



LOST WOODS

*The
Discovered
Writing
of*
RACHEL CARSON

“Lyric, descriptive,
informative, and moving.”

—BILL SHARP,

The New York Times Book Review

Edited and with an Introduction by Linda Lear

Lost Woods

The Discovered Writing of Rachel Carson

EDITED AND WITH AN INTRODUCTION BY

LINDA LEAR

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To my loving husband
John W. Nickum, Jr.

and

With gratitude to
Ruth Brinkmann Jerome
and
Ruth Jury Scott
whose lives have so richly blessed my own

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Clouds

TELEVISION WAS A NEW MEDIUM for writers in the 1950s, and Carson was not initially enamored of its creative merits. She did, however, recognize television's potential educational value.

When the idea for a show on clouds was proposed by an eight-year-old viewer of the CBS show *Omnibus* who wanted to see a program on "something about the sky," the Ford Foundation's TV-Radio Workshop approached Carson to write a television script on clouds. She agreed to collaborate with the *Omnibus* producer and with meteorologist Vincent Schaefer, who had discovered the process of cloud seeding and whose film footage formed the cinematic basis of the show. Her objective was to change the popular conception that cloud types and formations had no particular scientific significance, and to provide an awareness of a dynamic process that linked clouds to the broader web of life. The resulting script was vintage Carson, with an emphasis on the long journey of wind and water in a constantly renewing and unending cycle. This venture deeper into the science of weather and climate renewed her interest in writing on the subject of global climate change.

"Something about the Sky" aired on CBS *Omnibus* on March

11, 1957, and Carson and her family gathered around her brother's television set to watch her first successful endeavor in an unfamiliar medium. Several days later, Carson capitulated and bought her own television set.

I. Introduction

(Clouds drifting by, of various types, but all in motion)

☞ AMONG THE EARLIEST MEMORIES of each of us are the images of clouds drifting by overhead, fleecy, fair-weather clouds promising sunny skies – storm clouds bringing portents of rain or snow.

The farmer plowing his field reads the weather language of the sky.

So does the fisherman at sea, and all others who live openly on the face of the earth.

In those of us who live in cities, awareness of the clouds has perhaps grown dim; and even those who live in open country may think of them only as a beautiful backdrop for a rural scene, or an ominous reminder to carry an umbrella today.

The clouds are as old as the earth itself – as much a part of our world as land or sea.

They are the writing of the wind on the sky.

They carry the signature of the masses of air advancing toward us, across sea or land.

They are the aviator's promise of good flying weather, or an omen of turbulent air.

Most of all they are the cosmic symbols of a process without which life itself could not exist on earth.

II. The Ocean of Air

Today we are going to look at clouds as perhaps we have never looked at them before.

We are going to pretend we live on the bottom of an ocean – an ocean of air in which clouds are adrift – just as sponges and coral and spidery crabs inhabit the floor of the water ocean.

But it will not be hard to pretend that, for in fact that is just what we do. In relation to the air ocean, we are exactly like deep-sea fishes, with all the weight of tons of air pressing down upon our bodies.

And there are other similarities.

Our world is divided into three parts: earth, sea, and air.

Out there is the ocean of water – familiar, though always mysterious.

Its greatest depths lie 7 miles down.

From surface to bottom pressure increases, from 35 pounds to the square inch at the surface to 7¹/₂ tons in the greatest depths.

Waves move across it. Great currents flow through it like rivers.

Up there is another ocean – the air ocean that envelops the whole globe.

Its depth, from airless space down to where it touches earth, is some 600 miles.

Like the water ocean, its substance becomes more dense from surface to bottom. Only the lowermost layers are dense enough to support life.

Living on the bottom of this ocean of air, we support on our bodies a pressure of about a ton to the square foot of surface.

In this lower layer, too, clouds are born and die.

Like the sea, the atmospheric ocean is a place of movement and turbulence, stirred by the movements of gigantic waves—torn by the swift passage of winds that are like ocean currents.

Now that we are learning to read the language of the sky, we can interpret much of the structure of our air ocean by looking at the pattern of the clouds.

Look, for instance, at this ribbed pattern of high clouds.

Remember that they are perhaps 8 or 10 miles above us, and so the cloud bands that look rather close together are in reality perhaps 20 miles apart.

Like white caps on the crests of ocean waves, these clouds mark the crests of gigantic atmospheric waves—waves surging through space in an undulating pattern.

The bands of cloud mark the upsurges of condensation; the wave troughs of blue sky, the warmer air valleys of evaporation.

Clouds give other clues to the unseen structure of the ocean of air.

Aviators know the danger of flying in mountainous country, where savage downdrafts in the lee of high peaks may suddenly snatch a plane out of the sky.

The science of clouds is now showing how warning signals are hung out in the sky for all to read them.

When strong winds strike a mountain, the atmosphere up to a height of thousands of feet above the land is thrown into a strong wave motion which extends out over miles of valley on the lee side.

Clouds form on the crests of these atmospheric waves—the strange, almond-shaped lenticular cloud.

So mobile it seems a living thing, the cloud nevertheless maintains its fixed position at the crest of the air waves,

neatly balancing condensation and evaporation, built up on the windward side and eaten away on the lee side.

Lenticular clouds scattered out over the valley on the lee side of a mountain range are signs to the pilot of dangerous turbulence.

Here again the clouds are writing a story of violent movement within the atmosphere.

