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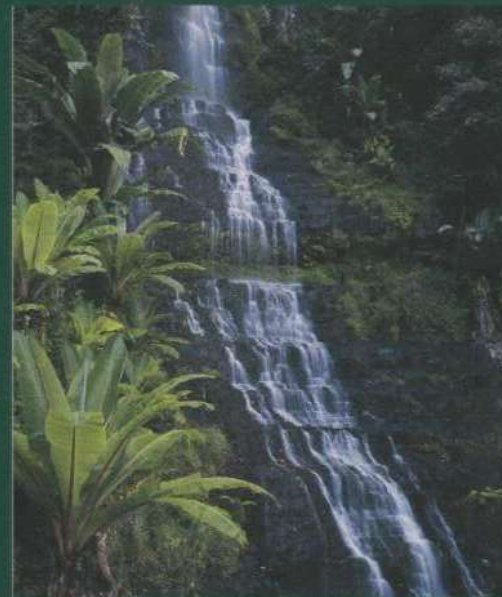
SECRETS OF THE SOIL

Peter Tompkins & Christopher Bird

ISBN 1-890693-24-3

# SECRETS OF THE SOIL

## New Solutions for Restoring our Planet



"A worthy sequel to Rachel Carson's *Silent Spring*"—*Boston Herald*.

By  
**Peter Tompkins & Christopher Bird**  
*Authors of The Secret Life of Plants*

An earlier edition of this book was published by Harper & Row.

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So long as one feeds on food from unhealthy soil,  
the spirit will lack the stamina to free itself from  
the prison of the body.

– RUDOLF STEINER

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## INTRODUCTION



No creature, not even swine, befouls its nest with such abandon as does homo sapiens, poisoning his habitat with fiendishly concocted chemicals and their deadly toxic waste. A morass of rotting human flesh awaits us all unless the antidotes are rapidly applied. Providentially, they exist, they work, and as detailed in these pages, can bring us back to health.

That the earth is ailing—almost beyond repair—was clear enough as early as 1912 to Nobel Prize winner Dr. Alexis Carrel. In *Man, the Unknown* this eminent French scientist warned that since *soil is the basis for all human life*, our only hope for a healthy world rests on reestablishing the harmony in the soil we have disrupted by our modern methods of agronomy. All of life will be either healthy or unhealthy, said Carrel, according to the fertility of the soil. Directly, or indirectly, all food comes from soil.

Today soils are tired, overworked, depleted, sick, poisoned by synthetic chemicals. Hence the quality of food has suffered, and so has health. Malnutrition begins with the soil. Buoyant human health depends on wholesome food, and this can only come from fertile and productive soils. Minerals in the soil, said Carrel, control the metabolism of cells in plant, animal, and man. Diseases are created chiefly by destroying the harmony reigning among mineral substances present in infinitesimal amounts in air, water, food, but most importantly in soil. If soil is deficient in trace elements, food and water will be equally deficient.

Carrel then came to the point: chemical fertilizers cannot restore soil fertility. They do not work on the soil, but are forcibly imbibed by plants, poisoning both plant and soil. Only organic humus makes for life. Plants, said Carrel, are the great intermediaries by which the elements in rocks, converted by microorganisms into humus, can be made available to animal and man, to be built into flesh, bone, and blood. Chemical fertilizers, on the contrary, can neither add to the humus content of soil nor replace it. They destroy its physical properties, and therefore its life. When chemical fertilizers are put into the soil they dissolve and seek natural combination with minerals already present. New combinations glut or overload the plant, causing it to become unbalanced. Others remain in the soil, many in the form of poisons.

Plants that are chemically fertilized may look lush, but lush growth produces watery tissues, which become more susceptible to disease; and the protein quality suffers. Chemical fertilizers, said Carrel, by increasing the abundance of crops without replacing *all* the elements exhausted from the soil, have contributed to changing the nutritive value of our cereals: "The more civilization progresses, the further it gets from a natural diet." Our present diet consists of adulterated and denatured foods, from which the most precious essential factors have been removed by coloring, bleaching, heating, and preserving. Pasteurizing milk kills the enzymes vital to nutrition, leaving only the rotted corpses of bacteria. White bread has its germ, which contains the vital nutrients, ritually removed, a deliberate castration.

Anyone alive before World War II, especially in Europe, knows that bread, fruit, vegetables, and meat bear no relation to what they were before the war. Our crop yields may have doubled or even tripled, but their nutritive quality has diminished progressively. Visual impression of foods has become the most important factor, though anyone with a glimmer of second sight will pass up, as no more alive than the products of Madame Toussaud's Wax Museum, the cosmetic and congealed displays of the grocery store today.

Abundance does not mean the food contains a sufficient amount of needed elements and vitamins. There is no doubt, says Dr. Melchior Dijkers, Professor of Biochemistry and Organic Chemistry at Loyola University, that malnutrition is the most important problem confronting mankind at the present time. The United States, despite its boasted food production, is grossly undernourished. And, though the per capita expenditure on health care in the USA is the highest in the world, so is the incidence of cancer, obesity, heart, and circulatory diseases.

Amazingly, Dr. Joseph D. Weissman, associate professor at the UCLA College of Medicine, a specialist in preventive medicine and immunology, has discovered, after years of research, that nearly all the noninfectious diseases that presently plague mankind are of recent origin, developed during the nineteenth and twentieth centuries, and that the billions of dollars spent on research, newer diagnostic techniques, organ transplants, coronary bypass procedures, chemotherapy, radiation, and all the various drugs, have not appreciably altered the advance of these killer diseases, but instead have merely enriched the chemist and the medical practitioner.

Dr. Weissman argues that most of today's killer diseases are caused by environmental toxins produced by our industrial society. Many doctors agree, aware that the great increase in diseases of degeneration, such as cancer and heart disease, undeterred by the advances of modern medicine, are primarily due to extensive use of synthetic chemicals in our daily diet, food preservatives, insecticides, fungicides, pesticides, and so on.

Most people, says Weissman, assume their ailments arise from causes beyond their control, unaware that they can choose a life of excellent health, remaining active, trim, and alert into their second century. He believes that choices of diet and lifestyle in our industrial societies play a large part, perhaps the largest, in whether or not we remain vibrant past our prime.

But doctors in general know very little about food. Dr. Robert S. Mendelsohn, Associate Professor of Preventive Medicine at the University of Illinois School of Medicine—described as a member of a small fraternity dedicated to freeing the healing art from the domination of drug companies—lays the blame on the plethora of misinformation on nutrition put out in medical schools, suggesting they might do better not to teach the subject at all.

Even more amazing, Dr. Weissman's research reveals that many of the killer diseases have developed only within the last hundred years, demonstrably through toxic chemicals introduced into the environment and food supply as by-products of the Industrial Revolution—chemicals such as chlorine and its compounds, coal-tar derivatives, pharmaceuticals, petrochemicals, and so on.

The emergence of industrialization, with its massive toxic wastes, coincided with the appearance of many of the new diseases. Our ancestors may have had a shorter life span, largely owing to infant mortality, says Weissman, but, like present-day primitive peoples, they were virtually free of "degenerative" diseases.

A hundred years ago coronary heart disease was virtually unknown in Europe and America. The first case described in medical literature surfaced in 1910. Today it is the leading cause of

death. Cancer, which today is responsible for 3.4 percent of all deaths in Europe and America, was responsible for only 1 percent a hundred years ago. Today even newborn and very young children are victims of cancer and leukemia. Diabetes, the third most common cause of death, once struck only one in fifty thousand Americans; now it strikes one in twenty.

Water, in primitive lands—as was the case in developing countries before the late nineteenth century—needed no disinfection. Where there are no industries or factories pouring waste pollutants into the environment, plants, marine life, and land animals are not tainted by dangerous chemicals. Now, not only water but soil and air are everywhere polluted, a pollution that is transmitted via plant and animal to man. In the developed world, says Weissman, there is virtually no clean soil or water left: toxins are in all the food we eat, the water we drink, the air we breathe. Fruits, vegetables, grain, fish, poultry, meats, eggs, dairy products are all affected. And some foods are concentrators and magnifiers of the pollution, the greatest concentrations of toxins occurring in animal fat and cholesterol. Mother's milk could not be legally sold in the supermarket; it would not pass the government's safety test.

Protection against disease, says Weissman, is more important, and more effective, than later therapy. And protective medicine starts in the soil.

Poisoning of the soil with artificial agricultural additives began in the middle of the last century when a German chemist, Justus von Liebig, known as the "father of chemical agriculture," mistakenly deduced from the ashes of a plant he had burnt that what nourished plants was nitrogen, phosphorous, and potash (or potassium carbonate)—the NPK of today's chemical agriculture.

Liebig's dicta—and he wrote profusely—led to a vast and profitable commercial development of synthetic chemicals. Lulled by propaganda, world farmers became dependent on German mines for supplies of potassium salts, known as "muriate of potash," without which they were told that nothing on their farms would grow. When World War I interrupted exports from Germany, prospectors located deposits in the United States, launching American companies into rapid exploitation of this bonanza of unnecessary chemicals.

