get the most from the least

Minerals, Milk & Immunity

Sea Energy for Optimum Nutrient Density & Diversity

by *David Yarrow*, December 2010, for **Acres USA**

IN 2004, I HELPED BOB CAIN START SeaAgri to market Dr. Maynard Murray's "sea solids" to American farmers. Our second trailer of Sea of Cortez sea minerals was shipped by rail to central New York. A truck hauled the load to Twin Oaks Organic Dairy in Truxton, where Kathy & Rick Arnold unloaded six tons. The other 14 tons trucked three hours east to my Hudson Valley farmhouse.

Soon after, Organic Valley dairy farmer Jim Gardiner stopped by Twin Oaks. Jim took an interest in the sea minerals, and took a ton back to his farm in Otselic. I never met Jim, but months later he left a phone message about "unusual" results using sea minerals on his farm. I tried to talk Jim by phone, but he was ever elusive—either outdoors, or away on a trek.

Nearly four years later, February 2008, Bob Cain invited me to MOSES in LaCrosse, Wisconsin, the Midwest winter conference. Bob gave a talk and slide show on the history of sea minerals and recent stories about SEA-90. After Bob's talk, a farmer stood to say, "I'm Jim Gardiner, organic dairy farmer in Otselic, New York."

I leaned forward to focus on this man's words.

JIM SAID HE GOT A TON OF SEA MINERALS three years ago, and rationed them to his cows in measured daily amounts.

Protein & Butterfat

Jim was surprised when, after a few days, milk protein rose 6 percent, and butterfat was up two points.

Jim said maybe the bump was quirk or coincidence. Stopped the sea minerals. Protein and butterfat declined to normal.

So, since sea minerals seemed to be working, Jim fed them again. Free choiced them, so cows can eat as much as they want. They ate quite a bit, Jim observed.

As before, protein and butterfat rose—evidence sea minerals were causing this response. So, Jim left cows on sea minerals.

But, Jim went on, after cows were on sea minerals a few weeks, something happened "that really got my attention. The somatic cell count dropped to near-zero—and stayed there." He had no need to even think to use antibiotics to control infection.

Jim said this got his attention so much, he told other dairymen in NY, Pennsylvania and Midwest about his cows' response to a full spectrum mineral supplement. They were collecting orders for a fourth 24-ton trailer of SEA-90 sea minerals.

THIS UNEXPECTED STORY WAS A TIMELY GIFT. Jim's information on sea mineral effects on nutrient quality and immunity was neither new nor astonishing. His experiment is evidence today to confirm Dr. Murray's research done 50 years ago. His results reveal key insights on minerals and health.

Timely, since my godson Daniel Kittredge was launching the Real Food Campaign to train Northeast growers how to produce nutrient-dense foods. We know nutrient-density is easy to achieve with vegetable, fruit and grain by soil application and inoculation.

Jim's experience shows nutrient-dense is possible in livestock—and measurable in milk. His story highlights how just this one cultural practice produced an animal food with superior nutrition. And biological farming offers a host of further materials and methods to upgrade soil fertility, plant health and nutrient quality.

Quality, not Quantity

Higher protein and butterfat is a valuable quantitative effect.

But this shift isn't just a measurable jump in milk nutrients. True value to a farmer isn't a higher price for premium product. Heightened immunity and productivity from healthier cows means lower vet bills, less stressful farming. Jim can also expect lower feed bills and better birth rates. And slowly his cows' manure will spread full spectrum minerals and microbes into his soils.

So, other benefits cascade from this nutrition enhancement. Most important is greater health for animals, farm and farmers.

It's hard to put a price on health. Probably foolish to try.

EXTRA MILK PROTEIN AND FAT—plus other unmeasured molecules—aren't ordinary chemicals, nor a common casein or lipid. These particular proteins build special enzymes, hormones and other unusual biochemicals that perform special functions in cell structure and metabolism. Often they are catalysts to accelerate chemical reactions, and regulators, to coordinate complex enzyme systems. Their unique energy states allow biology to operate evermore efficiently—optimally—intelligently.

This is because sea minerals contain rare elements that supply special orbital geometries and valence energies to create unusual shapes and functions for biomolecules and cells.

NATE HARKNESS FED HIS COWS SEA-90 for three years.

