

**“Declining Soil
Fertility Brings
Diseases and Pests”**

DIAGNOSES OR POST-MORTEMES?

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“For generations, the conquest of Nature has been accepted as man’s prerogative. But man is a part of Nature, it being his essential environment, and unless he can find his rightful place in it he has poor hope of survival. Man’s present behavior often resembles that of an over-successful parasite which, in killing its host, accomplishes its own death.

“Man’s environment is the whole natural scene, the earth with its soil, its plants, and its animals. In many places these have reached a natural balance which man disturbs at his peril.”¹

Since July 1, 1958, was the centennial of the presentation before the Linnaean Society in London of the Darwin-Wallace ideas with their emphasis on natural selection and the survival of the fittest through natural adaptation,² it is appropriate to note that while the lower life forms fit into their environment to validate the Darwinian postulates, man does not. He disregards the natural laws. He interprets his position at the apex of the biotic pyramid as one of regality with the lower life forms under peonage and in servitude to his dictates. Under his more recently boastful emphasis on economics and technologies for our “high standard of living,” he has not only exploited the lower life forms with the threat of their extinction, but, he is also mining and wasting the soil to destroy the creative foundation of all life. Like the successful parasite, man is killing not only his or-

ganic hosts, but also his inorganic one, namely the soil. He is slowly bringing on threatening death via degeneration (commonly labeled “diseases”) of his body while giving the distress call for more monetary support of his research mainly by post-mortems rather than diagnoses of the natural errors in his living anywhere on the face of the earth as if all soils could be “Lebensraum.”

For those of us concerned with agriculture, the mention of the names like Darwin, Linneus, Walton, Audubon and others as men who truly studied life forms in nature, reminds us that we in agriculture are forgetting to study Mother Nature. Instead, we are devoting our thought to human nature and its behaviors in politics, economics, and technologies. Research in agricultural problems fails to refer to the literature reporting scientific works of even a century ago to profit by the diagnostic helps from what was the observations, theories and conclusions of the pioneers. As far back as several millenia ago serious doubt was raised about man’s successful fitting of himself into the natural laws and amongst other life forms. Ancient writers raised the question “Can man save himself?” It is appropriate, then, to raise the larger question whether man can save himself in spite of his ruthless destruction of not only other life forms, originally evolved as living segments supporting him, but, also, of even the soil as the very foundation of the whole biotic pyramid. Can man survive when the soil is not only being depleted of its creative capacity,

¹C. L. Boyle “Mother Earth” Journal of the Soil Association VIII (1954).

²Charles Darwin, The Origin of Species.

the fertility, but is also given poisons—owner protests disregarded—that persist and bring on the death of the soil itself?

Agriculture Forgets Biology; It Emphasizes Economics and Technology

The present problems in agriculture seem to have arisen because of the disregard of the simple fact that, in the main, agriculture is normally the art of cooperating with the natural behaviors of the many life forms lower than man in the course of evolution. By the natural creation of these simple life forms and their products serving in his support, man and his survival are a consequence and not the creative power, nor the cause. The expanding technology, coupled with economics, in a land of many natural virgin resources has made the collection of a bounteous living in terms of monetary capital very simple, e.g. by the assembly line of industry dealing with dead materials. Consequently we have erroneously assumed that agriculture, too, can be wholly an industry. We have assumed that its living forms of plants and animals may be similarly managed with assembly line speed, and economic controls, from nature's raw materials to sales of finished products according to man's economic, industrial and technological planning.

More and more technologies and more and more economic manipulations have crowded into agriculture. The farm today is almost forgotten in its activities as a creative performance starting with a handful of dust into which the warm, moist breath of sunshine, air and water is blown to help that inorganic mass give forth an organic one in the many life forms. The economist points out how, through economic necessity, the acreage of the soil on the farm is becoming less of significance while the buying of necessities and the selling of farm output are becoming the main activities of agriculture. The economist reports also that in the last ten years some 200,000 small farms have been absorbed into an increasing number of larger farms under modern economical management and technological manipulations resulting in less farms needed as he sees it.

The fallacious logic in such thinking about the future of agriculture is readily evident if we will apply one of the age old tests of sound reasoning known

as "reducto ad absurdum." By carrying such reasoning about prospective extinction of the farmer to the ultimate limit, sound logic points out that through those shifts under economic compulsion, the mere buying and selling would eventually be all there is left to agriculture. The farm as productive and creative soil area would become unnecessary, according to that erroneous contention. The farm would have only site value for business transactions and we might substitute a paved street for it. Then, also, all the farms would be completely absorbed into successively larger and larger ones until there could be only one large farm. That would be managed wholly for buying and selling with the biological services and nature's creative performances of the great out-of-doors deleted entirely. Such reasoning founded on economics that neglects soil and biology reveals its own absurdity for the future of agriculture.