From the amount of phosphoric acid also found in the ash of his burnt plant, Liebig further concluded that phosphorous must be a prime requirement for the growth of plants. Since Roman times, farmers had been using ground-up bones to obtain their phosphorus. By treating bones with sulfuric acid Liebig created

what he called a "superphosphate." When vast quantities of sea-derived calcium phosphate were discovered—believed to be the skeletons of sea animals collected over millions of years—a whole new industry of artificial "mineral manures" was launched.

Up until Liebig's time, it was believed that because virgin soils were highly fertile, and contained much humus, the various stages of this brown decaying organic matter must be the principal source of nourishment for plants. Liebig attacked the notion with vehemence. Of humus and of the humic acid derived from it, he wrote: "There is not the shadow of a proof that either of them exerts any influence on the growth of plants either in the way of nourishment or otherwise."

As William Shestone put it in his 1875 biography of Liebig: "These were the facts and arguments by which, once and for all, Liebig rendered the humus theory untenable by any reasonable human being."

That the secret to fertilizing soil lay in organic excreta, not chemicals, Liebig only concluded ten years later. Too late. By that time the chemical companies were off to such a profitable start there was no stopping them in their headlong race to destroy the soil and all that it supports.

The first chemical produced on a commercial scale in the incipient "age of chemicals" was the sulfuric acid used by Liebig to produce his "superphosphate," a clear, corrosive, oily liquid still the most widely sold chemical today, basic to the manufacture of a host of other chemical substances, along with the production of dyes, drugs, paper, pigments, and explosives.

Next most important among the chemicals concocted in the lab for commercial use was alkali, a soluble mineral salt, named by the Arabs from the sea-beach saltwort plant from whose ashes they first derived the substance. While it was at first primarily used in the manufacture of soap and glass, by mid-nineteenth century all the major chemical agents in use were connected in one way or another to alkali. Britain's United Alkali Corporation, set up in 1891, became the world's largest chemical enterprise, with forty-three firms employing fifty chemists and twelve thousand plant workers, eventually to be swallowed up by the giant government-sponsored amalgam of Imperial Chemical Industries.

Accidentally, a whole new branch of chemistry was developed in the mid-nineteenth century by a young English chemistry student working in a makeshift lab in his father's house during the Easter vacation of 1856. Experimenting with coal tar, William Henry Perkin produced a mauve dye from its constituent benzene, the first of the so-called aniline dyes, remarkable for the way it held fast and would not wash out as did natural colors.

Patented, his mauve became fashionable at the court of both Victoria and Napoleon III, obtaining for Perkin a fortune and a knighthood. Soon aniline red, yellow, and black followed mauve; and millions remained to be made from synthesized indigo, the color of jeans.

When a disciple of Liebig, Friedrich von Kekule, realized—in what has been called “the most brilliant piece of prediction to be found in the whole range of organic chemistry” and one that would elevate him to the nobility—that six atoms of carbon in the benzene molecule could be linked together in a circle, with a hydrogen atom attached to each, German chemists saw their way to the construction of endless new compounds by artificially uniting carbon in their test tubes with nitrogen, hydrogen, sulfur, chlorine, etc., in what amounted to a heyday for sorcerer’s apprentices.

Drugs were soon added to the inventory of chemical-company products, as German and Swiss dye companies found endless new ways of turning coal tar and other waste products into a health-debilitating but highly profitable pharmacopoeia. In the United States alone, \$8 billion are spent yearly on so-called medicines. And coal tar dyes had further lethal uses, chemically essential to the vast expansion of explosives.

It remained for a German chemist, Fritz Haber, to discover in 1905 a laboratory process for turning the endless tons of free nitrogen in the air into liquid ammonia, 82 percent of which is nitrogen. By 1915 Karl Bosch, a German engineer, joined Haber in designing the first synthetic ammonia plant in the Reich, enabling the German High Command to indulge in the Kaiser’s war. German dye firms, banding together for patriotism and for profit, produced explosives, chemical fertilizers, drugs, and, as a bonus, the poison gases responsible for some 800,000 casualties in World War I.

With the end of hostilities, the huge amounts of gas left over were redirected to the insect—but on a wider scale, thanks to the improved methods of dusting and spraying developed on humans by the military. Increased doses of nitrogen, no longer needed for explosives, were indiscriminately dumped on crops, weakening their resistance to insects, creating a vicious circle that snowballed as it endured, progressively more profitable for the few as it poisoned soil and aquifer for the many.

German chemical companies, with money from their opposite numbers in the United States—who had made equally enormous profits from the war—amalgamated in 1925 to form the I.G. Farben conglomerate, soon the largest chemical enterprise in Europe, closely bonded with its U.S. partners. Together these conglomer-

ates funded Hitler, rearming his *Wehrmacht* as a “bulwark against the Soviets.” And with petroleum, courtesy of Standard Oil of New Jersey, Hitler was enabled to roll his tanks into Poland and into World War II.

While loyal GIs desperately struggled with their lives to undo this handiwork, at Auschwitz I.G. Farben, with slave labor guaranteed by Himmler, produced a special gas to exterminate millions of unwary victims, mostly Jewish.

From World War II, American chemical companies, which had boomed between the wars, derived an even greater bonanza from the free ammonia Bosch had prestidigitated from the air. A million tons of bombs were dropped on Germany alone, causing millions of dollars to be funneled by U.S. taxpayers into chemical-company coffers.

At war’s end, eighteen new ammonia factories, developed in the U.S. at taxpayers’ expense to manufacture explosives, were obliged to find a market for their surplus. Du Pont, Dow, Monsanto, American Cyanamid, with their vast wartime profits, produced ever more fertilizer to dump on the unwary farmer, who dumped it onto his fields to kill the goose that laid the golden egg.

As a by-product of the war, to keep fleas, lice, and other insects from contaminating GI troops, one of the most toxic pollutants ever invented was produced by a Swiss chemist, Paul Mueller, who chose to give the secret of its manufacture to the Allies: DDT. Derived entirely from the test tube, it was the most potent insecticide yet seen, capable of killing all sorts of bugs in a broad spectrum with astonishing speed and efficiency. On the home front, with manpower critically short, farmers used it against insects to increase crop yields and save on labor.

Following the Allied victory in 1945, DDT began to be used like water, until the toxin seeped into every animal and human body in America. Everywhere, chemical firms reinvested their wartime gains to launch into unparalleled growth in a massive quest for new synthetic broad-spectrum pesticides. The farmer, fearing disaster—his plants, weakened by a surfeit of chemicals, were attracting more and more bugs—turned to even more chemicals. Complacently, the companies brought out new products by the score, mostly chlorinated hydrocarbons similar to DDT, such as chlorodane, heptachlor, dieldrin, aldrin, and endrin; and “organic phosphates” such as parathion and malathion.

In an attempt to beat the game by ever greater production, trusting farmers in America, prodded by bankers, chemical companies, and the manufacturers of agricultural machinery, changed from a subsistence way of life to commercial enterprises, investing large cash payments in new land and equipment, going heavily



into debt on fertilizers, pesticides, and herbicides—and, in so doing, sealed their own doom.

That chemicals were pointlessly poisoning the soil, killing microorganisms, stunting plants and proliferating degenerative disease in man and beast was perfectly clear to a whole group of sensitive minds in Europe and America as early as World War I. Distinguished, distressed, and well-informed, several authors on both sides of the Atlantic were speaking up and propagandizing for a viable alternate method of agriculture requiring no chemicals.

Their main premise was that in soil properly nourished with adequate supplies of humus, crops do not suffer from disease, and do not require poisonous sprays to keep off parasites; that animals fed on these plants develop a high degree of disease resistance, and that man, nurtured with such plants and animals, can reach an extraordinary (and in fact quite natural) standard of health, able to resist disease and infection from whatever cause it may derive.

One of the first to sense that the use of chemical fertilizers was doing more harm than good, that it was destroying the life and vitality of topsoil, momentarily stimulating plant growth but actually inviting disease, was Sir Albert Howard. As a British colonial officer in India, with the high-sounding title of Imperial Chemical Botanist to the Government of the Raj at Pusa, Sir Albert had the rare opportunity of being free to carry out experiments without restraints, enabling him to grow whatever crops he liked in any way he liked with land, money, and facilities provided by the government.

He was thus able to observe, dispassionately, and with no axe to grind, the reaction of suitable and properly grown varieties of plants when subjected to insects and other potential pests. He found that the factor that most mattered in soil management was a regular supply of freshly made humus, prepared from animal and vegetable wastes, and that the maintenance of soil fertility was the fundamental basis of health.

He claimed that his crops, grown on land so treated, resisted all the pests that were rife in the district and that this resistance was passed on to the livestock when they were fed on crops so grown. He noticed that the natives never used artificial fertilizers or poison sprays, but were extremely careful in returning all animal and plant residues to the soil. Every blade of grass that could be salvaged, all leaves that fell, all weeds that were cut down found their way back into the soil, there to decompose into humus and reenter the cycle of life.

