

Name _____
Literacy Lab #10: "Dead for 32,000 years"

Date _____
Living Environment: Comet 2011-2012

"Dead for 32,000 Years, an Arctic Plant Is Revived"

Directions: Take a few minutes to read the article below either online (or on the back of this page.) Write responses to the statements or questions below. Cut/copy/paste is not allowed – use your own words and thoughts, based in research if needed.

Read more: <http://www.nytimes.com/2012/02/21/science/new-life-from-an-arctic-flower-that-died-32000-years-ago.html?scp=1&sq=arctic%20flower&st=cse>

Fact-finding: List three facts that you learned in this article.

- 1.
- 2.
- 3.

Vocabulary: List and define three unfamiliar words in the space below.

Implications: What are your feelings about this "discovery"? Why is this type of research important/unimportant? Fully explain your answers.

Dead for 32,000 Years, an Arctic Plant Is Revived

Living plants have been generated from the fruit of a little arctic flower, the narrow-leafed campion, that died 32,000 years ago, a team of Russian scientists reports. The fruit was stored by an arctic ground squirrel in its burrow on the tundra of northeastern Siberia and lay permanently frozen until excavated by scientists a few years ago.

This would be the oldest plant by far that has ever been grown from ancient tissue. The present record is held by a date palm grown from a seed some 2,000 years old that was recovered from the ancient fortress of Masada in Israel.

Seeds and certain cells can last a long term under the right conditions, but many claims of extreme longevity have failed on closer examination, and biologists are likely to greet this claim, too, with reserve until it can be independently confirmed. Tales of wheat grown from seeds in the tombs of the pharaohs have long been discredited. Lupines were germinated from seeds in a 10,000-year-old lemming burrow found by a gold miner in the Yukon. But the seeds, later dated by the radiocarbon method, turned out to be modern contaminants.



Despite this unpromising background, the new claim is supported by a firm radiocarbon date. A similar avenue of inquiry into the deep past, the field of ancient DNA, was at first discredited after claims of retrieving dinosaur DNA proved erroneous, but with improved methods has produced spectacular results like the reconstitution of the Neanderthal genome.

The new report is by a team led by Svetlana Yashina and David Gilichinsky of the Russian Academy of Sciences research center at Pushchino, near Moscow, and appears in Tuesday's issue of [The Proceedings of the National Academy of Sciences](#) of the United States of America.

"This is an amazing breakthrough," said Grant Zazula of the Yukon Paleontology Program at Whitehorse in Yukon Territory, Canada. "I have no doubt in my mind that this is a legitimate claim." It was Dr. Zazula who showed that the apparently ancient lupine seeds found by the Yukon gold miner were in fact modern.

But the Russians' extraordinary report is likely to provoke calls for more proof. "It's beyond the bounds of what we'd expect," said Alastair Murdoch, an expert on seed viability at the University of Reading in England. When poppy seeds are kept at minus 7 degrees Celsius, the temperature the Russians reported for the campions, after only 160 years just 2 percent of the seeds will be able to germinate, Dr. Murdoch noted.

The Russian researchers excavated ancient squirrel burrows exposed on the bank of the lower Kolyma River, an area thronged with mammoth and woolly rhinoceroses during the last ice age. Soon after being dug, the burrows were sealed with windblown earth, buried under 125 feet of sediment and permanently frozen at minus 7 degrees Celsius.

Some of the storage chambers in the burrows contain more than 600,000 seeds and fruits. Many are from a species that most closely resembles a plant found today, the narrow-leafed campion (*Silene stenophylla*).

Working with a burrow from the site called Duvanny Yar, the Russian researchers tried to germinate the campion seeds, but failed. They then took cells from the placenta, the organ in the fruit that produces the seeds. They thawed out the cells and grew them in culture dishes into whole plants.

Many plants can be propagated from a single adult cell, and this cloning procedure worked with three of the placentas, the Russian researchers report. They grew 36 ancient plants, which appeared identical to the present day narrow-leafed campion until they flowered, when they produced narrower and more splayed-out petals. Seeds from the ancient plants germinated with 100 percent success, compared with 90 percent for seeds from living campions.

The Russian team says it obtained a radiocarbon date of 31,800 years from seeds attached to the same placenta from which the living plants were propagated.

The researchers suggest that special circumstances may have contributed to the remarkable longevity of the campion plant cells. Squirrels construct their larders next to permafrost to keep seeds cool during the arctic summers, so the fruits would have been chilled from the start. The fruit's placenta contains high levels of sucrose and phenols, which are good antifreeze agents.

The Russians measured the ground radioactivity at the site, which can damage DNA, and say the amount of gamma radiation the campion fruit accumulated over 30,000 years is not much higher than that reported for a 1,300-year-old sacred lotus seed, from which a plant was successfully germinated.

The Russian article was edited by Buford Price of the University of California, Berkeley. Dr. Price, a physicist, chose two reviewers to help him. But neither he nor they are plant biologists. "I know nothing about plants," he said. Ann Griswold, a spokeswoman for PNAS, as the journal is known, said the paper had been seen by an editorial board member who is a plant biologist.

Tragedy has now struck the Russian team. Dr. Gilichinsky, its leader, was hospitalized with an asthma attack and unable to respond to questions, his daughter Yana said on Friday. On Saturday, Dr. Price reported that Dr. Gilichinsky had died of a heart attack.

Eske Willerslev, an expert on ancient DNA at the University of Copenhagen, said the finding was "plausible in principle," given the conditions in permafrost. But the claim depends on the radiocarbon date being correct: "It's all resting on that — if there's something wrong there it can all fall apart."

If the ancient campions are the ancestors of the living plants, this family relationship should be evident in their DNA. Dr. Willerslev said that the Russian researchers should analyze the DNA of their specimens and prove that this is the case. However, this is not easy to do with plants whose genetics are not well studied, Dr. Willerslev said.

If the claim is true, then scientists should be able to study evolution in real time by comparing the ancient and living campions. Possibly other ancient species can be resurrected from the permafrost, including plants that have long been extinct.

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