A CORRECTION

A regrettable typographical error was made in the publishing of Dr. Pfeiffer's important paper "Chromatograms of Grain and Flour" in the last issue of Bio-Dynamics (Number 54). On page 8, the fourth and fifth lines from the bottom, it was stated: "The percentage of essential amino acids of the total crude protein was 23.2%."

The figure should have read **29.2%.** It is suggested that readers make this correction in their copies.

F.H.

BIOCHEMICAL RESEARCH LABORATORY ANNUAL REPORT 1957 THROUGH 1959

This report covers the work of the laboratory during the years 1957, 1958 and 1959. No report was issued for 1957 and 1958 because we wanted to wait for the outcome of certain developments, which have now been completed and can be reported.

A. AGRICULTURE AND COMPOST RESEARCH

The compost research has made a great step forward in several directions. Under the leadership of several German manufacturing companies, Harald Lauenstein; Siemenswerke, Erlangen; Paul Beden Werke, Euskirchen, and in cooperation with the City of Erlangen, near Nuernberg, Germany, a composting pilot plant for the processing of municipal garbage was erected and operated during the summer of 1957. The purpose of this plant, which had a capacity of 20 tons per day, was to establish the Pfeiffer method of composting of wastes, described in THE COMPOST MANUFACTURERS MANUAL, published by The Pfeiffer Foundation, Inc., Phila., Pa., 1956, and to collect engineering data and information in order to find out the most suitable equipment, machines and handling of garbage. This plant operated for four months and was then dismantled in order to check all parts for wear and to design new machines wherever necessary.

The biological handling of the garbage compost led to the discovery of a new, fast, hot fermentation. It was possible to transform the garbage in even less than the stated 21 days; some compost was ready for use after 12-14 days. By "ready" we do not mean just broken down garbage but compost, that is, ma-

terial transformed into humus. The B. D. Compost Starter was used and once more proved its value. The Starter was contributed by this laboratory. Dr. E. E. Pfeiffer spent two months abroad in order to act as consultant in connection with the erection and initial operation of the plant.

On the engineering side, valuable information with regard to conveying (speed and dimensions of conveyors) was obtained, as well as about screening procedures. German garbage contains a lot of ashes (hard and soft coal). It appeared that soft coal ashes are hostile to bacterial action. A method of screening out these ashes prior to composting was worked out. Garbage abroad is very abrasive to the grinder which prepares it for composting. The grinder which we used (of American origin) performed very well as far as grinding is concerned, but the hammers wore out much too fast. The Buettnerwerke, Krefeld-Uerdingen, decided to construct a new grinder based on entirely different mechanical principles. The proof run with a pilot grinder, incorporating entirely new construction principles, was encouraging, so that the Buettnerwerke are now building a large grinder for commercial use. This grinder is now being tried out.

The new composting method with the fast, hot fermentation, works at a relatively low moisture content (about 35%). The compost is turned one or two days after the peak of heat development and once more three to five days thereafter, with proper moisture control. As soon as the beginning humus formation shows up, the piles are flattened out and air dried in order to arrest any further breakdown. The turning, lifting, shaking up of piles which get too wet, flattening out and loading, are done with an overhead loader which operates so economically that the cost of these operations can be reduced to a minimum.

One frequently reads that here and there one or two day composting methods have been developed and are practiced. The breakdown of organic matter during the first few days can be demonstrated. We already did this in our laboratory in 1952. We have not seen a humus-like product produced anywhere on the outside after a one day fermentation process. Broken down organic material is not yet humus. Those who make these claims do not realize that organisms related to nitrogen fixation, as well as humus-forming actinomycetes and streptomyces are slow growing organisms and need more time to develop. Some of

these need nine days to become effective. These fast processes, therefore, do not produce an acceptable humus product.

Plot and Mitscherlich vessel growth experiments, carried out by an official experimental station with the Erlangen compost, have demonstrated the superiority of this compost above any other compost not produced with the B. D. Compost Starter, using other methods of processing.

