

► Hawaii to Mexico, in 2001. The agency has given 29 companies permission to explore mining in international sea beds, including at 17 sites in the CCZ. Those companies, and the nations sponsoring them, must produce environmental assessments of their plots to satisfy the ISA's mandate to enable mining while preserving the ocean environment.

Sea-floor surveys are just beginning to map the vibrant life in areas marked for mining. Craig Smith, an oceanographer at the University of Hawaii at Manoa in Honolulu, helped lead expeditions in 2013 and 2015 to a territory in the eastern CCZ claimed by the United Kingdom. He was surprised to find hills and mountains rising across deep under-sea plains, and life more diverse than that seen at similar depths elsewhere.

Seventy per cent of the 154 marine worm species found by Smith's team seem to be unknown to science. The researchers discovered sea cucumbers they call "gummy squirrels", and a new member of the order *Relicanthus* that is related to sea anemones. The species attaches itself to the stalk of a sponge and extends its tendrils into the current. The team also saw rare worms that resemble squid.

Adrian Glover, a deep-sea biologist at the Natural History Museum in London, has found that potato-sized nodules of manganese and other metals in the eastern CCZ harbour

geometric sponges and other tiny, rarely seen invertebrates. And swathes of the sea floor are covered with enigmatic xenophyophores — ornate single-celled creatures that can be larger than a softball, and that exude slime as they feed. Most of the xenophyophores that scientists have found in the area were previously unknown, expanding the number of recognized species by about 30%.

But the wave of discoveries in the eastern CCZ is not limited to living species. Amon

**“What we do right now is going to have huge implications for decades.”**

stunned the audience at the deep-sea symposium with photos of fossilized whale skulls encrusted in metallic residues. Her preliminary analyses suggest the bones belong to perhaps 6 extinct species of whale that died between 1 million and 16 million years ago. A study published in August suggests that modern beaked whales feed on the sea floor in the eastern CCZ (L. Marsh *et al.* *R. Soc. Open Sci.* 5, 180286; 2018). The authors speculate that the whales ingest metallic nodules to regulate their buoyancy under water.

Amon is among the scientists who argue that their findings should prompt the ISA to conserve a section of the eastern CCZ. In

2012, the agency set aside nine preserves in the CCZ, relying largely on satellite images showing the density of plankton in the sea. But none of these areas is in the east, where researchers have begun to document surprisingly complex sea-floor ecosystems.

And Smith is pushing the ISA to support research in the open waters above sea-floor mining zones. He and his colleagues say that silt and toxins discharged by mining could prevent some marine organisms from breathing and eating, block bioluminescent light that some use to attract prey and find mates, and pollute the food web.

Researchers will never know everything that lives on the deep-sea plains, so they must plan around this uncertainty as they advise the ISA, says Malcolm Clark, a marine scientist who sits on the agency's legal and technical commission. “Scientists have to recommend a course of action that includes a learning process, so that if things start to go off the rails we can get back on course,” he says.

In the meantime, the ISA is under pressure to finalize its mining regulations by 2020 so that large-scale operations can begin. Japan began extracting deep-sea minerals late last year at a test site near the island of Okinawa. And a Belgian company, Global Sea Mineral Resources in Ostend, plans to test its equipment in the CCZ next year. ■

## POLICY

# NSF rolls out stringent anti-harassment policy

*National Science Foundation mandates that institutions report infractions by grant holders.*

BY ALEXANDRA WITZE

The US National Science Foundation (NSF) has unveiled its long-awaited policy to fight harassment by the scientists whose research it supports. Starting on 21 October, institutions that receive NSF grants must notify the agency of any finding related to harassment — including sexual harassment or sexual assault — by principal investigators (PIs) or co-PIs. Actions that must be reported include putting a scientist on leave during an investigation.

The rule will apply to all new grants and any extensions to existing grants made on or after that date. The NSF first proposed the policy in February, and received nearly 200 public comments on its initial draft.

It is the strictest action yet by a US research-funding agency on the topic of sexual

harassment. On 17 September, the National Institutes of Health said that it would introduce a centralized system for reporting harassment, but it has not imposed any new conditions on the grants it hands out.

Experts say that the NSF policy is a good first step, but far from a final one. “This rule is wonderful news, and goes beyond what I expected,” says Jane Willenbring, a geologist at the Scripps Institution of Oceanography in La Jolla, California, who has worked to improve safety at NSF-funded field sites, such as those in Antarctica. But she says that the NSF should consider investigating harassment complaints itself, rather than relying on the alleged perpetrator's academic institution to do the job.

