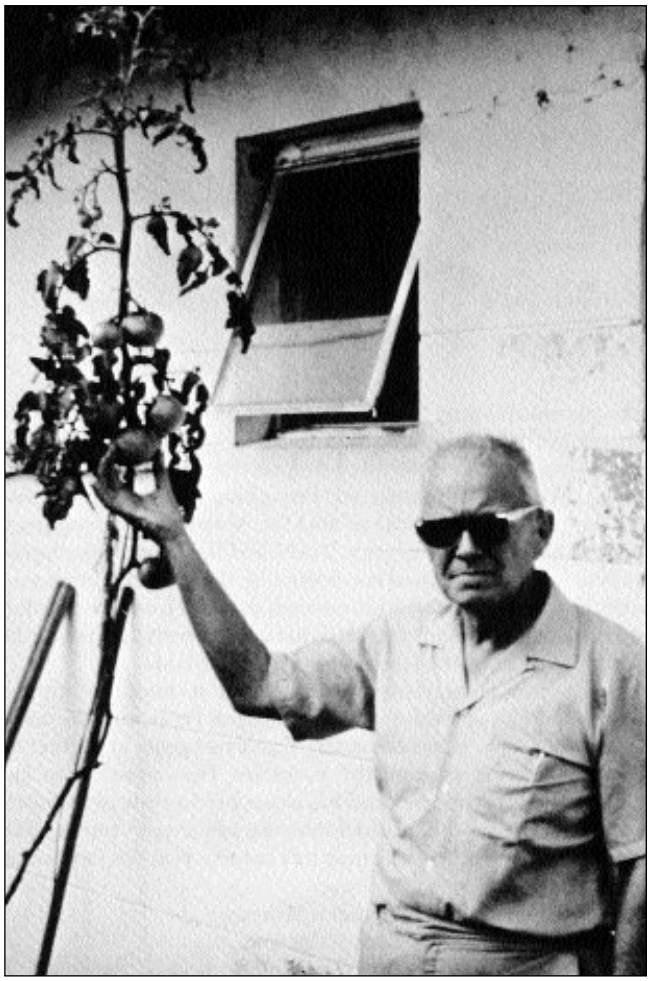
Trace Elements in Nature's Balance

The pioneering work and legacy of Dr. Maynard Murray was examined in our November 2001 issue ("Sea Energy in Agriculture: Renewing the Soil with Sea Solids"), but readers looking to examine Murray's findings in more detail have met with a problem: his book, Sea Energy Agriculture, *has been out of print for more than 25 years. In an effort to make this important work available for a new generation of eco-farmers,* Acres U.S.A. *has completed arrangements to publish a new edition of Murray's groundbreaking work. The following excerpt from* Sea Energy Agriculture *explains the core of Murray's startling theory: that sea solids — mineral salts remaining after water is evaporated from seawater — are the perfect trace element supplement. Salts on cropland? Read on. . . .*

by Maynard Murray, Ph.D.

Approximately 70 percent of the Earth's surface is covered by oceans and other collections of water. Protruding from these vast waters are pinnacles of land called continents. Over an estimated 2 billion years, the land has been worn down by rainfall, which washes the various soil elements out to sea. Thus, it is apparent that the sea is an enormous receptacle of the former chemical richness and balance that once supported life on land. Although it is not possible to know the exact rate of chemical denudation of the land masses over geological time or even at present, from recent estimates it has been determined that the rate ranges from six tons per square mile for Australia to about 120 tons per square mile for Europe. On a worldwide basis then, about 4 billion tons of dissolved material are carried to the sea by rivers each year. The most soluble elements are first picked up by rainwater and that is the reason why sodium chloride (common table salt) is so scarce on land, yet abundant in the sea. In several million more years, nature will succeed in completely eroding the land masses so that the sea will once more cover the earth and the cycle will be complete. Concurrently, geological forces will again raise land masses which will exhibit the rich chemical balance of the present seawater. This new state of balance will be temporary when taken over an extended time span since the same cycle of erosion would begin again.

Seawater is the most ancient natural solution on earth and, in my opinion, it is the most ideal physiologically. The disease resistance of plants and animals in the sea is remarkably different from disease resistance in land animals and comparisons between animals of the same or similar species are most interesting. For example, freshwater trout all develop terminal cancer of the liver at the average age of $5^1/_2$ years; cancer has never been found in sea trout. It is also known that all land animals develop arteriosclerosis, yet sea animals have never been diagnosed as arteriosclerotic. Investigators have also established the startling absence of disease in the sea, citing not only the absence of "chronic" disease forms, but especially the general vigorous health of sea animals that has apparently lengthened life many times in comparison to similar land species. These longevity differences are especially evident in such sea mammals as whales, seals and porpoises who have identical physiological systems with the majority of land animals important to man. And the major differences between sea and land life appear to be attributable to the superior food chain of the sea.