During a short trip abroad in 1958, manufacturers of other types of composting plants, and plants in operation, were visited in order to investigate the suitability of other constructions. No reason was found not to continue on our present path.

These experiences enabled us to accept a challenge which was presented to us: to compost poultry manure on a rather large scale in the state of Georgia. Gainesville, Georgia is the center of a large poultry raising and broiler processing area. J. D. Jewell, Inc. processes some 36,000-40,000 broilers per day. All offal from the slaughtering of the broilers is dehydrated and used as addition to feed. The poultry manure, so far, had been wasted. A process of converting this poultry manure into a valuable commercial organic fertilizer was suggested to J. D. Jewell, Inc. of Gainesville, Ga. Messrs. Jesse D. Jewell, Charles and Everett Davidson of Potash Rock Company of America, Lithonia, Ga. and Joe Francis of Hoosier Soil Service, Terre Haute, Ind., took the initiative to form the M.P.C. Corporation and built a poultry manure composting plant. This plant was ready by September 1958 and is in full operation now. (See details in NATURAL FOOD AND FARMING, Nov. 1959 and BIO-DYNAMICS No. 53, Winter 1960.) The new method of composting has been studied in numerous tests and analyses in this laboratory and the production of the M.P.C. Corporation is continually supervised by our control tests. Part of these tests are carried out at the plant, other more complicated ones in this laboratory.

Recently a 200 ton compost pile from a mixture of 50% poultry manure, 40% coffee grind (waste from coffee extraction), 10% chopped straw (all percentages by weight) treated with the B. D. Compost Starter was made by Heinz Grotzke at Golden Acres Farm, Inc. The method of handling was the same as described in BIO-DYNAMICS, Vol. XII, No. 4 ("Composting on the Farm with B. D. Starter"). This compost pile was covered with a plastic material. HYBRO-TITE (10 tons) was added after the first turning. This compost was turned only two

times. It had rained considerably on the pile during the first few weeks before the first turning and before covering it, so that the pile got thoroughly soaked with water. We were interested in this trial because the answer was sought as to how to proceed under extremely wet conditions. The pile handling is about the opposite of our fast, aerated process mentioned above. Here a slow process was tried out. The result was very satisfactory. This compost analyzed as follows: 33.4% organic matter, 2.3% nitrogen, 3.8% phosphate and 1.7% potash (all on dry base).

The result indicates that the composting under very wet conditions also can be licked. We now have handling instructions on file for many different conditions. The M. P. C. Corporation, Box 642, Gainesville, Ga., is authorized to represent the poultry manure composting process with the B. D. Compost Starter for all southeastern and middle eastern Atlantic states. Companies which desire to profit from these experiences are advised to negotiate with the M.P.C. Corporation. M.P.C. has recently completed its plant with the addition of a fully automatic conveying, screening and dehydration system which was built by Dan Vincent, Inc., Tampa, Fla. during the winter 1959/60 and is in operation. The capacity of this plant, accordingly, can be raised to 100 tons/day.

Over the last two to three years, many tests have been conducted which demonstrated the possibility of increasing the availability of soil minerals by way of organic acids and enzymatic reactions as produced by soil bacteria and root excretions. Actually, in the rhizosphere of plant roots, entirely different availability conditions exist as compared with the soil further away. The active area around the roots may extend to a distance of about 1-2 inches from the root. The B. D. Compost Starter, as a logical consequence from observations made in this direction, was used to make available the minerals in such natural inorganic materials as HYBRO-TITE, colloidal phosphate (LONFOSCO) and rock phosphate. These materials yielded most favorably to treatment with the B. D. Compost Starter. It is necessary to have a certain amount of organic matter, compost, sludge, cotton waste, cocoa waste, tankage, etc., present, but then a manifold increase of availability of potash from potash rock and of phosphate from phosphate rock can be obtained. These rock minerals have originally a very low availability but, through bacterial attack, become valuable and efficient fertilizers. A fertilizer

blend, bacterialized, was the result, as is produced at present by the Hoosier Soil Service, Terre Haute, Ind. The practical results with this blend on farms, at present mainly in the middle west, can be termed spectacular because of yield as well as quality of the products obtained (corn, wheat, oats) and in view of the low formula of NPK and the very low application rate per acre. While heretofore it was the opinion that large quantities of organic matter, rating 5 to 10 tons/acre or more, were needed, it now appears that these bacterialized organic-mineral mixtures show definite results at the rate of 300 to 500 lbs./acre, increase the yield, improve the humus content of soil and its structure, An entirely new vista with regard to soil fertilization has opened up, the consequences of which can only be imagined at present.

