www.nytimes.com
The New York Times ON THE WEB

February 12, 2002

Thermometer in Nanotube

By HENRY FOUNTAIN

Back in the analog age, a thermometer was a simple thing, just a glass tube containing a column of mercury. It was easy to understand how one worked. Heat caused the mercury to expand and travel up the tube. Then the world went digital, and thermometers (along with a lot of other things) became more complicated, and more mysterious.

They relied on thermoresistors, or devices that change electrical resistance with temperature, or infrared radiation to measure temperature, and their inner workings were hidden behind a plastic case and a digital display.

It is refreshing to note, however, that now that things have become really high tech, the thermometer has returned to its roots. Researchers at the National Institute for Materials Science in Japan have created a thermometer that is a simple tube-and-liquid-metal affair. Only in this case the tube is a nanotube, a hollow cylinder of carbon atoms that is 75-billionths of a meter wide.

By heating pure carbon with gallium oxide under a flow of nitrogen gas, the scientists created nanotubes that were filled with gallium, a metal that, like mercury, is liquid at relatively low temperatures. The researchers then found that when they increased or decreased the temperature in a range from 120 to 950 degrees Fahrenheit, the level of gallium in the tubes, about 10 microns long, rose or fell linearly.

Describing their "nanothermometer" in the journal Nature, the researcher said it should be relatively easy to calibrate and might be useful in various microenvironments. Reading it, however, is not so simple. You need a scanning electron microscope.

Birds Are What They Eat

Among certain loftier segments of New York society, you're either a Hamptons person or a Vineyard person. You've been summering in one of those locales since you were wearing diapers, and the idea of vacationing in the other Ñ well, it's just not done.

The black-throated blue warbler, an Eastern songbird that winters in the Caribbean, has some ingrained migratory habits, too. Some of the birds favor more westerly islands like Jamaica and Cuba, while others prefer more easterly sites on Puerto Rico and Hispaniola. Scientists have now determined that the birds are just about as predictable as some New Yorkers in exactly where they'll deign to go.

Migratory songbirds can be difficult to track by conventional methods like banding. So the researchers, working at Dartmouth and the Smithsonian Institution, tried a novel approach, analyzing ratios of carbon and hydrogen isotopes in the birds' feathers. The ratios vary, depending on what insects the birds eat (and what kinds of plants the insects eat). So a feather found in a specific breeding area will have an isotopic pattern that can be compared to feathers found in specific migratory locations.

The researchers, who described their work in Science, analyzed feathers from 700 warblers and found that more of the birds that bred in northerly parts of North America wintered in Jamaica and Cuba, while birds that bred in the southern parts migrated to Puerto Rico and Hispaniola.

The researchers suggest that the information, and future data gleaned for other species, should prove useful in predicting the effects of winter-habitat destruction on specific breeding populations.

On Solar Flare Patrol

After an 18-month delay caused in part by rough treatment during a test, a NASA satellite designed to study solar flares has been successfully launched. The craft, the High Energy Solar Spectro scopic Imager, was placed in Earth orbit last week aboard a Pegasus rocket.

NASA had hoped to launch the imager in 2000 to take advantage of greater solar activity then. But among other problems, it was damaged when it was mistakenly shaken with 10 times as much force as called for in a durability test.