Dr. Murray and one of his sea salt nourished, hydroponically grown tomato plants.

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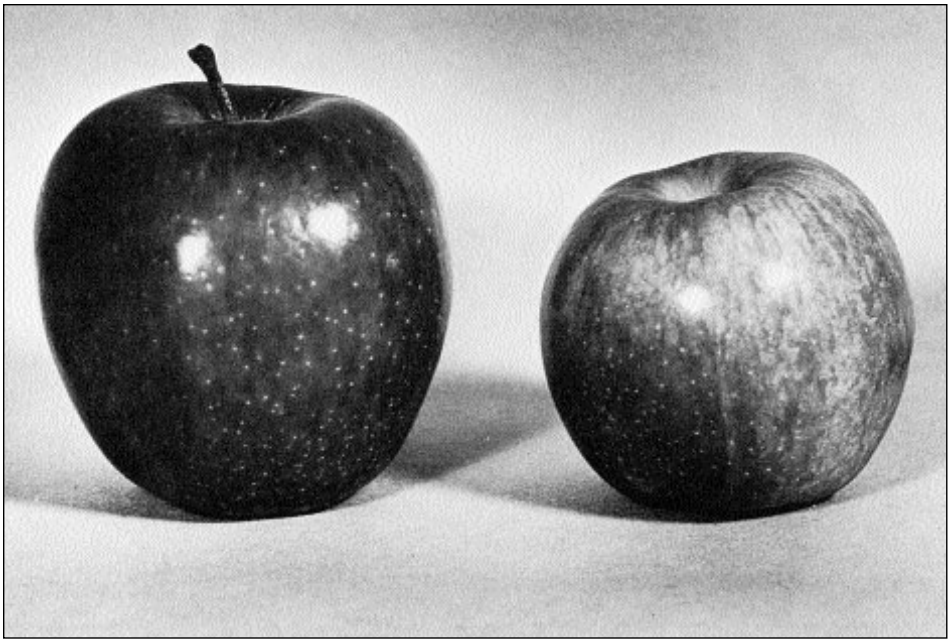

Results of sea salt nutrition experiments with apple trees: the smaller is the control.

The topsoil of land is characterized by elements in a colloidal state, defined as "a gelatinous substance which when dissolved in a liquid will not diffuse readily through animal or vegetable membranes." The sea is characterized by elements in a liquid crystalloid state, defined as "a crystallizable substance which when dissolved in a liquid will diffuse readily through vegetable or animal membranes." Unlike the colloid state of topsoil on land, the liquid crystalloid of the sea retains only the amount of each element that maintains a consistent chemical balance. Hence, excessive amounts of any given element(s) will drop to the bottom of the ocean, where it can be taken up only if the plant and animal life have depleted that element from the seawater solution. Thus the chemical balance is maintained.

The colloidal state of the land causes the opposite effect. When an element is leached from land, the resulting imbalance causes either a blocking of the other elements present so they cannot be taken up by the plants, or a substitution of some other element (for the one leached) takes place. As more and more of the topsoil elements were leached away, man began to put back manure, decayed foliate and dead animals for fertilizer. In the process he had returned the elements to soil in the same proportion as they had been cropped out. In modern times, agriculture has begun the process of adding the basic elements of nitrogen, phosphorus and potassium plus lime (calcium chloride) in large amounts which initially has caused the yield from crops to increase. As has already been pointed out, however, there is a growing evidence that excessive buildup of these four elements blocks the uptake of vital trace elements. In essence this means that leaching away of elements and excessive application of the four macro elements to crop reduced soil have seriously weakened our physiological food-nutrition supply to the point where it is amazing that we are able to function at all. It is no wonder that disease constantly attacks the various land organisms, including humans, in an attempt to naturally recycle the elements so that a fresh start can be made.