"We're an Organic Valley dairy. We started to transition our herd April 06," Nate explained. "We went '*on the truck*' the first part of May 07. From April 06 to May 07, we farmed organic, but got paid conventional milk price. '*On the truck*' means you grow organic product, and get paid organic prices. It's like you reached the promised land.

"Our farm started using SEA-90 in September 2007. Jim Gardiner started me on it. He said Bob Cain recommended 4 to 6 ounces per cow per day. I'm a typical farmer, too much feed means less money, so we fed four.

"We did that until December, at which point we kinda backed off. We'd been using this for four months. We should see results. We hadn't seen any obvious results. Nothing that was jumping out at you saying this is something.

"We called Bob Cain. He said farmers in Michigan feeding six ounces a day are seeing results. So, we bumped it up to six ounces per cow per day in December. And then we started seeing some really good results.

"One of the most obvious that my wife noticed the most was the odor. We're in a stanchion barn, enclosed, wintertime. You always have a little hint of ammonia or urine smell. Kinda lingers. Fans are running, but you always have that.

"And that went away. That was the first, most obvious change we noticed."

Ammonia, Enzymes & Microbes

This subtle shift in scent has immense significance. At the least, it was more pleasant for everyone in the barn—humans, cows, chickens. Fewer flies. Less irritation to eyes, nose and throat. Internally, less irritation to blood, kidneys, bladder.

But more critical, cows no longer excreted Nitrogen. Instead, they now made full use of available N. Likely, dormant metabolic cycles kicked in to convert toxic elemental N into stable biological forms. Excess N is now becoming biomolecules—notably amino acids, and then into proteins.

A key insight into the Nitrogen Cycle is it's almost entirely run by bacteria. Several families of microbes, working together, fix nitrogen gas (N2) into nitrate (NO3-) to start the N Cycle. Other families use varied chemical pathways to convert NO3- into

ammonia (NH4+). Still others convert NH4+ back to NO3-. Scientific study of N-Cycle microbiology is still young, and more advanced in other nations than chemical-dependent USA agriculture. Yet, even the National Science Foundation report on N-fixing bacteria is over 250 dense pages.

The alternative to these biological ways to fix and manage N is industrial fertilizer: NPK. Nearly all the huge energy needed to manufacture N is from fossil fuel. Half of US hydrogen is used to make industrial N fertilizers, and it all comes from methane.

Only by reviving and regenerating N-Cycle soil microbes can US farms move away from industrial chemical dependence.

BACTERIA ARE SPECIALISTS AMONG MICROBES. Bacteria families evolved by harnessing specific—often unique—metabolic processes, and sharing this information. Each clan of bacteria builds certain *enzymes*: special proteins with specific functional purpose. Many microbes synthesize unique molecules, which they then trade with other microbes, plants and animals.

B vitamins depict this primal microbial intelligence. Plants and animals need these special biochemicals. Three B vitamins are *required by law* to be added to milled, refined grains. All B's are produced by microbial synthesis. Assorted organisms, ranging from bacteria to yeast, manufacture B vitamins. Maybe that's why they're "B" vitamins—they're made by Bacteria.

Even B12—the "vegetarian vitamin"—is only synthesized by a microbe. Cows don't make B12, nor do plants. Cows and other ruminants culture B12-bacteria in their rumen. They barter for B12 with soil bacteria. Microbes get a stable, warm, alkaline environment, steady nutrient supply, and a free ride.

Cows are ruminants with complex digestive systems—a series of bacterial chambers to ferment grass. These bovine brewing vats of digestive microbes are how cows convert grass into nourishment, energy and protoplasm. Microbial communities in these digestive tanks perform many—perhaps most—primary synthesis of minerals into protoplasm and cells.

The Least Elements

And sea minerals are especially excellent nutrients to feed these brewing bacterial cultures.

19TH CENTURY CHEMISTRY LEARNED SEVEN **Major Minerals** compose 4% of living organisms. In 100 years, biology quantified these elements, discovered their properties, energies and uses. **Major Elements** are present at parts per thousand.

Late in the century, Kekule dreamed of a snake eating its tail, and conceived the benzene ring. **Organic Chemistry**, the science of Carbon chains and rings, began. Nature's most elaborate molecular structures are mostly made (95%) of four **Organic Elements**: H, O, C & N.

