An archival photo showing the missing attachments.

Berlin. So they introduced provisions which they were sure would negate the scheme.

They only agreed to approve the program if the proposed tractor would be capable of ploughing at night and then clearing bomb rubble in daylight hours. This would involve the utilisation of a builtin air compressor, capable of operating a jack hammer and rock drill! A tall order indeed and one that the Russians were certain could not be met.

But they underestimated the ingenuity of Orenstein and Koppel. Yes, they could arrange that – no trouble!

Somewhat bewildered by this response, the Russians realised that to have the entire concept thrown out they would have to insist upon a seemingly impossible technological design feature. Accordingly, they were emphatic that the tractor must also include integral gas welding and cutting equipment enabling the operator to cut up destroyed tram rails and damaged steel structures.

Following a tense pause of a few days, they were assured by Orenstein and Koppel this new demand would not be a problem for the tractor design team.

Thoroughly foiled, the frustrated Russians held a council of war. Their most brilliant city engineers were summoned. Right! A scheme was considered that would definitely put a halt to the entire project!

"Demand the tractor must also include an inbuilt generator for supplying emergency 230 volt power and arc welding, plus a heavy duty winch for pulling down teetering building walls".

They felt assured that such equipment loaded on to what began as a basic farm tractor, plus the attachments already insisted upon, would be beyond the capabilities of even these 'obnoxious' Orenstein and Koppel 'full of themselves' designers.

But they were so wrong! On the assurances given by Orenstein and Koppel that such a tractor would be built, the Russians had no choice but to concede defeat and sign the necessary approval documents.

The Orenstein and Koppel S32k

Only an unspecified very few number of the proposed tractors were subsequently produced, commencing in 1949. They were identified by the model number S32K. But an identical machine, minus all the Russian specified accoutrements, designated the Model S32, entered volume production the same year.

The engine was a development of the massively robust 3.2 litre 1938 diesel and featured two cylinders in V formation. The water cooled unit developed a lazy 36 hp at an easy vibration free 1300 rpm.

The tractor featured a leaf sprung front beam axle, a five forward speed gearbox, a limited slip differential and 12 volt electrical equipment.

Compressed air for operating a jack hammer and rock drill was supplied by utilising one of the twin cylinders as a compressor, which charged an air receiver fitted to the offside of the tractor. Oxy and acetylene cylinders were mounted on the flat top mudguards. A powerful 250 amp generator, located behind the operator's seat, was driven by a belt drive from the rear belt pulley. A pto driven winch, complete with sprags, was attached to the rear of the transmission housing.

The S32K was indeed a versatile tractor, as of course it could also perform normal farm tasks.

Tailpiece

In 1991 I was fortunate to be offered a rusty wreck, discovered under the collapsed roof of a garden shed. To my profound amazement the mass of rust turned out to be the remains of an Orenstein and Koppel S32K. Apparently a German immigrant imported it in the 1950s thinking he could continue his business as a plumber, using the tractor compressor to blow out clogged sewerage lines. But the Sydney Metropolitan Water Sewerage and Drainage Board forbade the practice and the unit was parked in a small shed and forgotten for several decades.

Over a 12 month period, I returned this amazing find into a completely restored condition. It became the crown in my classic tractor collection!

Also, Margery and I have been privileged in recent times to have had the opportunity of exploring the magnificent reborn Tiergarten. We found it hard to visualise how it must have looked during the devastation of the 1940s. ■

IAN'S MYSTERY TRACTOR QUIZ

Question: What on earth is this weird little crawler?

Clue: It is as British as Rolls Royce!

Difficulty: 'New' tractor people (i.e. under 50s) may have difficulty.

Answer: See page 48.

Noble gases and clever science equals better grasp on groundwater

By Thea Williams, CSIRO

THE gas trapped in Antarctic ice cores is known to provide unique insights into Earth's ancient atmosphere. Perhaps lesser known is the value of gases in Australian groundwater – the terrestrial equivalent.

That's because underneath parts of our flat, dry, ancient continent runs – very slowly – some of the oldest water on Earth.

A new laboratory at CSIRO is now able to contribute to telling us the history of Australian groundwater, its origins and how it has moved through space and time, with much greater precision and accuracy.

The Noble Gas Facility – the first in the Southern Hemisphere – provides an entirely new facility to contribute to Australian groundwater investigations. It has been a labour of love, taking physicists three years to build from scratch, especially adapted to Australian conditions.