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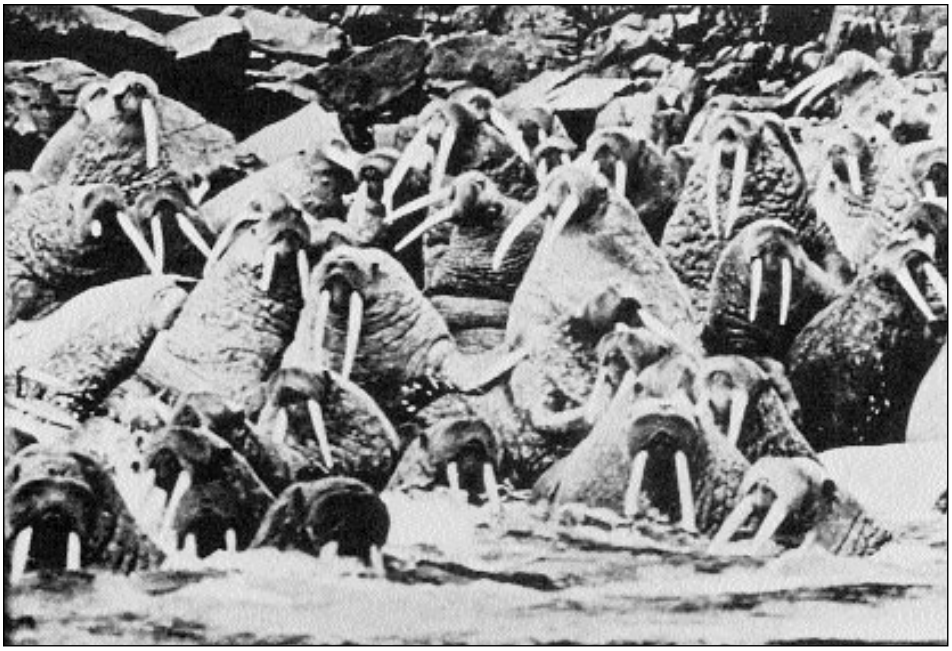
In the sea, by the very nature of its liquid crystalloid state, there is no occurrence of blocking or need to substitute elements. All elements of the atomic table are in a solution of consistency, balance and proportion, available to all sea life. The sea plants that ingest inorganic elements and thereby begin the food chain always have the same chemical solution to feed on so that their chemical analysis is always identical from one sample to the next. The extreme opposite is true on land, where even plants that are grown a few feet apart exhibit chemical differences, especially evident in the micro or trace elements. Given the consistent chemistry of the sea plants, there is never a need to attempt developing "disease resistant strains" as in land seed hybrids because sea plants are always disease resistant.

Further evidence of this consistent chemistry is found throughout the food chain in the sea when we note that animals feeding on a sea plant diet are also consistently balanced. These facts are rendered conclusive when comparisons are drawn between sea and land life. In land animals, for example, the range of iodine numbering in fat is tremendous and packing houses have found differences in animals from the same as well as different farms. In addition, while chemical analysis of muscle tissue of the whale and porpoise is always the same, the same analysis on land animals varies considerably from animal to animal.

An article appearing in *Science News* (Vol. 100, August 14, 1971) entitled "Trace Elements: No Longer Good Versus Bad," indicated the dramatic changes in interest in the topic of trace elements and health by the scientific community over the last ten years. This article points out that only a dozen or so trace element laboratories existed in the United States by 1966. Dr. James Smith, Chief of the Veterans Administration Hospital Trace Element Research Division in Washington, D.C. now estimates that there are over 50 laboratories in the U.S. devoted to working on trace elements and their role in physiology. Research is also being conducted in various European coun-tries, the Soviet Union, Egypt, Iran and Australia.

One of the breakthroughs of major proportions has been in the awareness that a particular element can be essential to physiology at a minimal level although it can be toxic at a higher level. Until just recently all of the research emphasis was placed on determining if an element was toxic and on symptoms of toxicity rather than on considering the quantitative amount and chemical state of the element when it was ingested. As is well known, sodium chloride is used universally as table salt in the inorganic form. Equally as well known in the scientific community is the fact that an excessive amount, such as four or five teaspoons of table salt, ingested at one time is potentially lethal to human life. The use of salt was a recognized method of committing suicide practiced by the Chinese in ancient times. Additionally, it can be



Animal life in the sea is far healthier than similar life on land. Tissue samples from an adult walrus compare with those of a baby walrus.

shown that an excessive amount of any element is toxic and even a small amount, if ingested by humans in inorganic form, may very well be toxic. As earlier described, people can utilize inorganic salts or elements only by having plant life in their intestines in the form of bacteria to hook up the inorganic element with a carbon atom so it can be transformed into an organic form. It is also interesting to note that many pregnant women and often people with heart disease, etc., are restricted to a salt free diet by physicians. Although one stalk of celery has as much sodium chloride in it as one would normally use at a given meal time through the salt shaker, salt free diets do not exclude celery. The obvious reason is that sodium chloride, per se, is not toxic; it is only sodium chloride in the inorganic state that produces toxic effects.

Crops and Soil Magazine (Vol. 13, No. 7, April-May 1961) carried an article entitled "Animal Health" by W.H. Allway, ARS, USDA, Ithaca, New York, from which the following quotation was taken: "Thus it may be more effective and efficient to supply certain trace elements to the livestock through the fertilizer-soil-plant route, rather than add these nutrients directly to the animal feed." This statement was based upon the observation that "increasing evidence indicates that various chemical compounds in which the trace elements may occur vary in their effect on animals."