Can Technology Save Itself?

Technology has demonstrated its success in what is lauded so universally as giving us a "high standard of living." Unwittingly, technology is simultaneously bringing us slowly to realize what the end of technology really is. Again the simile of the successful parasite is called forth.

"Technology, which is an instrument for utilizing the raw material of nature, can move towards its ultimate perfection only by impoverishing Nature; the less you have to work with, the more accurate and sharp must be both the machinery used and the technological thinking employed. The zero of nature would be the zero of technology that had reached both its apotheosis and its death. Conversely, technical thinking, as an art of the mind of man, is qualitative and living — but life is foreign to the essence of technology. Hence the full reduction of man to a set of measurable quantities would be the zero of all technics. The zero of human nature would be the zero of technics that had reached both its apotheosis and its death. Thus the complete technology is a contradiction. It follows, therefore, that as technology approaches its asymptote, it nears its own destruction."¹

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¹Federick D. Wilhelmson, Introduction to English Translation of Friederich Georg Juenger, *The Failure of Technology*, 1949, Henry Regnery Co., Chicago, Illinois.

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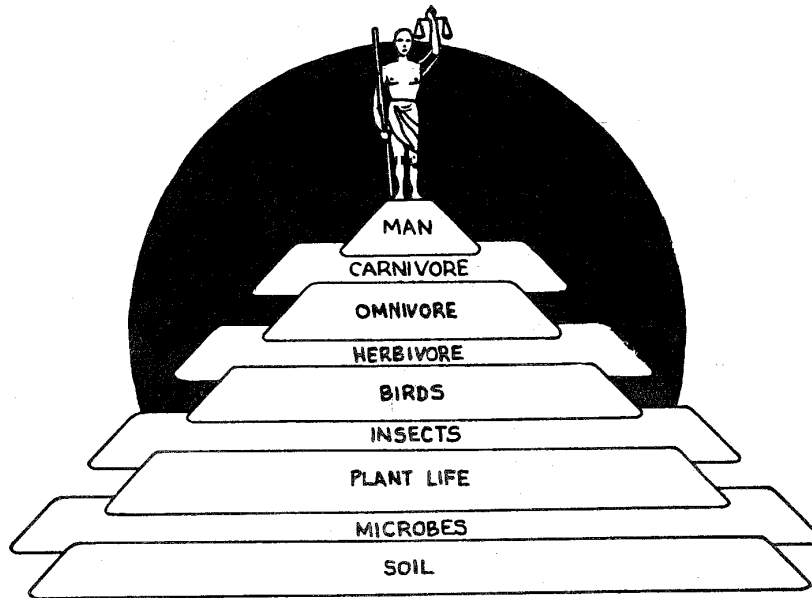
Friederich Georg Juenger has pointed out the significance of technology in relation to man and nature when he wrote the following well chosen words. "The human hand is the tool of all tools, the tool that has created, and now maintains the whole machine tool arsenal." He pointed out further that technology is the antithesis of conservation. "Since even the smallest mechanical process consumes more energy than it produces, how could the sum of all these processes create abundance? There can be no talk of riches produced by technology. What really happens is rather a steady, forever growing consumption. It is a ruthless destruction, the like of which the earth has never before seen. A more and more ruthless

destruction of resources is the characteristic of our technology. Only by this destruction can it exist and spread. All theories which overlook this fact are lopsided because they disregard the basic conditions which in the modern world govern production and economics."

"The machine does not create new riches. It consumes existing riches through pillage, that is, in a manner which lacks all rationality even though it employs rational methods of work." "When economic cries can no longer be overcome by economic means, human hopes turn toward stricter rationalization of technology; the idea of technocracy arises." "A planned economy goes hand in hand with technology."

It is necessary to point out often that conservation as a philosophy is incom-

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The Biotic Pyramid

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patible with technology and its consequent pressure for economic survival. It is the disregard of that simple fact and of the natural fact that agriculture is dependent on the production of life and of living products first, and on technology and economics, second, which brings on our national inclination toward post-mortem thinking. We analyze the failures and deaths rather than take to diagnosis of the natural situations which give the survival of the living through prevention of degeneration and disease rather than through cure. We treat the symptoms, but do not find the cause.

