

Bio-conversion

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We are stardust
We are golden
Billion year old carbon
Caught in the devils bargain
And we got to get ourselves
Back to the garden

Joni Mitchell, "Woodstock" 1969

The Woodstock generation. Counter culture. Age of Aquarius. Back to the land. Peace and love. We look back and perhaps chuckle at the innocence and naiveté of the hippie movement. We actually thought we could change the world, rearrange the world, love one another, and that somehow wars would end, people would have enough to eat, suffering cease, freedom ring, and nature be preserved.

It was a beautiful vision. It was the shared dream of myself and millions of other people. Picture yourself for a moment back in the 1960s and imagine the transition taking place. Many of us grew up with nature in the neighborhood. There were woods and forests on the edges of cities and farms. The fear of child molesters did not dominate our collective psyche and the children were free to roam and explore. Then came the Vietnam war, the bulldozers, the housing tracts, the concrete, the imitation food, and the oppression. We could not cope with the contrast and largely had only each other for comfort and hope.

What was the angst we felt; the devil's bargain? Something had happened to the collective culture which we missed and longed for. In the spring of 1970, many critical decisions were made. That was the year of the first earth day, only a month before the campus strikes following the Kent State massacre. It was the year we first saw the picture of the whole earth from space. Something happened to many individuals in 1970. For me, the issues of stopping the war and saving the earth were fused together. Social justice and ecology became mysteriously linked.

We are stardust, we are golden, billion year old carbon.

Our generation was not the first to ask the eternal questions, What is life? Who are we? Why are we here? Is there meaning in human effort? Is there an end to suffering?

Decades have passed and we have grown older. Some forgot the dream, becoming exploiters and wanton consumers. Others translated it into right living, raising families, doing good work, doing what good they could for peace and nature as they passed by.

But for some such as myself and others, the quest for resolution of the age old questions did not dim with time or change with the culture. For me, the commitment to be a "part of the solution, not the problem" became a lifestyle, a career, a mission, and a quest. Today I wish to share some of the images and visions that I have found in my life's journey into the "bio- conversion" experience. Bio-conversion is the process of natural transformation of decay into life, suggesting a new model of living; the life and culture of the "bio-convert".

When I made the commitment on Earth Day 1970 to pursue an environmental career, I had no clear vision of what the decision meant or where it would lead. Being a child of nature, growing up as a barefoot elf in a deciduous forest, civilization always seemed foreign to me. As I grew older, whenever I could, after school, on the weekends, I would escape into what few retreats of nature were still left amidst the creeping cancer of civilization. "They" never broke my child-like spirit. I never became fully civilized. Biological complacency never overtook my being.

Like a survivor of a sunken ship, I treaded water in what nature I could, keeping my head in the world of "earth being-ness", gasping at times, drowning it seemed in cities, but ever finding the will to seek out a pathway which seemed more natural and less destructive. I was on the verge of despising humans, their culture, inhumanity, destruction of habitat, cutting of forests, pollution of air, water, land, and slaughter of life.

Such desperation could not long endure, and seeking the paths of spirit guidance, I eventually came to a place where I surrendered to the overwhelming force of the universe. Call it God, life, a higher being, Gaia, or whatever, I was graced, perhaps inflicted, with a vision in 1971 of humans living in harmony with the earth. The words of the Lord's prayer "Your will be done, on earth as it is in heaven" suddenly

made sense. In my mind's eye, I saw concrete and asphalt being transformed into topsoil enriched gardens filled with fruit and flowers. The houses themselves seemed to lose their hard, cold, sensation of separateness, evolving, as it were, into *living* shelters with walls of growing plants, where birds, reptiles, plants, and people could live together in a friendly neighborhood and universe.

At that moment of desire and inspiration, I knew that I was loved; that everyone is loved, that we are all part of an infinite and loving universe, that truly we have a right to be here. I felt that the force of love was in my very being emerging from my genes as well as the walls, the floor, and air around me. I felt that love was the very fiber and fabric of energy itself, as well as in our consciousness. My sense of angst was gone. No longer was I a child of nature living in a dead world of human corruption, thwarted by artificial human contrivances at every turn. I was now a being of a new world, a state of mind where humans are an intrinsic part of nature, where humans can work and be in harmony with the bio- and geo-sphere. But what did this transformation, this "bio-conversion" mean?

