Fact-Checked Science

PAPER CHECK · MAGNETIC FIELDS AND THE BRAIN

Mice in a near-zero field lost memory, then recovered; the episode claimed far more

A 183-word abstract for a poster at the EGU General Assembly 2026 says that mice kept long-term in a hypomagnetic field, below 5 μT, lose adult neurogenesis and cognitive function [1]. It rests on four peer-reviewed mouse studies from the Beijing laboratory [2][3][4][5], in fields of 0.03–0.3 μT, 80 to 2,200 times weaker than Earth's [2 p. 2][3 §4.1]. S0 News made it one of a "triple on hypomagnetic fields" and said that "the brain stops working right" in a field "like we're entering" [17 02:13][17 02:34][17 02:17]. We checked what the abstract claims, what the papers found and what the episode said it found, keeping the three apart.

By Fact-Checked Science · Published October 21, 2026

OUR ANALYSIS marks our own reasoning and calculations, and the verdicts are our assessment. Everything else comes from the numbered sources. The abstract [1] has no pages or figures; for the 2021 paper [2], p. gives the page of the journal PDF and Fig. a figure or one of its panels.

Reversible deficits in mice, recast as a planet-wide alarm

OUR ASSESSMENT

0.29 μT
The field the 2021 mice lived in, about 190 times weaker than Beijing's 55 μT [2 p. 2]; three later studies used 31–32 nT [3 §4.1][4 §Methods][5 §Methods]

4 mice
per group in every cell count behind the claim, and 9–10 per group in the memory tests [3 Suppl. Table 1][3 §4.1][4 §Methods]

0 papers
Our search found no peer-reviewed measurement of either mechanism the abstract names: oxidative phosphorylation in neural stem cells, or the inflammatory signalling behind "chronic neuroinflammation" [1]

THE CLAIMS

TRUE
"Mice exposed long-term to a hypomagnetic field lose adult neurogenesis and cognitive function"
The abstract [1]
Three peer-reviewed studies from the same laboratory found fewer dividing cells in the dentate gyrus after 8 weeks [2 Fig. 1][4 Fig. 2] and fewer new neurons at 12 weeks [2 Fig. 2][4 Fig. 4], with worse scores on object-memory tests in all three [2 Fig. 5][3 Fig. 1][4 Fig. 8] and on a contextual-fear test in the 2021 study [2 Fig. 5], with 9–10 per group. All were male C57BL/6J, and every deficit reversed on return to the normal field [2 Fig. 6]. See section 2.

MISLEADING
"all hit the wild surge in reactive oxygen species"
The episode, 02:19 [17 02:19]
In this laboratory's work ROS fell in the neural stem cells, and that fall is the mechanism it gives for lost neurogenesis: a drug that raises ROS restored it [2 pp. 6–8][2 Fig. 5]. ROS rose in whole-hippocampus measures, modestly: p = 0.03–0.05 with 4 mice [3 Fig. 2b], and only at week 8 of 4, 6 and 8 [5 §Results]. See section 3.

OVERSTATED
"when you take away the magnetic field, the brain stops working right"
The episode, 02:32 [17 02:32]
Male mice kept 8 weeks in 0.03–0.3 μT showed no preference for a moved or new object and less contextual fear memory; locomotion, body weight and the volume of the dentate gyrus were normal [2 p. 8][2 Suppl. Fig. 4][3 Fig. 1]. Every deficit reversed within 2–8 weeks back in the normal field [2 Fig. 6][2 Suppl. Fig. 11]. See section 2.

PARTLY TRUE
"these effects are compounding the longer the situation unfolds"
The episode, 02:45 [17 02:45]
Within these experiments, duration mattered: fewer active mitochondria from week 6 and more ROS at week 8 [5 §Results], fewer dividing cells in the 2022 study by week 4 and in another [2 Fig. 1d][4 Fig. 2]. But the control mice drifted the same way with time [5 Fig. 5], and the deficits reversed within weeks of return to the normal field [2 Fig. 6] and within 24 hours in culture [6 §Results]. See section 4.

FALSE
"Low field strength like we're entering as Earth's magnetic field is tanking"
The episode, 02:15 [17 02:15]
Earth's surface field is about 23–67 μT [12 Table 1], 80 to 2,200 times stronger than the laboratory fields, and about 9% weaker than in 1840 [13 p. 1]. Neither the abstract nor the papers say Earth's field is changing; their motivation is deep-space travel and magnetically shielded rooms [1][2 p. 2]. See section 5.

1 · THE ABSTRACT

A 183-word poster abstract, not a paper

Six authors, five of them at the Chinese Academy of Sciences, submitted it for a poster in the session "Biogeomagnetism: From Geomagnetic Field to Planetary Habitability" at the EGU General Assembly in Vienna, May 3–8, 2026 [1]. It has no data, figures, sample sizes or durations, and no number apart from its definition of a hypomagnetic field as below 5 μT [1]. Conference abstracts are not peer reviewed.

