

BIOREMEDIATION: NATURE'S WAY TO A CLEANER ENVIRONMENT

In the early 1980's, studies by the U.S. Geological Survey had shown that microorganisms naturally present in the soils were actively consuming fuel-derived toxic compounds and transforming them into harmless carbon dioxide. Furthermore, these studies had shown that the rate of these biotransformations could be greatly increased by the addition of nutrients. Case in point, a massive fuel leak in 1975 had contaminated soil and water and threatened a nearby residential area. In the early 1990's, bioremediation was introduced and by 1993, contamination in the residential area had been reduced by 75 percent. Ground water that had once contained 5,000 ppb toluene now contained no detectable contamination.

Bacterial treatments have been used in the oil industry for several years. "Land farming" operations are commonly used to degrade waste streams from drilling, production and refining operations. In this case, the waste drilling fluids and cuttings, produced fluids, or refinery wastes are transported to a land farming operation. These land farms

are comprised of a series of diked ponds or cells. A liquid drainage and collection system is designed in the bottom of each cell. The drain system is covered with soil and the liquid waste stream is pumped into the cell. The liquid phase is collected by the drainage system, pumped to a treatment facility, treated to specifications and discharged. The solid waste remaining in the cell is left to dry. Once dry, the waste and the underlying soil are plowed. This is done several times during the degradation process. The natural soil bacteria degrades the waste into basic components such as carbon dioxide, water, hydrogen, etc. over time. Even oil mud cuttings and waste have been successfully treated in this manner.

Current estimates indicate cleaning up existing environmental contamination in the United States could cost as much as 1 trillion dollars. Bioremediation makes an attractive alternative because: 1) treatment takes place on site; 2) it harnesses natural processes and; 3) it reduces environmental stress caused by the introduction of unnatural methods.



The following are blunders that actually ended up in church bulletins:

- "Don't let worry kill you - let the church help."
- "Tuesday at 4:00 PM there will be an ice cream social. All ladies giving milk please come early."
- "Thursday at 5:00 there will be a meeting of the Little Mothers Club. All wishing to become Little Mothers, please see the pastor in his study."
- "The ladies of the church have cast off clothing of every kind and they may be seen in the church basement Friday."
- "At the evening service tonight, the sermon topic will be 'What is Hell?' Come early and listen to our choir practice."

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Although bioremediation holds great promise for dealing with intractable environmental problems, it is important to recognize that much of this promise has yet to be realized. Specifically, much needs to be learned about how microorganisms interact with different hydrologic environments. As this understanding increases, the efficiency and applicability of bioremediation will grow rapidly.

For additional information on bioremediation:

- **The Toxic Substances Hydrology Program**
- toxics.usgs.gov
- **CLU-IN - Hazardous Waste Clean-Up Information**
- www.clu-in.org
- **EPA REACH IT - Technology Selection Online**
- epareachit.org
- **Natural and Accelerated Bioremediation Research (NABIR)**
- www.lbl.gov
- **Biotreatment News**
- www.bio.org

PRODUCT CORNER

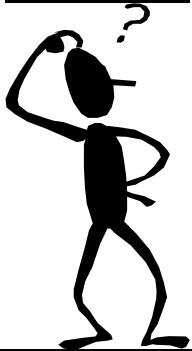
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THOUGHT TICKLERS



“Remember not only to say the right thing at the right place, but far more difficult still, to leave unsaid the wrong thing at the tempting moment.”

- Benjamin Franklin

“Freedom is just chaos with better lighting.”

- Alan Dean Foster

“Flattery is like cologne water, to be smelt of, not swallowed.”

“Every day I get up and look through the Forbes list of the richest people in America. If I’m not there, I go to work.”

- Robert Orben

“If your head is wax, don’t walk in the sun.”

- Benjamin Franklin

“Nothing is ever accomplished by a reasonable man.”

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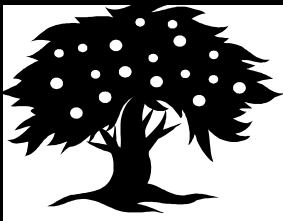
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The Road Not Taken

Two roads diverged in a yellow wood,
And sorry I could not travel both
And be one traveler, long I stood
And looked down one as far as I could
To where it bent in the undergrowth;
Then took the other, as just as fair,
And having perhaps the better claim,
Because it was grassy and wanted wear;
Though as for that the passing there
Had worn them really about the same,
And both that morning equally lay
In leaves no step had trodden black.
Oh, I kept the first for another day!
Yet knowing how way leads on to way,
I doubted if I should ever come back.
I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a wood, and I--
I took the one less traveled by,
And that has made all the difference.

Robert Frost



The Ecocycle

Modern farming and forestry practices often break the natural cycle. The natural cycle is becoming increasingly known as the "ecocycle" by conservationists and those taking a more progressive approach to agriculture.

Humus and other nutrients are constantly winding up either in landfills or incinerators instead of being returned to the soil where it can do the most good.

Approximately 70% of household waste is comprised of food waste, paper, etc. which originates from agriculture and forestry. More often than not, this material ends up in landfills or incinerators—breaking the natural cycle. By making compost, these nutrients can be returned to the soil thereby completing the cycle.

Synthetic nutrients are often used on farm and forest land instead of the natural nutrients. These synthetic fertilizers promote leaching of the soil and are often wasted because the bulk of the nutrients run off into water systems.