With these eleven atoms, Nature builds biological molecules with hundreds, thousands, even tens of thousands of atoms. Yet, nearly a century passed before DNA's spiral was decoded.

20th Century biology began to unravel Carbon's complexities. This third most abundant element is the brick to build biology's intricate molecules. C's 4-way connectors stitch together spiral backbones of Carbon chains, particularly proteins. C's 4-axis symmetry builds rings–from simple sugars to complex hormones.

In the last century, biology learned a few elements—just over a dozen—are essential at parts per million—the threshold of detection in 1910. **Trace Elements** are less than one percent of living bodies—most in micrograms—but they exert powerful influences on metabolism and health.

Elemental Intelligence

The extra-ordinary effects achieved by these least of all the elements is because they are mineral keys to biochemical locks. Trace elements added complexity allows biology to encode extra intelligence into structure. This heightened information capacity is used to regulate and coordinate cell operation. So trace elements are often essential to optimum endocrine function, neurological development and operation, immunity, and reproduction.

Iodine illustrates the links between trace element, endocrine hormones and intelligence. This element is so well-known to be so essential for health, salt sold in stores is *required by law* to have iodine added. The exception is unrefined salt from the sea, because this trace element is mostly found in the sea.

Iodine is still used medically as anti-bacterial disinfectant.

Iodine deficiency in gestation can cause cretinism—congenital failure of neurosystem growth—structural brain dysfunction.

Iodine deficiency leads to goiter, a malfunctioning thyroid—endocrine gland to govern growth, metabolism and immunity

In a nuclear incident, governments will distribute potassium iodide to mitigate radiation injury to thyroid.

Mineral, Molecule & Microbe

Thus, a microdose of a single element is critical to orderly growth, immunity, endocrine function, neurological development. Iodine illuminates the power of these least of all elements when packaged in biology.

MANY BACTERIA USE A SPECIFIC TRACE ELEMENT to build their specialized biomolecules. Trace elements are often "co-factors." Just one trace element atom in a large biomolecule provides unique abilities to that molecule. As co-factors in critical biomolecules, effects of traces far exceed their concentration in cell and tissue.

Trace elements may supply special geometry to fold molecules into certain shapes. Often a trace element delivers electromagnetic charges to align and accelerate a chemical reaction—a metabolic catalyst. Or a trace element's multiple valence electrons offer several energy levels to facilitate high efficiency, high frequency enzymes.

For example, in vitamin B12, the trace element keystone is cobalt. One cobalt atom sits at this multi-ring molecule's core and bonds to six other atoms. So, B12 can organize more complex shapes than Carbon or Nitrogen. And cobalt is magnetic—able to achieve special energy states and alignments.

Perfect practical example of this element+enzyme+microbe+plant teamwork is N-fixation—first step in the N Cycle. *Rhizobia* bacteria that live in nodules on legume roots are N-fixers. These microbes make a special protein enzyme that uses an atom of molybdenum. "Molly" sits in the enzyme reaction center to mediate the high energy needed to split N2 and add six Os.

So, bacteria perform many useful services for plants, animals and humans. They create chemicals to accelerate, coordinate and regulate biological processes. As metabolic accelerants, these *enzymes* speed up chemical reactions. As regulators, they're hormones to keylock metabolic paths. As coordinators, some transmit signals to synchronize cells. Most are complex proteins to optimize metabolism and coherent function.

Full Menu Minerals

With Nate's cows, sea minerals delivered the missing elements whose absence retarded N-cycle conversion, yielding toxic NH4+ waste. The sharp shift from 4 to 6 oz. ration suggests missing elements must be at threshold levels to be effective.

But with enough of these essential elements, enzymes are activated to turn waste into resource, and plug the N-Cycle leak.

NATE HARKNESS WENT ON TO TELL a more revealing tale.

One thing I can tell you for sure we seen that really amazed me," he began. "Spring 08, we turned cows out to pasture in April, and not one animal in that herd went after dirt.

"The farm I'm on was my dad's. We've pastured cows in the spring since I was a kid here on the farm. Dad would turn cows out early in the spring. And since we're organic, we turn cows out earlier than before, at the end of April.

"You can name any mineral program, and we tried it. Go down the list. We 've tried them all over the years.