Who and where
Jie Ren, Yukai Luo, Bingfang Zhang, Lanxiang Tian, Weixiang Guo and Yongxin Pan, of the Institute of Geology and Geophysics and the Institute of Genetics and Developmental Biology in Beijing, with one author at the Chinese Academy of Medical Sciences in Tianjin [1]. The abstract, updated March 14, 2026, is published under a CC BY 4.0 licence [1]. The poster itself is available only to registered attendees.

What it rests on
The abstract cites nothing. Its claims match four peer-reviewed mouse studies from the same laboratory, published between 2021 and 2024 [2][3][4][5], and a 2025 study of cultured stem cells [6]. Two of its statements go beyond what those papers measured: no study has measured oxidative phosphorylation in these stem cells, an idea the laboratory's 2024 review put forward as speculation [8 §5], and none has measured the inflammatory signalling behind "chronic neuroinflammation" (section 3).

In the abstract's words

HMF is the authors' abbreviation for a hypomagnetic field, GMF for the geomagnetic field and ROS for reactive oxygen species.

> *"We have experimentally revealed that, after long-term exposure to HMF, mice showed defective adult neurogenesis and cognitive dysfunction."*
> Ren et al. (2026) [1]

> *"Mechanistically, HMF exposure directly inhibits adult neurogenesis by suppressing mitochondrial oxidative phosphorylation and reducing the levels of endogenous reactive oxygen species (ROS) in neural stem cells. Additionally, HMF exposure increases the global ROS levels in the hippocampus."*
> Ren et al. (2026) [1]

> *"This ROS increase triggers oxidative stress and activates downstream inflammatory pathways, ultimately leading to chronic neuroinflammation."*
> Ren et al. (2026) [1]

The abstract's statements and what stands behind them

THE ABSTRACT SAYS	WHAT THE LABORATORY HAS PUBLISHED	OUR READING (OUR ANALYSIS)
Long-term exposure leaves mice with "defective adult neurogenesis and cognitive dysfunction"	Fewer dividing cells after 8 weeks [2 Fig. 1][4 Fig. 2] and fewer new neurons at 12 weeks [2 Fig. 2][4 Fig. 4]; worse object-memory scores in three studies [2 Fig. 5][3 Fig. 1][4 Fig. 8] and worse contextual-fear memory in one [2 Fig. 5]	Supported, in male mice from one laboratory, and reversible
The field reduces "the levels of endogenous reactive oxygen species (ROS) in neural stem cells"	A lower superoxide signal in sorted stem cells after 8 weeks, and recovery when a drug raised ROS [2 Fig. 4f–g][2 Fig. 5]	Supported
It does so "by suppressing mitochondrial oxidative phosphorylation"	No measurement we could find. The published mitochondrial result is a lower count of active mitochondria in cells from the whole hippocampus [5 Fig. 2], which is also all that the laboratory's 2026 review cites for the brain [9 §Mitochondrial quality control]. Its 2024 review offered the idea as a hypothesis: "We speculate that the shift between glycolysis and oxidative phosphorylation is a response to HMF" [8 §5]	Not measured; published only as speculation
It "increases the global ROS levels in the hippocampus"	A higher superoxide signal at 8 weeks, p = 0.03–0.05 with 4 mice [3 Fig. 2b], and a higher flow-cytometry signal at week 8 only, with 3–4 mice [5 Fig. 2F]	Supported, on small samples
This leads to "chronic neuroinflammation"	Altered microglial shapes, shown as images without statistics, and more astrocytes (p = 0.0008, 4 mice) at 8 weeks [4 Figs. 5–6]; the laboratory's review says the field "may also cause neuroinflammation" [8 §4]	Not shown; the inflammatory signals were never measured, and the authors say they "will be investigated in the future" [4 §Discussion]

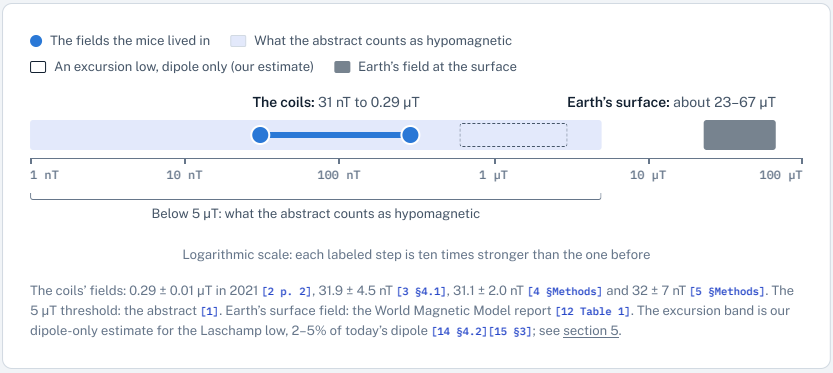
Quotations in the left column are from the abstract [1]. The right column is our assessment of the published papers against each statement.