Attention was called to the possibility of using microbial action to mobilize minerals by the fact that plant roots growing along marble plates (of gravestones) produce an etching pattern on the marble surface and that, many years ago, steel girders of a railroad bridge in Budapest had to be removed because of the attack of algae and bacteria splashed against the girders with the foam of the rushing water.

We were not at all surprised, therefore, when we read in a recent Russian publication that in Russia the use of bacterialized mineral fertilizers has already become an established practice. It is interesting to note that in Russia bacterialized fertilizers have been in use over the last few years. Similar results to the ones we have obtained are claimed there too. It is regrettable that western agricultural science bypasses these problems and is reluctant to accept the value of a new concept. It is also regrettable that a one-sided approach to composting by some of the experimental stations has not led to satisfactory results; in a way has even hindered composting from becoming a science. We only need to remember that for decades trials have been made only with straw compost, with the addition of a nitrogen correction, for instance, with ammonium sulfate, urea or other nitrogen sources. Opinions about the value of organic matter have been based on the results with such incomplete composts.

It appeared that composts deriving from different treatment and garbage processing plants show quite different efficiency with regard to soil and crops growing on them even though, by chemical analysis, the nitrogen, phosphate, potash and even organic matter content was about the same. The bio-

logical value of the compost contains certain intrinsic factors which cannot be caught by chemical analysis for NPK. It is therefore entirely insufficient to state the NPK and inadequate to make comparisons of composts based only upon their chemical components. It is much more important to know in what state (of compounds) the NPK and organic matter are present: biologically active, inert, etc.

Another problem is to determine the right moment when a raw material is broken down and ready for use. In the past, composts were allowed to rot completely until a humus earth was reached. These "composts" look beautiful and smell earthy but have lost up to 50% of the original content of nitrogen (of the raw materials) and even more of organic matter. Such composting procedures are wasteful. The necessity appeared to investigate the nature of the biological intrinsic quality, to follow the breakdown and transformation of composts in order to arrest the process at the right moment when maximum values can be preserved. No one single method of approach gave the answer. Some 26 or more different testing methods were tried over the years in our laboratory but no single one gave the complete answer. Also, these methods are time-consuming and some are rather slow, so that in the practical supervision of composting plants (production control) the results are obtained only long after the compost is finished and sold. The need existed for a quick orienting, qualitative method. This method was already developed in our laboratory in 1953 but it has only recently been perfected to an almost universal applicability.

In BIO-DYNAMICS, No. 49, we published a paper, "The Art and Science of Composting", which contains (a) our routine method of compost testing; (b) the new circular chromatographic method. First results obtained with this method were published in BIO-DYNAMICS, No. 50, Spring 1959. The problem of color reproduction of the chromatograms, which offers some technical and financial questions, had to be solved. Because of the sensitivity of the chromatogram and the manifold color hues, they cannot easily be photographed and reproduced in print. Our first paper contains, by way of illustration and explanation, some 24 color reproductions. The Fairfield Lithograph Co., 200 Henry St., Stamford, Conn. (Mr. Robert M. O'Dwyer) has shown great understanding of our problem. They have produced excellent color prints at a reasonable price. Their cooperation will enable us to publish more chromatograms in

order to demonstrate the many ways of application of this new method. The method allows one to follow all steps of compost fermentation, to determine when a compost is ready or overdone and to differentiate types of humus vs. crude organic matter.

