Legal Aspects of Bioremediation

The rediscovery of a New Technology

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Legal aspects of Bioremediation

- What is Bioremediation?
- Environmental Bioremediation can be defined as a treatability technology that uses biological activity to reduce the concentration or toxicity of a pollutant.
- It commonly uses process by which microorganisms transform or degrade chemicals in the environment.

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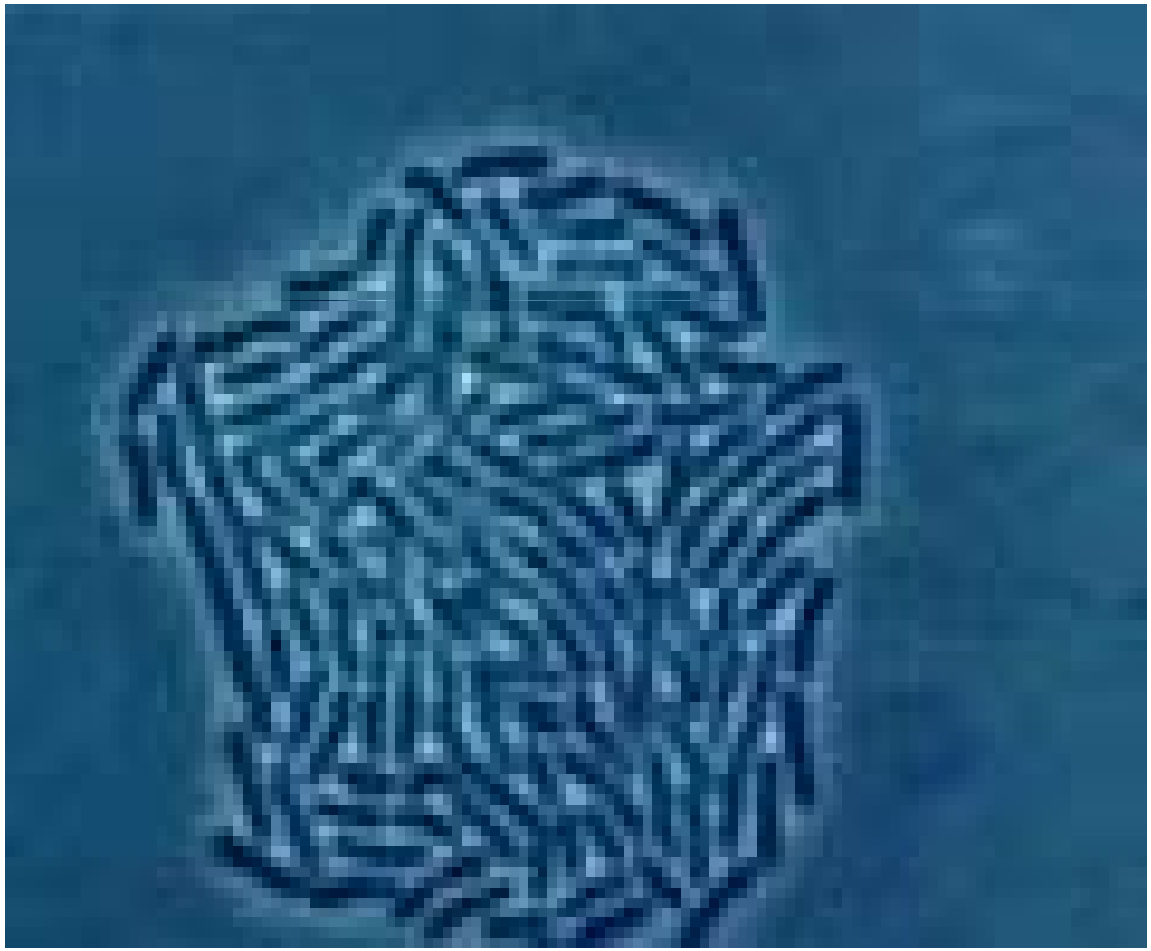
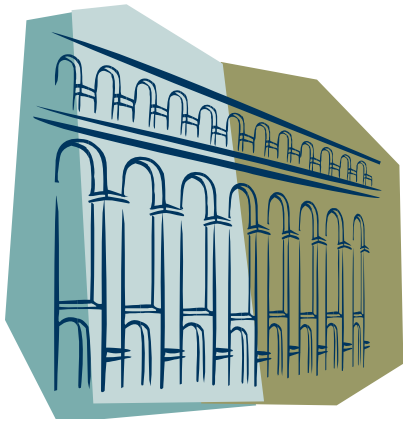