I saw that the dead images of my own life, the negativity, had become transformed into living positive ideals of life and growth. The pain and anger was being composted into new richness of soul awareness, fragrant as the forest floor. Where once I saw only concrete and unnaturalness, I now saw new beauty in human-tended gardens, landscapes, parkways, and forests formerly hidden in the cities and suburbs. Still, the pristine nature of wilderness holds a sacred place in my soul, but I now saw how wilderness could come into the human habitat over time, if only we could change our view of the human landscape and affirm life and the process of renewal like we had never done before.

How was I to share this vision of "peace with the world" I had experienced? Not by words, for the experience is beyond words. It could only be explained by the product of a life, my life as a human trying to demonstrate the vision of humans living in harmony with nature. I had made the commitment to foster peace and renew the earth. But what form would that service take? How could one life make any difference? In what vocation could both peace and biological harmony be found?

I started with the basics. Humans need air to breathe. Are people suffocating? No. But air quality is a concern. People need water to drink. Are people dying of thirst? No. But water quality and availability is a concern. People need food to eat. Are people dying of hunger? Yes. Are wars fought over food and land? Yes. This was where I would focus.

The search led me to studying the famine in Biafra, a nearly forgotten starvation of six million people in a long chain of famines in Africa which includes Ethiopia, Sudan, Somalia, and a host of other countries to come. I learned for the first time

about issues which *should* be taught in the grade schools, high schools, and colleges. I learned how human cultures come into a bio-region and begin consuming every biological resource available. First they cut the trees, then they burn the undergrowth, and finally oxidize the life out of the topsoil with tilling and chemical farming.

Slash and burn subsistence is the basic human practice; it is how humans relate to the biosphere. We cut and we burn. But what we fail to recognize is that when there is nothing left to cut, burn, or oxidize, the land no longer has the carrying capacity to support human populations or indigenous wildlife, and people subsequently starve and complex ecosystems disappear. This process of biomass destruction and desertification is taking place all over the world at a faster or slower rate, but eventually, if it is not stopped, will continue until the entire planet is a desert, nearly devoid of life.

In a United Nations publication detailing the cause of the famine in Biafra, of which there are strong economic and political forces at work as well, the author made the statement lamenting the loss of tilth and fertility in the topsoil, "If someone can devise a method of economically returning organic matter to the topsoil, they will have indirectly solved the world food problem by helping cultures become self sustaining." I said to myself, I can do that! What's organic matter?

Organic matter is the substance of life. It is carbon. It is dead life which is in the process of coming back to life. It is plant matter which is bio-converted into microbes, fungi, and other soil organisms, which also die, becoming the organic matter that is bio-converted into humus.

It is humus, the end of a long complex web of decomposition, that is the foundation and building block of life. Humus is the primary stage of renewable organic carbon as well as the final product of decay. Humus is the carbon form where decay and rebirth become one. Without humus, soils do not hold moisture, support earthworms, or foster root growth. Humus is the essence of soil fertility. Humus is concentrated carbon which fosters a living environment for the organisms that inhabit and sustain the topsoil. The topsoil ecosystem is so critical to life on earth, it should have its own ecological identity - the "humosphere". Without the humosphere, the terrestrial based biosphere could not exist.

Humans all too often take humus for granted when we eat plants which converted humus and carbon dioxide from the air into plant mass - our food. Indeed, we are, as Joni Mitchell sang, "billion year old carbon". Life itself is inseparable from carbon. The pure definition of the word "organic" means "contains carbon".

Carbon is the link, the common denominator, shared by all life forms, plant and animal. The roots of the word "humus" and "human" share a similar origin. Carbon is in the CO₂ we exhale, it is in the plants we eat, and in the feces we leave as we pass by. Carbon is not only the link between plants and animals, but is the element that connects us also with the soil and the atmosphere. If spirit has been called the "water of life", it could also be called the "carbon of life". But how many people truly grasp the importance of carbon, especially renewable carbon, in their daily activities, much less the web of life?

On any given day of the year, we might find these stories in the news.

Stream and lake pollution blamed on manure run-off
Scientists predict global warming will cause climate shifts
Death toll in Africa reaches one million from starvation
Citizens protest compost facility
Landfills close, methane gas explosions feared
Erosion problems get worse in farm areas
Floods ravage low lying areas, thousands homeless
Mississippi river flooding losses estimated at \$25 billion
Householder burns home as a result of careless leaf burning
Study shows 40% of rural residents burn or bury trash on-site illegally
Regional planners discuss issues of "sustainability and quality of life"

These seemingly unrelated stories all share one thing in common. - mismanaged carbon. After twenty-one years in the composting and renewable carbon management business, I am convinced that *renewable carbon management* is the greatest single issue facing the world today from the perspective of the survivability of the human race and the biosphere. Carbon cycling is an intrinsic part of the four basic elements, air, earth, fire and water. Mismanaging carbon imbalances these elements and causes inevitable biological consequences.