Sir Albert proved that livestock fed on organically grown fodder

were disease resistant, as were his oxen, which even during an epidemic of hoof-and-mouth disease rubbed noses with infected neighboring stock with no ill effects. "The healthy, well-fed animals reacted towards the disease exactly as improved and properly cultivated crops did to insect and fungi—no infection occurred."

As a result of his experiments, Sir Albert reached the conclusion that crops have a natural power of resistance to infection, and that proper nutrition is all that is required to make this power operative. "But the moment we introduce a substitute phase in the nitrogen cycle by means of artificial manures, like sulphate of ammonia, trouble begins which invariably ends with some outbreak of disease, and by the running out of the variety."

Crops and livestock raised on land made fertile by his methods of humus treatment attained a high measure of immunity from infective and parasitic, as well as from degenerative, diseases. Further, his treatment appeared to be curative as well as preventive.

By 1916 Sir Albert was lecturing that chemical fertilizers were a waste of money, maintaining that organic matter, along with the good aeration it promoted, was alone enough to allow microbes to provide sufficient amounts of nutrients to feed the world.

Returning to England in 1931 after thirty years in India, Sir Albert became known as the founder of the "organic" movement and set about popularizing his ideas. By the beginning of the Second World War he had brought out his *Agricultural Testament*, followed, when the shooting was over, by *The Soil and Health*, a book in which he warned that the use of synthetic chemical fertilizers leads to imperfectly synthesized protein in leaves, and thus results in many of the diseases found in plants, animals, and human beings. As a healthy alternative he pleaded for a simple system in which these proteins are produced from freshly prepared humus and its derivatives, in which case he averred that "all goes well; the plant resists disease and the variety is, to all intents and purposes, eternal."

In vain did such stalwart supporters of Sir Albert as Lady Eve Balfour do battle for his cause in Britain, organizing the Soil Association, and producing a thoroughly convincing work entitled *The Living Soil*. It validated Howard's basic premise that humus confers on plants a power of disease resistance amounting almost to immunity, something which cannot be obtained with artificial fertilizers.

In lucid terms Lady Eve pointed out that the action of compost is not due to the plant nutrients it contains, but to its biological reaction, which has the effect of fundamentally modifying the soil

microflora. "All these substances are merely some of the raw materials from which humus can be made. They cannot become humus until they have been metabolized by soil organisms."

But the odds were too heavily stacked against her. Imperial Chemicals forged ahead unmolested. In the United States, J.I. Rodale picked up the banner and launched a movement with his *Organic Gardening and Farming Magazine*, its tenets supported by *Pay Dirt*, published in 1945. At Emmaus, Pennsylvania, Rodale created an experimental organic farm and was active in organizing organic garden clubs throughout the United States. He pointed out that in China organic agriculture was able to feed a population of nine hundred million, nearly as many livestock, and, on about the same amount of arable land as is available in the United States, three times the number of hogs.

He quoted reports from travelers to China to the effect that there was no starvation, poverty, or the like, all without huge doses of chemicals, insecticides, and heavy, petroleum-gobbling machines, but only by careful composting of all organic stuff and a labor-intensive method.

Scientific support for the argument for organic farming came in lapidary language from one of the most brilliant soil scientists produced in America, Dr. William A. Albrecht, Chairman of the Department of Soils at the University of Missouri, with four degrees from the University of Illinois. Widely traveled, he had studied the soils of Great Britain, the European continent, and Australia, drawing conclusions seasoned by a farm boy's upbringing. His extensive experiments with growing plants and animals substantiated his observation that a declining soil fertility, due to a lack of organic material, major elements, and trace minerals, was responsible for poor crops and in turn for pathological conditions in animals fed deficient foods from such soils, and that mankind was no exception. Degenerative diseases, as causes of death in the United States, had risen from 39 percent of the population in the decade 1920-29 to 60 percent in the year 1948.

Organic matter, said Albrecht, may be called the constitution of the soil. And a good constitution, he added wryly, is the capacity, according to its meaning as used in the medical profession, of an individual to survive despite the doctors rather than because of them. Insects and disease, he pointed out, are the symptoms of a falling crop, not the cause. "The use of poisonous sprays is an act of desperation in a dying agriculture. Fertilizer placement is the art of putting salt in the ground so that plant roots can somehow manage to avoid it!"

In sum he preached that weeds are an index to the character of the soil. It is therefore a mistake to rely on herbicides to eradicate

them, since the chemicals deal with effect, not cause. Insects and nature's predators are disposal crews, summoned when they are needed, repelled when they are not. Crop losses in dry weather, or during mild cold snaps, are not so much the result of drought and cold as of nutrient deficiency. NPK [nitrogen, phosphorus, potassium] formulas, as legislated and enforced by State Departments of Agriculture, mean malnutrition, attack by insects, bacteria, and fungi, weed takeover, crop loss in dry weather, and general loss of mental acuity in the population, leading to degenerative metabolic disease and early death.

The vast bibliography of Albrecht's scientific and popular papers reveals a lifetime of meticulous scientific investigation into the chemistry and biology of the planet, highlighting the fundamental necessity for feeding plants, animals, and humans through ministrations to the soil itself, correcting deficiencies of diet at their point of origin: the soil.

In 1939 Louis Bromfield, author of *The Rains Came*, etc., returned from the India of Sir Albert Howard to his Malabar Farm in Pleasant Valley, Ohio, to put Howard's agricultural philosophy into practice. Working with Albrecht, he bought up several worn-out farms and produced abundant crops with organic techniques. In a practical way he proved that insect damage and disease could be controlled with humus, good plant nutrition, and sound soil management.

Were Thomas E. Dewey to have defeated Harry S. Truman in 1948, Bromfield was slated to become U.S. Secretary of Agriculture, with every intention of "derailing the fossil-fuel technology that had taken command of the education machine, USDA, Extension, and the farm press."

But Truman's triumph brought in the policy of deliberately banishing small farmers to industrial centers and of unleashing the petrochemicals. Through Truman's creation of the CIA and of a National Security Council trained for "dirty tricks," the multinationals were able, often through the guise of foreign aid, to impose their deadly chemicals not only on America, North and South, but on all the Third World markets. Sir Albert's Indians were brainwashed and corrupted into dousing their healthy plants with all kinds of poisons. Chemical-fertilizer consumption in India rose from 1.1 million tons in 1966-67 to 50 million tons in 1978-79.<sup>1</sup>

<sup>1</sup> During the late 1960s the United States and World Bank applied pressure on India to allow Western chemical companies such as Standard Oil of California and International Minerals & Chemicals to build fertilizer plants on the subcontinent. Collusion is indicated by the fact that farmers received subsidies from the Indian government of 10 to 20 percent on fertilizers and 25 percent on pesticides, plus government-backed loans to pay for them. As a result, fertilizer consumption in one area of India rose between 1969 and 1979 from 3.5 to 50 kilograms per hectare (a hectare is about an acre and a half).

While Albrecht was the leading scientific supporter of organic farming in America, no modern voice has spoken out against social injustice, environmental deception and commercial hypocrisy as applied to agriculture more candidly, clearly and trenchantly than Charles Walters Jr., A Kansan of Volga Germanic stock, Walters since 1971 has edited and published a straight-punching and hard-hitting monthly, *Acres U.S.A.: A Voice for Eco-Agriculture*, the *Eco* standing both for economic and ecological.

Schooled in economics by his Jesuit professors, Walters, has almost single-handedly fought the Truman heritage of diminishing the farmer, supporting instead the principle of *agricultural parity*, a concept so easy to understand that most economists and financial writers eschew it as "simplistic."<sup>2</sup> Walter's slogan, "Cheap food means sick or hungry people," dramatically emphasizes his belief that a Kansas farmer can no more collect a fair price for his production than the Zulu tribesman could pay for it so long as the price of food is arbitrarily kept below its fair market price.

With the publication in 1962 of Rachel Carson's startling exposé *Silent Spring*, the public was awakened with a shock to the danger of the situation, and organics took on new meaning in America. Great pressure had been put on *The New Yorker* magazine by the chemical companies to prevent her articles from being published, and legal action was threatened to prevent Houghton Mifflin from bringing out the book, accusing her of being a Communist.<sup>3</sup>

Yet, in 1963, Dr. Jerome Wiesner, science counselor to President John F. Kennedy, reporting to a commission assembled to examine the premises of *Silent Spring*, declared: "Use of pesticides is more dangerous than atomic fallout."

Carson had written: "We are rightly appalled by the genetic effects of radiation....How then, could we be indifferent to the

<sup>2</sup> Sitting in his Raytown, Missouri offices, we heard Walters take a call from one of hundreds of farmers seeking to elucidate the mystery of parity, and get to the nub of the matter in a few words: "When there is par exchange," said Walters, "that is to say when the farmer gets a full and not an arbitrarily discounted price for his produce—on a par with the price he has to pay for all that he imports onto his farm—then he prospers. He can pay off his debts. He can enjoy the earnings of the just. On the other side of that equation—and here's the rub—bankers and money-lenders must go hungry. The farmer doesn't need their loans. The international manipulators lose their base, the munitions makers see their profits eroded by peace. When basic raw commodities move across borders at less than equity of exchange, armies follow." Such talk, eminently reasonable today, in the McCarthy era could get one into trouble.