Natural Evolution Is Displaced by Industrial and Social Revolutions

The term "conservation" calls for emphasis on the continued flow of various life streams under evolutionary guidance by Mother Nature. Extensive conservation of natural resources can scarcely be expected as a sudden accomplishment through revolutionary changes in the past behavior patterns of human nature. Man is now given to much that suggests social revolution. One human segment is concerned about or quarrelling with another one. Natural creative forces are forgotten. Man will scarcely put himself back into the forces of natural evolution to even any minor degree. Nor will he give much hand to the support of it, save as it operates voluntarily through limited numbers of scattered individuals, or extensively only if it becomes part of the social revolution.

The present prominent emphasis on man as social matter of worldsize may well be viewed as the consequence of the economics of mass production in industry. Mass production demands mass markets. They, in turn, call for the building of a mass-mindedness for mass sales. As a case in point, human health has long been emphasized as a social and public matter when we use the term "public health" with attention to group responsibility more than to the summation of the respective responsibilities of each individual for his own good health, preferably by proper nutrition or even by his own choice of supplementary medication. Bad health because of body degeneration has re-

cently become a pronounced factor in creating mass-mindedness when public water supplies are considered by publicly elected officials as their responsible social area for mass medication. Likewise, the hypodermic needle, treating mass population is a sequel to the mass mental preparation, apt to be called education rather than hysteria. Likewise food sales and supplementary materials in that category also come under mass-mindedness until the degeneration of the human body is exhibiting itself in three phases; namely (1) failing reproduction with rackets in bastard babies taking on revolutionary social dimensions; (2) failing health in the diminishing ability of bodies to build their own protection, and the resulting allergies, heart failure, defective eyes and teeth, poliomyelities and others bringing mass movements for economic advantage in businesses like "health insurance;" (3) failure in proper vigor of body growth, or a perversion of the body's capacity to direct and differentiate cell growth, so well recognized as the phenomenon of cancer.

Such degenerations may well remind us that their beginnings are centered in the disturbed or erratic activities of the body proteins in the food and processed by the metabolism of them. Economics, technology and mass-mindedness weaken the human section of the biotic pyramid, because they undermine the health and vigor of the animal life, the next and the most significant factor in offering the more complete protein nutrition in support of man. Only slowly are we coming to a post-mortem, and then are reasoning in reverse, namely, from the top of the biotic pyramid downward. Only slowly, and after complete diagnosis of the problem, will we see soil exploitation as the basic cause.

The economics of livestock management has been perverting and eliminating the evolutionary chances for the survival of the fittest among our domestic animals. The life streams of these warm-blooded bodies have been directed toward the monetary speculation of buying low and selling high. In the economist's concepts, apparently the economic finality of agriculture consists of one that includes only buying and selling. The farm as it feeds the animals is not viewed as animal nutrition for growth, self-protection and repro-

duction. Instead it is viewed only for fattening, and hydration for the maximum gain in body weight in the shortest possible time. It is not viewed for the health of the beast that would contribute to its extended survival.

The pig may serve as a case for illustrating the weakening health of the animal segment of the biotic pyramid through the shift of the production of this animal from a natural flow of life to an industrial compulsion of it. The hog has been humorously defined as a four-legged, voracious appetite for corn and a high-power for converting carbohydrates into fat. Strangely, there seems to be more voraciousness grown into the hog according as the ration consists more and more of carbohydrate-rich corn and less of the costly—usually purchased—protein supplements. As a consequence of the selection for, and propagation of, more voraciousness, the life streams of the hogs have been perverted into more hog diseases. "There is a new one about every two years," the chief animal husbandryman of one of the mid-continental experiment stations told us in public.

Such economic disasters resulting from that perversion of the animal appetite toward the increase of diseases, are lessened by marketing earlier in the hog's life when ton-litters go to sale in six months. By selling nearer the animal's birthday, one escapes much of the hazard from disease through the long-lasting innate immunities passed on by the mother to the offspring. Such a short life span allows the animal, though sickened by the fattening performance that is abetted by castrating and elimination of any of its efforts contributing to species survival, to get to the packer where its premature sacrifice keeps the health irregularities hidden in their sub-clinical stages and prohibits them from reaching the clinical one required for the fullest recognition of bad health. Slaughter is, then, an economic venture in disregard of the animal's poor health under an inspection geared to the clinical cases only while it is unmindful of the sub-clinical and of incipient extinction of this domestic species.

