HIBERNATION*

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> "What must now awake, when Nature
> forsakes Man, is courage of the soul."
> Rudolf Steiner, *The Cycle of the Year.*

Around Michaelmas, more or less, the woodchucks in this area (southern Pennsylvania) begin to become drowsy. Their body temperature begins to fall. They drift into a deeper and deeper lethargy. They seek the darkness and quiet of their earthen burrows.

At first they are listless and quiet, but open-eyed. Then they grow sleepier, but still are sensitive to noises and slight disturbances in the world around them. Their body temperature begins to alternate as well. As they fall into a deeper sleep their temperature falls — closer and closer to the temperature of the air. At 60°F. their body temperature was 96.8°F. Now the internal temperature dips closer and closer to the 45°F. of the air. Breathing becomes slower. Normal breathing, at thirty breaths per minute, goes down to one breath every five minutes. This is a rhythmical process: periods of wakefulness and rise in body temperature, alternating with deeper and deeper lethargy and increasing internal cold. While entering hibernation a woodchuck changes from a warm-blooded to a cold-blooded animal.

At the point of complete rest, the woodchuck's body temperature is 37°F. At first this state looks like sleep, but it is different. The animal is dead-motionless, except for very rare breathing, one breath every five minutes. The heartbeat, which at normal temperature was about seventy-five beats per minute, is only five beats per minute at 39°F.

Now let us look at a picture of two women on a snow-covered plain, "painted" by Rudolf Steiner in a lecture called "The Being of the Arts."**

> Let there be spread out before us a wide plain, covered with snow; streams and lakes here and there, frozen over. Partly frozen too, a seashore not far away, with floating

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icebergs; some scattered bushes and low trees covered with snow and icicles. It is evening. The sun has already gone down, leaving a golden glow in the sky. Close by stand the figures of two women. And from the sunset a messenger is born, sent forth from the worlds of the Spirit. He approaches the two women and listens attentively to what the two women have to say about their innermost feelings and experiences. One of them, standing there, presses her arms to her body; she shrinks into herself and says "I am cold!"

The other woman gazes across the snow-covered plain and across the frozen waters and at the icicles hanging from the trees. Words come from her lips — as she utterly forgets her own feelings, forgets the cold that the physical landscape is making her endure: "How beautiful everything is!" Warmth pours into her heart; for she has forgotten what she might feel under the influence of the physical cold. She is moved to the depths of her being by the solemn beauty of the frozen landscape.

The twilight deepens and the last red fades from the sky. The two women fall into a deep sleep. The woman who had felt the cold so intensely in her own body sinks into a sleep that could almost bring about her death. The other woman falls into a sleep in which there can be seen the consequences of her feeling, expressed in those words "How beautiful everything is!" Through her sleep, her limbs are warmed, her being remains fresh. As she was falling asleep, this woman heard the words of the youthful messenger who had been born out of the sunset, "You are Art." She brought into her sleep the results of her experience, her impressions before the landscape which has been described. A kind of dream mingled with her sleep — and yet it was no dream, it had a certain reality, a quite special reality; only its form was like a dream. It disclosed a reality which her soul could not easily have approached before. What this woman experienced was no dream, only the likeness of a dream — what she experienced can be called astral Imagination.

While we speak about hibernation, let us just keep this passage from Rudolf Steiner's "The Being of the Arts" in mind. We will return to it later.

There are several states which are loosely called hibernation. Most of the insect kingdom and all of the reptiles and amphibians go into a state called winter rigidity. Insects have very little consciousness and no internal temperature to lose. Reptiles have

more consciousness, but are also coldblooded. That is an inaccurate phrase — "homiotherm" is better. Their temperature is the same as the environment. Nevertheless they produce little of their own internal warmth. They become increasingly rigid below 60° F. So long as their hearts do not freeze, frogs easily survive freezing.

True hibernators are mostly rodents: woodchucks, chipmunks, red squirrels, field mice and hamsters and also most species of bats.

The third group are the animals actually considered dormant. Dormancy is called, in biology, carnivorean lethargy. These animals include the skunk, the bear, the badger and racoon. These animals begin to hibernate, but never go so far as true hibernators. Respiration only goes down to twelve breaths per minute, as opposed to one breath every five minutes for the woodchuck. Temperature is also not so low: 85° F. or thereabouts. Of course, 85° F. would be a very low temperature indeed for human beings. They would rarely survive it for long. In higher mammals we call this condition hypothermia. The one woman described in the passage above was succumbing to hypothermia. This condition can lead to a coma and further degeneration.