Its applications range from paleoclimate studies to pollution and hydrology. Most of all, we'll get a much better understanding of the precious resource and how it might be impacted through use and by development.

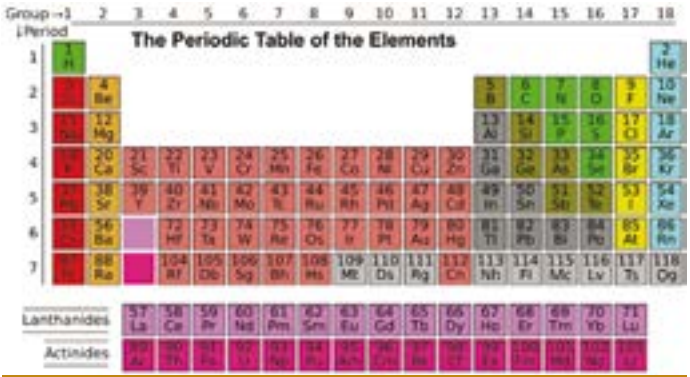
Back to the periodic table

Forgotten your high school chemistry or physics?

It's UNESCO's International Year of the Periodic Table this year, 150 years since Dmitri Mendeleev discovered the Periodic Law on March 1, 1869, which came to be considered the 'common language for science'.

CSIRO physicist Dr Axel Suckow has made a career from noble gases.

"They're the elements on the right side of the Periodic Table



The periodic table.

CSIRO physicist Dr Axel Suckow has made a career from noble gases.

of elements and they don't react – and they are helium, neon, argon, krypton, xenon and radon," he says.

"Helium was first seen on the sun when Bunsen and Kirchhoff developed spectral analysis. Argon has the highest mixing ratio in the atmosphere – there is 10,000 times more argon than helium.

"Krypton and xenon are difficult because they are hard to separate."

They have unique signatures because of radioactive decay from the rocks hosting aquifers where the groundwater flows, and each tells a different story of geological history of the groundwater.

Axel likens them to a footprint in the sand – pieces of information you can follow. They are, in fact, called tracers.

"A traced substance can allow you to follow a natural process – in water it can tell us how fast water moves, how does it mix, where does it infiltrate, at which temperature, how fast does it infiltrate, where does it exit," Axel explains.

The copper tubes contain the gas extracted from water samples and, here, attached to the mass spectrometer for analysing. (IMAGE: CSIRO)

The first noble gas machine in the Southern Hemisphere, capable of analysing fossil water unique to Australia. (IMAGE: CSIRO/James Knowler)

Building a noble gas facility

There aren't many people in the world who know how to build a noble gas machine. Axel spent time towards the end of his PhD in Heidelberg sleeping in the lab with an alarm waking him up every 20 minutes to change valves. He knew then, the machine had to be automated.

He built a noble gas machine in Vienna – 3.5 years to build the hardware, two years spent developing the software and another 18 months 'teaching' it to calibrate the data from samples. With that experience, and help from CSIRO staff in the 'Environmental Tracers and Applications' team, it has 'only' taken three years to build the new machine in Adelaide – instead of seven.

The Noble Gas Facility in Adelaide is completely automated. This doesn't just make it simpler to use, it makes it much more accurate, he says.

The water samples are collected in the field in copper tubes that can be tightly clamped off to ensure there is no contact with air.

Back in the laboratory the water samples start in the gas preparation line, where the gas is extracted – using liquid nitrogen which freezes the H_2O, to an industrial hairdryer which progressively releases noble gases.

A second room is dedicated to the mass spectrometer.

Here, the noble gas machine uses three cryotraps, separating out the gases at extreme cold temperatures – 10 Kelvin where 0 K is equivalent to –273.15 °C.

The mass spectrometer blasts the gas with electrons to ionise the inert atoms and uses magnetic fields to measure the ratio of each gas.

The mass spectrometer provides a clear ratio of the chosen noble gas in the sample and its isotopes.

"We constructed the machine for Australian groundwater. There are about 12 noble gas machines, mostly in Europe and Northern America, this is the first in the Southern Hemisphere," says Axel.

He explains that the new noble gas machine is especially adapted for analysing Australian groundwater which includes high concentrations of reactive gases such as CH4 (methane) and helium.

And, put simply, distinct ratios of these gases define precise periods in Earth's history, in rock or water.

What noble gases tell us about Australia's ancient groundwater

CSIRO has a long-standing history with capability in the use of environmental tracers across various projects. But historically, other existing environmental tracers used to investigate