Some recent reports on research in pig nutrition tell us that while a fifty-pound pig is becoming a 300-pound one, its fat content is multiplied about 17½

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times. But during that same time, the lean portion (the protein) is increased only four times. This simple fact has been the natural biochemical principle undergirding the economic speculation on all fattening activities, but it has also been the reason for the mounting failure of hog production to the point near hog extinction, when protein is the only living tissue and the only compound that can grow, protect, and reproduce. With such perverted animal physiology under the economic speculation of buying, fattening, and selling, we fail to see that while there is the increased enshrouding of every capillary of the blood vessels and every cell with a thickening layer of fat, the cells normally fed by the diffusion of the nutritives from the capillaries to them will become more starved. Their excretory products will accumulate, since fat hinders the two-way ionic and molecular exchanges between the capillaries and the cells to give hidden hungers and excessive accumulation of metabolic wastes.

Such conditions represent a lazy and sick body of our domestic animals. No wild animal chooses to be fattened. Instead each small one aims to become a big one and then exercises its ambitions to make a lot more of little ones. Wild animals choose their own medicine according as the soil grows it, and thereby exemplify better health and survival on their own than our domestic ones do under our management.

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manding the perverted evolution of our animals for only economic gains, and predicting extinction of the domestic species, calls attention also to the mid-gets or dwarfs in the beef cattle, dairy cattle, and even horses. These are offspring born with some irregular anatomy, and with a physiology that has lost its power to grow the normal animal. Because of the past emphasis on the male or the bull, for example, as half of the herd naturally the male side of the breeding line was first indicted for elimination and thereby solutions of this damage by the dwarfs. Such thinking about dwarfs forgets that man's management of nature seldom brings into the breed any characters adding to the animal's fitness for survival. Quite to the contrary, man's selection and propagation have been given to bringing about losses of such. We are slowly accepting the postulate that such selection and propagation of species, mainly for economic advantage, may have accentuated successive losses in the generations moving the life stream forward.

Each chromosome and each set of genes of the procreating cells is a protein unit which divides all its parts equally by cell division. Each unit must grow into its corresponding previous size before the cell's next division, if the succession of divisions for growth is to continue. Such growth demands that the protein representing it be supplied in the feed as nutrition of any warm-blooded animal. But when we feed mainly carbohydrates to fatten, and supply only the minimum of "crude" protein in the ration, the probabilities are high that deficiencies in nutrition may be hindering the growth of all the genes to their normal size or function. Consequently, the accumulation of deficiencies and imbalances in nutrition may starve out some genes to delete the one or more that might represent the growth potential in which a dwarf is born deficient.

We are slow to see the sins of our omission. We prefer to place the blame somewhere else, even to the point of killing the bull rather than recognizing the necessity for all life forms, including man, to fit into the laws of nature.

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Those laws, not the animal breeder, guarantee the growth, health and survival of the species. Agriculture is calling for the diagnoses of such disasters as cases of protein deficiency in the lower segments of the biotic pyramid about to topple itself, with man included. We are more prone to destroy the beast when it aborts, when it gives midgets or when it contracts a disease common also to ourselves. Destroying the evidence is apparently a more common practice than diagnosing it to find the cause of the abnormalities.

Wildlife, unhampered by man's selection and propagation according to economic dictates, demonstrates nicely its fitness for the particular soil in its climatic setting. It shows the heavier individuals and the greater fecundity according as the soil pattern demonstrates its highest fertility. Such has been the report of the Conservation Commission of the State of Missouri after they have undergirded their program by the basic concept of all wildlife as just another crop of higher quality in health according as the soil fertility is higher.

Low-Protein Crops Invite Pests and Diseases

Our agricultural crops also illustrate the fact that an evolution of species for speculative economic values only through man's management has increased pests, diseases and extinction, rather than their healthy fecund survival. Careful study of an ecological climax of plants emphasizes the seed's protein supply in the germ as the limited flow in successive crops for their survival and continued creation. Any such ecological plant climax reminds us that its freedom from pests, diseases, or weeds, and the dense growth, all occur in the absence of crop rotations, of weed sprays, insect poisons and even of cultivation and fertilizer treatment of the soil. Such a climax is possible only on the soil where the fertility is most accurately balanced to meet the physiological requirements of the particular plant species in question better than of any other. Also, such is possible only because the accumulated fertility annually released by rock decomposition has been taken by the plant, preserved and returned each year in the enlarg-

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ing annual growth of organic matter returned to the soil to be sustenance through partial decay for the succeeding crops.

Man's failure to maintain such a flow and return to the soil of both inorganic and organic fertility under his crop removal from the soil rather than complete return, has been the quiet force pulling down to a lower and lower level the protein potentials of soils with each crop succession. In nature, evolution was a case of construction towards higher complexity through more complicated synthesis of more protein with man as the climax. When man's production of crops depends more on blind faith in survival because of a certain pedigree of the seed than on undergirding the potential crop with nutritional security through the fertile soil, the evolution so managed invites pests, diseases and crop extinction. Depletion of soil fertility cannot mean successive crops of the same protein and nutritional potentials equal to those grown on the soil when first broken out of the virgin sod under a natural plant climax.