Winds that rush down mountain slopes are known the world over –

the foehn wind of the Alps – the chinook of the Rockies – the zonda of the Andes.

As moist air is carried up and over a mountain peak by strong winds, cloud is formed and pours over the crest of the mountain like a waterfall – the foehn wall or foehn cloud.

Here again the flier who can read the clouds stays clear.

These are among the spectacular features of the aerial drama – to which we shall later return. But meanwhile, what of the basic meaning of the clouds – what is their role in the life of the earth?

For us, as living creatures, they are one of the reasons we are men instead of fishes. As land creatures, we must have water.

Without clouds, all water would remain forever in the sea, from which our early ancestors emerged 300 million years ago.

Without the miracle of clouds and rain, the continents would have remained barren and uninhabited, and perhaps life would never have evolved beyond the fishes.

III. The Water Cycle

Almost all of the earth's water is contained in the oceans that encircle the globe – all but a mere three percent.

But to us, inhabitants of the land, that three percent is vital.

It is engaged in a never-ending cycle of exchange:

from sea to air – from air to earth – from earth to sea.

Water from the sea is constantly being brought to the land.

There it makes possible the existence of plants and animals.

There, in streams and rivers, it carves and molds the face of the land, cutting valleys, wearing away hills.

Over all the vast surfaces of the ocean, stirred and broken by the wind, molecules of water vapor are escaping into the overlying air.

This occurs everywhere to some extent, but in the warm tropical seas on each side of the Equator – the belt where the Trade Winds blow – the escape of water vapor into the air is tremendous.

The warm, moist air rises; in the cooler air aloft it condenses.

Processions of woolly cumulus clouds are set drift in the trade wind.

The moisture in these clouds may fall as rain and be recondensed several times, but it eventually becomes part of the vast circulation of the upper atmosphere –

drifting over the continents –

embodied in the clouds that day after day move from horizon to horizon.

Then in a drama of turbulence and change hidden within the heart of the clouds, the water vapor begins to return to the liquid state – begins to drop earthward with increasing momentum.

Rain falls on the earth –

the end of a long journey that began in a tropical sea;

yet in a constantly renewing cycle there is no end,
as there is no beginning.

Stage succeeds stage, turning again and again upon itself
like a wheel.

Or, in the cold regions, snow –

a deep, soft, sound-absorbing blanket bringing a great quiet
to the earth; storing moisture that will be released gradually
to the thirsty land.

From the run-off of high ground – from melting snowfields and
glaciers,

the water finds its way to the streams:

the noisy hill streams tumbling over rocky beds –

the quietly rolling waters of the valleys and plains –

all to return at last to the sea.

Sometimes the process is marked by the violence of storms

sometimes Nature indulges in the wild fury of floods –

But often the cycle brings us nothing more troublesome than a

gentle April rain – and always it is in the main a beneficent

process,

bringing the continents to life.

IV. Cloud Forms

What of the clouds themselves – the aerial agents of this cosmic
process?

Someone has said that without the gift of sight, one could

never imagine clouds – their beauty, their ever-changing

shapes, their infinite variety of form.

STRATUS

Rolling, swirling along the floor of the air ocean are the lowest
clouds of all – fog.

For fog is nothing but a stratus cloud so near the earth that sometimes it touches it.

Fog may shut down quickly over a clear autumn night when the air over the land loses its heat by rapid evaporation into the open sky.

Such a fog is a shallow one; though we earth-bound mortals grope blindly through it, the tops of tall trees may clear it, and in the morning the sun quickly burns it away.

Fog of a different sort forms when warm sea air rolls in over colder coastal waters and over the land –
 shutting down harbors –
 grounding planes –
 isolating ships at sea with its soft grey swirling mists.

When a fog drifts at a height of a thousand feet or so, forming the aviator's "ceiling," it is really a layer cloud called stratus.

As we fly above it, it is a veil through which the earth is seen dimly, like the shallow bottom of a bay when one looks down from an idling skiff.

Or it may stretch away to the plane's horizon like a monotonous Arctic icefield.

Compared with the high-drifting cirrus wisps and the soaring columns of the cumulus, the stratus clouds are the duller earthlings – coarse-textured clouds formed of large water droplets.

CUMULUS

Most beautiful in the infinite variety of their shapes are the cumulus clouds.

These are also the clouds that generate the most incredible violence known on earth – for beside the power of a tornado or a hurricane even the atomic bomb is insignificant.

The birth of a cumulus cloud is relatively peaceful and simple.

As the earth warms under the morning sun, it heats unevenly.

Invisible columns of warm air begin to rise – from a plowed field, a lake, a town – any area warmer than its surroundings.

The column of rising air contains invisible molecules of water vapor drawn from vegetation, evaporated from the surface of earth or water.

Such warm air can hold quantities of water in the vapor state.

Rising, it cools; at a certain point it can no longer contain its water invisibly; and the white misty substance of a cloud is born.

Broad-winged birds like hawks and eagles find these soaring “thermals” and ride them for hours.

Glider pilots seek them out, locating them by the clouds at their summits.

Polynesian navigators steering across the South Pacific from atoll to atoll, find their way by the cloud rising like a kite from each pinpoint of warm land.

Most cumulus clouds have straight-edge bases, as though evened off by the stroke of a cosmic knife – but the shaping blade is the altitude that marks a sharp change to cooler temperature – below this line the air column holds its vapor invisibly – once above it, all the water molecules blossom, through condensation, into the fabric of a cloud.

In regions of very warm, moist air, the atmosphere is in the power of highly unstable forces.