<sup>3</sup> Jack Doyle, Director of Agricultural Projects for the Environmental Policy Institute, in his brilliant *Altered Harvest*, reports that shortly after Carson's book called attention to the acute toxicity of some pesticides and their indiscriminate use throughout the country, several members of the National Academy of Sciences engaged in pesticide problems and related fields attacked the book.

same effect from farm chemicals used freely in the environment?"

The meaning of this strange language, as Charles Walters was quick to point out in *Acres U.S.A.*, proved elusive, until an Italian scientist, Amerigo Mosca, winner of the chemistry prize at the Brussels World's Fair, presented certain startling findings.

Mosca stressed the point that toxic farm chemicals are radio-mimetic in that they ape the character of radiation. The damage resulting from nuclear radiation is the same as the damage resulting from the use of toxic genetic chemicals, said Mosca. And the use of fungicides of organic syntheses (Zineb, Captan, Phaltan, etc.) annually causes the same damage to present and future generations as atomic fallout from 29 H-bombs of 14 megatons—damage equal to the fallout of 14,500 atomic bombs of the Hiroshima type.

Mosca computed that in the United States in the 1970s, yearly use of toxic genetic chemicals was about 453,000 tons, which caused damage equal to atomic fallout from 145 H-bombs of 14 megatons, or 72,000 atomic bombs of the Hiroshima type. And in charts, graphs and statistics—all of which appeared as part of his running story—the Italian scientist revealed that mentally retarded babies had reached the stunning statistic of 15 percent of live births. He concluded that damage to plants, crops, and soil fertility, coupled with water pollution, was practically incalculable. Continuation of the scenario would see the destruction of the American people within a matter of a generation.

Mosca's full report was classified by the Italian government, not to be revealed for fifty years—by which time, perhaps, it was hoped that sinister allegations about Montedison, producer of megatons of fertilizers, pesticides, and herbicides—would be glossed over and forgotten.<sup>4</sup>

Driving over hundreds of miles of country roads, Walters could

I.L. Baldwin, chairman of the pest control committee, wrote a long, critical review for *Science* magazine. Another member of the pest-control committee, economic entomologist George C. Decker—who had also been a frequent consultant to the chemical industry—called the book "science fiction," comparable in its message to the TV program *Twilight Zone*. At congressional hearings, Mitchel R. Zavon, a consultant for the Shell Chemical Company, also a member of the academy's pest control committee, characterized Carson as one of the "peddlers of fear" whose campaign against pesticides would "cut off food for people around the world." Two other academy scientists suggested that Carson's work suffered from ignorance and bias and that she had ignored the sound appraisals of pesticides conducted by responsible bodies such as the academy!

<sup>4</sup> It was recently revealed in the Italian courts that Montedison had corrupted and subverted Italy's leading publisher, Rizzoli, owner of Milan's leading newspaper, *Il Corriere della Sera*, into acting as its covert PR outfit with funds manipulated through a phony Masonic outfit in conjunction with the Vatican Bank and the CIA.

not help noticing increasing funerals due to death by cancer among his farmer friends and a host of "scrambled children tetragonically birthed, bodily deformed or mentally retarded." Grieved by the untimely lingering cancer death of his sister, exposed to agricultural chemicals in the factory where she worked, he bluntly entitled one front-page article: *"Is Modern Agriculture Worth Having?"*

And Walters was among the first to expose the dangers behind the now highly propagandized irradiation of foodstuffs to kill pathogens and extend shelflife.

When I saw this process proposed behind the scenes, [said Walters], I cited dozens of scientists who warned about some of the consequences of eating irradiated food: embryonal damage, reduced digestibility, malignant lymphomas in mice, changes in organs, and more. Since the after-effects of the consumption of irradiated foods on living tissue are similar to those of direct radiation, the relevant problems, which include an eventual reduction of the resistance against infectious diseases, AIDS included, deserved attention, but the Svengalis of science defend irradiation as cheap.

That all this horror is unnecessary, redundant, and avoidable has now been demonstrated by a band of happy warriors in their battle for organic farming. Healthy and economic alternatives do exist, though some of them appear extraordinary. To discover what they might be, we crisscrossed the planet up and down. To describe them we have produced this book, along with an appendix on where and how to apply the knowledge. With a little effort the planet can be saved from destruction by corruption, poison, and pollution. The Garden of Eden is not forever lost. The secret to its revival lies buried no deeper than the first few inches of your soil.

## SECRETS OF THE SOIL

## Chapter I

# CORNUCOPIA



One warm December morning, solstitial sun sparkling on the wooded hills of southern Virginia, six of us sat in a circle looking, no doubt, like a coven of warlocks and witches, stuffing freshly gathered cow manure into desiccated cow horns.

We were on the hundred-acre farm of a former U.S. naval commander, Hugh J. Courtney, gray-bearded and easy-going in his blue denim coveralls. For almost ten years Hugh has been devoting his retirement to producing the various biodynamic preparations recommended over half a century ago by the clairvoyant Austrian scientist Rudolf Steiner as a prime remedy for our planet's sickening soil.

By three o'clock, as the sun slanted deeper through the pine groves, we had stuffed 850 horns bought by our host, over a period of years, from a cooperative slaughter house at fifty cents apiece. No longer foul smelling as when first collected, the horns had been placed in fifty-five gallon drums of water until the pith within had rotted away. The manure—fresh from a small herd of Angus-Guernseys leisurely browsing the biodynamically fertilized meadows that ran down to a meandering creek—was surprisingly sweet to the nostrils.

Some fifty gallons of this manure filled various crocks and pails, awaiting processing as our host explained how he'd first gotten into biodynamic farming in College Park, Maryland, when he

chanced to find on the shelves of the Beautiful Day Trading Company a hard-to-find volume on agriculture written by Rudolf Steiner.

"Many occult disciplines," said Hugh, his smile angelically benign, "speak peripherally of agriculture. But this is the only one I've found that puts it all together."

Steiner's booklet is indeed quite startling, requiring more than a single reading. Conceived in June of 1924—just a year before he died at the age of sixty-four—it came in answer to the plea of a group of German and Austrian farmers worried about the plight of European agriculture. Seed stock had dangerously degenerated and a crippling increase in animal and plant disease was ravaging the countryside. Steiner replied with eight lectures delivered in the Silesian town of Koberwitz, now a part of Poland. Bound together into a booklet with the simple title of *Agriculture*, the lectures now constitute the basic and extraordinary primer for what has come to be known as biodynamic gardening and farming, the essential remedy, according to its practitioners, for the planet's dying soil.

Mosaically pointing out the danger of chemical fertilizers and the importance of good compost and humus for a healthy agriculture, Steiner anticipated such pioneers of "organic" agriculture as Howard, Balfour, and Rodale. But Steiner went further, much further, by attributing the effectiveness of his biodynamic method to cosmic, telluric, and spiritual influences on soil and plant. And so weird were Steiner's recipes and explanations, later embraced and brought to America by his Austrian protégé, Eherenfried Pfeiffer, that early practitioners of biodynamic farming in the United States behaved virtually as a secret society for fear of being accused by their more orthodox chemical neighbors of practicing witchcraft.

"You can give people," said Courtney, "only what they are ready to receive." His kindly eyes, magnified by heavy horn-rimmed spectacles, darted from side to side as if testing the environs for the approval of unseen listeners. "More intrepid souls," he went on, "saw in biodynamics a means of working with the energies which create and maintain life. To them, Steiner's spiritual science is a desperately needed human service offered to a dying earth, to aid nature where she is weak after so many centuries of abuse. And that's how it stands today."

Steiner's declared aim, as was Alexis Carrel's, was to work with the soil as the true foundation of human health. This meant restoring to the soil the organic matter it needs to hold its fertility, and restoring to the soil a balanced system of functions by treating it not merely as a mixture or aggregation of chemicals, whether

mineral or organic, but as a truly living system.

Like his fellow organic enthusiasts, Steiner insisted on avoiding chemicals, concentrating instead on natural composts inoculated with the product of certain revivifying herbs. These he selected to help microorganisms quickly decompose the raw organic matter of the compost heap into simple compounds, reassembling them into the ingredients of a long-lasting, earth-smelling, dark brown, light-textured, friable humus, a substance which, because of its colloidal state, holds its structure, resists leaching, helps fix nitrogen directly from the air, and increases the availability of minerals to the plants—the staff of life.



Stuffing fresh cow manure into desiccated cow horns. When dug up the following year, the manure will have turned to sweet-smelling friable humus.

As we sat in the noonday sun dutifully scooping spoonfuls of khaki manure into conical cow horns from an apparently endless succession of burlap bags, an associate of our host, a biodynamic herbalist, Lee McWhorter, elaborated on the essential role of microbes in the soil. "Traditional agriculture," he explained, "depends entirely upon the recycling by bacteria and other microbes of various chemical elements—principally the nitrogen, sulfur, carbon, and oxygen on which plants are nourished. Nitrogen is of paramount importance to life on earth. It's an essential constituent of nucleic acids and amino acids, the building blocks of both proteins and enzymes, the source of sap and blood. But, although it is abundant in the air above every acre of land, it cannot be

tapped by most plants without the aid of microbes. Hence the symbiotic relation, beneficial to both plant and microbe, which must have developed many millions or billions of years in the past."