Depletion of the soil has reversed the natural evolution which built the climax. It has decreased the chances for survival of the same plants by their high production of proteins, their improved self-protection and fecund reproduction. This fact is established clearly by the decline of protein concentration of corn, more pronouncedly since its general hybridization. When in 1911, before hybridization practice was common, the mean concentration of protein in this feed grain was reported as 10.30 per cent for a single grade.¹ By 1950 the top grade among five, then listed, contained 8.8 percent while the lowest had 7.9 percent.² By 1956, among fifty tested corn grains from the outlying experiment fields of the Missouri Experiment Station, one sample of those hybrids reached the

low of 5.15 percent of "crude" protein, or a value just half of what it had been forty-five years ago.

Wheat, illustrated by county-wide values for protein concentration, has been telling the same story, according to the surveys reported for Kansas by the USDA from 1940 intermittently to 1951. This grain, not under hybridization, has been giving increasing acre yields for that state through which the annual total state yields have approached 300 million bushels. But its protein has dropped from a high of nearly 19 percent in 1940 to a high of 14 percent by 1951.³

Selection and propagation of corn and wheat, coupled with hybridization of the former, have been proclaimed widely as reasons for their large acre-yields, measured, of course, only as bulk and bushels. Little attention has been paid to the declining soil fertility by which the photosynthesis or accumulation of sugars and starches emphasizes itself in that increasing bulk, while the biosynthesis of proteins, which would consume or convert much of those bulky reserves by that process, is decreasing. Hybridization of plants and selection for high yields of vegetative mass represent, for plants, the equal of castration for the animals in that they eliminate the struggle for the survival of the species. Instead, it gives a physiological pile-up of carbohydrates by which the sunshine absorbed by the plant is used with a reported efficiency of 30 percent, when for protein production that efficiency is reported at only three percent.

For the plants, the declining soil fertility functions like a kind of fattening and growing that transcend even those for the pig. It is the declining soil fertility, then, as it is giving plant values of only fattening potential for animals, that is undermining the warm-blooded segments as well as the plant segments of the biotic pyramid, including animals and man. Less healthy plants degenerating, as it were, in their own physiology may well be inviting diseases and pests rather than that these have become such powerful predators.

¹Melvin O. Steen. Not How Much But How Good. Missouri Conservationist, January 1955.
²W. A. Henry. Feeds and Feeding, 1911. Published by the author, Madison, Wisconsin.
³F. B. Morrison. Feeds and Feeding, 21st Edition, 1950. Morrison Publishing Co., Ithaca, New York.

¹W. A. Albrecht. Soil Science Looks to the Cow. The Polled Hereford World. Sept., 1957.

Declining Soil Fertility Brings Diseases and Pests

That we are pushing crops to the fringes of soil fertility for their survival is indicated by the common farmer report when he says, as an example, "I must get some new seed. My oat crop is running out." He is merely reporting that the regular use of some of his own grain as seed for the next crop, while depleting the neglected soil fertility, has demonstrated the extinction of that species. It is showing that it can no longer survive in that soil-climatic setting. If its own seed will not be its reproduction, shall we not see the advent of a failing physiology because of failing soil fertility, that was formerly protection against diseases and pests under natural survival?

Research at the Missouri Agricultural Experimental Station using the colloidal clay technique to vary the ratios of the different nutrient elements for growing plants has demonstrated that the soil, as balanced or imbalanced plant nutrition, may be the difference respectively between plants free from fungus or subject to serious attack while that difference was accompanied by widely different chemical compositions of the plant substance. It has also demonstrated that when the carefully controlled plant nutrition with nitrogen and calcium—connected with fluctuating protein concentration of the vegetation—was varied in respect to these two elements of only, the presence and the absence of the thrips insect was demonstrated accordingly. Still further, the attack on stored corn grain by the lesser grain borer was more pronounced and earlier according to the imbalance of the soil fertility and according as the grain was an hybrid rather than open pollinated.

Here are facts telling us that we have pushed crops to the fringes of soil support and even beyond those for crops that may be still making vegetative growth when imported seed grown on more fertile soil somewhere else is used for the planting. Faith resting on the seed is weakening and eliminating this segment in the biotic pyramid to weaken, via poor nutrition, the segment of the animals directly above the plants and of man at the apex. We are, however, gaining re-

spect for the insect portion above and the microbial segment just below the plant. It is giving hope for the soil as the foundation of all life.

