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The strangest thing comes out of your tap

WATER

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IT covers three-fifths of the globe and is essential for life as we know it. Yet water remains one of the most bizarre, complex and misunderstood fluids.

Many believe that science takes the wonder out of the world by analysing it to death. The example of water shows that the reverse is true: the more we know about water, the more mysterious it becomes. Only a few days ago a joint Japanese-American team made another strange discovery: you actually can "flatten" water to create a glassy form of ice.

The properties of water defy expectations. It is liquid at room temperature, whereas substances made of similarly-sized molecules, such as methane, are gases. The boiling point, melting point and heat-conducting abilities of water are higher than those of any comparable substance.

Most substances shrink when you cool them, but ice takes up more space. From one perspective — that of passengers of the Titanic, for example — this is bad news, as ice floats. Fortunately for things that swim, paddle and wallow, an insulating skin of ice forms on a lake to protect the waters below so that they remain liquid.

Water also has dazzling properties as a solvent. Sugar, salt and other minerals dissolve readily, making it an ideal medium to transport nutrients into cells. This is why the search for alien life is allied with that for alien water.

All of its strange properties can be understood in terms of water's molecular make-up. In 1784, the English chemist Henry Cavendish (1731-1810) described its chemical composition, a combination of hydrogen and

in this way at room temperature. The molecules link up to make a liquid, rather than move independently, as in a gas. In ice, hydrogen bonds hold each water molecule apart, at bond's length, so the solid is less dense than the liquid. This is why we should blame hydrogen bonds for the loss of the Titanic.

Hydrogen bonds explain other mysteries. At atmospheric pressure and temperatures below freezing, the molecules link together in larger networks whose fundamental building blocks are six-membered rings of hexagonal symmetry. This symmetry is preserved in snowflakes.

To date, about a dozen solid forms — or phases — of water have been found, with a few more awaiting confirmation. For example, one was found by using a special anvil, tipped with diamonds, to compress water 6,000 times more than normal at temperatures between -10C and -50C to create a form of ice that may exist on other planets in the solar system.

In the past few days, a new type of ice, called "Nebraska ice", has been created by squashing water flat. Dr Kenichiro Koga from Fukuoka University of Education, Dr Hideki Tanaka of Okayama University, and Prof Xiao Zeng of the University of Nebraska-Lincoln forced water to form a two-dimensional glass-like substance instead of three-dimensional ice crystals.

The achievement grew out of computer simulations that came up with the startling