"Did you know," asked one of Courtney's neighbors, Will Chapin, who had joined us to help with the horns, "that more microorganisms germinate in half a cup of fertile earth than there are humans on the planet, and that a hundred thousand or more of them flourish on every square inch of human skin?" He paused to let the weight of his figures make their impression, then added: "The combined weight of all the microbial cells on earth is twenty-five times that of its animal life; every acre of well-cultivated land contains up to half a ton of thriving microorganisms, not to mention up to a ton of earthworms, which can daily excrete a ton of humic castings."

With his gloved hand he pared the excess manure from a freshly stuffed horn.

"But producing humus," interjected our host, raising his spoon for emphasis, "is only part of the solution. As basic as is the presence in the soil of teeming microorganisms for the creation of good friable humus, it is merely an indication that more powerful forces are creatively at work, both cosmic and telluric. That, in essence, is what Steiner's book on agriculture is really all about."

As we rested from our Augean efforts, Courtney's wife, Liz, a cheerful and attractive teacher of dramatic arts, announced a break for lunch. During the course of it, Courtney described the true purpose of what we were doing: preparing the first and perhaps most important of Steiner's remedies for a dying earth, arbitrarily called "preparation 500," an alchemical rather than a chemical potion. Our cow horns, like so many ice cream cones filled at a Tastee-Freez emporium, were to be buried in the ground for the winter, during which time our host assured us that cosmic and telluric influences, called by Steiner *formative forces*, would transform or even transmute the manure to a dark, earthy, and odorless substance, a third of a cup of which, stirred into three gallons of rain-water, in extremely dilute, literally homeopathic, amounts, would be capable of revivifying an entire acre of dying land.

The rest of the preparations, as Courtney described them, BD 501 to 508, sounded arcane enough to have been added to the "eye of newt, toe of frog, finger of a birth-strangled babe" stirred into a potentizing cauldron by the witches in *Macbeth* to ensnare the Thane of Cawdor. BD 501, perhaps the least exotic, is simply quartz crystal ground to a fine powder. It too is buried in a cow horn, but throughout the summer, *not* the winter. A quarter tea-

spoon of it, stirred into three gallons of water, is sprayed in the spring or early summer on one acre of growing plants. Its function, according to Steinerians, is to "enhance light metabolism in the plant, stimulating photosynthesis and the formation of chlorophyll." It is intended to influence the color, aroma, flavor, and keeping qualities of crops.

The next five preparations—502 to 507—were explained as being designed strictly to be inserted into a compost pile to help microorganisms transform it quickly into fertile humus, somehow drawing on what Steiner calls *etheric formative forces*. Considerably more exotic, 502 and 506 are usually treated as a pair, prepared together: the first consists of blossoms of yarrow stuffed into the bladder of a freshly killed buck deer. The bladder, obtained from a hunter, is blown up like a balloon and allowed to dry before being stuffed. BD 506 is the flower of dandelion to be inserted into a cow's mesentery—that tenuous membrane which surrounds the animal's internal organs. It is essential, or so our host insisted, that the dandelion be placed in the *inner* side of the mesentery. Reversed, it is inclined to putrefy. Bladder and mesentery, suitably stuffed, spend the winter buried beneath the soil, there to be worked on by the mysterious forces of the cosmos, which Steiner describes as pululating with life beneath the snowy frozen soil of winter.

BD 503, the flower of camomile, is stuffed into a bovine intestine, as with sausage meat—"a charming operation" according to Steiner—and must be buried all winter in a sunny spot where the snow will remain over it for long stretches at a time.

The stinging nettle, annoying in the field, turns out to be a boon to its neighbors, according to Steiner, as a great enlivener of the soil, stimulating its health and helping to provide plants with the individual components of nutrition they most need. As preparation 504, it is buried without benefit of sheath, preferably between layers of netting—iron netting, warned our host, not copper. Iron, he explained, is related to the planet Mars which goes well with the nettle, whereas copper is less good because of its association with the planet Venus—strange astrological notions later to be validated scientifically by a variety of supporting sources.

BD 505 is the bark of an oak tree, preferably a white oak, ground up and placed in the skull of a domestic animal—cow, sheep, goat, pig, or cat. Put into the earth under a layer of peat moss, it is to be irrigated with rain water to acquire a coating of slime.

Last of the compost inoculants, 507, is also the simplest, being merely the juice of valerian blossoms, a wild plant that grows abundantly in the northeast United States, especially in Massachusetts.

Finally there is Steiner's preparation 508, which does not go into the compost. It is common or garden horsetail, *Equisetum arvense*, brewed into a strong tea to be sprayed onto plants and trees in the spring and summer to prevent fungus molds.

Our host, aware that his explanations were straining our credulity, relented and informed us it was time to bury the horns, a performance he wished to carry out while the sun was still up, before the ground began to freeze.

Stacked in wooden crates, our handiwork was loaded into a Ford pickup and driven down to a spot in the valley by a stream where a circular hole twelve feet wide and two feet deep had been dug into the soft alluvial soil.

Starting from the center, one by one, the well-stuffed horns were placed tip down in a growing circle until all 850 stood neatly stacked. The lot was then covered with about eight inches of dirt, and we were invited to return in the spring to see for ourselves how the tellurian forces of winter had miraculously transformed this cow dung into manna.

As Courtney leveled the fresh soil on the pile, he fortuitously struck a small horn left over from the previous year. Shaking out a small amount of dark friable matter into the cup of his hand, he assured us it was sufficient to bring new life to a whole acre of land. But first it would have to be stirred homeopathically into

Lee McWhorter and Will Chapin burying some 850 cow horns filled with cow manure. They will stay below the ground from shortly after the Winter solstice until St. John's Day or Midsummer Day (June 24) the following year.



three gallons of water for an hour, twenty seconds one way, twenty seconds the other, in order to be "potentized with the required forces of the cosmos." Arcane as it sounded, this too would be explained in terms to satisfy the orthodox.<sup>1</sup>

Back on the hill by the house site, in a root cellar dug into the earth, walled with stone and roofed with cement, our host opened deep bins to show us by the light of a lantern the various Steinerian preparations—500 to 507—lying in earthenware crocks surrounded by damp peat moss to keep them moist and protect them from such noxious effects as gasoline fumes or electric current. The 500, in a forty-gallon crock, seemed to radiate energy, while the others lay tranquilly waiting to be potentized by homeopathic stirring.

Such a wild alchemical approach to gardening and farming made it easier to understand why early biodynamic farmers had chosen to do their stuff on the q.t. But it was a challenge to us to find out if and how such homeopathic wizardry might actually work in practice to effect, as claimed, a revolutionary approach to modern agriculture.

To show us his own quiet method of performing this apparent magic, Lee McWhorter invited us to his herb farm in the Shenandoah Valley, strangely named La Dama Maya, in honor, as he explained it, of a Californian biodynamic flower girl he had met and married in Mexico, motivated, he believes, by some metempsychotic Mexique past.

<sup>1</sup> The essence of homeopathy—generally described as a system of medical practice that treats a disease by administering minute doses of a remedy that would in a healthy person produce the symptoms being treated—is that the smaller the amount of matter the more powerful the force exerted, as if power were a prisoner of matter.



## Chapter 2

## PULSE OF LIFE



One gray day between Christmas and New Year's we set off across the Blue Ridge Mountains to the McWhorter farm in the Shenandoah Valley. Our objective was to learn to make regular biodynamic compost and its homeopathic substitute known as "barrel compost."

Lee and his wife, Maureen, were waiting in their two-story Victorian farmhouse with a jug of herbal tea. Our various astrological signs determined to the satisfaction of Lee, a Virgo, and Maureen, a triple Scorpio, we were led to a greenhouse that stretched the length of the house. Trays of nursling herbs lay in phalanxes, redolent with the scent of rosemary, wormwood, myrtle, thyme, Greek oregano, golden sage, salvia, santolina, and a delicate winter savory, all vibrantly alive and flourishing despite the season.

And so began the lesson in how to brew the prime and most important ingredient in biodynamic farming: Steiner's preparation 500. Into a five-gallon bucket containing three gallons of rain water, Lee poured half a handful of the black 500—enough, he assured us, to spray a whole acre. Rhythmically he began to stir it with a long stick, first clockwise to create what looked like a deep vortex, then counterclockwise to create a seething, bubbling "chaos," followed by another swirling vortex.

"I use this special stick," said Lee, "to get the vortex to the bottom of the bucket. It's just a plain old stick. But it has a curve

that helps. You have to get the outside moving. Steiner claimed the vortex was the rhythm of life, that a lot of seeds have the shape of a vortex. This particular motion seems to energize the water."