Let us look now at this progression of animals, in regards to what they can forego and still live: The human being can sacrifice very little of his warmth; the bear can sacrifice some of his warmth; the rodent can sacrifice all of it; in the lower animals the warmth organism is in the environment. Here we have an image and measure of how far the animal is emancipated from environmental change, and therefore dependent on a special internal environment of his own.

Among the lower animals, those which habituate water are the slowest to become rigid, if they do at all. Fish migrate to deeper central strata, turtles and frogs, snails and crustaceans, to the mud bottom. Dragonflies — that wonderful order of "water-butterflies" — can be seen out on warmer days in November. Springtails can be out in February, if the water is a brisk spring. Hydras can be active at 39° F. However, most insects are immobile below 60° F.

There are several characteristics of water which make it the lively medium that it is. Any other liquid would sink as it froze, rendering the depths an impossible habitat. Water is the only material substance that becomes lighter as a solid. Secondly, the oxygen content of water increases with the drop in temperature: At 77° F. there are 6 cubic cm. of 0_2 per liter of water; at 32° F. there are 10 cubic cm. of 0_2 per liter of water. If this storing

ability of 0_2 were not present under the crust of ice, the pond animals would suffocate.

If water is remarkable in its free state, it is even more remarkable as a cellular colloid. Insects eliminate all free water from their system prior to winter rigidity, eliminating around 30% of their body weight. Free water, of course, would freeze and they would burst like pipes in an undrained vacation house in winter. Bound water does not freeze, except at very low temperatures. It is inherently self-contained against the environment. It will not conduct electricity, nor dissolve sugars. In the state of winter rigidity, the metabolic rate within this bound water is only 1/10 of what it was in summer at 68° F.

One of the most beautiful sounds associated with the coming of autumn is heard from the *Orthoptera:* the crickets, grasshoppers and katydids. They are like tuning forks for the quality of change to winter sleep. At 82° F. the cricket makes eighty-nine calls per minute; at 68° F. it makes thirty-eight; at 58° F. it makes twenty. Below that it falls off sharply. No *Orthoptera* survives the winter as an adult, but rather in another state as an egg or young nymph.

Ants and termites do winter-over as adults, dormant and consuming only half the oxygen they do in summer. However, at any rise in temperature, they can become active, which you may have observed if you cut trees in midwinter. Among wasps only the queens survive and hibernate. Among the bees — always the exception among the lower animals — the hive forms a ball and creates its own warmth by continual movement.

Beetles and butterflies enter the dormant state most often in the form of pupa or chrysalis, though beetles often winter-over as adults. The image of the chrysalis is not only a transient stage of dormancy, but a transformative state of continuing development. It is the image of a special kind of sleep, which is not a stupor in response to environmental adversity, but a dissolving of a past form so that something new can arise. The shape of the chrysalis, particularly those of the beetles, reminds me of a decorated Egyptian mummy — a different kind of sleep, to be sure! Still, it is strongly evocative of something *we* go through, a symbol of something which involves us.

Snails and mussels become immobile at low temperatures and take in very little oxygen. Fish, on the other hand, thrive at temperatures which are impossible for other coldblooded animals. However, they do become less mobile below 40° F. At 57° F. they breathe sixty to eighty times per minute; at 38° F. they

breathe thirty to forty times per minute. If the winter is terribly long, however, the oxygen supply in a frozen pond can be depleted and the fish can suffocate.

Amphibians have a clear winter cycle. After a certain time in autumn they refuse food, do not move and cease to shed their skins. Frogs rise up and down with precision according to temperature. Below 50°F. they seek the bottom. Below 41°F. they do not move. Frogs regularly survive freezing nearly solid. So long as the deep blood vessels and the heart are not frozen solid, they revive quite easily. In early fall, amphibians fill a fat body near the kidney which provides enough heat to prevent the heart from freezing. Tadpoles, however, which still belong to the fish stage, do not even need that small amount of emancipation from the yearly cycle to survive. They swim very late into the winter.

Snakes, like frogs, can stand long periods of being partly frozen. In a sheltered place they can withstand a temperature of 32°F. so long as there is no wind chill. All turtles are air-breathers, though some water turtles have an air bladder; in dormancy, however, all turtles can live in the bottom of a pond without breathing for three months or more.

Birds are the first conspicuous non-hibernators. Those that cannot bear the cold leave the area. The birds which remain are remarkable for their alertness. They eat the dormant insects, which comprise 88% of their diet. They are the first animals to carry independent warmth within themselves. To do so, they have a tremendous rate of metabolism. This warmth separates them from the cold water and cold air: to a certain extent, these elements become a separate world within them, an inner world of warmth and light.