Then a cumulus cloud puffs up and up to extraordinary heights.

When the tornado of June 9th, 1953, approached the city of

Worcester, Mass., observers at MIT reported that the clouds towered right off the radar screens, which could register only to altitudes of 50,000 feet.

Even higher clouds are known from the true tornado country of the middle west –

70,000-foot giants more than twice as high as Everest.

CIRRUS

Most ethereal and fragile of all are the high-floating wisps of cirrus, drifting just under the stratosphere.

If we could approach them closely in an airplane we would find them glittering in iridescent splendor like the dust of diamonds.

Up in these substratospheric vaults of sky, from which the earth looks like the sphere it is, there is a hard, bitter cold, far below zero, summer and winter.

So the cirrus clouds are composed of minute crystals of ice –

the merest specks of substance, so thinly spread through the sky that not more than 2 or 3 occupy a cubic inch of space.

It is the high-riding cirrus that first beholds the sunrise, or in evening holds the light of sunset longest, reflecting back to the dark earth the splendor of a light no longer visible – the rose and gold, the wine and scarlet of the sun.

The cirrus clouds are the birthplace of the snow, slowly cascading down to earth in long, curving streaks as the crystals fall behind the swift winds of the upper sky.

Halos seen around the sun or moon are the ice crystals of a cirrus veil called cirro-stratus.

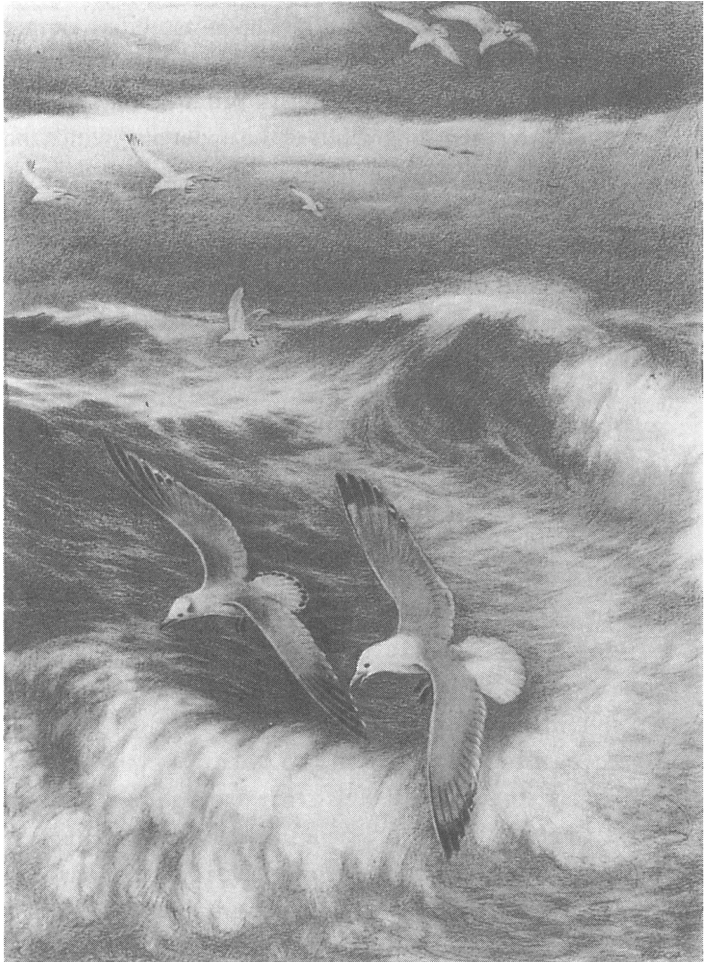
Like the lower clouds, cirrus is formed of water vapor that is drawn from the sea and pumped aloft in the swift updrafts

of cumulus clouds – or that rides up an ascending elevator of warm air slipping over a cold front.

Sometimes cirrus is born of material torn from the top of high cumulus by the strong winds of the upper air – winds that tear off the crests of the clouds as, at sea, a gale blows off the wave crests and sends the spindrift scudding away over the water.

Sweeping curls of cirrus indicate the passage overhead of a rushing current of air, pouring through the sky at a speed of two or three hundred miles an hour. [. . .]

Ed.: Carson ends the script with the story of jet streams, the strongest of all winds, and conjectures that the forces that direct the jet stream will be “found in the far depths of the sky [and] written in the clouds.”



Part Four



Part Four covers the period 1959–1963. During that time Carson was occupied with either writing or defending Silent Spring, which she had initially titled “The Control of Nature” when she began her research in the fall of 1957. It took nearly five years for her to gather evidence, synthesize, and shape the enormous body of scientific literature into a compelling indictment against the flagrant misuse of synthetic chemical pesticides, and the folly of trying to conquer nature.

Included in Part Four are three of Carson’s most important public speeches, as notable for their clarity of language as for their expression of her convictions about both the dangers of pollution and the interconnectedness of life. Attacks on Carson and her work increased after 1962, and she answered her critics with a calm but compelling analysis and unexpected political insight. Carson had attacked the integrity of the scientific establishment, its moral leadership, and its direction of society. She exposed their self-interest as well as their poor science, and defended the public’s right to know the truth.


At the same time as Carson carried out her public crusade she was fighting an even graver private adversary. Diagnosed with an aggressively metastasizing breast cancer in 1961, she defended the earth she loved with an added passion born of knowing that her opportunities to speak out were now limited. Part Four ends with letters to her physician and to her dearest friend.

