Professor Peter Hiscock; (top left) the tiny fragment; Dr Bruno David. Photo: Janie Barrett

of the newly arrived Aboriginal people, who were able to adapt and exploit the resources of their new environment.

Australian National University archaeologist Sue O'Connor found the fragment in a large rock shelter known as Carpenter's Gap – one of the oldest radiocarbon dated locations in the country.

"Nowhere else in the world do you get axes at this date," Professor O'Connor said. "In most countries in the world [axes] arrive with agriculture after 10,000 years ago."

Monash University archaeologist Bruno David, a member of the team that found and dated the Arnhem Land axe fragment, said uncertainty remained as to whether axes were developed before or after humans arrived in Australia. Regardless, he said tools would have been both functional and desirable "just like other items of material culture are across the world today".

Kimberley Land Council chief executive Nolan Hunter said the discovery, published in the journal *Australian Archaeology*, showed technologically innovative people had lived in the region for 50,000 years. "These are the direct ancestors of today's Kimberley Indigenous people and the evidence of the world's earliest ground-edge stone axe shows that our people were leaders in technological innovation," Mr Hunter said. The traditional owners of the land where the fragment was found are the Bunuba people.

Bunuba leader June Oscar said the find was further confirmation her people's ancient and enduring connection to the land.

"Bunuba country is rich in historical and scientific items as well as traditional culture. We must all work to keep it strong and healthy and continue the work that has led to this outstanding discovery."

Professor Hiscock said there could yet be older axes in Australia that are yet to be discovered, with the northern part of Australia the most likely place to look.

Nanocars rev up for the world's biggest little race

Peter Spinks
Science Writer

The world's smallest cars, built at the mind-numbingly small scale of billionths of a metre, are gearing up for the world's first nano grand prix.

The molecule-sized cars, complete with chassis, two axles and four freely rotating wheels, are so small that they have to be monitored by special high-resolution microscopes.

Nobody will see this miniature grand prix, at least not directly. But cars from five teams will be viewable through sophisticated instruments, known as scanning tunnelling microscopes, developed for the grand prix to be held in October in the French city of Toulouse.

Each of the entries will be propelled across a custom-built gold surface by an electric current supplied by the tip of a scanning electron microscope. The track will be kept cold, at minus 268 degrees, and in a vacuum.

Time trials will determine which nanocar is the fastest, though there may be head-to-head races with up to four cars on the track at once, organisers said.

"Our entry will be a new model and the latest in a line that are built using special methods of chemical synthesis," said chemist, computer scientist and nanotechnologist James Tour, of Rice University in the US. "It's challenging because, first of all, we had to design a car that can be manipulated on a gold surface," Professor Tour said.

"Then we had to figure out the driving techniques appropriate for that car. But we'll be ready." The latest versions of their car are able to roll at room temperature.

While practical applications for the tiny machines may be years away, the breakthrough suggests they will be easier to adapt to a wider range of uses than the originals, which needed to be heated to 200 degrees before they could move across a surface.

Professor Tour's original single-molecule car had buckyball wheels and flexible axles and served as a proof-of-concept for the manufacture of machines at the nanoscale.

A light-activated paddlewheel motor was later added to propel it, and the wheels were changed from buckyballs (hollow spherical molecules comprising many carbon atoms) to carboranes, a cluster of boron, carbon and hydrogen atoms.

These were easier to make and permitted the motor to move because the buckyball wheels trapped the light energy, that served as fuel, before the motor could turn. Since then, nanotrucks, nano-backhoes and other models have been added to the ultra-tiny showroom.

Professor Tour's nanocars will be driven by the team of Professor Leonhard Grill, from Karl-Franzen University in Austria, specialists in manipulating objects at the nanoscale.

The race is organised by the Centre for Materials Elaboration and Structural Studies of the French National Centre for Scientific Research.

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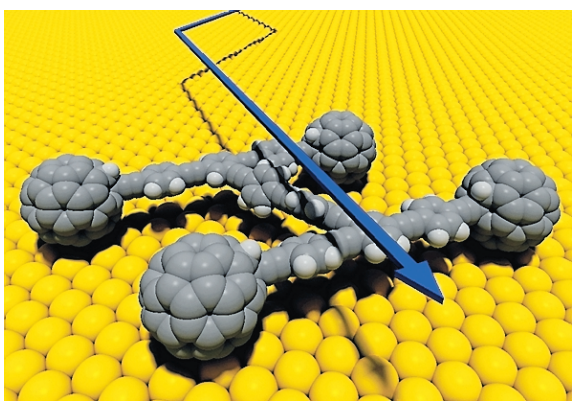

Invisible to the naked eye: Rice University's four-wheeled nanocar.