In our present research program, there is now the problem of extraction and determination of humus fractions (chemically, spectroscopically, biologically and microbiologically) with the use of filter columns and chromatographic separation. In this way, we hope to take the entire composting work out of the realm of guessing and dilettantism or amateurdom and put it on a calculable, scientific basis.

B. INVESTIGATION OF QUALITY OF AGRICULTURAL PRODUCTS.

Protein, amino acid and germination tests have been made of the differently treated soils and their products, which demonstrated the improved quality of the produce when using the bio-dynamic method. In this connection, a new test for quality control of seed was worked out in this laboratory. It consists of the heating up of seeds for 30 minutes to a temperature of 212°F. in a dry oven. The germination of seeds prior to and after the heating is measured. It was found that seeds (grains, so far) from such bacterialized soils and fertilizer show a significant resistance to the heat treatment. (Preliminary results published in BIO-DYNAMICS, No. 46 — "Quality Production of Seed Protein".)

It was also observed that wheat seed which survived this heat selection and was planted again produced a new crop with a considerably higher protein and gluten content. The original wheat had, for instance, 11% protein, while the seed harvested from the heat selected offspring had 16-17% protein and, in the third generation, even 20%. Further studies in this direction are under way. We have started a seed selection and seed breeding program with the intention of developing a new strain of wheat with that high a protein content and high protein quality. This seed breeding program is still in the experimental and observation stage. It will probably take five more years, after these first three initial years, before we can have the new strain ready for practical use. To follow up this line will be one of the most important tasks of this laboratory from now on.

Another group of tests was conducted with the use of a seed germination machine, the so-called Herbagere, which produces sprouted seeds for cattle feeding. It was learned that seeds

sprouting in a compost solution produce different protein content and a different amino acid pattern in the young green leaves as compared with seeds germinated in a nutrient solution or in plain water. (Published in BIO-DYNAMICS, Vol. 47 — "Protein Changes During Germination and Earliest Leaf Growth".)

The original Herbagere is now replaced by a new construction, produced and sold by Buckeye Corp., Springfield, Ohio. At Golden Acres Farm, Inc., Newtown, Pa., this new sprouting machine is in use in order to produce sprouted grains for poultry and livestock feeding. We had the opportunity to study this machine thoroughly and to run tests on the sprouted grain. Based upon these tests, we are of the opinion that much can still be improved upon in the sprouting of grains. One handicap we see, for instance, is the fact that artificial light is used instead of daylight. Also, the light is used 24 hours, instead of installing a light rhythm. Agricultural literature in recent years contains much information on the importance of light intensity and light rhythm on the protein quality, the production of vitamins and on enzyme reactions. More research in this direction needs to be done to make these sprouts fully efficient and to obtain maximum feeding value. While the direction is outlined in our preliminary tests, the laboratory lacks funds at present to work out more details.

It is possible to increase the protein content of seedlings significantly by letting them sprout in B.D.-treated compost solutions — another example of increased enzymatic activity.

Another project of the laboratory concerns the quality control of agricultural products, determination of their natural original value, as well as finding out how much they lose in the course of processing. The crystallization method developed by this writer has been used for many years. To this has recently been added the determination of the amino acid pattern of proteins with a chromatographic method originally developed for diagnostic determination of amino acids in the urine. (Cf. "A Study of Amino Acid Metabolism with Urine from Tuberculous Patients", The American Review of Tuberculous and Pulmonary Diseases, Vol. 76, No. 5; "Amino Acid Metabolism and a New Test for Amino Acids in the Urine", Journal of Applied Nutrition, Vol. 11, No. 3) The same method can be used for the control of food products and agricultural products in the raw and processed state. Nutritional supplements have been checked for private clients in this way.

The new chromatographic circular filter paper method already described above in its application to soil and humus determination has also been a useful tool for quality and processing control of foods, as well as coffee, tea, tobacco and, most recently, for the differentiation of vitamin preparations. (Cf. BIO-DYNAMICS No. 50.)

