

3. BIOREMEDIATION

1. Speaking. Work in pairs. Ask and answer questions about science and technology.¹

What was your favorite science subject? Biology? Physics? Chemistry? Why?
 What is science? What is technology? What is the difference between science and technology?
 What are some of the greatest technological achievements?
 In your opinion, what is the greatest technological invention? Why?
 Do you think modern technology reduces or increases stress? Why?
 What are the advantages of technology? What are the disadvantages of technology?
 Do you think that one day science will find a way to make people live forever? If so, do you think that that would be a good or a bad thing?
 Do you think couples should be allowed to choose the sex or other characteristics of their baby like eye color? Why or why not?
 What do you know about biochemistry? What does it study?
 Have you heard of biotechnology? Can you define it?

Useful phrases: *I am sure that... I think that... because... In my opinion...
 I would guess that...I'm not sure about... I have no idea if...*

2. Place the examples of biotechnology into the right column.

Do you know any other examples?

making cheese/yogurt
cloning
anthrax
antibiotics vaccines
making wine/beer
biofuels
biodegradable plastics
genetically modified plants
ricin

Food	Medicines	Eco-friendly products	Waste Disposal	Genetics	Biological Weapons

3. Try to complete the biotechnology quiz.

1. How many enzymes have been identified in the body?

- a) 100
- c) 3,000
- b) 15,000
- d) 6,000,000

2. Biotechnology started about 6,000 years back with

- a) use of tractors
- b) fermentation of beer
- c) importation of foreign materials
- d) it did not start 6,000 years ago.

3. Pasteurization was developed in

- a) 1861
- c) 1209
- b) 1890
- d) 2004

4. Is it possible to clone all organisms on this planet?

- a) Yes, only the technology is limiting
- b) Yes, but God will punish us
- c) No, it is only possible with a few organisms
- d) No, some organisms have no genes

5. What is a DNA Chip?

- a) a new flavor (a bit like cheese and onion) of potato chips
- b) a new type of microchip, faster than a Pentium
- c) a device to allow the rapid identification of DNA sequences
- d) a type of enzyme

6. How large is a typical bacterium?

- a) 1 mm
- b) 1 nanometer
- c) 1 micrometer
- d) 1 picometer

7. Which of the following is not made using biotechnology?

- a) latex
- b) vinegar
- c) beer
- d) cheese

8. What is a restriction enzyme (endonuclease)?

- a) an enzyme which cannot be exported to Iraq
- b) a compound which breaks down fat
- c) an enzyme which cuts DNA
- d) a type of drug

9. How large is the human genome?

- a) pretty large
- b) 400 000 base pairs
- c) 4 million base pairs
- d) 3 billion base pairs

10. What is E. coli?

- a) a bacterium living in our intestines
- b) an essential tool for molecular biologists
- c) dangerous disease (for certain strains)
- d) a, b and c.

LISTENING: BAV 1²

Atlanta (January 20, 2004) — Investigators lead by Assistant Professor Frank Löffler in Georgia Tech's School of Civil and Environmental Engineering have isolated a bacterium they named BAV-1 that can be used to clean toxic sites and prevent cancer-causing substances from reaching drinking water supplies.

Kirsti Ritalahti is reporting on the findings.

4. Listen and circle the right answer:

The bacterium lives in: a) soil
 b) groundwaters
 c) the sea

5. Listen again and fill in the gaps according to the recording.

They're very good organisms. These organisms help a lot of the contaminated areas, or sites that we would have around in our environment and they do so by just carrying out their daily activities. So they're and eating various chemicals that are in the and they survive that way and at the same time they help us by things that we don't want to have there.

We have recently an organism that we refer to as BAV 1, and that stands for Bachman vinylchloride 1. Bachman is the road site where we found it and it degrades this chemical vinylchloride that contains one chlorine on it and it's a and a chemical we don't want accumulating in our groundwater supplies at all. And BAV 1 is a member of a group of organisms called Dehalococcoides, and that's basically, „dehalo-„, means removing a, like chlorine, and „coccoide“ means a shape. This is Dehalococcoides isolate BAV1. It's very small, it's smaller than one micron in, and it lives in our groundwaters – in almost any groundwater area. It does not grow using – in fact, if we put it out in our room, it would die. It has to breathe these chlorinated

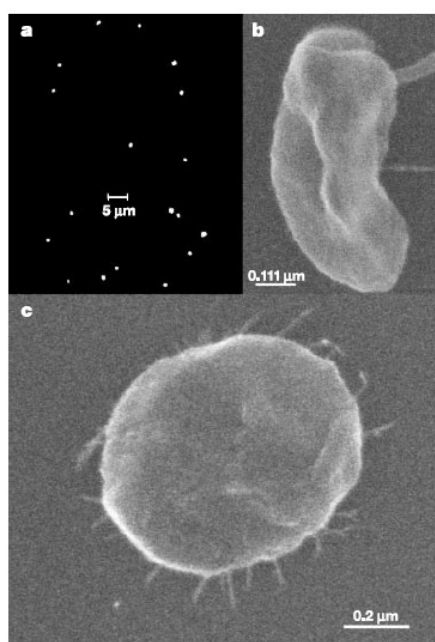


Figure 1 Micrographs of isolate BAV1. a, Epifluorescence observed after acridine orange staining. Original magnification $\times 1,000$. b, c, Scanning electron micrographs indicating a disc-shaped morphology (b) and displaying peculiar appendages (c).