Research into the protein requirements has shown that the insect segment in the biotic pyramid is struggling for its complete proteins just as all life forms are. Now that the separate amino acids can be measured more accurately and that they can be supplied in pure form as items in the insect diet, research has shown that insect reproduction varies widely according to the balance of the separate amino acids in the insect's required suite of them. For instance, the mosquito requires a list of a dozen of the amino acids—among which are the eight required by man—if its egg-laying performance is to hold up at the rate of 14,000 eggs per fortnight. This insect can survive on as few as eight of those acids, but, by such limitation reduces the egg-laying or even may prohibit it.¹

The household cricket suggests its struggle for protein also when it is used as an assaying agent for nutritional values of chopped forage of the same plant species grown on separate plots as different treatments of the same initial soil. The same number of nymphs so fed varied in body size, survival number, rate of sexual development, and failure of such, simply because of the variable fertility of the soil growing the forage.

Therefore insects, too, classify under the category of survival of the fittest. Their sudden ravages suggest a sudden change in the chemical composition of their new crop victim, representing those resulting in a particularly suitable insect diet when formerly the victim's chemical composition was unsuitable for survival of the particular insect.

Since changes in the plant's chemical and biochemical composition result from unappreciated changes in the soil, our neglect of that foundation of all life with its consequent fertility depletion may well be the reason for insect pests on many crops. Should we not

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¹Lea, A. O., J. B. Dimond, D. M. Delong. Role of Diet in Egg Development by Mosquitoes (*Aedes aegypti*) Science 123:890, 1950.

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approach the insect problem from that line of reasoning and diagnoses before we wage war by means of powerful poisons for insects of which the physiology in terms of protein requirements is not so far different from that of the human body? What can be speedy lethality for the very small insect body may be simply a slower rate of poisoning for the larger human body. Plant destruction may be due to failing plant physiology for which the killing of the insect is only an attack on the symptom and not a removal of the cause.

The differences between no insects and serious ravages by them hangs by, indeed, a slender thread when, for example, the commonly serious attack on corn by the root aphid does not occur on the corn teosinte hybrid growing on the same soil along with the ravaged corn plants.¹ When changes in the plant composition brought about by so little natural plant modification as hybridization in such similar plants will serve as prevention of insect invasions, it seems like fallacious logic to call for cure in the form of wholesale poisoning of the tempted invader with all the dangers to other life forms in the same area, and even to the plant considered for protection.

Fallacious Beliefs in Epidemics Are Correcting Themselves; Microbes Are Saving Us

With respect to the microbial segment just above the soil supporting the entire biotic pyramid, we have long fostered a hatred—and fear—even worse than such for insects. But more recently even public health officials have been saying less about “epidemics”; are using the quarantine less; and viewing the situation more as one of weakened, and susceptible patients rather than a case of an all-powerful invading enemy or disease. There is the gradual recognition that epidemics are the result more of hysteria than of proper diagnoses when, (a) every extensive disease has its ecological limits; and (b) within the affected areas there

are always those who do not take the disease. Epidemicologists are apt to forget that after the presence of the microbe in some carrier has been established, that is not necessarily proof that the microbe is the cause of the epidemic. Contemporaneous association of two phenomena is not necessarily proof of any causal connection. It may be a case of some common cause of both of them.

Serious degeneration of the human body may be caused by (1) nutritional deficiencies due to deficiencies in the soil and in the amount of food; (2) refinements and processing treatments despoiling the food; (3) imbalances in the diet; and (4) additives to the food of drugs and chemicals of poisonous potential not yet measured. We are slow to see the possible invasion by the various agencies, commonly disposing a cadaver—even a prospective one—as due to that victim's behavior bringing on the invasions. Placing the blame on some lower life form and starting a fight on it by powerful poisons suggests our ignorance of the Chinese philosophy which says “Whenever we strike a blow, such is a confession that we have run out of ideas,” especially those we might have had by more careful diagnosis of the basic facts of nature.

The advent of antibiotics reminds us that the life forms as far below us as the soil's cellulose-digesting fungi have natural biochemical protection for us as well as for themselves in those compounds. Also, the antibiotics are produced by those microorganisms only when certain requisites of soil fertility nourish them, as was illustrated for the isolation of *Streptomyces aureofaciens* by its dominance only in the plot under continuous grass some sixty years on Sanborn Field at the Missouri Agricultural Experiment Station. But the tremendous amounts of antibiotics now being used in fighting bacteria point to the desperation with which man is grasping at the self-protecting biotics in the very lowest level of life forms. He has not fostered development of self-protection by his own body through guided nutrition. Instead, he uses hypodermic torment of it with unknowns under “cut and try” processes with high economic earnings

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¹W. B. Gernert. Aphid Immunity of Teosinte-Corn Hybrids Science N.S. XLVI. (1190) 391-2. 1917.