Vanishing Americans

CARSON HAD BEEN WORKING *on the book that became* *Silent Spring* for nearly two years when the *Washington Post* published an editorial commenting on a recent *National Audubon Society* report describing the effects of an unusually harsh winter on migrating birds in the South. Knowing that climate variations explained only a small part of the population decline, Carson wrote exposing the role the widespread use of toxic chemicals played in “silencing the birds.” Her focus on birds offered a good opportunity to gauge the public’s awareness of the pesticide problem.

Her letter, published in the newspaper a week later, provided the first clue that Rachel Carson was studying the subject of synthetic pesticides. She was gratified when the public response to her article testified to an intense interest in the subject.

An added benefit of the publication of Carson’s letter was the support of the *Washington Post* owner Agnes Meyer and of activist Christine Stevens, president of the *Animal Welfare Institute* in New York. Both women subsequently became influential advocates of Carson’s work.

 YOUR EXCELLENT MARCH 30 EDITORIAL, “Vanishing Americans,” is a timely reminder that in our modern world nothing may be taken for granted – not even the spring songs that herald the return of the birds. Snow, ice and cold, especially when visited upon usually temperate regions, leave destruction behind them, as was clearly brought out in the report of the National Audubon Society you quote.

But although the recent severe winters in the South have taken their toll of bird life, this is not the whole story, nor even the most important part of the story. Such severe winters are by no means rare in the long history of the earth. The natural resilience of birds and other forms of life allows them to take these adverse conditions in their stride and so to recover from temporary reduction of their populations.

It is not so with the second factor, of which you make passing mention – the spraying of poisonous insecticides and herbicides. Unlike climatic variations, spraying is now a continuing and unremitting factor.

During the past 15 years, the use of highly poisonous hydrocarbons and of organic phosphates allied to the nerve gases of chemical warfare has built up from small beginnings to what a noted British ecologist recently called “an amazing rain of death upon the surface of the earth.” Most of these chemicals leave long-persisting residues on vegetation, in soils, and even in the bodies of earthworms and other organisms on which birds depend for food.

The key to the decimation of the robins, which in some parts of the country already amounts to virtual extinction, is their reliance on earthworms as food. The sprayed leaves with their load of poison eventually fall to become part of the leaf litter of the soil; earthworms acquire and store the poisons through feeding on the leaves; the following spring the returning robins

feed on the worms. As few as 11 such earthworms are a lethal dose, a fact confirmed by careful research in Illinois.

The death of the robins is not mere speculation. The leading authority on this problem, Professor George Wallace of Michigan State University, has recently reported that "Dead and dying robins, the latter most often found in a state of violent convulsions, are most common in the spring, when warm rains bring up the earthworms, but birds that survive are apparently sterile or at least experience nearly complete reproductive failure."

The fact that doses that are sub-lethal may yet induce sterility is one of the most alarming aspects of the problem of insecticides. The evidence on this point, from many highly competent scientists, is too strong to question. It should be weighed by all who use the modern insecticides, or condone their use.

I do not wish to leave the impression that only birds that feed on earthworms are endangered. To quote Professor Wallace briefly: "Tree-top feeders are affected in an entirely different way, by insect shortages, or actual consumption of poisoned insects. [. . .] Birds that forage on trunks and branches are also affected, perhaps mostly by the dormant sprays." About two-thirds of the bird species that were formerly summer residents in the area under Professor Wallace's observation have disappeared entirely or are sharply reduced.

To many of us, this sudden silencing of the song of birds, this obliteration of the color and beauty and interest of bird life, is sufficient cause for sharp regret. To those who have never known such rewarding enjoyment of nature, there should yet remain a nagging and insistent question: If this "rain of death" has produced so disastrous an effect on birds, what of other lives, including our own?

To Understand Biology/ Preface to *Animal Machines*

CARSON AGREED TO CONTRIBUTE *an introduction for the Animal Welfare Institute's educational booklet, Humane Biology Projects, which addressed the need for reform of biology instruction in the nation's high schools. The Institute opposed animal experimentation and worked to change the callous attitude toward systematic cruelty that often accompanied classroom biology projects.*

A. w. i. head Christine Stevens was also instrumental in introducing Carson to the work of British activist Ruth Harrison, whose book Animal Machines exposed the inhumane methods of raising livestock and the deplorable conditions in which they were kept before slaughter. In 1963 Carson wrote the preface to Harrison's book.

Carson's ideas about the humane treatment of animals place her fully in the tradition of Albert Schweitzer and his philosophy of the reverence for life. Her contributions to these publications emphasize the unity of all life, and the need to cultivate an emotional response to the living world.

Through the next several years Carson quietly aided the work of

Stevens and the Animal Welfare Institute, writing to members of Congress in support of legislation banning the use of certain leg traps and against the inhumane treatment of laboratory animals. But she had to be careful not to draw too much attention to her support for causes that might link her in the public mind with fringe groups and extremists, lest she jeopardize her all-important work concerning the misuse of pesticides. Had this not been a real political consideration, Carson undoubtedly would have been an outspoken advocate of the humane treatment of animals.


To Understand Biology

✎ I LIKE TO DEFINE BIOLOGY as the history of the earth and all its life – past, present, and future. To understand biology is to understand that all life is linked to the earth from which it came; it is to understand that the stream of life, flowing out of the dim past into the uncertain future, is in reality a unified force, though composed of an infinite number and variety of separate lives. The essence of life is lived in freedom. Any concept of biology is not only sterile and profitless, it is distorted and untrue, if it puts its primary focus on unnatural conditions rather than on those vast forces not of man's making that shape and channel the nature and direction of life.

