontail will occasionally defend her young against a prowling house cat. A friend recently told me that his big Belgian hares fairly kicked a cat silly when placed in a pen with them, but I believe such offensive actions are rare among cottontails. The only resistance I have ever seen one offer, save among his own people, was simply a vigorous struggle to escape from whatever had clutched him. In this connection, I have seen a few youngsters scratched badly by inadvertently picking up a cottontail and receiving a full, ripping stroke from the claws of his strong hind legs.

Yet in spite of his enemies, he manages to live on among us, even to hold his own against such prodigious odds, and to remain a cheerful, happy fellow into the bargain. Dallas Sharp, in one of his delightful stories, implies that a cottontail never laughs—that his life is too full of tragedy for laughter, that it is only one dreary round of enemies and fears and escapes. And, indeed, he has plenty of all three! But I believe that Sharp takes him too seriously for all that. Nature gave him more that his share of enemies, for he is an inoffensive fellow, and ill deserving of them, but I believe she compensated him by giving him a short memory. As I see him, he doesn't brood over his troubles; he has forgotten them ten minutes after their occurrence. Not that the happening doesn't remain with him in a subconscious sort of way, and so serve him on the next occasion, but it simply does not stick in the forefront of his mind to plague him. He has other things to think about; an escape to him is merely an incident of the day's work—he is ready for another as soon as he has gotten his wind. If he is killed, that is the end of him; his friends will wear no mourning, and they hold no funerals or post-mortems in cottontail land.

True, I have never heard a cottontail laugh, and it may be that he doesn't, but any one who has ever seen a group of cottontails disporting themselves in a moon-lit meadow, cannot help but see that some fun is going on. I think, too, he must sometimes laugh exultingly, in sheer physical pride of his muscles. What an immense physiological explosion must take place in them to heave him six feet high into the air when he vaults over an opponent in a high-kicking match. Or when he brings those long hind paws of his with a

resounding whack upon the ground, as a signal to his friends that danger stalks their trail.

In fact, I often feel that I can read the humor of a cottontail by looking at his tracks. Here he goes now across this open patch of light snow, fairly burning up the course, as it were, with great, prideful, ten-foot leaps; he's showing me what a real cottontail can do when in the "pink." Now he slows down to a succession of mere "three-footers," then applying the brakes still more, is now hopping only contemplatively along. He nibbles here at a partly-shelled ear of corn, moves off slowly, then with one tremendous, dynamic leap, lands four feet off to one side. "Ha! Ha!" he chuckles, "It will take a hound some time to pick up that trail." Laughter? Of course he laughs!

These tracks of his and his kind are curious things; nothing quite like them in nature—four marks in the snow arranged in a deep triangle, the two great, parallel oblong dents in front marking where his long hind legs have over-reached the lesser impressions of his front ones. Just recently a boy said to me:

"A funny thing happened today. I tracked a rabbit up to where he was sittin', an' he wasn't there!"

"Hold on," I said, "Let's get this straight. You say you tracked a rabbit to where he was sitting and he wasn't there?" "Well," he said sheepishly, "he ought to have been there."

It was the old story of tracking a cottontail backwards. To the novice, he is always travelling tail-end foremost!

I said a while ago that he was an inoffensive fellow, but many farmers and gardeners would probably demur to that. He is said to ruin orchards by girdling the trees in winter when the ground is covered with deep snow. He is guilty occasionally of this, especially when hungry and hard put, but Seton has partially cleared him by showing that field mice are the chief offenders in this respect. He is also doubtless fond of garden vegetables in season, but who isn't? On the other hand, he digs no holes in the ground, gnaws into no containers, keeps no one awake at night with his mating calls, fights nothing but his own kind, kills nothing. Not altogther blameless, perhaps, but certainly a desirable and useful citizen of the wild. Since he digs no dens nor builds any kind of dwelling, he often makes use of abandoned skunk or ground-hog holes, during severe weather or when closely pursued by an enemy. He will even on such occasions enter hollow trees, and climb up high on the inside, if the cavity is not too large. Several cottontails may use the same den at the same time, and it is at these times he falls an easy victim to the so-called sportsman using a ferret. For when a ferret enters, the cottontail flees in mortal terror, and usually runs blindly into the sack or net placed over the burrow.