"But yet, every spring, when we turned our cows out, they'd find a spot, like a rut, where dirt was exposed, and they'd literally eat dirt. They'd pick their mouths up out of the dirt with it packed in their noses and jaws. They were eating dirt. Every year.

"That told me they were missing something. I communicated that to our mineral people, and they would tweak the program. Well, it didn't do any difference.

"So, in 07-08 winter, with SEA-90 six ounces per cow per day from December on, and feeding vitamin A, D & E mixed with selenium. That's all our cows were getting. That was it. We weren't feeding them anything else.

Full Spectrum Fertility

"Those cows walked out of the barn that spring, and weren't a bit interested in eating dirt. They were just interested in eating grass, and they went at it. So, whatever they were missing through all those expensive minerals, all those years trying different things, and tweaking programs

"To this day, I still don't know what was missing. But whatever it was, SEA-90 must provide it, because the cows weren't interested in dirt."

SEA MINERALS DON'T DELIVER ONE, OR TWO, or a few elements. These crystals are an optimum multi-mineral metabolic enrichment to support and accelerate biological syntrophy.

The sea is no ordinary solution. Seawater is Earth's own ancient solution to cook up cells and life. All 84+ elements that dissolve in water are in seawater.

Nor is the sea an accidental solution. Ocean chemistry is no casual coincidence of geology. The sea was Earth's sink for over a billion years, as water washed elements out of rocks into solution, and down streams and rivers, eventually to collect in the sea. Ocean chemistry pooled, blended, sifted, stirred, and precipitated to create a soup within and out of which life emerged.

To sift, sort and stir the sea mineral soup wasn't just geology. It was more than mechanical and chemical. Biology joined in.

The sea contains every element in the carefully calibrated, controlled ratios needed for optimum, full function biology. It's not merely that the sea contains so many element. A further, more profound benefit is sea minerals are a balanced biological blend. All elements are in reasonable ratios in optimum groupings.

Sea in Seasoning

From evolution's beginning, micro-organisms helped process and re-formulate the minerals, gases and energy in sea water. By varied methods, for varied purposes, living organisms co-created and cooked in this ancient sea soup, constantly seasoned by new minerals from continental bedrocks.

One early bacteria ate Iron, converting it to an insoluble precipitate that sank to the sea floor to accumulate in thick beds. Iron ore is a fossil by-product of this ancient bacterial digestion.

With magnetic iron removed, Oxygen could exist free in sea water. Photosynthetic bacteria flourished, fixing sunshine into sugar and Oxygen. Bluegreen algae—the first plants—evolved, and Earth's biological atmosphere—the Biosphere—formed.

Later, a new organism appeared in shallow, warmer waters to combine Calcium with CO2 into Calcium Carbonate (CaCO3). These cells used insoluble CaCO3 to build hard crystal skeletons around their soft, watery, thin-film, membrane-bound bodies. Their spiny, prickly armor became shells and shields to protect them from microbial predators.

The sea's early exoskeletal life—in death—drifted to seafloors. Over geological time, their fossils became limestone, dolomite and similar rock—sources of agricultural Calcium for soils.

So, in eons of evolution, minerals in the sea were adjusted to optimize them for biology. These dissolved elements and their ratios changed to expand the boundaries of life, and nurse an abundant diversity of organisms. Still today, the sea is Earth's ultimate reservoir of biological diversity.

Yet, lately, coral colonies and tidal communities are in sharp decline from rising heat, acid and pollution.

NATE SHARED EIGHT 24-TON TRAILERS with many other farmers. He described their experiences:

"One Mennonite farmer in Penn Yan NY feeds sea minerals religiously. He tells me the reason he does is because his butterfat came up. He ran out of SEA-90, so he went back to his regular salt, which doesn't have the full elements the sea does. He fed that, and butterfat went down.

"When he got SEA-90, it went back up. He is pretty convinced sea minerals are giving him the increased butterfat."

"Some put sea minerals on fields and see phenomenal results. Amish gentleman last year put it on his fields in Fort Plain NY. He called me, 'I want to put this on my fields. Is it too late?'

"I said, 'Probably too late to benefit first cut. But by the time it gets into your soil, it should benefit your second cut somewhat.'

"So he put it on. He called me end of June, 'We had decent rainfall all spring. My first cut wasn't too bad. But my second cut was almost twice my first. Do you think it's from sea minerals?'