To the extent that it is ever necessary to put certain questions to nature by placing unnatural restraints upon living creatures or by subjecting them to unnatural conditions or to changes in their bodily structure, this is a task for the mature scientist. It is essential that the beginning student should first become acquainted with the true meaning of his subject through observing the lives of creatures in their true relation to each other and to their environment. To begin by asking him to observe artifi-

cial conditions is to create in his mind distorted conceptions and to thwart the development of his natural emotional response to the mysteries of the life stream of which he is a part. Only as a child's awareness and reverence for the wholeness of life are developed can his humanity to his own kind reach its full development.

Preface to Animal Machines

 THE MODERN WORLD worships the gods of speed and quantity, and of the quick and easy profit, and out of this idolatry monstrous evils have arisen. Yet the evils go long unrecognized. Even those who create them manage by some devious rationalizing to blind themselves to the harm they have done society. As for the general public, the vast majority rest secure in a childlike faith that "someone" is looking after things—a faith unbroken until some public-spirited person, with patient scholarship and steadfast courage, presents facts that can no longer be ignored.

This is what Ruth Harrison has done. Her theme affects practically every citizen, for it deals with the new methods of rearing animals destined to become human food. It is a story that ought to shock the complacency out of any reader.

Modern animal husbandry has been swept by a passion for "intensivism"; on this tide everything that resembles the methods of an earlier day has been carried away. Gone are the pastoral scenes in which animals wandered through green fields or flocks of chickens scratching contentedly for their food. In their place are factorylike buildings in which animals live out their wretched existences without ever feeling the earth beneath their feet, without knowing sunlight, or experiencing the simple

pleasures of grazing for natural food – indeed, so confined or so intolerably crowded that movement of any kind is scarcely possible. [. . .]

As a biologist whose special interests lie in the field of ecology, or the relation between living things and their environment, I find it inconceivable that healthy animals can be produced under the artificial and damaging conditions that prevail in these modern and factorylike installations, where animals are grown and turned out like so many inanimate objects. The intolerable crowding of broiler chickens, the revoltingly unsanitary conditions in the piggeries, the lifelong confinement of laying hens in tiny cages are samples of the conditions Mrs. Harrison describes. As she makes abundantly clear, this artificial environment is not a healthy one. Diseases sweep through these establishments, which indeed are kept going only by the continuous administration of antibiotics. Disease organisms then become resistant to the antibiotics. Veal calves, purposely kept in a state of induced anemia so their white flesh will satisfy the supposed desires of the gourmet, sometimes drop dead when taken out of their imprisoning crates.

The question then arises: how can animals produced under such conditions be safe or acceptable human food? Mrs. Harrison quotes expert opinion and cites impressive evidence that they are not. Although the quantity of production is up, quality is down, a fact recognized in a most significant way by some of the producers themselves, who, for example, are more likely to keep a few chickens in the back yard for their own tables than to eat the products of the broiler establishments. The menace to human consumers from the drugs, hormones, and pesticides used to keep this whole fantastic operation somehow going is a matter never properly explored.

The final argument against the intensivism now practiced in

this branch of agriculture is a humanitarian one. I am glad to see Mrs. Harrison raise the question of how far man has a moral right to go in his domination of other life. Has he the right, as in these examples, to reduce life to a bare existence that is scarcely life at all? Has he the further right to terminate these wretched lives by means that are wantonly cruel? My own answer is an unqualified no. It is my belief that man will never be at peace with his own kind until he has recognized the Schweitzerian ethic that embraces decent consideration for all living creatures – a true reverence for life.

Although Mrs. Harrison's book describes in detail only the conditions prevailing in Great Britain, it deserves to be widely read also in those European countries where these methods are practiced, and in the United States where some of them arose. Wherever it is read it will certainly provoke feelings of dismay, revulsion, and outrage. I hope it will spark a consumers' revolt of such proportions that this vast new agricultural industry will be forced to mend its ways.

A Fable for Tomorrow

THE BRIEF FABLE *with which Carson opens Silent Spring is one of the most memorable in contemporary nonfiction and elicited more controversy than almost any other part of the book. Many scientists were appalled that Carson dared begin a book about the science of chemical pesticides with an allegory about the environmental pollution of an imaginary town. Some simply ignored the fact that it was a fable and attacked Carson because the town was not accurately described, while others accused her of writing science fiction throughout. By contrast, most literary critics praised her use of the fable as a brilliant rhetorical device and a creative way of introducing the disturbing subject of the deliberate poisoning of the earth.*

Carson realized her first chapter, originally titled "The Rain of Death," might be too formidable and used the fable as a device to engage the nonscientific reader. In early drafts, Carson gave her town a name, Green Meadows, and centered the action on a young man who returns home after many years only to find his town devastated by ecological havoc. At the urging of her publisher, she rewrote the fable making it clear that the town was a composite of

many communities and became the voice of the fable's narrator. The opening paragraphs recall the once bucolic town of Springdale, Pennsylvania, where Carson grew up, which was subjected to an earlier kind of industrial pollution.