During 1959, the decision was made to add another department to our laboratory, namely, *Quality Food Testing.*

With regard to proteins, not the absolute quantity or percentage of crude protein decides the nutritious value but the composition of its component parts — its amino acids. A protein which is low in essential amino acids is inferior to one with a high percentage of these essential amino acids. A food deficient in lysine is inferior, no matter how high its protein content; for lysine is the limiting factor. Without it, the organism to be fed cannot properly utilize all other amino acids. Unfortunately, most grains are lysine deficient. A protein deficient in arginine, lysine or tryptophan will not support proper hormone levels and reproduction in animals and man thus fed. Conditions like those in a wasting disease, and retarded growth, will result.

Science has only scratched the surface of these problems. But the data already available are important signposts. Nutritional science needs to be put on an entirely new footing as soon as the problem of protein quality is involved. Our laboratory became interested in these problems and has started to test all kinds of foods and feed for their amino acid pattern.

The question, whether and to what extent agricultural practices, soils, and fertilizer applications can influence the protein quality becomes of paramount interest, inasmuch as it appears that amino acid supplementation can become a double-edged sword. Publications can already be found pointing out that amino acid supplementation of food cannot be the answer, at least not in unskilled hands, for twice the daily requirement of certain amino acids may already lead to a toxic disturbance of the balance. (Cf. "Amino Acid Supplementation of Cereals", C. A. Elvehjem, Cereal Science Today, 1. 162-4, 1956.)

The circular chromatographic method supplements our knowledge of food quality. Our first aim was to establish standards: of the best quality, of differences between bio-dynamically, organically or minerally fertilized food plants and of average commercially produced foods. These standards we now have

on hand for grains, most green leaf vegetables, carrots, fruits (apples, citrus fruit), herbs, some nuts and also for different yeasts. We are still building up our set of standards.

In addition to chemical analytical findings, we feel urged to introduce a new term, "biological quality" or "biological activity". This does not concern only vitamin contents but also enzymatic contents and activity. Enzymes are the most powerful and important agents of any metabolism. Their proper function decides the health and life of every living cell. If they are destroyed, for instance, by storage or processing, the food loses much of its intrinsic value.

The mere stating of how much protein, carbohydrate, fat, minerals or even vitamins a food contains, unfortunately does not tell the whole story. It is necessary to know the protein quality (amino acids); it is also necessary to know the enzymatic activity. In soils, we are not satisfied to know of the presence of a mineral; we need to know whether it is available to the plant root and we need to know the biological processes which make it available. We need to learn how to influence these biological processes in order to arrive at a maximum efficiency in using minerals and organic matter. Likewise, a compost may have the same NPK as another and still may be dead organic matter or exist in a state where it cannot be utilized at once.

A plant may keep well because of stable, heat resistant enzymes or may not keep at all because of an incomplete balance.

A food may contain major nutrients but these may not be balanced and the digestion may be impaired.

A human being may get all the "percentages" of this and that but still be in a state of malnutrition because of imbalance or poor utilization and digestion. Enzyme systems play an important role in all these biological and biochemical transformations.

Finally, we have made an observation which gives rise to further investigation. A seed obviously is a living entity. It changes continuously because, even as seed in a dormant state, it breathes and undergoes changes of its inner chemical structure, of its moisture, and especially of its enzyme systems. In short, a seed lives until it has aged so much as not to be able to germinate any more. The lifetime of seeds is variable; wheat oats, etc., have a relatively short life, some weeds a very long

one. (Cf. BIO-DYNAMICS No. 53, E. Riese — "The Germinating Force of Seeds".

In making crystallization tests and chromatograms of seeds, it was observed that these change from month to month; yes, it was even observed that the germination percentage showed a fluctuation, so that seed from a certain origin germinated better in September, less in November, better again in January, and so on. The crystallization and chromatogram, accordingly, were different, showing better and poorer structures. In order to observe this fluctuation throughout the year, continuous controlling experiments were started.