Legal aspects of Bioremediation

- Is Bioremediation a New Technology?

History

- The Romans and others built intricate networks of sewers for collecting wastewater which underwent subsequent biological treatment.
- Roman architects planned, designed and constructed sewage systems, which conducted the polluted water to a collection vats and lagoons. In these sites is where microorganisms did the work of Biodegradation of organic waste.



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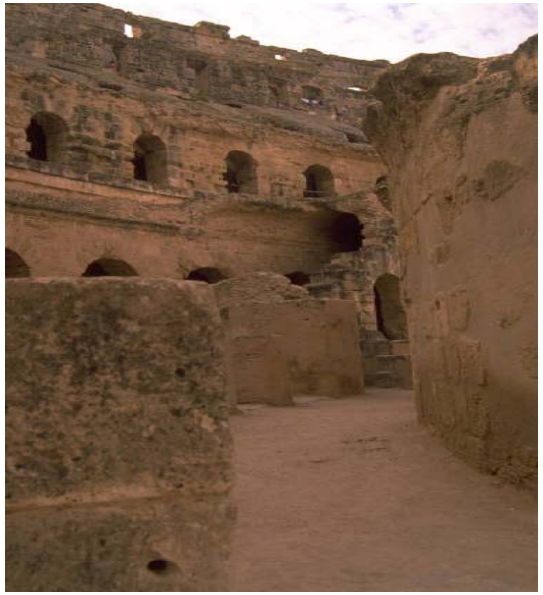
- There is evidence of *kitchen middens* (ancient household garbage dumps) and compost piles dates back to 600 B.C.



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- Bioremediation follows the chemical principle that every biochemically synthesized organic compound could be potentially biodegradable.
- In principle, no organic compound has infinite persistence built into its chemical structure. In line with this principle, somewhere there is a class of microorganisms that possesses the metabolic, enzymatic, or genetic potential to degrade every organic chemical.

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- So, how does Bioremediation works?

- Every living organism, including the bacteria and the microbes need three key elements to survive, food, water and a surrounding environment which can be appropriate for growing and reproduction.

  – The proper source for food for the bacteria and microbes should be carbon, which is also known as the nutritional substrate, in our particular case it would be that contaminant agent. According with this, bioremediation uses the life-cycle principle, of the bacteria in order to clean a contaminated site.

  – Bioremediation, uses the metabolic process to degrade or transform contaminants, so that they remain no longer in harmful form.

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- In addition to such bio chemical characteristics it's important to keep in mind that given the fact that, microbes are always present, it's almost practically impossible to find an environment-free of microbes.

Legal Aspects of Bioremediation

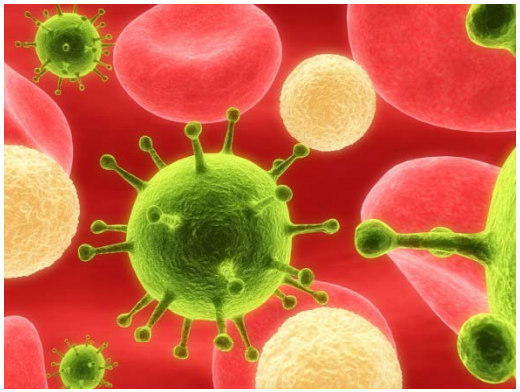
Legal aspects of Bioremediation

- Professor Barry King said in his book, “we have an endless kind of “work force” which brings us to an infinite possible sites which would be suitable for the use of a bioremediation Technology.”