Most of the higher animals do not hibernate, but true to the general tendency in nature maintain a certain degree of emancipation from seasonal changes. They respond to the change, their metabolism changes, but they do not identify with change as fully as the lower animals do.

Bats, however, go into a remarkable torpor during the winter, though they can awaken on warm days. Their breathing during summer is two hundred respirations per minute or three per second. In winter they vacillate from one breath every three minutes to sometimes twenty-three breaths a minute. Bat breathing is a phenomenon unto itself! Their body temperature ranges from 31°F. to 48°F. Bats are able to unfold from their

deep sleep, fly around in a few circles and then return to hibernate once again.

Bears, skunks and racoons are intermittent sleepers as well. Bears provide a remarkable image of winter sleep. They mate in early summer. The cubs are born during dormancy in mid-January. The she-bear suckles them while asleep. She breathes five times per minute and is in a state of hypothermia (85° F.). Male bears, however, are often seen ranging out in midwinter.

The awakening from winter sleep of mammals like the woodchuck is very dramatic. It is very like the spring itself. For such sluggish little animals, they literally burst into life. You may recall that at 39° F their hearts beat five times per minute. Their normal heartbeat (at 70° F. outside temperature) is seventy-five beats per minute. When they awaken in spring, however, a floodgate is opened! The heart surges into life at two hundred beats per minute; body heat rises live a fever, from a consumption of twenty-seven calories to four thousand calories per day for an average size woodchuck (an average person consumes around 2500 calories per day). Nor is external temperature the cue for this activity. It can be below freezing outside — the force of the year is in them. Is this why people consider them to be a reflection of the severity of the winter?

Now we can look again at the human being. It's clear — whether we are in this hall or in a disco — that the force of the year is not in us. When people were undisturbed peasants, they lived a more natural rhythm. More and more we do not. Destructive non-natural rhythms enter into our life, but so also do constructive non-natural rhythms. Even when we become natural farmers we realize it is not the same as it used to be. Rob Johnston in his *Johnny's Selected Seeds* writes: "Agriculture, the intentional concentration of food production, is inherently un-natural. Likewise — more or less — is human life style."

This begs the question as to what forms of human life — which will never, like the woodchuck's, be exactly the same as the cycle of the year — may yet be deeply, differently compatable with the yearly rhythm. T.S. Eliot was aware that culture was slipping into a sub-human stupor. Listen to these lines from "The Love Song of J. Alfred Prufrock":

> Let us go then, you and I,
> When the evening is spread out against the sky
> Like a patient etherized upon a table;

Again a sunset, but a deeply distasteful, humanly indifferent

image. So here we have a patient etherized, a woodchuck changed from a warm-blooded to a cold-blooded animal, a woman whose inner experience is only the outer cold.

Yet, while one woman was lying in a state of hypothermia, reduced to a "hibernating animal," another was as far above waking consciousness as the sleeper was below it. "She had made herself completely at one with the Imaginative world." It is just at Michaelmas that such pictures must be experienced as the counterpole to the dying of nature in Autumn. Let us return, then, to the two women we met at the beginning of this paper, after they have endured a night on that arctic landscape.

> In awakening she could see that night had passed. Once more she was surrounded by the snow-covered landscape, before her the shore with floating icebergs, the trees with their hanging icicles. But as she awoke she observed that the other woman was lying beside her, stiff with the cold she had endured. This woman had not been inwardly warmed by taking with her the impression of the landscape's beauty. The first woman, who had passed through all these experiences during the night, now observed that the other woman who was almost frozen because she could not experience anything in the spiritual world, was human knowledge! And she took her to herself to pass on some of her own warmth. She protected and cared for her, and the other woman grew warm through the impression of all that had been brought from her experiences during the night.
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> Dawn rose from the east over the landscape, proclaiming the coming of the sun. The red of the dawn grew stronger and the soul of the woman, who had passed through the experiences of the night, was now fully awake . . . She now understood that she would have to rescue the science that had become half-frozen. She learned that she had to warm it and permeate it with all that she had herself become: bringing first what she was as Art . . . And she observed how, with the speed of the wind, what has been half-frozen can return to life when science takes what she can give into its knowledge.

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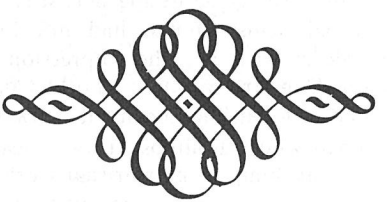

In the eye of the soul is mirrored
The light of hope of the Earth.
Holy wisdom of worlds
Speaks in the heart of Man:
The father's eternal Love
Sends to the Earth the Son,
Who on Man's pathway sheds
Bounty of Heaven's Light.

Rudolf Steiner