He was sitting on a milk stool, silhouetted against a backdrop of snowflakes falling gently beyond the greenhouse door. "I stir it less than a minute one way before reversing. When I get the rhythm I just sit and contemplate what I am doing. The important thing is to put your thoughts and determination into what you are doing. Steiner says you should put your very life into it, so that what comes back out of the earth is a reflection of your own effort and spirit. The foundation of Steiner's thought is that all aspects of the physical world are permeated and guided by the spiritual. He believed that the soil, in addition to being supplied with nutrients, microorganisms, and humus, needed to be affected by the will and spirit of the farmer, or gardener, as well as by intangible forces stemming from the moon, the other planets, the sun, and the stars. I'm putting energy into this stirring. I know I'm turning the stick; but what's turning me? Perhaps the bluefish I ate for dinner last night. It goes around and around, the same basic rhythm in the universe, a pulse that I can only call life. If Steiner is right, that vortex I'm looking at in this bucket is drawing the



Lee McWhorter creating the vortex to suck cosmic and planetary forces into three gallons of water to create BD 500.

forces in from the air, from the cosmos. Those are life-giving forces, not death-dealing. Somehow they're there: kinetic, potential."

He paused, reflectively, then went on stirring. "But an hour is a long time to keep this up," he said with a sigh. "It's not so bad if you've got three or four people to help. Steiner envisioned getting his guests to do it after Sunday lunch, as a form of entertainment. If you'd like to participate I've got some other sticks, and you can see for yourselves which you prefer. It's easier with a longer stick. You can make a smaller circle and get a bigger vortex."

When the hour was up, Lee paused to admire what looked like a bucket of plain water with a few dregs of dirt in the bottom. "This is it!" he said. "The magical potion. But it's not all that powerful all by itself. We've learned that it's more effective on soil that has been treated with compost made with the other preps from 502 to 507, or sprayed with an infusion of the barrel compost which already contains all the preps. So I'm going to mix into this 500, homeopathically, an ounce of barrel compost. It will only take another twenty minutes."

We had seen the compost he was referring to, dark and earthy, at Hugh Courtney's lying in a barrel dug into the soil down by the stream: but we had not understood its function, Lee explained that it had been developed by a German follower of Steiner, Maria Thun, who had observed and experimented with plants for some ten years on a German government research farm near Kassel. The barrel compost was a simpler method for getting all the Steinerian preparations into the soil, homeopathically. Not that one didn't want to spread normal biodynamic compost, he added quickly. It was a question of acreage: if one had too much land, and couldn't afford to make that much regular compost, the barrel mixture had a great effect, especially good for the changeover from orthodox chemical fertilizing to the biodynamic method.

"Steiner," said Lee, "explicitly stated that as a result of the concentration and subsequent dilution of the preps it was what he called the radiant effect that was doing the work. No longer the substance itself."

Maria Thun's barrel compost is made by inoculating a gram or so of each of the preparations 502-506 into a mixture of cow manure, fresh eggshells, and ground-up basalt, a volcanic rock that contains all the elements that become clay after dissolution.

Its advantages, Lee explained, are that it can be prepared at any time. It needs less incubation than regular biodynamic compost to be complete, perhaps two months instead of six, and is not only powerful as a fertilizer but is said to put the earth in a state of defense against the pernicious intrusion of radioactivity,

especially against the fatal fixation of strontium-90/2 in the bones. Eggshells, he said, add to the soil the element of calcium, and plants grown in high-calcium soils have less radioactivity, especially in Europe. Suitably stirred, for a good hour, the mixture of cow dung and additives is placed in a barrel—open top and bottom—which has been buried in the earth to its waist, then banked with earth to within an inch of its top, there to spend the winter.

"A barrel of this compost, when fermented," said Lee, "can contain anywhere from fifteen hundred to two thousand ounces of the finished product, each ounce of which will care for an acre of land. That means that one barrel can take care of a pretty big spread, some thousands of acres. Just the essence of the preparations, even in the tiniest doses, appears to have a regenerative effect on the soil and make the 500 more productive. In a pasture, everywhere the cows have dropped their dung there will be dead things. Those dead things will biodegrade into healthy humus much faster after you've sprayed with the essence of the barrel compost. If you have a lot of acreage you can't possibly make enough actual compost, let alone spread it: it might take tons and tons. But an ounce—or 100 grams—of this barrel compost stirred into water and stimulated by the forces freed through the compost, can generate a billion microbes in each teaspoon of soil. You get an idea of what's happening if you realize that each and every one of those microbes has a mouth and is eating debris on the ground, then laying down its corpse as organic residue, often in a matter of minutes. Pretty soon your fields are rich in humus. But Steiner, mind you, was perfectly clear that the presence of abundant microorganisms in the soil is merely an indication that cosmic forces are at work. It's like flies: they only come if there's dirt. Ditto with the microorganisms: they only proliferate if the forces are there. And the preps mediate the forces."

As soon as he'd finished stirring the potion of barrel compost into the bucket of 500, Lee took a piece of cheesecloth and strained the contents into a backpack sprayer, leaving about a quart of liquid in the bucket. "I don't want any residue to clog my nozzle," he explained. "I'm going to spray one acre of my outdoor herbs, as an autumn spray. In Steiner's day, before they invented the backpack sprayer, they used a pail and a big brush to swish the stuff onto the ground. Maureen still likes to do it that way, and it works just as well."

Pail and brush in hand, Maureen looked like an Andrew Wyeth painting as she set off into the field.

"We spray in the autumn after everything is clear," said Lee: "when the earth is still exhaling, before the ground freezes. I want to get the farm sprayed so that when the earth breathes in again

in the spring it will breathe all these forces back into the earth. Then things will come back to life. Normally we wouldn't spray in the middle of the day, like this. I'd do it early in the morning. But with so little sun, the stuff's not about to evaporate."

A light snow was still falling as we followed Lee into the garden to watch him spray his dormant herbs.

"We haven't put anything on this soil but biodynamic preps for ten years," he said. "The full effect of the method appears in the course of the first three or four years. It consists of a continuous increase in fertility, and an improvement in the quality and flavor of the produce. And we harvest on those calendar days when the moon is influencing certain portions of plants and giving them a better keeping quality. Our customers all remark about the beauty and power of our herbs, but if I try to explain to them that it comes from cosmic forces, my wife makes me hush. She says the customers aren't ready for such talk. At least not yet. It's too far out."

Lee moved about the aisles between his rows of herbs pumping a fine mist into the air. "After many years of careful research," he went on, "the Bio-Dynamic Association of America in Kimberton Hills, Pennsylvania, produced a calendar which shows specific days (and hours) judged best for working on the leaf, root, fruit, or flower portions of crops: one works with spinach on a leaf day, potatoes on a root day, peaches on a fruit day, blossoms on a flower day. The days succeed each other in cycles of nine, or just over a third of a moon period. We do our transplanting only on a root day, so the roots can dig right in. The place I've noticed it most is with broccoli seedlings. It takes most people a couple of weeks to get them up. We do it by the moon and they come up in three days. Everyone knows that apples are pruned and cow horns sheared when the moon is waning, lest the moon's powerful tide-raising forces cause both tree and cow to bleed away without healing. If you want your hair to grow luxuriant, you cut it only at the very moment of full moon. So we figured: why not pay attention to the rest of the calendar? Once you tune into the cycles of the moon you quickly see the effects they are having, even on the weather."

Lee smiled at us broadly: "The mechanics may appear complex, but the premise is simple. This planet, and everything on it, is an integral part of both the solar system and the cosmos: every last blade of grass is affected by the whole. With his clairvoyant vision, Steiner could describe the formative forces as they operate in cycles."

"What about the 501?" we asked.

"Ah!" said Lee. "That's for spring and early summer. When the

leaves are beginning to sprout, when the plants have three or four sets of leaves and are starting to grow, then we spray with the silica 501. A gram of ground-up quartz crystal mixed into three gallons of water, stirred for twenty minutes clockwise, then counter-clockwise, just as with the 500, makes a potentized liquid. Scrutinized under the microscope, the 501 would most likely show nothing but three gallons of plain old rain water. But its effect is immediate and noticeable. Steiner says it enhances light metabolism in the plants, and stimulates photosynthesis and the formation of chlorophyll. I know that it influences color, aroma, and the keeping qualities of all our crops. And you can spray 501 throughout the summer to keep bringing in the forces of light."

Lee put down his backpack while there was still some fluid in the tank. "Now I'll show you how to make a biodynamic compost pile." His enthusiasm was in no way flagging. "I don't make them very big. I don't need to on just nine acres, especially when I spray with the barrel compost. But I like to put a handful of the regular biodynamic compost in the hole when I transplant an herb. If you didn't use the barrel compost by the ounce you might have to use as much as five hundred to a thousand pounds of the regular biodynamic compost on each acre. On a thousand acres it would mean you would have to be making tons and tons of the stuff. So you see the advantage of barrel compost? Luckily, once you start spraying and composting, either with one or the other, each year you need less and less. If you don't mind standing out here in the snow, I'll build you a small heap, right here and now, and we'll inoculate it."

Picking what he considered a suitable spot for the pile, Lee cleaned off an area three by four feet to reveal the bare earth. "The pile has to be in direct contact with the soil," he explained, "so that the earth forces can work their way up to affect the pile, and the earthworms and microorganisms can have access to decompose the material."