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rather than carefully studied theory based on observation of fundamental principles of nature's performances that guarantee health. Seemingly we are bent on the economics and technologies of treating the body by means which only the life forms as low as the ray fungi can offer. That may be the Frankenstein operating via degeneration. This philosophy of fighting an enemy is contrary to the Darwinian concept of survival of the fittest, namely, by improvement through natural nutrition and not because of poisons scattered over the environment in a fight on diseases and pests removing the unfit.

The lucrative returns via giving relief from bad health have given us many post-mortems with clinical conditions of the bodies. But post-mortems do not give diagnoses of subclinical ailments of living bodies which are troubles becoming more common in environments containing "smog," 2-4-D, DDT and others of pronounced lethality for lower life forms and of accumulative death potentials for us when present at rates of only a very few pounds per acre. It has taken nearly two or three generations to focus attention on the accumulative disturbances from tobacco, hydrogenated fats, and many other substances of commercial significance, only lately geared into health research on a larger scale. While many poisons of the past are being discontinued, the concentration of their use is taking to the most powerful ones, namely, the chlorinated ring-structures or hydrocarbons especially those of which the beneficial role in nature's great biotic arrangement we do not yet comprehend.

We Are Poisoning the Foundation of the Biotic Pyramid, the Soil

One institution in Germany, concerned with the nutritional qualities of the foods we grow and the dangers to health by pesticides, has been reporting pesticide residues in vegetables as a

1Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse (BAQ). Progress Report 1957-1958, Geisenheim-Rheingau Dr. W. Schuphan.

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consequence of their application to the planted seeds. For black radishes at eight weeks, four of the applied chemicals were found in 0.1 p.p.m. In carrots at 25 weeks, three preparations were present in 0.06 to 0.125 p.p.m., the tolerable limits of 1954. Other radishes, at 7 weeks after seeding, had a mean content of four preparations between 0.125 and 0.250 p.p.m., exceeding the tolerable limit. For onions, no residues were found after 25 weeks.

Successive growth weights of rats fed vegetables treated in the customary manner with pesticides and hormones emphasize their damaging effects.

The forerunner of the chlorinated ring-structures, or hydrocarbons commonly listed as DDT has been accumulating in the soils and retaining its poisonous nature there, when for many organic substances the microbial life in the soil is considered their destruction. But carbon ring-structures are even poisons for soil microbes and remain unchanged in the soil to a greater degree than we realize. Not only DDT but its many relatives by other names, including chlordane, aldrin, dieldrin, benzenehexachloride (BHC), endrin, heptachlor, lindane, methoxychlor, TDE, and toxaphene behave similarly in the soil.

Chemical extractions of the soils and bioassays of them by insects where previously treated with some of these pesticides, tell of the seriously poisoned soils with those conditions holding on over many years. Studies in the Department of Entomology of the University of Wisconsin tested turf soils from Cleveland, Ohio, in 1955 to which DDT was given as treatment for Japanese beetle in 1945. For applications at the rates of 12.5, 25.0 and 37.5 as pounds per acre in 1945, the amounts recorded in 1955 were 10.9, 14.1 and 17.9 percent respectively of those applications. For 14 apple and peach orchards "the DDT, recovered from the soil, amounted to 93.5-106 p.p.m. in Indiana, 38.6 p.p.m. in Ohio, 36.6 p.p.m. in Missouri, and 1.5-38.3 p.p.m. in Michigan. The time periods of the accumulations included one apple orchard for 11 years; two for 9 years; six for 10 years; two peach orchards for 10 years and three from 3-6 years."

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For crop soils 24 samples listed for DDT in the upper six-inch soil layer. 22 contained DDT ranging from 0.38-4.6 p.p.m. The amounts recovered were 0.53-0.90 p.p.m. in Wisconsin (corn), 0.56-1.0 p.p.m. in Iowa (corn, oats, and alfalfa), 0.76-2.22 p.p.m. in the East St. Louis area of Illinois (corn, horseradish, potatoes), 0.6-3.25 p.p.m. in the Rochelle area of Illinois (corn, lima beans, barley and pumpkin), 1.46-4.6 p.p.m. in the DeKalb area of Illinois (corn, peas, barley, lima beans, oats), 0.38-0.55 p.p.m. in North Dakota (potatoes, wheat, flax, barley), and 0.49 p.p.m. in Missouri (potatoes). The average recovery from all 24 crop soils investigated resulted in 15.5 per cent of the total

amount applied and 61.2 per cent of the average yearly application. No relationship was established between the amount of DDT found in the soil and the various crops grown on the soils.