6. READING.³

Match words that go together (more than option is possible).

1) discover	a) a pollutant
2) clean up	b) into the atmosphere
3) publish	c) supplies of drinking water
4) leech	d) a scientific paper
5) contaminate	e) a strain of bacteria
6) release	f) physiological studies
7) conduct	g) into groundwater

Bacteria May Be Star Player in Toxic Cleanup

Scientists have discovered a strain of bacteria at the bottom of New York's Hudson River that might prove useful as an agent for cleaning up a common pollutant.

The microbe "breathes" a synthetic chemical known as TCA (1,1,1-trichloroethane), transforming it into a cleaner substance.

TCA is used as a solvent in many common products such as glue, paint, industrial degreasers, and aerosol sprays. It can also be created in landfills and hazardous waste sites when substances decompose and their chemical components interact.

The newly discovered bacteria (named TCA1) remove chlorines from TCA to make chloroethane, a less toxic substance that can be more easily degraded by aerobic microbes in the soil, according to the researchers, who are based at Michigan State University's Center for Microbial Ecology.

Baolin Sun was the main author of a paper on the findings published in last week's issue of the journal *Science*.

The bacterium uses TCA in the same manner that people use oxygen. This is the first known bacterium that breathes the chlorinated solvent TCA. It breathes TCA, and the only way we know how to grow the bacteria is to feed them TCA.

TCA is among the pollutants found at more than half of the so-called Superfund sites designated as priority areas for chemical cleanup by the U.S. Environmental Protection Agency (EPA).

TCA often leeches into groundwater and soil, contaminating supplies of drinking water. As TCA evaporates, it breaks down into chemicals that are released into the atmosphere, destroying Earth's protective ozone layer.

The researchers initially discovered the bacterium in sediment dredged from the bottom of the upper Hudson River in New York, a Superfund site. Later they also found it growing naturally in Michigan's Kalamazoo River.

In the lab, the bacterium thrived as long as the researchers kept feeding it TCA. "We have not recreated the bacterium in the lab but enriched its activity and isolated a pure culture from the sediment source," said Sun.

TCA1 is "a naturally occurring bug—it's like we captured a wild animal and brought it into a zoo," he added.

The researchers are now conducting physiological studies of the bacterium.

They hope it will prove useful in the growing field of bioremediation, the process of using microbes to clean up harmful chemicals from the environment.

It is not yet clear whether TCA1 is a microbe that has adapted locally as a result of the pollutants in the Hudson and Kalamazoo Rivers or occurs independently of pollutants.

7. Read the text quickly and try to find the following information as quickly as possible. How can the newly discovered bacterium help the environment?

8. Read the text again and try to find a definition for the following expression: BIOREMEDIATION

9. Transferring Information

Supply the missing information.

Then form a question about it:

Name of Bacterium		
Name of Pollutant		
Researchers Based at		
Author of the paper		
Study Published in		

Then ask and answer questions in pairs.

10. Look at these sentences. They should be Answers to your Questions.

Example: Q: When did Alfred Nobel invent dynamite?

A: In 1866.

a) Q:

.....
A: The Hudson River

b) Q:

.....
A: TCA.

c) Q:

.....
A: Glue, paint, industrial degreasers, and aerosol sprays.

d) Q:

.....
A: It breathes it and transforms it into a cleaner substance.

11. Translate the underlined sections of the text.

12. SPEAKING. Work in pairs. Summarize the main points of the article.

13. HOMEWORK. Grammar.⁴ Plural of Latin and Greek words in English.

In specialized terminology there are a lot of words of Latin and Greek origin. They usually form the plural by the same endings as in their original languages.

a) Study the chart and put the nouns into the appropriate columns

analysis [ɪs] analyses [ɪːz]	nucleus [əʃ] nuclei [aɪ]	formula [ə] formulae [iː]	datum [əɪm] data [ə]

series [ɪːz] series [ɪːz]	criterion [n] criteria [ə]	appendix [ɪks] appendices [ɪsiːz]	genus [s] genera [rə]

larva, medium, synthesis, coccus, phenomenon, alga, bacillus, thesis, fungus, crisi, vertebra, calyx, spirillum, species, mitochondrion, bacterium, cervix.

b) How do you pronounce: cocci, algae, fungi, calyces?

c) Change the following sentences from plural to singular.

Example: 1. These data suggest a change in volume. – This datum suggests a change in volume.

2. What criteria did the scientists use?
3. The formulae represent the molecular structures of the substances.
4. The investigated phenomena are not frequent.
5. Food plants have to compete with weeds pests, viruses and fungi.
6. The analyses of the results did not prove his hypotheses.

d) Write the plural form of the words in *italics*. Example: fungus - fungi

1. Even the best psychiatrists sometimes make mistakes in their *diagnosis* and treatment.
2. A scientist is supposed to generate *hypothesis* and test them against empirical observations.
3. Nuclear energy is produced using the heat generated by splitting the *nucleus* of atoms of certain elements.
4. After analysing all the *datum*, they were able to draw conclusions.
5. *Bacterium* are capable of bringing about chemical reactions of amazing variety.

Sources: ¹ Available at <http://iteslj.org/questions/>

² Available at <http://www.innovations.gatech.edu/bioremediation/avindex.php>

³ Anna Brendle for National Geographic News, November 4, 2002

⁴ Oreská, Alžbeta. *Activity book English for chemists..* Bratislava : Slovenská technická univerzita, 2005.

Adapted from Marie Sabolová and Milada Pavlovová.