Although only twenty elements (or minerals) are known to have a specific role in human physiology, several more are known to have beneficial effects in the physiology of plants and animals. The heavy metals, i.e., lead, silver, gold, cadmium, mercury, antimony and aluminum among them, have a suspected positive role and even known poisonous elements such as arsenic can be beneficial in some animals if they are ingested in organic form and in the trace amount. Finally, the *Journal of the American Medical Association* (Vol. 201, No. 6, August 7, 1967) has reported that William H. Strain, Ph.D. and Walter J. Pories, M.D. of the University of Rochester School of Medicine and Dentistry are investigators who champion the position that no element presently can be ruled absolutely unessential to humans. In short, specialists in trace elements generally agree that more trace elements await discovery as dietary essentials in various animal species and possibly in man.

Since it is true that major work is being done on the physiological role of trace elements and no element has been ruled out as possibly being important in physiology, why then did I become interested in the use of whole seawater as a fertilizer? The answer lies, at least partially, in the fact that while some 20 elements have been determined as having a role in physiology, there remain the additional 72 elements which make up the atomic table.

It has been estimated that a definite physiological role for a particular element is newly discovered on an average of one every 10 years. Thus, it is apparent that we may have to wait for five or even six hundred years before all are discovered unless the rate of discovery is markedly increased. The very nature of the scientific method precludes that the researcher is not a generalist so the process only allows isolation of one variable at a time in order to identify that variable's specific role. I am not seeking to disparage the work of men in such fields as soil science, plant physiology, animal husbandry and medicine in general, however I am suggesting that we simply cannot wait for the inferred number of years for every remaining element to be identified and its role in physiology to be specifically defined! For example, since only a few of the enzymes have had their necessary trace elements identified, only around nine trace elements are listed under "Recommended Dietary Allowances." However, since thousands of enzymes have been identified, there are undoubtedly thousands more enzyme-trace element joint functions remaining that must be isolated and described. The article "Trace Elements: No Longer Good Versus Bad" describes such action as follows: "A trace may stick to an enzyme like a sidekick and alter its structure, or it may help carry glucose through the cell membrane as part of its function."

Our health simply cannot wait for the exact role of each element to be discovered.

If a cell exhibits the complete chemistry that should occur, and the food which has been ingested was grown in seawater or on sea solid fertilized soil, the cell will most probably be just as resistant to disease as the cells of plants and animals are in the sea. If our present diet does not permit us to take in a complete chemistry, then our cells are incomplete and are subject to invasion by foreign organic matter such as bacteria, virus or fungus. What is even more insidious is that, although we may not have a known or diagnosed disease, we may be suffering from the "disease of dilution," characterized by an organism that malfunctions by

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comparison with its potential. It is always interesting to read the tremendous amount of research that has been done on disease resistance or the effects of medication and note the statistics. One is constantly faced with the fact that a certain percentage responded and a certain percentage did not. The question "why" is prompted when one is faced with the results of these tests and the answer is that the test subjects' chemistry was obviously different, comparatively speaking. If one were to analyze the food that was eaten by the animal and/or human subjects in the experiments, one would find that their food intake varied tremendously in elemental composition and, therefore, nutritional value as a direct result of the chemical imbalances of our soil.

I began my research 35 years ago because I felt that we should put all of the elements back into the soil in the same proportions that they are found in the sea. I felt strongly that the plants should have the opportunity to take up any element they might need. The possibility also exists that a plant may take up certain inorganic elements that, while not critical for its own physiology, are required by animals in an organic form and only plants can perform the necessary transformation.

Experiments indicated that land plants will tolerate from 400 cc to 1,000 cc of seawater to one-third cubic foot of soil. When seawater is dried by evaporation, the remaining sea solids can be administered as regular fertilizer to the land in the amount of 500 to 3,000 pounds per acre. It was also noted that unless serious rain water runoff occurred, this single application would last four to five years. Corn, wheat, oats, barley, bay, fruit trees, all vegetable crops and other plant life were raised on seawater or sea solid treated acreage. The tolerance experiments indicated that the sea can be recycled back to the land masses and the resulting color, disease resistance, taste and production yields were outstanding. A summary of my research findings is presented in this book.

Maynard Murray's Sea Energy Agriculture *is now available from the Acres U.S.A. bookstore for $16, plus $3 shipping in the U.S. (see back page for international rates). For credit card orders, call toll-free 1-800-355-5313, or visit our website at <www.acresusa .com>.*