

Abstractions



LAST AUTHOR

Massive population bursts in small arctic rodents called lemmings were so legendary that they became folklore. In days gone by, thousands migrated across the

Scandinavian tundra every three to four years. But since 1994 there has been no boom-and-bust cycle. On page 93, Nils Christian Stenseth, a theoretical ecologist at the University of Oslo, and his colleagues piece together disparate long-term data sets to substantiate growing speculation that climate change is affecting lemming population dynamics. Stenseth tells *Nature* that lemming population cycles could disappear altogether.

In a boom, do lemmings really jump off cliffs?

The biggest misconception about lemmings — widely circulated by a 1950s Disney movie — is that they purposefully march to the sea to commit suicide. In reality, during peak years, lemmings are driven to move downhill to explore new habitat. Some can accidentally head into the sea, but it is a random process amplified by the sheer number of lemmings.

What types of data did you compare with lemming density counts?

We used snow-condition data collected by university students taking winter ecology courses at the Finse Alpine Research Center. First author Kyrre Kausrud built a time series from the student reports and modelled meteorological data from nearby field stations to fill in gaps in the data. We also incorporated hunter-reported bird catches to show that certain bird populations exhibit similar fluctuations because they are secondary prey for predators whose abundance increases during rodent population bursts.

How does climate change affect lemmings?

Our data show that fluctuations in temperature and humidity cause the lowest layer of the snowpack, where lemmings live and reproduce during winter, to harden drastically — making it difficult for lemmings to reproduce. If lemming cycles disappear, the region's entire community structure may be altered.

What have you learned from this work?

That it is crucial to collect, maintain and make available long-term data sets of biodiversity — which I hope becomes a higher priority.

Will lemming folklore be replaced by a climate-change fable?

Perhaps. Lemmings are a charismatic species, but their distinctive population cycles were part of a past when climate was different. To see climate change so clearly affecting nature might make people realize how important ecological changes can be. ■

MAKING THE PAPER

Markus Lagos

An early-Earth simulation finds fault with a planet-dating technique.

Accurately dating the formation of Earth's core is key to understanding the birth and evolution of Earth and other planets in the Solar System. Until now, scientists have used a radioisotope dating technique based on the decay of uranium into lead to decipher the timeline of this event. But this method relies on assumptions that a team of petrologists and geochemists has now overturned.

Before Earth's metallic core formed, molten metals coexisted with less dense silicate-based materials in a fiery furnace in which pressures and temperatures were high. In a process thought to be similar to that by which rocks rich in iron are smelted to separate out impurities and produce metallic iron, these molten metals are thought to have migrated away to the centre of the Earth in the first 30 million to 40 million years after the formation of the Solar System.

Scientists previously believed that lead has an affinity for iron metals, and that as a result most of Earth's lead would have been whisked away to the planet's metallic core some 2,900 kilometres below the surface. This explained why a substantial amount of lead that was present during the early formation of the Solar System is now 'missing' from Earth's mantle.

Uranium, meanwhile, stayed behind and dissolved into the silicate portion of the evolving planet. The uranium includes two isotopes that decay to two different lead isotopes at specific, known speeds. As a result, or so the established dogma held, most of the lead now at the planet's surface should be a product of decayed uranium. Researchers therefore thought that they could determine the rough time at which Earth formed by calculating when the uranium first began to decay.

"Most people thought that core formation



could explain the lead isotope signature of the Earth," says Markus Lagos, a geochemist affiliated with the University of Bonn. But he and his co-workers now show that lead does not have a preference for metallic iron, but instead partitions with lighter silicate materials such as those seen in Earth's crust and mantle (see page 89).

The theory that the missing lead is in Earth's core had been around for some 40 years but had never been rigorously tested, says Lagos. So the team performed partitioning experiments with a mixture containing metals, sulphides and silicate material at temperature and pressure conditions that simulated those of early Earth. "We found that lead does not go into the metal phase," says Lagos. "So whatever the lead isotopes tell us, it is not the timing of core formation."

Although the team has resolved one key problem, a question still remains — where did the missing lead go? One possibility is that Earth's building materials could already have been depleted in lead. Another theory is that lead, which is quite volatile at high temperatures, may have been lost by degassing to the early atmosphere. And if Earth then collided with other planetary bodies early in the Solar System's evolution, the lead fingerprint may have been stripped from the atmosphere by the impact. Because it is commonly believed that the Moon formed through such a collision, the lead isotope signatures may instead date the formation of the Moon. ■

FROM THE BLOGOSPHERE

Another means of measuring author authority — or quantifying author contributions — is assessed by *Nature* associate editor Noah Gray at his Nature Network blog Nothing's Shocking (<http://tinyurl.com/66asud>). The plan is a formula that provides each author with a rank and fractional credit based on that rank.

Gray points to one of many

flaws in such proposals: "An attempt to actually place a value on the number of times you happened to complete some Western blots for a colleague seems to provide false authority where none should lie." He adds that, at least in biology, it is well known that if an author appears fifth in a list of eight, he or she was not the driving force behind the project.

Almost ten years ago, *Nature* began to recommend an 'author contributions' paragraph at the end of a manuscript, a popular service useful to authors and readers, although not a panacea for those seeking a simple (and unobtainable) metric. Many discussions on author credit are archived at Nautilus (<http://tinyurl.com/6zg2h2>). ■

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