❧ THERE WAS ONCE A TOWN in the heart of America where all life seemed to live in harmony with its surroundings. The town lay in the midst of a checkerboard of prosperous farms, with fields of grain and hillsides of orchards where, in spring, white clouds of bloom drifted above the green fields. In autumn, oak and maple and birch set up a blaze of color that flamed and flickered across a backdrop of pines. Then foxes barked in the hills and deer silently crossed the fields, half hidden in the mists of the fall mornings.

Along the roads, laurel, viburnum and alder, great ferns and wildflowers delighted the traveler's eye through much of the year. Even in winter the roadsides were places of beauty, where countless birds came to feed on the berries and on the seed heads of the dried weeds rising above the snow. The countryside was, in fact, famous for the abundance and variety of its bird life, and when the flood of migrants was pouring through in spring and fall people traveled from great distances to observe them. Others came to fish the streams, which flowed clear and cold out of the hills and contained shady pools where trout lay. So it had been from the days many years ago when the first settlers raised their houses, sank their wells, and built their barns.

Then a strange blight crept over the area and everything began to change. Some evil spell had settled on the community: mysterious maladies swept the flocks of chickens; the cattle and sheep sickened and died. Everywhere was a shadow of death. The farmers spoke of much illness among their families. In the

town the doctors had become more and more puzzled by new kinds of sickness appearing among their patients. There had been several sudden and unexplained deaths, not only among adults but even among children, who would be stricken suddenly while at play and die within a few hours.

There was a strange stillness. The birds, for example – where had they gone? Many people spoke of them, puzzled and disturbed. The feeding stations in the backyards were deserted. The few birds seen anywhere were moribund; they trembled violently and could not fly. It was a spring without voices. On the mornings that had once throbbed with the dawn chorus of robins, catbirds, doves, jays, wrens, and scores of other bird voices there was now no sound; only silence lay over the fields and woods and marsh.

On the farms the hens brooded, but no chicks hatched. The farmers complained that they were unable to raise any pigs – the litters were small and the young survived only a few days. The apple trees were coming into bloom but no bees droned among the blossoms, so there was no pollination and there would be no fruit.

The roadsides, once so attractive, were now lined with browned and withered vegetation as though swept by fire. These, too, were silent, deserted by all living things. Even the streams were now lifeless. Anglers no longer visited them, for all the fish had died.

In the gutters under the eaves and between the shingles of the roofs, a white granular powder still showed a few patches; some weeks before it had fallen like snow upon the roofs and the lawns, the fields and streams.

No witchcraft, no enemy action had silenced the rebirth of new life in this stricken world. The people had done it themselves.

This town does not actually exist, but it might easily have a thousand counterparts in America or elsewhere in the world. I know of no community that has experienced all the misfortunes I describe. Yet every one of these disasters has actually happened somewhere, and many real communities have already suffered a substantial number of them. A grim specter has crept upon us almost unnoticed, and this imagined tragedy may easily become a stark reality we all shall know.

What has already silenced the voices of spring in countless towns in America? This book is an attempt to explain.

Women's National Press Club Speech

SILENT SPRING WAS SERIALIZED in three summer issues of the *New Yorker* in 1962 and published in late September. The high level of public interest that surrounded the book included notice by President John F. Kennedy, who convened a special panel of the President's Science Advisory Committee to look into the problem, the introduction of legislation in several states seeking to halt the spraying of pesticides without citizen notification, and general uproar in the agricultural chemical industry and among government scientists.

Carson took many of her critics in stride, but she could not abide those that damned the book without having read it. As debate grew more acrimonious in the fall of 1962, Carson's public remarks grew sharper, culminating in her appearance at the Women's National Press Club in December. In this speech, Carson attacked the smugly self-satisfied chemical industry and exposed their counterparts in industry-funded research institutions.

With national television cameras rolling, Carson charged that basic scientific truths were being compromised "to serve the gods of profit and production."

❧ MY TEXT THIS AFTERNOON is taken from the *Globe Times* of Bethlehem, Pa., a news item in the issue of October 12. After describing in detail the adverse reactions to *Silent Spring* of the farm bureaus in two Pennsylvania counties, the reporter continued: “No one in either county farm office who was talked to today had read the book, but all disapproved of it heartily.”

This sums up very neatly the background of much of the noisier comment that has been heard in this unquiet autumn following the publication of *Silent Spring*. In the words of an editorial in the *Bennington Banner*, “The anguished reaction to *Silent Spring* has been to refute statements that were never made.” Whether this kind of refutation comes from people who actually have not read the book or from those who find it convenient to misrepresent my position I leave it to others to judge.

Early in the summer—as soon as the first installment of the book appeared in the *New Yorker*—public reaction to *Silent Spring* was reflected in a tidal wave of letters—letters to Congressmen, to newspapers, to Government agencies, to the author. These letters continue to come and I am sure represent the most important and lasting reaction.

Even before the book was published, editorials and columns by the hundred had discussed it all over the country. Early reaction in the chemical press was somewhat moderate, and in fact I have had fine support from some segments of both chemical and agricultural press. But in general, as was to be expected, the industry press was not happy. By late summer the printing presses of the pesticide industry and their trade associations had begun to pour out the first of a growing stream of booklets designed to protect and repair the somewhat battered image of pesticides. Plans are announced for quarterly mailings to opinion leaders and for monthly news stories to newspapers, maga-

zines, radio, and television. Speakers are addressing audiences everywhere.

It is clear that we are all to receive heavy doses of tranquilizing information, designed to lull the public into the sleep from which *Silent Spring* so rudely awakened it. Some definite gains toward a saner policy of pest control have been made in recent months. The important issue now is whether we are to hold and extend those gains.

