Eureka! Daily discoveries for the scientifically bent

by Scott_LaFee

ANTHROPOLOGY 101

The Inuits of the Bering Strait once kept the bladders of every animal they killed in the belief that the animal's soul resided there. Once a year, all of the collected bladders would be pushed through a hole in the ice so the animals could be reborn and hunted again.

VERBATIM

VERBATIM - The best defense against the atom bomb is not to be there when it goes off. -- British Army Journal. CNS Photo. JUST ASKING - How much deeper would the oceans be without sponges? CNS Photo. WWWEIGHT - If the Internet has a physical nature, how much does it weigh? CNS Photo. SMALL TALL TREES - Scientists have learned how to make trees small. CNS Photo. The best defense against the atom bomb is not to be there when it goes off.

- British Army Journal

'TRUE FACTS'

A typical cubic meter of office air contains several hundred fungal spores, 89 micrograms of ethanol, 42 of acetone, 16 of formaldehyde, half a microgram of chloroform, and the byproducts of human flatulence - a major source of methane and hydrogen sulfide.

JUST ASKING

How much deeper would the oceans be without sponges?

WWWEIGHT

Beyond our computers and other hardware, most of us don't much think about the physical nature of the Internet. Or even if it has a physical nature. If it does, how much does it weigh?

Well, it turns out there's an answer to that last question, according to the editors at Discover magazine, who have worked through the math. Here's the short version:

All information sent over the Internet travels the same way - as packets of data (bit patterns) that are repeated over and over from computer router to computer router, repeater to repeater, until they arrive at their final destination. These packets may be electrons traveling through an Ethernet cable or photons radioed out from a Wi-Fi card.

Bits - the stuff of computer memory - are stored as a 1 or a 0 in capacitors on chips. Electrically charged, a chip records a 1; uncharged, it records a 0. These capacitors don't require a lot of charge to do their job - just 40,000 electrons to record a 1. That's infinitesimally small: Roughly 5.7 x 10 to the 18th power electrons flow through a 100-watt light bulb every second.

Now consider a typical e-mail, which the editors say contains about 50 kilobytes of data, or about 409,600 bits, roughly divided with half being 1s and the other half 0s. That works out to a total requirement to charge

the necessary capacitors of about 8 billion electrons.

One electron weighs 2 x 10 to the negative 30th pound, so a 50-kilobyte e-mail weighs about two ten-thousandths of a quadrillionth of an ounce, or about the weight of 21,000 lead atoms.

"That may sound like a lot," write the Discover editors, "but in fact it's a tiny amount - an ounce of lead contains 82 million quadrillion atoms."

OK, so now we know the weight of one typical e-mail. What about all of the information flowing through the Internet at any one time, all those Web pages, instant messages, video streams and more?

One estimate puts the total at about 40 petabytes, or 40 x 10 to the 15th, or 40,000,000,000,000,000 bits of data. Plug that number into the formula for the 50-kilobyte e-mail and you get a grand total weight of the Internet of 1.3 x 10 to the negative 8th pound, or about 0.2 millionths of an ounce.

BRAIN SWEAT

Rearrange the following letters to make two words that are antonyms: Foldouts.

BRAIN SWEAT ANSWER:

Loud and soft.

HAVE SOMETHING TO SAY?

SMALL TALL TREES

Only God can make a tree, wrote the poet Joyce Kilmer, but scientists have learned how to make trees small. Small not as in the practice of bonsai, but rather as in the reduction of traditionally large tree species like poplars through genetic modification, which can limit a tree to anywhere from half its normal height to just a few inches.

In the journal Landscape Plant News, scientists at Oregon State University report that they have manipulated the heights of several tree species in field experiments by inserting specific genes from the plant Arabidopsis thaliana, a small, bushy species much studied by science.

Arabidopsis contains genes that inhibit a class of plant-specific hormones called gibberellic acids. Commercially, gibberellic acids are used as sprays to control the size and fruiting of orchard trees. In trees, the acids promote the elongation of plant cells. When they are inhibited by hormones from Arabidopsis, however, the cells do not fully elongate, and the trees remain short and stocky.

"It's really interesting that these genes from Arabidopsis, which is a small plant in the mustard family, have been conserved through 50 to 100 million years of evolution and can perform more or less the same function in poplar trees," said Steven Strauss, a professor of forest science at Oregon State. "The modified trees themselves look pretty much normal, just a lot smaller, and a little more compact or bushy."

Researchers suggest their work may have broad commercial applications. For example, urban homeowners with limited space might be able to plant an elm that stops at 30 feet tall rather than 100 feet or more.

From an environmental viewpoint, the scientists say, the modified trees are unlikely to spread uncontrollably because they would compete poorly with normal or wild trees because low height is a disadvantage for trees competing for sunshine.

Still, don't look for dwarf trees at your local nursery anytime soon. The research is merely "proof of concept," and further development faces multiple social, financial, legal and regulatory hurdles, researchers say.

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