With a wheelbarrow he set about collecting various ingredients to build up in layers, first one of dried weeds, which he picked from the edge of a field. These he covered with a couple of inches of earth, followed by a layer of straw, followed by a layer of cow manure. "Its biodynamic manure," he said with a happy grin. "I brought it here from Hugh Courtney's in the back of my pickup. I should be putting in a layer of quicklime, but I don't have any, and with this soil it'll do just as well without."

Lee dug up some thistles, followed by some green weeds that were alive and doing well. "This is white yarrow," he said, tearing it up by the roots and waving it in the air. "It grows wild like a weed. But I've got it planted around here; we harvest it in the

spring, especially for Hugh. It's one of the 'preps' that goes into a stag bladder. And we use it in our herbs. It's a good expectorant to get rid of phlegm, and it's also a diathoretic to make you sweat. Growing medicinal herbs is a matter of intent: you have to know just what effect you're looking for; and the herbs ought to be biodynamically potentized, otherwise they have little or none of their natural powers."

Lee wheeled his barrow to where he had three compost piles already working, separated by three pallets. The first was completed, as could be seen from the shovelful of dark-brown, friable material he produced from it, sweet-smelling and earthy, crawling with earthworms. Next to it was a second pile in the process of biodegrading; he figured it would be ready in a couple of months. The third pile, exuding fragments of orange peel and egg shell, was clearly being built up from kitchen residue.

"I've got other small piles of compost like this all over the property," said Lee. "When they're ready, I can spread them right on the spot." He shoveled some of the biodegrading material onto his barrow and started to wheel towards the fresh pile he was building. "A little of this older stuff will act as a starter in the newer pile. But the real starters are the Steinerian preps, the ones Pfeiffer kept talking about but tried to keep restricted. I'm going to insert them as soon as the pile is about four feet high and has a skin."

By skin, Lee meant a layer of straw and earth to insulate the



A shovelful of compost inoculated with six biodynamic preparations. It has turned into humus alive with earthworms, the basis for biodynamic farming and gardening.

pile from the fiercer elements, but not the quickening rain. This he arranged cosmetically with his shovel before using the handle to dig five holes a few inches apart, about eighteen inches deep into the pile.

"Into each of these holes I'm going to put one of the preps, 502 to 506," he explained, producing from his pocket five little plastic containers, not much bigger than teabags, the contents of each of which, about a gram or so, he shook into each hole before sealing it.

The last preparation, 507, *Valeriana officinalis*, or the juice of the valerian plant, he poured from a small quarter-ounce vial into his backpack sprayer which still contained the remnants of the mixture of barrel compost and 500. This he sprayed over the whole pile in a fine drizzle.

"The compost has to be damp," he explained, waving the nozzle, "or it won't heat up. But it mustn't be too wet, or the aerobic microbes won't have enough air to breathe; fermentation won't take place, and the compost will rot instead of biodegrading."

He looked up with a satisfied grin. "Come back in the spring and you'll see a lovely pile of degraded compost, ready to give life to the soil. This pile will have turned to soft, dark, friable humus, the secret of agricultural health on this planet—courtesy Dr. Steiner, his cosmic forces, and billions or trillions of cooperative microorganisms."

"Who else," we asked, "is farming this way in America?"

"Ahaa!" came the answer. "For that you will have to go to Kimberton, to the Bio-Dynamic Association of America, and talk to the man who runs it now, Roderick Shouldice. He can tell you where all the skeletons are buried! I know there are lots in the Dakotas and in Ontario. As for the rest, I'd like to know myself."

## MOONSHINE



Thirty miles west of Philadelphia, in the low-lying hills of Kimberton, the first biodynamic farm in America, Camphill Village, came into being in the late 1930s, dedicated to an ecological, nonsynthetic, sustainable agriculture. On a thousand acres of what might be the rolling downs of Surrey, Alarik Myrin, president of the Sun Oil Company, first gave sanctuary to Steiner's early follower, Ehrenfried Pfeiffer, an anti-Nazi biochemist and pragmatic farmer, who fled the Nazi millennium to bring his master's agricultural message to America.

The old mansion house, overlooking a sprawling four-hundred-acre farm, now houses a large group of cheerful handicapped persons of various ages—frail human beings, exterminatable under Hitler's genetic laws, but cherished by Steiner, who devoted some of the best years of his life to the science of successfully rehabilitating the handicapped. Camphill Village, now one of many such institutions stretching from Ireland to Botswana, is a non-profit venture partly funded by government. We found its members happily attending to their chores about the farm, which economically includes a bakery, a cheese factory, and even a store, where only biodynamic products are sold, including delicious home-baked bread and remarkably tasty vegetables.

Of the Bio-Dynamic Association, not a sign. A wild goose chase, we wondered, forewarned that the practitioners were wary of publicity? Then we met in the wood-paneled, picture-windowed

coffeeshop a quiet, outgoing young man in his thirties, Roderick Shouldice, recently appointed administrator of the association. He explained that the original biodynamic acreage had been divided by Myrin at his death into two farms, side by side, both biodynamically run. One was for the handicapped group, where visiting students could also learn the biodynamic method. The other, adjacent, of five hundred acres, is run as a dairy farm to nourish the students of the Steinerian Waldorf School, from kindergarten through twelfth grade. Extra income is derived by trucking fresh milk, yogurt, and cheeses to Philadelphia—the state of Pennsylvania being one of three in the Union which still allows raw milk for sale.

Aiming at self-sufficiency as well as health, the farms grow their own wheat, rye, soybeans, and corn, along with most of their fruits and vegetables. Many of the fruit trees, deliberately planted by Pfeiffer in the early 1940s on the strip-cultivated slopes to help avoid erosion, are still bearing fruit: apple trees and pear trees, their bark painted with a special Steinerian prep to avoid mildew: in this case a mixture of fine clay and fresh cow manure dissolved with 1 percent equisetum tea and one portion of stirred 500 reduced to a consistency that can be used as paint.

In a well-designed root cellar built by Pfeiffer near one of the tenant houses—handy in those days as a war-time bomb shelter—Steiner's various preparations, 500 to 507, lay awake in earthenware pots surrounded by peat moss, their lids daubed with yellow paint to differentiate yarrow from oak-bark or nettle, waiting to be inoculated into compost, or be sprayed homeopathically onto an avid soil.

Kimberton Hills, as Ron Shouldice explained, does not use Maria Thun's barrel compost, but has enough cows of its own to regularly spread the real thing on all its acres from a series of fifty-foot-long compost heaps inoculated with the preps. Rod does this himself, injecting piles that have been front-loaded into windrows by two professional biodynamic farmers who oversee the land and care for the livestock. Swiss and Hereford cows, pigs, sheep, goats, chickens, pigeons, all produce biodynamic manure for biodynamic compost, it being a part of Steiner's notion that every farm should be fertilized by the animals that live on it, creating a cycle of ever-increasing richness in soil untainted by foreign or chemical elements.

To stir the 500, which is made right there on the farm, Rod uses a system with a platform six feet above ground, surmounted by a trellis from which a ten-foot pole dangles into a 135-gallon barrel. The system allows Rod to stir ninety-five gallons at a time, with little exertion, being relieved of the suspended weight of the



Underground vault created by the Myrins in 1942 to house the various Steiner preps in earthenware pots surrounded by peat moss.

pole. The resulting 500 is easily poured by gravity into a sprayer hooked to a tractor, which can spray five gallons onto each of nineteen acres. The entire farm is fertilized with biodynamic compost from the windrows, lightly turned into the topsoil in the spring, and regularly stimulated by the cosmic forces released through the spraying of 500 and 501.

To these biodynamicists, the whole earth is but a reflection of what is taking place in the cosmos, an idea that goes back at least to Ancient Rome, confirmed to them by intensive laboratory and field experiments carried out during the past half century. As an indication that man once understood the power of the sun's intercourse with soil and plant, they point to the Egyptian glyph of the Sungod Ra, depicted with rays that end in manipulative hands.

Every twenty-four hours, sun, moon, planets, and stars, as observed by these stargazers, have a strong and pronounced effect upon the growth of plants. Planting and harvesting at Camphill Village Farm are done as strictly as possible in conjunction with the Kimberton Hills Calendar, whose editor, Sherry Wildfeuer, and several contributors, are in residence nearby. Steiner and his followers maintain that as the sun, the moon, and the planets move through the twelve zodiacal segments of the sky they have differ-

ing effects on the earth and on the plants that grow in it.

Because each day the sun rises four minutes later than the stars against which it moved the previous day, in a year it gradually traverses the entire circle of the zodiac, spending a month in each constellation. The moon, in its monthly cycle, spends only about three days in each. Apart from its obvious waxing and waning—the influence of which on tides and growing plants is no longer in dispute—the moon has two other motions which are said by Steinerians to affect both plants and planet. The moon's elliptical orbit brings it at times nearer and at times farther from the earth, creating an harmonic effect comparable to the earth's drawing nearer to and farther from the sun in summer and winter. When the moon reaches its nearest point, or perigee, and a "winter" moon is evoked, the plants' relation to the sun, according to biodynamic farmers, is hindered in that seeds put down at the moon's perigee produce plants that tend to be vulnerable to fungus diseases and pests.

