

Conservation

Rhino horns have got smaller

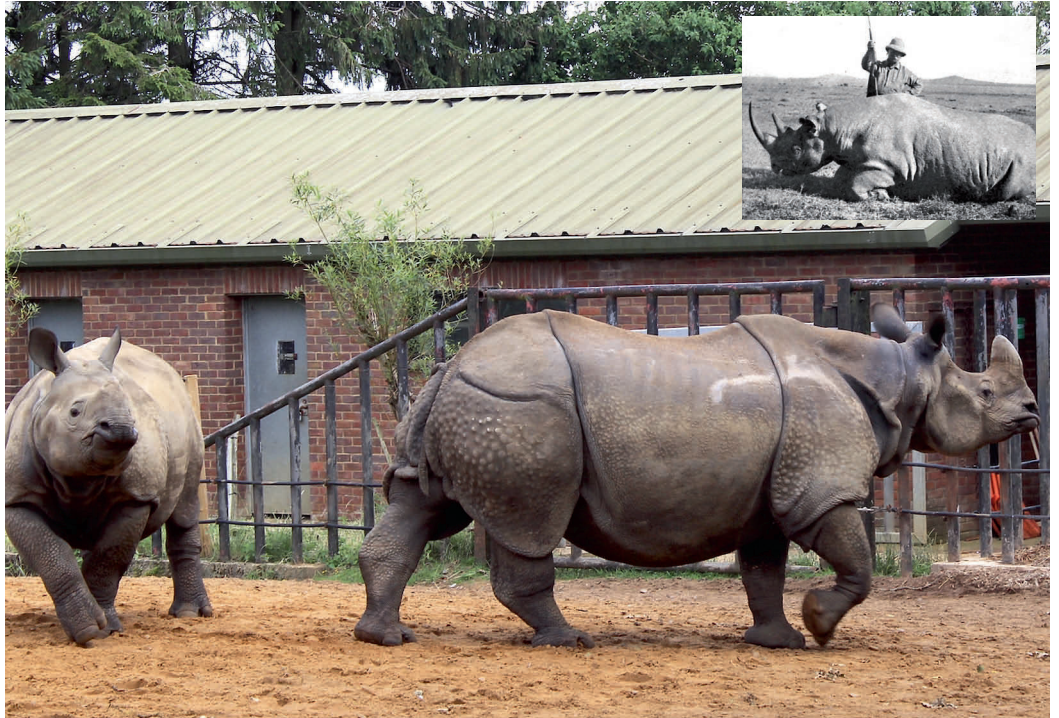
Archive photos suggest poaching may have driven evolutionary changes in five species

Christa Lesté-Lasserre

RHINOCEROS horns appear to have become significantly smaller over the past 130 years, probably as a result of poaching.

Oscar Wilson at the University of Helsinki in Finland and his colleagues analysed 80 profile-view photographs of five rhino species dating from 1886 to 2019, which rhino experts worldwide had uploaded to a database. They used image software to estimate each rhino's horn size relative to its body size and found a gradual decrease over time (*People and Nature*, doi.org/gq5xgs).

Most of the photographed rhinos had been born in the wild, but were living in zoos or sanctuaries at the time of the photos, such as the Indian rhinos (*Rhinoceros unicornis*) pictured here. One photo in the collection showed former US president Theodore Roosevelt with a black rhino (*Diceros bicornis*) he killed in 1911 (inset). ■



OSCAR WILSON

Physics

Stellar smash could reveal quark matter

GRAVITATIONAL waves created when two neutron stars collide may contain evidence of a previously unseen type of matter made of quarks.

Neutron stars form when massive stars run out of fuel and collapse. They are densely packed with neutrons, each of which contains three quarks held together by the strong nuclear force. When two neutron stars merge, their particles are so forcefully smashed that the quarks may be able to leave their neutron confinement and form a type of matter called quark matter. These mergers also result in space-time rippling with gravitational waves.

Grant Mathews at the University

of Notre Dame in Indiana and his colleagues have used computer simulations to work out how gravitational waves could reveal the presence of quark matter in merging neutron stars.

The researchers simulated two neutron stars colliding to see what frequency of gravitational waves would be produced in different situations, such as at different temperatures and densities. They found that when quark matter formed, the gravitational waves would have a set of frequencies peaking at about 3 kilohertz – a clear sign to look for.

In 2017, the Laser Interferometer Gravitational-Wave Observatory (LIGO) spotted gravitational waves

emanating from a merger of two neutron stars. However, Mathews says that the detection only captured waves with some frequencies. This was sufficient to determine that a merger had taken place, but wasn't enough to decisively pinpoint what happened inside the stars.

Some people suggest that quark matter inside neutron stars behaves similarly to perfect conductors of electricity, while others posit that quark matter is an exotic fluid that

sloshes inside the stars with zero viscosity, says Mathews.

His team's simulations account for some of these scenarios, so they could be compared with future measurements of gravitational waves. He presented the work at the International Symposium on Origin of Matter and Evolution of Galaxies in Hanoi, Vietnam, on 26 October.

"There are a lot of exciting things coming in the next two years. All the detectors have been upgraded, they will all measure more frequencies and we will be able to learn more," says Veronica Dexheimer at Kent State University in Ohio. ■
Karmela Padavic-Callaghan

3 kHz

Frequency of gravitational waves emitted by quark matter forming