"I said, 'I'm sure it benefited. I wouldn't give sea minerals all the praise, but I'm sure it shares the benefits.'

"He called me up the end of July, and his third cut was almost as good as the second. So he was very pleased."

Nano-nutrients: quantum biology

THE LAST TWO DECADES PUSHED BIOLOGY to new thresholds. It's now clear living organisms need certain rare elements at less than a part per million.

Below Trace Elements in the Table of Elements are **Rare Earth** elements. These heavier atoms have many electrons orbiting in very large electron clouds. They have up to a dozen valence electrons, and complex orbital geometry to share them in making bonds. Some of these large, dense atoms are also essential to biology, needed at a few parts per billion—"nano-elements." These elements impart special capacities to create exotic, complex biomolecules for highly specialized functions.

We know from creating crystal semi-conductor microchips for modern electronics, each element delivers unique properties to alloys, changing physical and energetic character of metals and ceramics. An extremely minute amount in a crystal has huge effects on electronic behavior. Semi-conductor science knows the power of "doping" at parts per million—even parts per billion.

What works with solid-state electronics is even more true in cell biology. Long ago in evolution, Nature—especially cells—learned to operate at radio frequencies using quantum energy states. Each cell is a liquid-crystal biomolecular microchip operating at ultra-high frequencies.

Nano-nutrients are much like semi-conductors in each cell's liquid crystal circuit board. Just a trace of these elements allow enhanced signal processing for energy and information.

YTTRIUM IS MY FAVORITE of these least of all the elements.

This Rare Earth metal toughens auto paints, is the red in digital displays, and is super-conductive. In cells, Yttrium seems concentrated in the nucleus and attaches to DNA. Early evidence suggests it affects replication—reading genetic code from DNA into messenger RNA.

Yttrium's triple valence is identified by its column 3 position in the Table of Elements. Like the letter "Y", Yttrium connects three atoms to coordinate splitting spiral strands of replicating DNA.

Pico-elements: 5-sided symmetry

Yttrium's fifth row position in the Table of Elements suggests its outer orbit electrons use 5-sided symmetry. Not triangular

(tetra), nor 4-sided (octa/hexa). Yttrium's unusual 5-sided geometry allows it to precisely lock onto and spin the DNA spiral.

Yttrium uses an *Icosahedron* to organize its bonds, with 20 triangular faces in twelve 5-sided vertexes. Buckminster Fuller used an Icosahedron to design his geodesic domes, and Nature uses this geometry as its architecture for cell membranes. Yttrium can coordinate up to twelve bonds to form some of Nature's most complex biomolecules.

Heavier elements in the lowest rows of Natural Elements have even more complex electron orbit geometry and valence energy levels. Multiple energy levels allow an atom to make eight, twelve—even up to 20—bonds to other atoms.

Carbon, by comparison, only forms four bonds in a simple tetrahedron. Other elements in that row—Oxygen, Nitrogen, Boron—are limited to the same simple 4-axis symmetry.

Evidence further suggests certain other very rare elements are essential at parts per trillion. These elements occupy bottom rows of Natural Elements, including the Platinum series, with Gold and Mercury. I call them "pico-elements."

Parts per trillion is staggering to imagine. A millionth of a millionth. The current detection threshold by lab analysis. A human body is estimated to be a few trillion cells. Imagine parts per trillion at the scale of cell membrane or DNA spiral!

These very exotic elements do very exotic things for cells—like convert ammonia to amino acid, or transcribe DNA into RNA.

Heath & Wealth

2011 MARKS THE THIRD YEAR DON CORDES of Cordesview Farm in Hillman, Michigan has fed SEA-90 in their free-choice mineral program.

Don used a mineral feeder that can introduce ten varied mineral products, and a cow chooses what she needs day-to-day. When Don added SEA-90 to the feeder, cows immediately showed significant interest—his first indication SEA-90 has things cows want, but aren't in other minerals.

Within six months, Don saw a decrease in somatic cell counts, fly pressure and hoof problems. Don knew sea minerals were benefiting his herd and profits. The next spring, Don broadcast 250 pounds per acre on all pastures.

After a year, Don saw somatic cell counts drop over 100,000.

Since then, somatic cell counts are stable under 130,000.

Milk protein and butterfat increased three and two percent.