Mismanaged carbon impacts the air as excessive CO₂ in the atmosphere causes atmospheric warming. Humus loss affects the life and sustainability of the soil. Organic matter in the water supply causes water pollution, reduces oxygen levels causing fish kills and excess weed growth. In order to solve the problem of managing carbon, we need to first become more aware of the manner in which humans handle fire and oxidation.

Much has been written concerning excess combustion of fossil fuels as a cause of increased atmospheric carbon dioxide levels. Not as much attention has been given to the destruction of biomass reserves through forest burning, Tee harvesting, wetland destruction, and soil humus oxidation. All too often, the reaction of many environmentalists has been to take a position of "anti-human activities" calling for

decreased consumption of fossil fuels. Only recently has any significant attention been given to the role of the humosphere and biosphere in regulating CO₂ levels, and the potential of soil based "carbon sinks" to convert atmospheric carbon into terrestrial carbon forms.

Ignoring the problem of humus loss through soil oxidation creates an oversimplified view of the global carbon management problem. Humus loss is the main cause of the serious problem of soil compaction which results in lower crop yields. When we think of topsoil loss, we usually think of rain and wind carrying minerals away, rarely about the quiet oxidation resulting in gradual annual decreases in soil organic matter levels. Topsoil is not a static mineral asset which can be purchased or replaced. It is a living ecosystem that has to be cultivated and sustained by replenishing carbon losses at a rate equal to, or greater than, the rate in which carbon is oxidized.

Mismanaged soil carbon also has the neglected consequence of ever decreasing earthworm populations. The absence of earthworm tunnels reduces soil percolation, causing increased runoff, which leads to flooding and erosion. Worm populations diminish in direct proportion to the available organic matter in the soil. When worm populations decrease, the mammals, reptiles, birds, and fish that feed on earthworms are also affected. Earthworms are a primary protein source for a wide variety of animals, many of which, like frogs, are inexplicably disappearing. Soil carbon and earthworm populations are directly linked.

Mismanaged carbon is also a great planetary problem because humus depletion results in crop failure and hunger. In the third world and in the technical civilization, dependence on fossil carbon is no solution. We have seen enough of the results of chemical dependency in our culture. But studies show that once organic matter levels drop below two percent, even chemical fertilizers begin to lose their effectiveness. But my point is not "anti-chemicals" as is the cry of some in the organic agriculture movement. I call for the affirmation of the positive, the abundant use of compost and humus, and am convinced that once soil carbon is properly managed, the use of chemicals will gradually be diminished.

Much of the problem of carbon mismanagement is due to ignorance. If citizens were "bio-converts", meaning persons who had made the decision to manage carbon wisely to support both the human and biological cultures, they would not be protesting composting facilities. If humans ran compost sites properly, residents would not need to protest. If people were educated, they would never presume to burn leaves or brush which could be composted, chipped, and mulched, much less burn trash full of toxic plastic fumes. If farmers were educated, they would not let manure stockpile in festering globules, causing runoff and odors. If compost sites were proliferated, there would be little methane generated at landfills, because the

organic fraction would be diverted into making humus instead of causing problems and methane in landfills.

I have worked with many a college graduate who majored in biology who was completely ignorant regarding soil ecology, the value of humus, and even the basic process of carbon cycling from decay to CO₂ and back to plant life. If biology majors are biologically illiterate regarding renewable carbon, how much more education must we do to reach the general public, or even our children? We teach water respiration to fifth graders, but not carbon respiration. We teach recycling, but not composting. We teach about saving whales and endangered species, but little of saving topsoil and endangered earthworms.

Let me share some alarming facts.

Each American generates approximately one ton garbage each year which is landfilled, around 250 million tons. Of this, 70% is organic material including paper, wood, food scraps, grass clippings, brush, and leaves. We gladly PAY to landfill these materials, but are reluctant to pay to have organics converted into compost and humus.

Since the turn of the century, the humus content of the average topsoil has dropped from seven percent to three percent. At two percent or less, plants can hardly grow, even with additional chemical fertilizers. The average population of earthworms has dropped from 1000 pounds per acre down to 300 pounds per acre or less. Some soils with high use of biocides have no earthworms at all.