But most of the time, and often in the severest weather, he sits right out in the open meadow, oat-stubble, or cornfield in what is commonly called his "form" or "squat." This squat is nothing but a sitting place, often so illy covered as to leave the occupant half-exposed. Often, however, he is more careful in his choice of a site. Commonly he digs a slight hollow under a protecting bunch of grass or cornstalks, then pushing into the cavity with his back to the wind, settles himself comfortably with his head at the opening. I have not found, as Seton maintains, that he usually has two openings to his squat. Sometimes, he doesn't even go to the bother of making a squat, but utilizes some artificial thing such as a cavity under a sod in a ploughed field. I remember my astonishment at seeing one leap from beneath the skull of a horse, into the brain cavity of which he had partially wedged his haunches, and just recently I saw a friend capture one squatting in a card-board box.

But where or whatever his squat may be, he spends most of his daylight hours sitting in it, and will often use the same one many times if not molested too much. I recall one that used the same form for nearly a month, and a local hunter told me of finding one sitting in the squat of another cottontail that he had killed the day before. Recently, while hunting, I found one dead and frozen

solid in his squat, but sitting so naturally that I booted him hard before discovering my error.

If frightened from his squat, he often springs only a few feet from it, and "freezes," holding this fixed position unblinkingly for as much as five minutes unless forced to move. More often, however, he springs from it at full pace, especially if his disturber is a dog, hurling that two or three pound body of his through space at an astounding speed. He can give any ordinary dog a close race for the first hundred yards or so, but he seems to have little stamina for a long run, and owes his ability to get away from a dog to his knowledge of the country, and his knack for getting under cover. When hard pushed he may even take to the water—though he dislikes it exceedingly—swimming with great speed and power for short distances. He does not, as Seton maintains, fall over at the first touch of a shot, but may run long distances when badly wounded—a broken leg seeming to slow him up very little. If undisturbed, however, he commonly sits quietly all day.

But as soon as dusk comes on, brer cottontail leaves his squat and sets forth on the adventures of the night. These adventures will have their origin in three primary doings of every good cottontail, namely, to get something to eat, to keep from being eaten, and to reproduce his kind. If it chance to be spring or summer, the last of these will hold his dominant interest, for timid though he is among other creatures, among his own kind, he is something of a philanderer, something of a brawler, and is right willing to come to blows to decide who is to father the most cottontails. But having once fathered them, his responsibility ends. He may realize that in yonder fur-covered and furlined nest, his wife, Molly, has borne him ten or a dozen tiny, blind, pink, squirming, potential cottontails, but his paternalism in the matter apparently goes no further than his realization. He is thinking up a new liaison before the tiny squirmers have opened their eyes. This keeping pace with the daily casualty list among cottontails is a big job for him. Death for him and his kind is always just around the corner.

And in this connection, some time ago I had a strange experience with a cottontail. I had been out for a stroll that morning and was resting for a moment sitting on the ground with my back against a tree. I was sitting very quietly, as it is my habit on these occasions, since I long ago found out that wild animals often pay little attention to a person if he is not moving. Soon my gaze fell upon a cottontail squatting against the base of a tree perhaps twenty feet away. There was nothing unusual in this, for they were plentiful thereabouts, but what then followed was highly unusual. Without any apparent reason, and certainly without making much fuss about it, that cottontail suddenly sprang several feet straight out from where he was sitting, kicked a few times, and quietly died. When I had sufficiently recovered from my surprise, I walked over and picked him up, but a careful examination gave me no clue as to what had killed him. I even skinned him to see if he had some hidden wound, but aside from being rather thin, he appeared normal. Cottontails are said to live seven or eight years, but even this short span is probably attained by not more than one in a million. If this cottontail whose demise I witnessed really died a natural death, then two remarkable phenomena occurred coincidentally that morning: a cottontail came to his death without violence, and an observer happened to be there to witness his passing.

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