European biodynamic moon watchers such as compost developer Maria Thun, point out that with the ascending moon, plant forces and saps flow upwards more strongly to fill the plant with vitality. But, when the moon has reached its highest point and begins to go down again, the plant, they say, orients itself toward the root, a time more favorable for transplanting because it enables the plant quickly to form rootlets with which to anchor itself. As the sap flow weakens, it is also a suitable time for pruning trees or clipping hedges. When the moon runs low on the horizon, echoing the sun's influence in autumn and winter, the vitality of plants is said to concentrate in their lower parts: time to concentrate on manuring, rooting, cutting, composting, and harvesting root crops.

Biodynamicists point out that the forces streaming continually from the direction of the constellations are "focused" by the moon and are able through its power to become directly effective in plant life. They therefore choose to work with plants on those days when the moon has entered a zone of the sky that especially enhances the growth of that part of the plant they wish to encourage.

Knowing which days are especially favorable for leaf or fruit vegetables, Rod explained that at Kimberton Hills they sow cabbage seeds on a leaf day and wait for a fruit day for tomatoes. The four aspects of a plant—root, leaf-stem, flower, and fruit-seed—have distinct qualities and functions. In cultivating plants, biodynamicists try to encourage the root growth of carrots, beets, turnips, and potatoes; the leaf growth of lettuce, spinach, and grass; the blossoms of their favorite flowering plants; and the



When Steiner noted that the icy crystals that form in winter on the panes of windows are different in a flower shop from those appearing on the windows of a butcher shop, he suggested to Pfeiffer and to another of his early followers, Lily Kolisko, that they experiment in the lab with the formation of crystals as a means of demonstrating what he called his "formative forces" in nature. To satisfy Steiner's desire to demonstrate what lies "beyond the veil of matter," Pfeiffer developed a system known as chromatography in which various solutions of mineral salts, imbibed by rounds of paper, were made to reveal the differing patterns left by forces at work in soil and plant life. With a similar method, known as "capillary dynamolysis," Kolisko went further, validating not only Steiner's but Paracelsus's dictum that each planet is linked to a metal on which it has a special effect, varying with the motions of that planet. With her method Kolisko was able to explain such mysteries as why highly refined metal objects such as ball bearings can turn out badly if manufactured at an inappropriate planetary phase. The same subtle forces she found to be at work in the living cells of plants, affecting both their growth from seed and the quality of fruit and vegetable, and even such odd facts as that lumber, to be lasting, must be cut in the appropriate moon phase.<sup>1</sup>

Rod told us how Kimberton Hills student farmers are trained in the observation of color, movement, and the gradual transformations of nature. By these means they are able to recognize what they call the "plant being" that lives and unfolds through all the forms from seed to root to leaf, and back to seed again. Taking advantage of cosmic cycles, they like to harvest lettuce and other upper-plant crops in the morning when they are most full of vitality, and root crops in the late afternoon when they are most full of life. Transplanting they consider best done at night when the downward flow of sap can be used for establishing roots in their new environment. By performing normal agricultural practices such as seedsowing, transplanting, cultivating, and harvesting at times when the appropriate element is working strongly from the cosmos, they have shown that one can enhance the size, form, flavor, and storage quality of crops.

It has been shown that plants react strongly to changes in the weather by rushing sap to their roots in anticipation of a coming storm. This enables them to send sugar back up to leaves and boughs when things have quieted, and so repair any damage by the storm. The mystery remains as to how the plants can tell that

<sup>1</sup>The many painstaking experiments to validate the actual effect of stars, sun, planets and moon on germination of seeds and the growth of plants were carried out over a period of thirty years by Lily Kolisko

a storm is coming, but an empirical test is easily made from the sugar content of a plant just before, during, and after any storm.

Taking a leaf from Steiner and his occult masters, Kimberton farmers are aware, as Rod explained, that the four parts of the plant correspond to the four classic elements of nature: earth, water, air, and fire. Clearly, they say, the root of a plant is concentrated in the element of earth, the green vegetative parts are linked to the flow of moisture, the flower opens into the airy element, and the fruit is slowly ripened by the warmth of the sun, which seals the seed.

Astrologically—and enigmatically—they associate the four elements with four segments of the zodiac: earth with Taurus-Virgo-Capricorn; water with Cancer-Scorpio-Pisces; air with Gemini-Libra-Aquarius; fire with Aries-Leo-Sagittarius. And they conceive that the moon, passing before these constellations, enables those particular elemental forces to work more strongly into plant life. Maria Thun, and, following in her footsteps, the authors of the Kimberton Hills Calendar, have accumulated years of data on the effect on the growth of plants of planetary oppositions, trines, and conjunctions. Whereas oppositions and trines are said to be positive, nodes (where orbits intersect), occultations (when one celestial body passes in front of another), and outright eclipses (when one body obscures another), are generally considered unfavorable for plant work, usually causing adverse effects, especially in sowing.

And just as the rise in traffic accidents occurring on node days has been confirmed statistically, so have the effects of the moon on cattle-breeding been established by Steinerian farmers over the years. If a bull is taken to the cow on a node day, either the cow remains barren or, worse, the calf is born with undesirable characteristics. Experience has shown that when planets enter into opposition at 180 degrees, be it with the sun or with one another, the life forces of the plant are increasingly intensified, beginning several days before the actual event. Steinerians claim that the forces of both opposing planets, influenced by the impulses from their respective zodiacal constellations, interpenetrate, fructifying and augmenting one another in their effect upon the earth. The moon's effect, says Maria Thun, can sometimes be enhanced through oppositions, but on other occasions be diminished.

All of this lore, which echoes ancient astrological knowledge—as Rod admitted—is actually the result of many, many years of careful laboratory experiments, with strictly scientific methodology carried out by devoted followers of the Steinerian vision. When Maria Thun first began her studies of the rhythmic cycles of the



## Zodiac Sign Influences

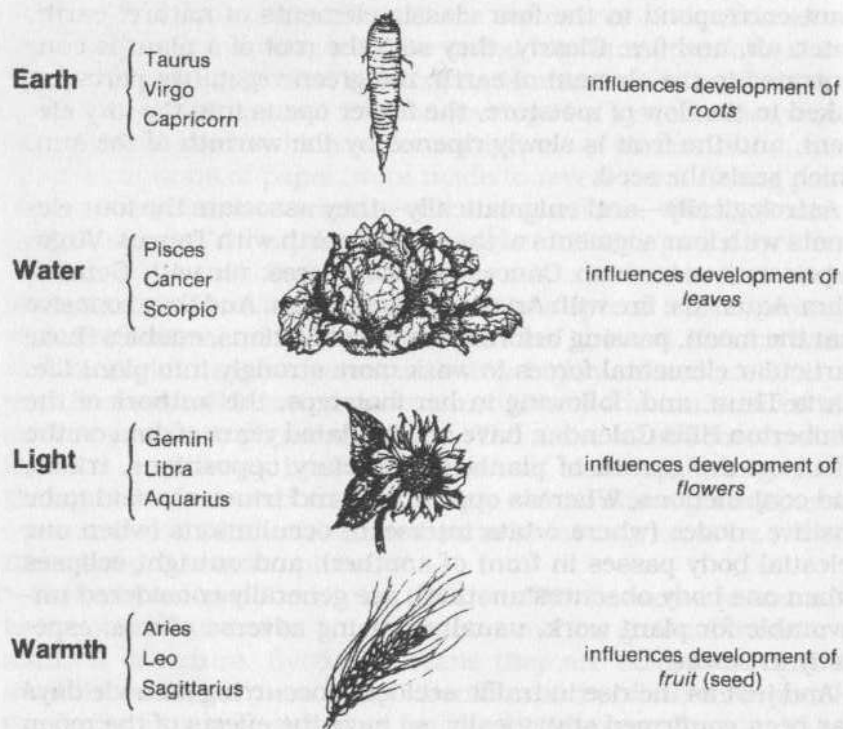


Chart showing influences on the growth of plants attributed by biodynamic farmers and gardeners to zodiacal signs and their respective elements.

moon, she was unaware that her Kassel vegetable garden was near the center of a ring of hills, each connected since ancient Celtic and Druidic times with a different zodiacal sign. But she soon found that the ancient history of these "mystery centers," enabled her to interface the effects of moon, sun, and planets, enclosed as they are within the twelve zodiacal constellations, various sections of which are visible at night at different times of year. The result was the creation of a calendar, the Biodynamic Sowing Chart, incorporating all the data of the three moon rhythms, the planetary positions, and the zodiacal signs, by which the members of such communities as Kimberton can plant and harvest their superior products. By creating her sowing chart on

this basis, Thun was careful to be correct, not only geometrically, and theoretically, but actually. To sow seeds by the wrong moonshine, without paying attention to the exact scope of each particular celestial sign would be to escape its influence and, like Procrustes, not make beds to fit people of different heights, but cruelly stretch or amputate them to fit a single arbitrary bed.