The attack is now falling into a definite pattern and all the well-known devices are being used. One obvious way to try to weaken a cause is to discredit the person who champions it. So the masters of invective and insinuation have been busy: I am a "bird lover – a cat lover – a fish lover" – a priestess of nature – a devotee of a mystical cult having to do with laws of the universe which my critics consider themselves immune to.

Another piece in the pattern of attack largely ignores *Silent Spring* and concentrates on what I suppose would be called the soft sell, the soothing reassurances to the public. Some of these acknowledge the correctness of my facts, but say that the incidents I reported occurred some time in the past, that industry and Government are well aware of them and have long since taken steps to prevent their recurrence. It must be assumed that the people who read these comforting reports read nothing else in their newspapers. Actually, pesticides have figured rather prominently in the news in recent months: some items trivial, some almost humorous, some definitely serious.

These reports do not differ in any important way from the examples I cited in *Silent Spring*, so if the situation is under better control there is little evidence of it.

What are some of the ways pesticides have made recent news?

1. The *New York Post* of October 12 reported the seizure by the Food and Drug Administration of more than a quarter of a million pounds of potatoes – 346,000 pounds to be exact – in the Pacific Northwest. Agents said they contained about 4 times the permitted residues of aldrin and dieldrin.
2. In September, Federal investigators had to look into the charge that vineyards near the Erie County thruway had been damaged by weed-killer chemicals sprayed along the highway. Similar reports came from Iowa.
3. In California, fumes from lawns to which a chemical had been applied were so obnoxious that the fire department was called to drench the lawns with water. Thereupon the fumes increased so greatly that 11 firemen were hospitalized.
4. Last summer the newspapers widely reported the story of some 5000 Turkish children suffering from an affliction called *porphyria* characterized by severe liver damage and the growth of hair on face, hands, and arms, giving a monkey-like appearance to victims. This was traced to the consumption of wheat treated with a chemical fungicide. The wheat had been intended for planting, rather than for direct consumption. But the people were hungry and perhaps did not understand the restriction. This was an unplanned occurrence in a far part of the world but it is well to remember that large quantities of seed are similarly treated here.
5. You will remember that the bald eagle, our national emblem, is seriously declining in numbers. The Fish and Wildlife Service recently reported significant facts that may explain why this is so. The Service has determined experimentally how much DDT is required to kill an eagle. It has also discovered that eagles found dead in the wild have lethal doses of DDT stored in their tissues.
6. This fall also, Canadian papers carried a warning that

woodcock being shot during the hunting season in New Brunswick were carrying residues of heptachlor and might be dangerous if used as food. Woodcock are migratory birds. Those that nest in New Brunswick winter in the southern United States, where heptachlor has been used extensively in the campaign against the fire ant. The residues in the birds were 3 to 3.5 ppm. The legal tolerance for heptachlor is ZERO.

7. Biologists of the Massachusetts Fish and Game Department have recently reported that fish in the Framingham Reservoir on the outskirts of Boston contain DDT in amounts as high as 75 ppm, or more than 10 times the legal tolerance. This is, of course, a public water supply for a large number of people.

8. One more item – an Associated Press dispatch of November 16th: a sad commentary on technology gone wrong. A Federal Court Jury awarded a New York State farmer \$12,360 for damages to his potato crop. The damage was done by a chemical that was supposed to halt sprouting. Instead, the sprouts grew inward.

We are told also that chemicals are never used unless tests have shown them to be safe. This, of course, is not an accurate statement. I am happy to see that the Department of Agriculture plans to ask the Congress to amend the FIFRA to do away with the provision that now permits a company to register a pesticide under protest, even though a question of health or safety has been raised by the Department.

We have other reminders that unsafe chemicals get into use – County Agents frequently have to amend or rescind earlier advices on the use of pesticides. For example, a letter was recently sent out to farmers recalling stocks of a chemical in use as a cat-

tle spray. In September, “unexplained losses” occurred following its use. Several suspected production lots were recalled but the losses continued. All outstanding lots of the chemical have now had to be recalled.

Inaccurate statements in reviews of *Silent Spring* are a dime a dozen, and I shall only mention one or two examples. *Time*, in its discussion of *Silent Spring*, described accidental poisonings from pesticides as *very rare*. Let’s look at a few figures. California, the only state that keeps accurate and complete records, reports from 900 to 1000 cases of poisoning from agricultural chemicals per year. About 200 of these are from parathion alone. Florida has experienced so many poisonings recently that this state has attempted to control the use of the more dangerous chemicals in residential areas. As a sample of conditions in other countries, parathion was responsible for 100 deaths in India in 1958 and takes an average of 336 deaths a year in Japan.

It is also worthy of note that during the years 1959, 1960, and 1961, airplane crashes involving crop-dusting planes totaled 873. In these accidents 135 pilots lost their lives. This very fact has led to some significant research by the Federal Aviation Agency through its Civil Aeromedical Unit—research designed to find out *why* so many of these planes crashed. These medical investigators took as their basic premise the assumption that spray poisons accumulate in the pilot’s body—inside the cells, where they are difficult to detect.

These researchers recently reported that they had confirmed two very significant facts: 1. That there is a causal relation between the build-up of toxins in the cell and the onset of sugar diabetes. 2. That the build-up of poisons within the cell interferes with the rate of energy production in the human body.