So far we can only state that there seems to be a certain cycle. From practical experience we know that wheat mills better after the grain kernel has well matured; also, the flour needs a settling or "steaming off" period after milling. Continuous enzymatic changes take place as long as the seed and flour are "alive".

In the past it has been observed that rye flour does not bake well when the rye in the fields is in blossom. It has also been observed that, at the time the grapevines are in bloom, the wine in barrels begins to ferment again. It is our intention to follow up these natural cycles of fermentation with the final aim of finding new methods by means of which the original quality can be preserved.

The second step of interpretation of these chromatograms was to learn to identify the meaning of color and form reactions. At present we can differentiate between the influence of certain proteins, amino acids, gluten, starch, sugars and vitamins (especially thiamine, riboflavin and niacin) and of enzymes (especially proteolytic and diastatic enzymes). To do this has become one of the most fascinating studies in our laboratory. An entirely new approach and vista have opened. While this new test appeared at first to give only qualitative information, it is now being perfected to give also semi-quantitative and differential information.

Right now we are investigating the changes milk undergoes from pasteurization and boiling, even from prolonged boiling; the changes which take place from grain to flour, different degrees of milling, gluten and starch extraction; in addition, the further changes which a dough undergoes by way of fermentation with yeast, and finally, the influence of baking. About the study on grains, flours, yeasts, live and dead seeds, germinating

seeds, a paper has been published in BIO-DYNAMICS No. 54, Spring 1960. The next paper will be on flour, dough and bread, apples and probably sugars.

At present this food testing laboratory performs basic research and is not as yet self-supporting. It is hoped that testing services for others will eventually make it independent. One phase of its work concerns the study of the keeping and/or carrying quality of agricultural products by way of aging, storage, freezing or any other processing.

During the three year period covered by this report, the following tests were carried out:

Crystallization tests of all kinds	2221
Amino acid analyses of all kinds	1775
Bacteriological analyses of composts	96
Soil tests of all kinds	1142
Chemical quantitative analyses for NPK	553
Chemical quantitative analyses for protein	670
Chemical quantitative analyses for fats	33
Germination tests of seeds (all kinds)	268
Chromatograms of soils and composts	141
Chromatograms of produce and food items	249

Finally, a word about the financial situation of the laboratory. The testing services, which have been established over many years, such as crystallization tests, amino acid tests, soil, compost and protein analyses, are self-supporting but do not provide much extra revenue for our basic research. Any new problems or research task, as outlined above, (for instance, chromatographic quality food research or seed breeding) must be looked upon as basic research which cannot be commercially utilized. In order to carry on with the basic research program, the laboratory needs voluntary contributions and grants.

The gross income from testing services has steadily increased from $2,918.96 in 1952 to $12,139.40 in 1959. The expenses for basic research have to be adjusted to the available means, that is, contributions. These contributions have shown considerable fluctuation over the years, with a low of $3,158.15 in 1958 and a high of $9,024.06 in 1954. In 1959, $3,781.81 was received as regular contribution and a special grant (probably not to be repeated) of $4,000.00 to get started on the food quality program. The expenses for the year 1959 were almost $25,000.00. The laboratory was not in a position, therefore, to make both ends meet. Nevertheless, it was decided to go ahead with

the basic research program. The minimum budget for 1960 will be $25,000.00, but we would like to enlarge it to $28,000.00 — at the very least. Half of this total budget is expected to come from testing services. For the balance of from $10,000.00 to $13,000.00, we need contributions in order to be able to carry out our program and reach our goal.

We trust that the readers of this report will understand our situation and help us to carry on. The friends of our work have helped so generously in the past and have been so encouraging that we look with confidence into the future. It is to these contributors to whom we owe our special gratitude. Without them, no basic research could have been undertaken.

Due to the nature of this kind of research, frequently with an entirely new approach, searching for new and heretofore unknown methods of analysis, testing and experimenting, we need the special interest of people who have the foresight and pioneering spirit to advance into the unknown. Our endeavor to make, for instance, organic agriculture and composting an exact science, has for many years met only a well-meaning smile, but many years of frustration had to elapse before people began to show real interest and accept our point of view and to profit from our experience. Now it is the quality concept of natural uncontaminated food which is at stake and which we want to raise to an acceptable scientific level.