Erika Marin-Spiotta, a geoscientist at the University of Wisconsin–Madison, says that she would have liked to have seen the NSF

policy apply to current grants, not just those awarded or extended after 21 October. The new rule, she says, “is the bare minimum requirement” of what is needed.

NSF director France Córdova says the rule will not be the agency's final action against harassment. “NSF does not consider its work in trying to address harassment finished,” she says.

## MANDATORY DISCLOSURE

The rule will require an institution to notify the NSF within ten business days if it finds that a PI or co-PI on an NSF grant has committed harassment. Institutions are also required to report when they take any administrative action related to a harassment finding or investigation, such as putting a PI or co-PI on leave. The NSF policy does not, however, require institutions to notify the agency when they

begin an investigation. “There’s a delicate balance between receiving complaints and the due process people are entitled to,” says Córdova. “An actual finding of determination is something concrete we can take action on.”

Roughly 2,000 universities and other research institutions receive NSF funding. They are already legally responsible for complying with federal civil-rights laws — including the Title IX legislation that bars discrimination on the basis of sex, which has been widely used to battle sexual harassment and assault on campus. Many people do not report harassment through their home institutions, however, because they fear retaliation or assume that an investigation will not be thorough, Marín-Spiotta notes. The NSF’s new policy allows people to report harassment directly to the agency in addition to, or rather than, going through an institution.

Since it first proposed the reporting rule in February, the NSF has received “five or six” notifications from institutions of findings involving harassment by grant recipients, and “probably at least twice that” number of notifications from individuals who have encountered or witnessed harassment involving grantees, says Robert Cosgrove, a compliance programme manager at the NSF.

Reports of harassment involving NSF grantees can be filed online at <https://nsf.gov/harassment>. Rhonda Davis, head of the NSF Office of Diversity and Inclusion, says she has added several staff members who are experienced in dealing with harassment to work on the reports.

Asked explicitly about bullying, Córdova noted that it is covered under “other forms of harassment” in the NSF rule.

#### BROADER ACTION

The push to deal with harassment in science continues to expand. On 15 September, the governing council of the American Association for the Advancement of Science in Washington DC voted to establish procedures to revoke fellowship honours for scientists found to have committed misconduct or ethical breaches, including harassment. And Congress has asked the US Government Accountability Office to open an investigation into how the various government funding agencies deal with sexual harassment involving their grantees.

Córdova says that the NSF and other agencies are waiting for the Senate to confirm a director for the White House Office of Science and Technology Policy to help coordinate anti-harassment efforts across agencies. Kelvin Droegemeier, a meteorologist at the University of Oklahoma in Norman, has been nominated for that post, but is not yet confirmed. ■



Thousands of years ago, some young children laboured in salt mines in what is now Austria.

#### ARCHAEOLOGY

# Prehistoric children toiled at tough tasks

*Kids as young as eight worked as brickmakers and miners.*

BY TRACI WATSON

A surge of interest in the archaeology of childhood is revealing details of the skilled and sometimes back-breaking work that youngsters performed hundreds to thousands of years ago.

Their tasks included mining salt and forming bricks. Some children were already learning to create clay vessels by the time they were six years old. Researchers presented several of these findings at a meeting of the European Association of Archaeologists (EAA) in Barcelona, Spain, earlier this month.

Artefacts and skeletal remains that provide details of child labour from so long ago are still relatively sparse. But scholars are showing increasing interest in the subject, says archaeologist Mélie Le Roy at the Mediterranean Laboratory of Prehistory in Europe and Africa-UMR 7269 in Aix-en-Provence, France, who was one of the session organizers.

“In the next years,” she says, “we will find more and more evidence that children were

participating early in their lives in economic society.”

#### WORKED TO THE BONE

Researchers paid little heed to children in the archaeological record until recently. But in the 1990s, more archaeologists began to examine the role of women in the past. That led some scientists to start studying other overlooked groups — including children.

Recent work suggests that some prehistoric youngsters toiled in harsh environments, including mines. Researchers excavating the ancient salt mines of Hallstatt, Austria, have discovered a child-sized leather cap dated to 1000–1300 BC, along with very small mining picks, says archaeologist Hans Reschreiter at the Natural History Museum of Vienna. This suggests that children were working in these mines at least two centuries earlier than scientists had thought.

To confirm this, Reschreiter and his colleagues plan to test heaps of human excrement found in the Bronze Age section of the ▶

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