

EXHIBITION

The liquid of life

Josie Glausiusz

Atlanta, Georgia, will run out of drinking water within the next four months if it doesn't rain soon. The city is experiencing its driest year since 1931. Only a dramatic cut in water use can save the situation, officials announced in October. The average resident, like the average North American, uses between 227 and 340 litres of water per day.

Most of us would quickly use less water if we had to carry that much for miles every day on our heads in the type of brass jug toted by women in Jalalabad, Afghanistan. One such flower-etched vessel is on display at the American Museum of Natural History's new exhibition, *Water: H₂O=Life*, and visitors are invited to lift it. Full, the jug weighs about 11 kilograms. I could barely raise it above my knees, let alone hoist it onto my head. Trudging home with hefty pitchers like this is a way of life for many: in some parts of sub-Saharan Africa, women spend between 15 and 17 hours a week collecting water.

Water: H₂O=Life clearly conveys how vital water is to our existence, how imperilled we are without it, and how big the divide is between the affluent West, where water flows freely from taps at a cost of about a quarter of a US cent per litre, and poorer regions of the world, where shanty-town dwellers pay a premium for trucked-in water. State-of-the-art interactive video displays, the museum's dearly loved dioramas (one of a life-size polar bear on ice), maps and satellite images detail grim statistics. For example, 20 litres per day is the minimum amount of clean water required to meet basic human needs — drinking, cooking and hygiene. Some people in parched places have to survive on just 5 litres or less. One quarter of Mexico City's residents have no access to tap water; others have only 1 hour a week.

The exhibit's emphasis is on water conservation, often at the expense of the esoteric science of water or the politics of its



Bottle perspective: 3 litres of source water are used to make 1 litre of bottled water.

scarcity in many conflict zones. Information is largely pitched at the curious layperson or schoolchild — the show was instigated when a 2006 survey by the National Oceanic and Atmospheric Administration revealed alarming public ignorance. The beautifully designed displays excel at showing visitors how to save water and energy. A mound of plastic bottles explains that it takes 3 litres of water to produce a 1-litre bottle of the stuff; and that 40% of them in the United States are filled with filtered tap water — at 1,000 times the price.

The exhibit also artfully demonstrates the innovative methods that people are using to extract, conserve and purify water. More than 700 PlayPump water systems have been installed in rural South Africa and other sub-Saharan countries. Children spinning on these colourful merry-go-rounds 16 times per minute generate enough energy to pump about 1,400 litres of water per hour from boreholes 40 metres deep. (I enjoyed hand-whirling a miniature PlayPump to fill a toy jerrycan from a tiny tap.) Perth in Australia gets 20% of its water supply from the Indian Ocean, desalinated with wind power. Windhoek in Namibia reclaims up to 30% of its water from sewage.

Some water-purification methods on display

are delightfully low-tech. Bangladeshi women have cut cholera incidence in half using sari fabric, folded eight times, to filter bacteria from water. This, more than a century-and-a-half since the link was first made between cholera and polluted water. That connection prompted UK authorities to build separate water mains and sewerage tunnels emptying downstream into the Thames river, a system that is still in use. The Thames and Lee rivers now supply drinking water to 8.3 million residents in the London area every day. Alas, modernity does not always equal progress. Many times a year the antiquated system spews hundreds of millions of litres of untreated sewage directly back into the rivers. With some stretches of pipe more than 100 years old, the city itself accounts for 25% of water leakage in Britain. Whether in sodden London or arid Atlanta, saving water is a hard habit to learn, it seems. ■

Josie Glausiusz is a New York-based science journalist and editor, and author of *Buzz: The Intimate Bond Between Humans and Insects*.

***Water: H₂O=Life* runs at the American Museum of Natural History in New York until 26 May 2008. It will then tour the United States, Australia and Canada until 2011.**

script of this age and of uncovering the hidden text beneath the overwriting. His contribution has a personal tone ideal for the palimpsest story but rather too lightweight for scientific technicalities such as the mechanism of the multispectral imaging used to bring out the obscured text. Netz, a classicist at Stanford University, makes less allowance for his audience. His valuable examples may warrant several re-readings for non-mathematicians.

The most exciting of the discoveries in the newly deciphered text was Archimedes' use of infinity. The Greeks were wary of infinity, a concept they endowed with implications of chaos and disorder. When infinity was con-

sidered in Greek mathematics, it was treated as potential infinity, rather than the real thing. A potentially infinite pile of logs will never run out — there are always more — but it contains a finite, if indefinite, number.

Before the codex was deciphered, it was thought that, apart from some playful consideration of true infinity by Galileo Galilei, the concept was hardly touched on until the nineteenth century. Netz painstakingly retrieves text from the codex proposing that two infinite sets have the same size because the elements in them can be put in a one-to-one correspondence. Such sets are now said to have the same 'cardinality', the modern concept that estab-

lishes that two sets are equivalent in magnitude. Yet here was Archimedes using this argument more than 2,000 years before Georg Cantor added it into the mathematical armoury.

Netz also shows how Archimedes used a remarkable physical extension of geometry to calculate the area under a parabola, and undertakes some work based on a game called the *stomachion* (bellyache). However, it is Archimedes' use of the infinite that has the biggest impact on our understanding of the history of mathematics and that best demonstrates the value of Netz and Noel's work. ■ Brian Clegg is the author of *A Brief History of Infinity* and editor of www.popularscience.co.uk.