Another problem has recently come up. We have several times been approached with the request to teach our methods; to have qualified young scientists on our staff. Several students of agriculture, of composting methods and of food evaluation, some from this country, others from such far away countries as Taiwan, Portugal and Germany, have asked to learn in our laboratory for shorter or longer periods. This can be arranged only on the basis of scholarships. So far we have been able to grant only one scholarship for a three month period last summer and to support a foreign visitor during his five week stay in this country last winter. Such a scholarship program would greatly help to spread the radius of our work.

What has been achieved so far was possible only because of the splendid cooperation of our staff. This staff at the present time consists of 11 people. Erica Sabarth is in charge of chemical analyses and new research problems, assisted by Ruth Baumeister. Mathilde Vibber is in charge of crystallization tests and soil and compost bacteriology. Margrit Selke is in

charge of all B. D. Compost Starter problems. Lisa Monges is in charge of the new chromatographic quality research. Hanna Eickelbeck assists M. Vibber and M. Selke. Mrs. Adelheid Pfeiffer takes care of the administration and Elsie Etelson is our secretary. Maria C. Linder worked during the summer months on problems of insecticide residue in farm products and Peter Baumeister helped with greenhouse experiments. Peter Escher has been very helpful with many technical and mechanical problems.

To all these co-workers I owe my gratitude and respect for their willing and painstaking work. Great sacrifices have been made by all of them by being satisfied with minimum remuneration in order to allow the laboratory to carry on.

The Threefold Farm group and Spiritual Science Foundation have been our host for many years, allowing us the use of space in their auditorium building and other facilities on their grounds. Without this friendly cooperation of all concerned, the existence of the laboratory would not be possible.

EHRENFRIED E. PFEIFFER

PLEASE NOTE

Write to Bio-Dynamic Farming and Gardening Association, Inc.
R. D. 1
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c/o Threefold Farm
Spring Valley, N. Y.
For B. D. Tree Spray, B. D. Spray Mulch.

THE INFLUENCE OF THE SOIL ON THE HEALTH OF PLANTS, ANIMALS AND MAN

"The Agricultural Problem — Man's Program or Nature's", was the title of an illustrated talk delivered by Dr. William A. Albrecht at a Spring State Meeting of the New Jersey Chapter of Natural Food Associates on April 21st. Dr. Albrecht, Professor Emeritus of the Department of Soils, University of Missouri, is one of the world's great soil scientists.

The meeting was held at Stevens Institute of Technology, Hoboken, N. J., and was also addressed by Roland C. Clement, head staff member of the National Audubon Society and Harold Peters of the Society's research department. Ethel E. DeLoach, State President of N.F.A. presided and the speakers were introduced by the state program chairman, Dr. Winston H. Bostick, head of the Physics Department at Stevens Institute. Porter Evans spoke briefly, urging the formation of local N.F.A. clubs in various parts of the State.

Dr. Albrecht spoke extemporaneously, mostly in connection with illustrative slides, of various experiments, that carried his story graphically. What follows is from notes taken by the undersigned.

He said that soil is studied by agricultural students in terms of its *ash value,* although the ash value in plants amounts to only about 7% and what we eat is essentially the organic value of the plant. We disregard the organic chemistry side and actually know very little even about the inorganic. In this field the so-called *unessential elements* have been very largely neglected.

Breakdown symptoms in plants, animals and in microbial life are increasing, and one is forced to the conclusion that that is why degenerative diseases in man are increasing.

"We used to think that microbes were the cause of diseases. Now there is evidence that when microbes have entered the picture, they have come in simply as evidence of the breakdown of the body's defenses."

In this connection he told of the experience of a veterinary friend of his who, after a lifetime of practicing his profession, recently went on vacation to Nevada and shot an elk. The friend told him that in cutting up this animal for meat he had his very first experience of dissecting a fully healthy animal.