Milk solids increased eight to ten percent.

Calf mortality dropped 75%.

Don believes his herd health is the best he's ever seen in 60 years as a dairyman. Protein and sugar in forage and hay are now high enough to sustain his herd with no added feedgrain. Cows freshen better since he broadcast SEA-90 on pastures.

The Most from the Least

Organic Valley Coop tests acceptable Lab Pasteurized Count for shelf life. Milk shouldn't test over 240. Monthly average under 76 is $.40 per CWT premium. Don's milk consistently tests 10-60!

Raw milk customers claim Don's cows' milk tastes sweeter--highest quality in Michigan.

The best of this story, however, is Cordesview Dairy is more profitable than ever before!

YOU GET THE MOST FROM THE LEAST. Elements essential at parts per billion and trillion are biological accelerants. But are typically toxic at parts per million.

Atoms in the Table of Elements' upper rows use *Tetrahedron* geometry and 4-axis symmetry to form up to four bonds. Carbon uses this perfect tetrahedral symmetry.

Trace elements in lower rows use an *Octahedron*, with four 3-sided faces at a vertex, to make up to six bonds.

Next step in density and complexity is *Hexahedron*. Its three 4-sided faces at each vertex make up to eight bonds. Sodium chloride's cubic crystals make visible this simple 3-axis symmetry. We live in this 3-D, 4-square reality.

Orbital Geometry

Atoms in the Table's lowest rows organize their orbitals in a Dodecahedron—Nature's most complex solid, with twelve 5-sided faces in twenty 3-sided vertexes. The heaviest bottom row elements form many more bonds to other atoms—up to 20—arranged in space with 5-sided geometry.

DNA is abbreviation for "De-oxyriboNucleic Acid." Many know "nucleic acid" is two amino acids that are treads in DNA's spiral staircase—crosslinks in the double helix. Few know "ribo" is "ribose"—a 5-Carbon sugar—the risers to lift the spiral up step by step. Two ribose molecules—one at either end of each amino acid crosslink—are opposite faces of a Dodecahedron.

So, DNA, our best example of biomolecular complexity, is built with 5-sided symmetry—a Dodecahedron that tips over and ratchets around face-by-face.

So, these heaviest elements provide 5-sided geometries to allow Nature to build these most complex biomolecules. Nano-nutrients are also necessary to translate information encoded in that spiral into instructions for a cell's molecular machinery.

Shape: Membrane & Immunity

An ancient adage declares: *as above, so below.*

A corollary of this wisdom says "as within, so without."

In a cell, practical application of this principle knows that DNA in a nucleus is in intimate connection with membrane at the cell periphery. Innermost and outermost surfaces of a cell are in close communication. The intelligence of cell membranes as orderly geometry is dimly understood by biology—not near as well as with DNA. Yet, this higher level of molecular intelligence is critical to immunity and reproduction.

Unified cell operation is possible due to elements with 5-sided symmetry, which are keystones in reproduction and immunity. Their multitude of electron orbits allow biology to build its most complex molecules with high level functions to optimize biological processes. As co-factors in endocrine hormones, neuro-transmitters, enzyme activators, and metabolic regulators, these least of all elements build biology's most unique and intelligent molecules. These high order biomolecules allow a cell to function as a coherent system.

Not just an enzyme or metabolic cycle, but more as a whole system scale, or an entire organism.

Structure encodes information as shape, to allow biology to hold and manipulate memory. Memory is the functional basis for identity and immunity. These least of all elements allow the operation of higher levels of

More complex shapes encode more extensive information.

This principle is seen vividly in electron microphotos of red and white blood cells. Red cells don't have a nucleus, and don't contain DNA. These exceedingly simple cells just store heme, which is iron, and thus oxygen for metabolic combustion. Red blood cells have smooth membranes because they have no genetic intelligence or molecular memory.

White cells, however, have complex membrane textures. They are the defense cells of our blood's immune system that manufacture anti-bodies to combat alien cells, or even attack and consume alien cells. White cells carry anti-body intelligence in their DNA, and have rough textured membranes. Folds, twists and turns in their membrane is information encoded in its nucleus.

White cells are simple beside the complex surface of a human egg. Libraries of genetic memory encoded as chemical structure articulated in intricate spinning and weaving of cell membrane.

Minerals and money. Wealth and health.