The loss of earthworms and organic matter has reduced the water holding capacity of some farm soils by 70% or more, resulting in increased runoff. Flood plains based on 7% organic soils full of earthworms are being rewritten. 100 year floods are now 25 year floods. 50 year floods are now 10 year floods. 10 year floods are now 2 year floods. We will spend billions of dollars per year to compensate people for flood losses but will not spend the same dollars needed to build soils to prevent floods.

Studies show that we now have up to 10,000 times the number of sea gulls as a result of our landfill practices. Sending food scraps to landfills feeds these flying rats at such astronomical rates that gulls are now everywhere whereas they used to be only near coastlines. Watch a farmer plow a field during the day and you will see dozens of gulls following, eating the earthworms.

We read about the national debt reaching the trillions of dollars, but do we read about the topsoil debt? If we have 350 million acres of farmland, and each acre needs 200 tons of compost to build its fertility level back up, that means that we are in debt to our children a total of seventy billion tons of compost! Even 100 million

tons of compost diverted annually from landfills is only a start in the monumental task of farmland rebuilding. But landfill diversion is where we must begin, since the dumping fees can become a subsidy to help the bio-converts perfect the process of adding value to low grade carbon resources.

Every year, the organic matter levels in our farm soil drops another fraction of a percent. Crop rotation, conservation tillage, and other sustainable practices may decrease the rate of soil organic matter loss, but they do little to build it back up. At a value of \$20 or more per ton for compost, what farmer can afford to put \$4,000 worth of compost on his field to build it up to sustainable levels? Like leaves feeding a forest soil every year with a layer of organic material, we also need to feed our farm soil with an annual load of organic matter, a loading rate which exceeds the oxidation rate, at least twenty tons per acre every year.

The problems seem insurmountable, and I am just one person working in the composting field trying to make a difference. But the long term solution is to educate people by sharing the vision of a biologically harmonious future, and encourage them to become "bio-converts".

What does it mean to be a bio-convert?

1. Accept your humanness

This means to recognize that we are all biological creatures that have carbon needs and carbon outputs. Every act of carbon consumption has a carbon consequence. When we eat food, a part of that food came from topsoil somewhere. When we excrete the finished food, a small amount of carbon has to be managed by someone. Accepting ourselves as being human is actually quite an achievement. Some religions teach us to deny our biological origin, that dead flesh and feces are taboo. Simply accepting your biological being-ness is an important first step.

2. Become aware of local biological cycles

Learn what types of soils are in your bio-region. Get a book on soil microbiology and learn about soil organisms. A great primer is Charles Darwin's 1881 book on earthworms. Find out how manures are being managed and which farms are practicing sustainable farming techniques. Learn where your sewer goes, how your feces are managed, and where the biosolids are used. Study your local trash management practices and find out where the recycled paper and compostable materials go. Visit and learn about your local composting operations. Find out if local governments use compost in parks and transportation projects. Become aware of wetland issues and peat moss harvesting practices. If you have a septic system, learn how it works, find out if it is in working order.

3. Learn about global carbon cycles

Study the issue of global warming. Learn about the carbon respiration cycle, about mass balances, carbon sinks, climate modeling, and fossil versus renewable carbon use. As we use fossil fuels, we add to the CO₂ reservoir in the atmosphere. Do not dwell on guilt or recrimination, however. It may be that we humans are here on earth to remedy the global cooling caused by plants removing TOO MUCH CO₂ from the atmosphere. Plants are actually suffering from too little CO₂ compared to the past. Ice on the planet is relatively recent, only about two million years. Humans are born oxidizers, they burn everything in sight, converting carbon to CO₂. But the RATE of increased atmospheric CO₂ is too fast for the biosphere to adjust. Ask the question, "How can we slow global warming down to thousands of years rather than decades?"

4. Take responsibility for your carbon consequences

If the biosolids from the local wastewater treatment facility are not being managed properly, advocate beneficial use. Do not trust that others are as "carbon-conscious" as we bio-converters are. If source separated organics are not being composted, become an advocate for composting. Mixed waste composting, full of glass, plastics, batteries, and metals is a last resort, not a first option. Learn to compost at home. Let grass clippings lie. Observe how Nature is the ultimate mulcher, letting thin layers of organics decompose on the surface. Start an earthworm bed. Do more than passive piling of organic byproducts; learn the principles of active, hot composting. Make your own potting soil. Become an advocate for landfill diversion. Promote compost use in your community. Spread compost over your lawn as a top dressing. Better yet, put down three inches of compost and till it in nine inches deep. Promote sustainable agriculture, buy from farms that use wise carbon management practices. Think about our bizarre death rituals, how we handle our deceased bodies, and reflect on the degree in which cultural taboos still have a hold on the collective consciousness.