I am, of course, happy to have this confirmation that cellular processes are not so “irrelevant” as a certain scientific reviewer of *Silent Spring* has declared them to be.

This same reviewer, writing in a chemical journal, was much annoyed with me for giving the sources of my information. To identify the person whose views you are quoting is, according to this reviewer, *name-dropping*. Well, times have certainly changed since I received my training in the scientific method at Johns Hopkins! My critic also *profoundly disapproved* of my bibliography. The very fact that it gave complete and specific references for each important statement was extremely distasteful to him. This was *padding* to impress the uninitiated with its length.

Now I would like to say that in *Silent Spring* I have never asked the reader to take *my* word. I have given him a very clear indication of my sources. I make it possible for him – indeed I invite him – to go beyond what I report and get the full picture. This is the reason for the 55 pages of references. You cannot do this if you are trying to conceal or distort or to present half truths.

Another reviewer was offended because I made the statement that it is customary for pesticide manufacturers to support research on chemicals in the universities. Now, this is just common knowledge and I can scarcely believe the reviewer is unaware of it, because his own university is among those receiving such grants.

But since my statement has been challenged, I suggest that any of you who are interested make a few inquiries from representative universities. I am sure you will find out that the practice is very widespread. Actually, a visit to a good scientific library will quickly establish the fact, for it is still generally

the custom for authors of technical papers to acknowledge the source of funds for the investigation. For example, a few gleaned at random from the *Journal of Economic Entomology* are as follows:

1. In a paper from Kansas State University, a footnote states: Partial cost of publication of this paper was met by the Chemagro Corporation.
2. From the University of California Citrus Experimental Station: The authors thank the Diamond Black-Leaf Co., Richmond, Virginia, for grants-in-aid.
3. University of Wisconsin: Research was also supported in part by grants from the Shell Chemical Co., Velsicol Chemical Corporation and Wisconsin Cannery Association.
4. Illinois Nat. Hist. Survey: This investigation was sponsored by the Monsanto Chem. Co. of St. Louis, Mo.

A penetrating observer of social problems has pointed out recently that whereas wealthy families once were the chief benefactors of the Universities, now industry has taken over this role. Support of education is something no one quarrels with—but this need not blind us to the fact that research supported by pesticide manufacturers is not likely to be directed at discovering facts indicating unfavorable effects of pesticides.

Such a liaison between science and industry is a growing phenomenon, seen in other areas as well. The AMA, through its newspaper, has just referred physicians to a pesticide trade association for information to help them answer patients' questions about the effects of pesticides on man. I am sure physicians have a need for information on this subject. But I would like to see them referred to authoritative scientific or medical litera-

ture—not to a trade organization whose business it is to promote the sale of pesticides.

We see scientific societies acknowledging as “sustaining associates” a dozen or more giants of a related industry. When the scientific organization speaks, whose voice do we hear – that of science? or of the sustaining industry? It might be a less serious situation if this voice were always clearly identified, but the public assumes it is hearing the voice of science.

What does it mean when we see a committee set up to make a supposedly impartial review of a situation, and then discover that the committee is affiliated with the very industry whose profits are at stake? I have this week read two reviews of the recent reports of a National Academy of Sciences Committee on the relations of pesticides to wildlife. These reviews raise disturbing questions. It is important to understand just what this committee is. The two sections of its report that have now been published are frequently cited by the pesticide industry in attempts to refute my statements. The public, I believe, assumes that the Committee is actually part of the Academy. Although appointed by the Academy, its members come from outside. Some are scientists of distinction in their fields. One would suppose the way to get an impartial evaluation of the impact of pesticides on wildlife would be to set up a committee of completely disinterested individuals. But the review appearing this week in *The Atlantic Naturalist* described the composition of the Committee as follows: “A very significant role in this committee is played by the Liaison Representatives. These are of three categories. A.) Supporting Agencies. B.) Government Agencies. C.) Scientific Societies. The supporting agencies are presumably those who supply the hard cash. Forty-three such agencies are listed, including 19 chemical companies comprising the massed might of the chemical industry. In addition, there are at least 4

trade organizations such as the National Agricultural Chemical Association and the National Aviation Trades Association.”

The Committee reports begin with a firm statement in support of the use of chemical pesticides. From this predetermined position, it is not surprising to find it mentioning only *some* damage to *some* wildlife. Since, in the modern manner, there is no documentation, one can neither confirm or deny its findings. *The Atlantic Naturalist* reviewer described the reports as “written in the style of a trained public relations official of industry out to placate some segments of the public that are causing trouble.”

All of these things raise the question of the communication of scientific knowledge to the public. Is industry becoming a screen through which facts must be filtered, so that the hard, uncomfortable truths are kept back and only the harmless morsels allowed to filter through? I know that many thoughtful scientists are deeply disturbed that their organizations are becoming *fronts* for industry. More than one scientist has raised a disturbing question – whether a spirit of lysenkoism may be developing in America today – the philosophy that perverted and destroyed the science of genetics in Russia and even infiltrated all of that nation’s agricultural sciences. But here the tailoring, the screening of basic truth, is done, not to suit a party line, but to accommodate to the short-term gain, to serve the gods of profit and production.

These are matters of the most serious importance to society. I commend their study to you, as professionals in the field of communication.



When Rachel Carson died of cancer in 1964, her four books, including the environmental classic *Silent Spring*, had made her one of the most famous people in America. This trove of previously uncollected writings is a priceless addition to our knowledge of Rachel Carson, her affinity with the natural world, and her life.

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