Scientists have subjected iron to the extreme conditions found in the middle of Earth, yielding new clues to the composition of the planet's outer core.

Analysis of seismic energy travelling through Earth’s interior, along with other observations, suggests that the planet’s core is dense, metallic and probably made of iron. But geologists have not pinned down the core’s exact composition.

Iron is liquid at the high temperatures and pressures in Earth’s centre. In previous experiments, researchers quickly shocked iron to simulate these extreme conditions. But Yasuhiro Kuwayama at the University of Tokyo and his colleagues slowly squeezed iron between two diamonds. This technique helped the team to measure the iron’s density more precisely than previous experiments had.

Pure liquid iron is 7.5% more dense than Earth’s outer core, the team found. That means the iron in the outer core must be mixed with one or more lighter elements.

**PUTTING THE SQUEEZE ON LIQUID IRON**

**WHY MALE ALLIGATORS CAN’T TAKE THE HEAT**

Rising global temperatures could shift the balance between males and females in crocodile and alligator populations, potentially leading to a sharp decline in the reptiles’ reproduction rates.

In many reptiles, the temperature of the nest determines the sex of hatchlings: in alligators, temperatures between 32.5 °C and 33.5 °C produce mostly males, whereas temperatures slightly above or below these produce mostly females.

Between 2010 and 2018, Samantha Bock at the University of Georgia in Athens and her colleagues measured the temperatures of 86 nests made by American alligators (*Alligator mississippiensis*; pictured) in Florida and South Carolina. The researchers also collected data on daily air temperatures at these sites and found that average nest temperatures were higher during warmer years.

Using estimates of future climate change, the researchers predicted that, if global temperature continues to rise unabated, sex ratios at both sites will become highly male-skewed by the middle of this century. But, by 2100, higher nest temperatures could produce up to 98% females.

**CRISPR PASSES SAFETY TEST IN HUMANS**

The first human trial of cells modified with CRISPR gene-editing technology shows that the treatment is safe and lasting. A team led by You Lu at the West China Hospital in Chengdu took immune cells from people with aggressive lung cancer and applied CRISPR to them to disable a gene called PD-1. Usually, the PD-1 protein sends signals that keep immune cells from mounting an attack against the body’s own tissues, but active PD-1 can open the door to the spread of cancer (lung-cancer cell pictured).

The team injected each study participant with edited versions of their own immune cells. Participants experienced only mild side effects, and there were few potentially dangerous mutations caused by gene editing – the authors’ main fear.

The modified cells remained in the blood for at least four weeks, showing that the strategy could have a lasting effect. However, the trial involved only 12 participants, and did not lengthen their lives. The authors call for a larger study with newer gene-editing systems.

The experiment ushered in a slew of CRISPR-based trials, some of which have already reported results.

**KEEP COOL AND COLOURFUL WITH LAYERED PAINT**

A layer of dark paint effectively reflects the Sun’s rays if it’s just the right thickness and has an undercoat of white paint — allowing coloured surfaces to be made cooler. (Thermal image, pictured; left square shows coloured paint alone, right square the same paint with an underlying white layer.)

Reflective white paint can keep buildings cool in summer, reducing the energy needed for air conditioning. But aesthetics has long stood in the way: not everyone likes white.

Nanfang Yu, Yuan Yang and their colleagues at Columbia University in New York City devised a two-layered arrangement in which one layer of paint appeals to the eye and the other reflects heat. When the colour-containing topcoat is less than 100 micrometres thick, the invisible, near-infrared portion of sunlight, which carries about 50% of the light’s heat, can pass through it. The near-infrared light is then reflected by the white layer underneath.

Commercial red, blue and yellow paints stayed cooler on top of a white titanium dioxide undercoat than did paints with no undercoat. An underlying layer of spray-on coating developed by the researchers kept a black topcoat 15.6 °C cooler in hot sunshine than did an unaccompanied black layer.