Some bioassays by means of the common laboratory fruit fly of the Aldrin and Lindane in Soils, also at Wisconsin, were checked against recovery by chemical extraction of these poisons from the soil² as was done for DDT reported above. Their disappearance period measured for inorganic soils of different textures, namely sand, sandy loam, loam, and for the organic ones, namely, muck. The dosage per mortality for both aldrin and lindane was higher as there was more clay in the inorganic soils, and still higher for the organic matter of the muck. Data are given in Table I.

TABLE I.

Disappearance of Lindane from 22 months after treatment.

Soil Type	Treatment (Pounds Per Acre)	Chemical Assay P.P.M.	Bioassay P.P.M.	Bioassay Confidence Limits P.P.M.	Bioassay Chem. Assay x 100
Muck	10	11.6	2.21	1.87- 2.61	19
	100	118.6	28.4	24.1 -33.4	24
Loam	10	1.85	0.5	0.46- 0.56	27
	100	29.8	10.3	9.4 -11.7	35
Sandy	10	1.8	1.65	1.47- 1.85	90
Loam	100	29.0	22.2	20.1 -24.0	76

Disappearance of Aldrin—25 months.

Muck	20	4.95	2.25	2.08- 2.43	45.5
	200	158.0	57.5	53.2 -62.0	36.2
Loam	20	0.69	1.89	1.75- 2.04	274.0
	200	16.5	28.0	26.0 -30.2	169.5
Sandy	20	0.24	1.25	1.15- 1.36	522.0
Loam	200	22.5	66.0	60.5 -72.0	293.0

It is significant to note that the organic matter of the soil is an absorber of the insecticides to reduce their lethality. With ordinary common soils of low organic matter the absorption is not significant. The percentage of organic matter demonstrating significant protection was much higher than most common soils contain.

Other reports of persistence of these indestructible poisonous compounds in the soil compel us to put them into a different category of most organic substance which "decay in the soil." These chlorinated hydrocarbons do not decay so rapidly but may even be transformed into more poisonous ones.

If then our soils have been depleted in fertility to the point where the crop plants have been pushed to the soil fertility fringes for their survival or are literally "sick plants" at the outset, surely we would not "add insult to injury" by poisoning the soils as additional hindrance to the struggle of the species to survive in spite of us rather than because of us. Can we not see insects as a symptom of the failing crop rather than the cause of it?

(Continued on Page 32)

¹E. P. Lichtenstein, DDT Accumulation in Mid-western Orchard and Crop Soils Treated Since 1945. Jour. Econ. Ent. 50(s) 545-547, 1957.
²C. A. Edwards, S. D. Beck and E. P. Lichtenstein. Bioassay of Aldrin and Lindane in Soil. Jour. Econ. Ent. 30(s). 622-626, 1957.

AIBRECHT—

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SUMMARY

Consideration of nature's processes in their course of evolution of different species emphasizes them as the positive force which has built up the segments of different life forms, including man, for survival of the healthy and the most fit for each particular climatic setting according as it produced soils of high protein potential for growth, self-protection and fecund reproduction, so well illustrated in ecological climaxes. This was the situation as long as man, also exemplified his behavior according to the laws governing him as simply another biotic form. But after man's shift to his assumption of control of his environment for his advantage, the forces of evolution in the positive, or for survival of the fit, have been thwarted more and more until in each biotic segment we can now read the evidence that many transplanted life forms are misfits in their soil-climate setting for the production of the foods by which they can be healthy. This holds true for man too. In consequence of his faith in his technologies to control the locations and all lives below him, the slow ex-

tingtion of the biotic pyramid as a whole has gotten underway, including the destruction of the soil itself as the biotic foundation.

The present social revolution is multiplying the hindrances to healthy survival of the various life segments. There is usually hope, however, in the deepest darkness just before dawn. By looking to the *natural laws and their application* as helps, *man may* rescue some areas to *re-establish ecological climaxes* for some of the life forms serving below him and thereby supporting the climax of healthy survival of himself in limited numbers. If such prove to be a vain hope, then the post-mortems of these many failing segments in the biotic pyramid will in their summation be the diagnosis telling us of the impending post-mortem of the human species itself.

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