PURSUIT OF ZΩH — THE WEEKLY

This Week in Biology

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THIS WEEK

Ant colonies that age well, and rice that listens

Harvester ant colonies grow less likely to die as they age, rice detects a stink bug through the RNA scraps it leaves, mouse embryos soften their nuclei to switch on their genes, and chlorophyll's tail-attaching enzyme gets a structure.

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01

EVOLUTION OF AGING

Harvester ant colonies grow less likely to die with age

In most insects and vertebrates, death rates climb and reproduction drops with age.[1] Blaine Cole and Diane Wiernasz of the University of Houston tracked 3,285 colonies of known age of the western harvester ant, Pogonomyrmex occidentalis, over 34 years in Colorado and saw the opposite, called negative senescence.[1,2] Older colonies are larger on average, and growth and reproduction rose together instead of trading off.[1] The queen persists while workers, each living about a year, keep being replaced: a body the authors call a replaceable soma.[2]

> WHY IT MATTERS
> *It shows aging evolving along a different path when the unit that survives and reproduces is a whole colony, not a single body.*[1,2]

CAVEAT *The pattern is about colonies; individual ants do not become biologically younger.*[2]

[1] doi:10.1073/pnas.2612817123 · [2] phys.org

3,285

harvester ant colonies of known age followed in a 34-year field study

SOURCE 1

ON THE ROAD?

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pursuit-of-zoe.com/pages/biology#zoh-weekly

02

PLANT IMMUNITY

Rice senses a stink bug through the RNA scraps it leaves

Sucking insects inject digestive enzymes into plants, among them ribonucleases that chop up RNA.[3] A team at the Chinese Academy of Sciences' Center for Excellence in Molecular Plant Sciences reports in Nature that the green stink bug's salivary T2 ribonuclease leaves behind 2′,3′-cyclic nucleotides, which the rice RNA-binding protein NIB1 picks up.[3,4] Binding drives NIB1 into nuclear condensates that recruit the immune regulator EDS1 and turn on defense.[3,4] Applying the nucleotides alone set off the same NIB1- and EDS1-dependent response.[3]

WHY IT MATTERS

The pest's own digestion becomes the warning signal, and NIB1-like proteins are widespread in land plants, so the route may be common.[4]

CAVEAT *The experiments center on rice and the green stink bug; the case for other pests rests on how common the enzymes and sensors are.*[4]

[3] doi:10.1038/s41586-026-11259-z · [4] phys.org

MECHANISM

Stink bug saliva RNase cuts rice RNA

↓

2′,3′-cyclic nucleotides are released

↓

NIB1 binds them and forms condensates

↓

Condensates recruit EDS1

↓

Rice defenses switch on

03

DEVELOPMENTAL BIOLOGY

Mouse embryos soften their nuclei to switch on their genes

Early mammalian embryos must begin reading their own genome, a step called zygotic gene activation.[5] Researchers in Japan, including groups at Kindai University and the National Institute of Genetics, report in Nature that nuclei in two-cell mouse embryos turn strikingly soft and deformable.[5] The autophagy factor LC3 quickly strips lamin B1 from the nuclear envelope.[5] Holding lamin B1 in place, or stiffening the nucleus with an engineered tether, left gene activation incomplete and harmed development.[5] Soft nuclei gathered active RNA polymerase II and key gene loci near the envelope.[5]

WHY IT MATTERS

It adds the physical state of the nucleus, not only the marks on its chromatin, to what governs how a new genome starts working.[5]

CAVEAT *The work is in mouse embryos; it does not address human embryos.*[5]

[5] doi:10.1038/s41586-026-11240-w

MECHANISM

LC3 clears lamin B1 from the envelope

↓

The two-cell nucleus turns soft

↓

RNA polymerase II gathers near the rim

↓

Zygotic genes switch on

04

STRUCTURAL BIOLOGY

First structure of the enzyme that gives chlorophyll its tail

Chlorophyll a gets the oily tail that anchors it from chlorophyll synthase (ChlG), an enzyme known for decades whose structure had not been solved.[6,7] Groups at Osnabrück University, the Algatech center in Třeboň and the University of Sheffield used cryo-electron microscopy on ChlG from the cyanobacterium Synechocystis sp. PCC 6803, bound to its partner HliD, with and without the tail donor geranylgeranyl pyrophosphate.[6,7] A central pair of HliD proteins holds two ChlG molecules and carries four chlorophylls and two carotenoids.[6] Modeling and mutations suggest how the active site selects substrates and joins tail to ring.[6]

WHY IT MATTERS

The last step in making chlorophyll can now be seen at the active site, and the HliD layout sheds light on how plant light-harvesting antennae evolved.[6]

CAVEAT *Where chlorophyllide sits in the active site comes from AlphaFold modeling, not from the cryo-EM maps.*[6]

[6] doi:10.1038/s41589-026-02357-0 · [7] phys.org

MECHANISM

Ring part: chlorophyllide

↓

Tail donor: geranylgeranyl pyrophosphate

↓

ChlG links tail to ring

↓

Chlorophyll a, beside partner HliD

WORDS THIS WEEK

Negative senescence
A pattern in which, as an organism or colony gets older, its yearly risk of dying falls and its reproduction rises.

Soma
The non-reproductive part of an organism. In an ant colony, the workers play this role while the queen reproduces.

Biomolecular condensate
A droplet-like cluster that proteins and RNA form inside a cell without a membrane, gathering partners so a reaction or signal can happen.

Zygotic gene activation
The point when an early embryo stops relying only on its mother's stored RNA and starts transcribing its own genes.

Lamin B1
A protein of the nuclear lamina, the mesh lining the inside of the nuclear envelope that gives the nucleus its stiffness and shape.

Cryo-electron microscopy
Imaging of flash-frozen molecules with an electron beam; many thousands of particle images are combined into a 3D structure.

SOURCES

1. PAPER B. J. Cole & D. C. Wiernasz, “A replaceable soma enables negative senescence in harvester ants,” Proceedings of the National Academy of Sciences (9 Nov 2026). doi:10.1073/pnas.2612817123
2. NEWS “Ant colonies defy aging patterns as death risk falls and reproduction rises,” Phys.org, provided by the University of Houston (12 Nov 2026). https://phys.org/news/2026-11-ant-colonies-defy-aging-patterns.html
3. PAPER X.-X. Guo et al., “A plant RNA-binding protein senses 2′,3′-cNMP produced by insect effectors,” Nature (11 Nov 2026). doi:10.1038/s41586-026-11259-z
4. NEWS “Plant sensing mechanism guards against pests,” Phys.org, provided by the Chinese Academy of Sciences (12 Nov 2026). https://phys.org/news/2026-11-mechanism-pests.html
5. PAPER M. Tanaka et al., “Transient nuclear softening for zygotic gene activation in mice,” Nature (11 Nov 2026). doi:10.1038/s41586-026-11240-w
6. PAPER D. Shvarev et al., “Structure of chlorophyll synthase in complex with the LHC-like protein HliD,” Nature Chemical Biology (9 Nov 2026). doi:10.1038/s41589-026-02357-0
7. NEWS “Biologists reveal chlorophyll-building enzyme's structure for first time and clarify its mechanism,” Phys.org, provided by Osnabrück University (11 Nov 2026). https://phys.org/news/2026-11-biologists-reveal-chlorophyll-enzyme-mechanism.html

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