If, instead, compost is added to the soil, we imitate nature's own way of supplying nutrients. Life is restored to the soil, organic content is increased, it preserves moisture and nutrients and prevents leaching.

- Bedminster

**Intellectuals solve problems;
geniuses prevent them.**

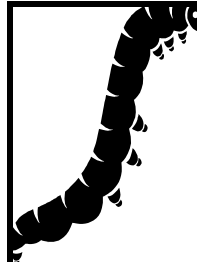
- Albert Einstein



NAME YOUR POISON!

- Advertisements for coffee in London in 1657 claimed that the beverage was a cure for scurvy, gout and other ills.
- Willow bark, which provides the salicylic acid from which aspirin was originally synthesized, has been used as a pain remedy ever since the Greeks discovered its therapeutic power nearly 2,500 years ago
- From the 1500's to the 1700's, tobacco was prescribed by doctors to treat a variety of ailments including headaches, toothaches, arthritis and bad breath.
- Ginger has been clinically demonstrated to work twice as well as Dramamine for fighting motion sickness, with no side effects.
- Morphine was given its name in 1803 by the discoverer, a 20 year old German pharmacist named Friedrich Saturner. He named it after Morpheus, the Greek god of dreams.
- Quinine, one of the most important drugs known to man, is obtained from the dried bark of an evergreen tree native to South America.

- www.corsinet.com



John Henry Fabre, the great French naturalist, conducted an unusual experiment with some Processionary Caterpillars. These caterpillars follow each other blindly, eyes half shut, head snugly fitted at the rear of the one in front of it.

Fabre filled a flower pot close to the rim with dirt, carefully arranging the caterpillars in a circle around the rim of the flower pot so that the lead caterpillar touched the last one making a complete circle.

Around and around they went, hour after hour, day after day. They obtained no nourishment and no rest although a source of food was only a few inches away and there was plenty of room to rest. For seven full days and seven full nights they went around the flower pot. Finally, they dropped dead of starvation and exhaustion.

Moral of the story? Don't confuse busyness with purpose. It's a matter of diligent planning versus hasty activities. Think first about your purposes--identify who, and what, are really important to you. Then plan specific things you can do to further those purposes.

- wolverton-mountain.com

VEN-BRIEFS

Out of the mouths of....dogs?

A gadget that analyzes a dog's whines and growls and translates them into words will be launched next year. The "Bow-lingual", developed by a Japanese toy manufacturer, consists of a six-centimeter dog collar microphone that transmits sounds to a palm-sized console. The console uses 200 different words, including "fun", "boring" and "happy", to translate six basic dog "emotions" in real time. A series of similar words automatically produces sentences such as "Please, please, if you don't listen to me, I'll sulk." The device can also be set to "Dog Diary" mode to record and analyze a whole day of emotions. An owner returning home from work could be greeted with: "I had a relaxed day today, peaceful". Or "Lots of enjoyable things happened! A mega-happy day!"

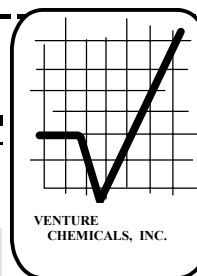
- Reuters

Lightning Sparks Evolution

Bolts of lightning that strike the ground may help bacteria adapt and evolve. Experiments suggest that electrical currents help soil bacteria exchange DNA. Bacteria are already known to take up and use foreign DNA released into the environment when other organisms die. Scientists knew this "horizontal gene transfer" occurs naturally in soil, but thought it was relatively rare. However, recent genomic research indicates that this gene take-up is widespread and has played a major role in the evolution of the bacterial genome. Lightning may seem relatively rare, but there are about a hundred flashes a second around the planet. Ground strikes almost always create currents in the surrounding soil similar to those from the simulated bolts.

- Applied and Environmental Microbiology
(vol. 67, pg. 3440)

CHARTS - N - TABLES



DENSITY CONVERSION

pounds per gallon (lb/gal)	pounds per cubic foot (lb/ft3)	grams per cubic centimeter (g/cm3) *	kilograms per cubic meter (kg/m3)
6.5	48.6	0.78	780
7.0	52.4	0.84	840
7.5	56.1	0.90	900
8.0	59.8	0.96	960
8.3	62.3	1.00	1000
8.5	63.6	1.02	1020
9.0	67.3	1.08	1080
9.5	71.1	1.14	1140
10.0	74.8	1.20	1200
10.5	78.5	1.26	1260
11.0	82.3	1.32	1320
11.5	86.0	1.38	1380
12.0	89.8	1.44	1440
12.5	93.5	1.50	1500
13.0	97.2	1.56	1560
13.5	101.0	1.62	1620
14.0	104.7	1.68	1680
14.5	108.5	1.74	1740
15.0	112.2	1.80	1800
15.5	115.9	1.86	1860
16.0	119.7	1.92	1920
16.5	123.4	1.98	1980
17.0	127.2	2.04	2040
17.5	130.9	2.10	2100
18.0	134.6	2.16	2160

SUMMER'S OVER!

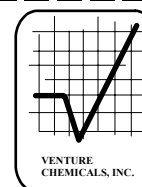


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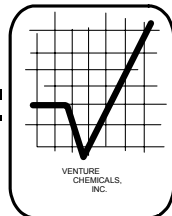
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