EXTRACTIONS

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GLOBAL WARMING HEATING UP

New evidence, presented at a recent North American summit on long-range weather forecasting, indicates the Earth is warming five times faster now than it did last century — faster than most scientists previously believed. Global temperatures increased less than one degree Celsius over the past 100 years, but are now projected to rise another 5.2 degrees by the end of the 21st century. And there is evidence that current efforts to cut greenhouse gas emissions will do little to cool things down. For instance, implementing the Kyoto agreement — which requires participating countries to scale back their greenhouse gas emissions to 1990 levels over the next decade — will delay the warming trend by about 10 years, but won't stop it according to Francis Zweirs, chief of the Canadian Centre for Climate Modeling and Analysis.

It is unclear whether greenhouse gases are entirely to blame or if the planet is on a natural warming cycle that predates a century of record keeping. Some natural warming is short-term, like El Niño, which hits about once a decade due to changes in ocean temperatures caused by shifting currents around the equator. In 1997, El Niño pushed ocean temperatures up four degrees and caused storms around the world. But even without these short-term influences, the globe is steadily warming.

[from Calgary Herald, March 7, 2001, http://www.newscientist.com/global/global.jsp?id=2283900, http://www.newscientist.com/global/global.jsp?id=us9999443]

NEW CO_2 MOP

Toshiba Ceramics Co. Ltd. have just unveiled a new ceramic material, lithium silicate, that absorbs carbon dioxide (CO_2) faster than similar materials and does so at room temperature. The collected CO_2 could be recycled to promote plant growth in greenhouses or combined with hydrogen to produce methanol. The company plans to launch the prototypes of the CO_2 collection devices by the end of the year.

[from http://ens.lycos.com/ens/apr2001/2001L-04-19-09.htm]

SOOT AND GLOBAL WARMING

Reducing worldwide soot emissions could be as important as reducing CO_2 emissions in the attempt to slow global warming. A recent computer model that simulates the emission, movement, transformation, and removal of soot shows that just five days after entering the atmosphere, particles of pure soot are very likely to end up in mixtures with dust, sea spray, sulphates and other chemicals. Most previous studies of the impact of soot on global warming assumed that soot never mixes with other particles in the atmosphere. However, these black carbon mixtures are a significant cause of global warming, second only to carbon dioxide (CO_2), because they absorb more sunlight and radiate twice as much heat as do particles of pure black carbon. The study's author, Stanford University Professor Mark Z. Jacobson, says that technologies already exist for removing excess soot produced in diesel engines and coal-burning generating plants.

[from http://www.sciencedaily.com/releases/2001/02/010208075206.htm]

WARMER SUMMERS TRIGGER ANTARCTIC ICE SHELF COLLAPSE

While past observations indicated that Antarctica was cold and stable, recent research shows that warmer summer surface temperatures can cause more ice on Antarctica's ice shelves to melt, then flow into cracks and increase the chance of a major collapse. Ted Scambos of the University of Colorado at Boulder led a study team that used satellite observations of meltwater on the Larsen Ice Sheet and a thermodynamic computer model. They determined that when meltwater flows into a crevasse as shallow as 15 feet and then freezes, it acts as a wedge that could fracture a 660-foot-thick ice shelf. Recent summer temperatures are just a few degrees below the presumed threshold for surface ponding that produces subsequent ice-cracking events. Some areas of Antarctica have warmed by as much as 2.5 degrees Celsius in the past 50 years, and if the warming continues, much of the ice shelf could be destroyed, increasing sea level significantly.

[from http://www.sciencedaily.com/releases/2001/01/010117075358.htm]

FERNS, ROCKS, AND ARSENIC

Two low-tech, natural processes for removing arsenic (*As*) contamination have recently been announced.

Dr. Lena Ma, of the University of Florida, found the Chinese brake fern flourishing on an old wood-preservation site contaminated with copper arsenate and discovered that the fern was gobbling up as much as five grams of *As* for each kilogram of its foliage. Under laboratory conditions, she has been able to quadruple this figure. Unlike many ferns, brake prefers sun to shade, so it should be able to remove *As* from a variety of contaminated sites.

During routine cholera testing in the Zimpán Mining District, the National Water Commission of Mexico found 17% of groundwater samples had *As* concentrations over the Mexican drinking water standard of 50 ppb, while the chlorinated municipal water had 400 ppb. Commercial point-of-use purification systems lie well beyond the reach of most people in the region (72% of the population earned less than US$3.00/day in 1994). As a low-cost method of water purification, geoscientists on a joint Mexico-US team are suggesting using a local clay-rich calcareous shale. The researchers believe that one or two kilograms of crushed shale, added to about 20 litres of contaminated water, stirred frequently over 24 hours, could effectively reduce *As* concentrations from 500 ppb to 30 ppb, well below acceptable maximums. Villagers could then filter the water to remove the rock particles and kill any bacteria with bleach to complete the purification process. However, the researchers warn that further field testing will be needed before residents should try it for themselves.

[from The Economist, Feb. 1, 2001, and http://unisci.com/stories/20012/0402015.htm]

ARSENIC CRISIS IN INDIA

In many parts of India, geochemical soil leaching has contaminated the drinking water with arsenic (*As*), and *As* poisoning has reached epidemic proportions. Research reported by Dr. Allan H. Smith of the University of California at Berkeley shows that one in ten people in India will die of cancers caused by long-term exposure to *As* at levels greater than 500 ppb, far above the World Health Organization standard of 10 ppb. Smith noted, "The scale of this environmental disaster is . . . beyond the accidents at Bhopal, India, in 1984, and Chernobyl, Ukraine, in 1986." The Indian government has appealed for international help to buy much-needed water treatment units.

In response, UNICEF has funded installation of enough groundwater arsenic treatment units (ATUs) to provide safe drinking water to more than 4500 villagers in West Bengal. The ATUs, designed by Atlanta-based Apyron Technologies, rely on modified granular metal oxides and other composites that adsorb the heavy metal ions from the water.

[from http://www.pollutiononline.com, (search for arsenic India)]

DISEASE LINKED TO ARSENIC EXPOSURE

A team at Dartmouth Medical School recently discovered the mechanism by which long-term exposure to low levels of arsenic (*As*) increases the risk of vascular disease, diabetes, and several types of cancer. In the body, hormones secreted into the bloodstream by glands act as chemical messengers to help regulate the body's functions. Each hormone binds to a particular receptor to initiate its effect. Like pesticides, *As* is an endocrine disrupter: it suppresses the ability of a particular hormone receptor to respond to its normal hormone signal. (Metals had not previously been shown to act as endocrine disrupters.) Arsenic disrupts the function of a receptor for glucocorticoids, steroid hormones that regulate embryo development, stress, blood glucose levels, blood vessel function, and lung and skin development.

Before this research, it was thought that endocrine disrupters function in one of two ways. One is to mimic the normal hormone, bind to the receptor, and trick it into activating when it normally would not. The other is to bind to the receptor and block the ability of the normal hormone to activate it. But Joshua Hamilton and his colleagues in Dartmouth's Toxic Metals Research Program found that *As* disrupts the action of the glucocorticoid receptor in a third way. When *As* is present, rather than turn on or off inappropriately, the activated receptor cannot stimulate the correct signals and in particular cannot turn on certain hormone-responsive genes.

Further research at Hamilton's laboratory will determine whether the effects observed in cultured cells also occur in animals or humans exposed to low doses of *As* and whether *As* has a similar effect on the estrogen, progesterone, and testosterone receptors.

[from http://www.sciencedaily.com/releases/2001/03/010301072022.htm]

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