5. Become an advocate of bio-conversion

Bio-converters are not highly esteemed in our culture of oxidizers. Eliminate the word "waste" in your vocabulary when it comes to discussing organic resources. Avoid using references to organic matter in a derogatory manner, such as the phrase "opening a can of worms". What is so bad about cans of worms? Bio-converters want to conserve carbon, build the soil, and reverse the oxidation cycle. People will laugh at you, ranking you down the list with septic pumpers, trash collectors, composters, manure handlers, and undertakers. But remember that carbon incrementation, building soil fertility, is the ONE KEY to solving numerous

environmental problems. Carbon management is the new "general field theory" of sustainability, if not cosmic consciousness. It is the dying race of hell bent oxidizers that has their priorities reversed, and they, sadly or happily, are a passing breed.

It is reported that Jesus told Peter to "feed my lambs". Well, my translation is "Feed my worms."

You have probably heard the saying, "Give a man a fish, you feed him for a day, teach a man to fish, you feed him for life."

But we have seen that people too often keep fishing until all the fish are gone. We need to teach people how to *raise fish*. The deep ecology lesson will help us complete the circle, which is to teach people how to raise earthworms which then feed fish and poultry. We need to learn how to grow our own *fish food*!

There was a biological need for the human race as an oxidizer. The plants were cooling off the planet and Gaia needed a fire worshiper to return carbon dioxide to the air to warm the planet back up. But we have served our purpose as fire starters and slash and burn agriculturists. We now know that we can manage the atmospheric CO2 like a reservoir, letting the planet gradually warm if we learn to control our fires and rebuild the humosphere and biosphere with living carbon reserves.

But the vast majority of humans will not become bio-converts. They will continue to slash the forests, burn the undergrowth, consume every drop of fossil fuel, and oxidize the topsoil down to its mineral base. We will not be able to slow global warming until a large percentage of the population has switched to biologically harmonious practices. I am afraid that we are looking at generations where people who depend on climate for food, on chemicals to compensate for the lack of humus, and fossil fuel to transport food, will not be able to sustain their fragile culture. I do not think that we can build the soil or conserve biomass fast enough to prevent rapid global warming.

I predict that it is the new carbon and biologically friendly communities that will survive the inevitable climate transition, resulting in an entirely new species of biologically integrated humans. The carbon friendly humans will transcend the wanton biomass oxidation and biosphere slashing practices of their Neanderthal ancestors. These "carbon conscious" new cultures begin with a few people gathering together who make the commitment to become bio-converts. These small groups will eventually evolve agricultural cooperatives, become involved with composting facilities, large worm farms, organic poultry operations, renewable fuel systems, and local produce cultivation. These new sustainable communities will be able to weather the coming climate change, where organic matter and water conservation

practices will produce food, fiber, fuel, and fertilizer in lands which once required precipitation and fossil fuels to survive.

Organic material increases soil productivity to the extent that people will be able to produce more food on less ground. This one fact will enable more cultures to become increasingly self reliant and less dependent on the global, fossil carbon based, corporate agricultural infrastructure. With water conservation and wise management of organic residuals, people anywhere can harvest carbon from the atmosphere through the sunlight of photosynthesis and ultimately control their own destiny with respect to food, fiber, fuel, and fertilizers. Earthworm cultivation may be the missing component in deriving added value from the process of maximizing organic matter potentials.

There will soon come a time when the bio-converts will bring literally megatons of earthworms into a city to devour and divert the discarded and wasted organic materials from the landfills and use the "block which the builder cast out to build their church". These megatons of living energy will help balance the karma of the megatons of atomic destruction which the oxidizers were determined to use only a few years ago. Once people recognize that *biological realities* are the first order of civilization, even of spiritual responsibility, then the cultural and technical barriers preventing bio-transformation of the planet can be removed.

Eventually the soil WILL be restored, even made richer than believed possible, square foot by square foot, acre by acre, community by community, until plants thrive everywhere to their optimum. When people become free from biological need, the fear which drives the tyrants will be removed as biological scarcity becomes a chapter of our distant cultural past. Life can and will arise from the compost enriched soil in abundance of biblical proportion.

Perhaps we can even visualize a world where the concept of separation of that which is touched by the hand of man from that which is of nature will be gone. We need to compost our dead notions of civilization and isolation and find the core essence of survival, renewable carbon. Then indeed, we will find an era of light and life, where God's will is done on earth as it is in heaven.