King, Barry et al, Practical Environmental Bioremediation 3(Lewis Publishers ed., 1998)

“What People Usually Think of as Pollution, Bacteria Think of as Lunch.” Michael Kukuk

Missouri Environmental Law & Policy Review
1996



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- In the 1970s, Ananda Chakrabarty and his colleagues at General Electric discovered a strain of bacteria that is able to degrade some components in crude oil.
- Mr. Chakrabaty was awarded the first U.S patent for a living organism that had been genetically altered.
- *Diamond v. Chakrabaty,*477 U.S. 2204 (1980).
- Mr. Chakrabaty, as a General Electric microbiologist, filed a patent application, in which asserted the invention of a bacteria capable of breaking down multiple components of crude oil.

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Types of Bioremediation

Legal aspects of Bioremediation

- **Phytoremediation:** Is the use of plants to remove pollutants from the environment or to render them harmless, its also called Phytoextraction.
- **Bio augmentation:** Is the addition of microorganisms that can bio-transform or biodegrade a particular contaminant.
  - This process consists in the artificially introduction of acclimated, genetically altered or engineered microbes into the soil or water, in order to degrade and metabolize hazardous organic chemicals.

Legal aspects of Bioremediation

- **Bio stimulation**: This process consists in the addition of oxygen and/or inorganic nutrients to indigenous microbial populations in soil and groundwater. Taking advantage of the in situ bacteria.
- **Fungal remediation.** Fungal- based remediation is an *ex situ* form of bioremediation, in which hazardous organics are degraded or detoxified by fungi that are introduced into the contaminated soil via a fungal inoculum, eg. Depleted Uranium, Gulf War.

LEGAL FRAMEWORK

Legal aspects of Bioremediation

- CERCLA
  - Strict liability statute.
  - Establish who is responsible for the disposal of hazardous waste.
- § 9660 :
- ***"(b) Alternative or innovative treatment technology research and demonstration program"***

Legal aspects of Bioremediation

- RCRA
  - Regulates the generation, transportation, treatment, storage and disposal of Hazardous waste.
  - § 6903 establish what is consider as a treatment. "*means any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste or so as to render such waste nonhazardous,..*"

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- TSCA
  - EPA has contended since 1984 that the definition of a “chemical substance” in TSCA is broad enough to include the genetically engineered microorganisms developed through biology.
  - Microbial Products of biotechnology
    - Intergeneric Microorganisms

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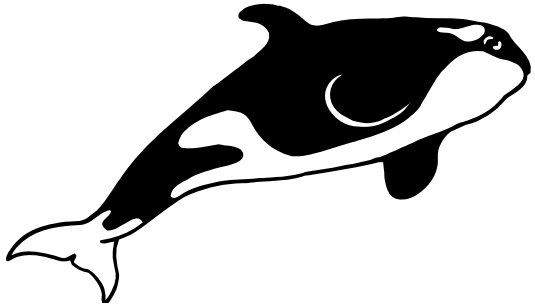
- Oil Pollution Act
- § 1011 establish the following;

"*The President shall consult with the affected trustees designated under section 1006 on the appropriate removal action to be taken in connection with any discharge of oil*"

Legal aspects of Bioremediation

- Marine Mammal Protection Act
- Endangered Species Act
  - These Statutes regulate what would be considered as a “taking”.



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- DOWNSIDES OF BIOREMEDIATION
  - BEST DEMONSTRATED AVAILABLE TECHNOLOGY
  - THE DERIVED FROM RULE under RCRA
  - Lack of knowledge of this technology


INDESCRIBABLE...
INDESTRUCTIBLE!
NOTHING CAN STOP IT!
THE BLOB
STEVEN McQUEEN
ANETA CORSEAUT
EARL ROWE
PRODUCED BY
JACK H. HARRIS
DIRECTED BY
IRVIN S. YEAWORTH, JR.
SCREENPLAY BY
THEODORE SIMONSON AND KATE PHILLIPS
A TONYA PRODUCTION

Questions??