2 · THE EXPERIMENTS

Male mice spent eight weeks in coils that cancelled almost all of Earth's field

The four mouse studies behind the abstract come from one laboratory, the Biogeomagnetism Group of the Institute of Geology and Geophysics in Beijing, with the Institute of Genetics and Developmental Biology for the 2021 study [2 p. 1]. All used adult male C57BL/6J mice [2 p. 14][3 §4.1], and all compared mice in coils that cancel the local field with mice in the same kind of coils left at Earth's field [4 §Methods][5 §Methods].

How weak is a hypomagnetic field?



The coils' fields: 0.29 ± 0.01 μT in 2021 [2 p. 2], 31.9 ± 4.5 nT [3 §4.1], 31.1 ± 2.0 nT [4 §Methods] and 32 ± 7 nT [5 §Methods]. The 5 μT threshold: the abstract [1]. Earth's surface field: the World Magnetic Model report [12 Table 1]. The excursion band is our dipole-only estimate for the Laschamp low, 2–5% of today's dipole [14 §4.2][15 §3]; see section 5.

INSIDE THE COILS
31 nT–0.29 μT
against 55.3–55.6 μT in the control coils [2 p. 2][3 §4.1], measured with fluxgate magnetometers through each experiment [2 p. 14][4 §Methods][5 §Methods]

AT EARTH'S SURFACE
23–67 μT
the field's approximate range around the globe [12 Table 1]. The 2021 paper gives 25–65 μT [2 p. 2].

EARTH'S FIELD IS STRONGER BY
OUR ANALYSIS
80–2,200×
roughly: 23,000 nT ÷ 290 nT ≈ 80; 67,000 nT ÷ 31 nT ≈ 2,200. The coils removed 99.5% of Beijing's field in 2021 (0.29 of 55.26 μT) and 99.94% in the later studies (31–32 nT of 55.5 μT).

The five studies

What each study did and found

STUDY	ANIMALS AND GROUPS	FIELD, TEST VS. CONTROL	EXPOSURE	MAIN FINDINGS
Zhang et al. 2021, *Nature Communications* [2]	Male C57BL/6J mice, 8–10 weeks old; 4 per group for every cell count, 9 per group for behaviour [2 p. 14][2 Suppl. Table 1]	0.29 ± 0.01 μT vs. 55.26 ± 0.05 μT, in 1.5 m Helmholtz coils; controls in the same coils with the power off [2 p. 2][2 p. 14]	2 to 12 weeks, then 2–8 weeks back in the normal field for some groups [2 Suppl. Table 1]	Fewer dividing cells from week 2 (F(1,23) = 24.96, P < 0.0001) and fewer new neurons (P = 0.0007), simpler dendrites, a lower superoxide signal in stem cells, no preference for a moved or new object and less contextual fear; all restored by a drug that raises ROS or by return to the normal field [2 Figs. 1–6]
Tian et al. 2022, *IJMS* [3]	Male C57BL/6J mice, 7 weeks old at entry; 10 per group for behaviour, 4 for the ROS stain, 3 for the gene array; double-blind [3 §4.1]	31.9 ± 4.5 nT vs. 55,548.5 ± 12.8 nT, in double-wrapped coils [3 §4.1]	8 weeks	Less time in the open-field centre (p = 0.0002) and lower novel-location and novel-object preference (p = 0.0001); a higher superoxide signal across the hippocampus (p = 0.03–0.05); Nox4 up 2.55-fold and Gpx3 down 1.70-fold [3 Figs. 1–3][3 Table 1]
Luo et al. 2022, *Frontiers in Physics* [4]	Male C57BL/6J mice, 7 weeks old at entry; 10 per group for behaviour, 4 for histology; double-blind [4 §Methods]	31.1 ± 2.0 nT vs. 55,547.8 ± 11.4 nT, in double-wrapped coils [4 §Methods]	4, 8 and 12 weeks	Fewer dividing cells at 8 weeks (p = 0.0201) and 12 (p < 0.0001), not at 4; fewer new neurons at 12 weeks (p = 0.022); altered microglial shapes and more astrocytes (p = 0.0008); anxiety-like behaviour and lower object preference (p < 0.0001) [4 Figs. 2–8]
Tian, Ren and Luo 2024, *Biochem. Biophys. Rep.* [5]	Male C57BL/6J mice, 8 weeks old; 3–4 per group for flow cytometry; blinded [5 §Methods]	32 ± 7 nT vs. 55,574 ± 12 nT, in double-wrapped coils [5 §Methods]	4, 6 and 8 weeks	A lower active-mitochondria signal from week 6 (marginal at week 4, p = 0.0499); a higher ROS signal at week 8; lower PGC-1α mRNA; mitophagy genes, food intake, weight and thyroxine unchanged [5 Figs. 1–6]
Ren et al. 2025, *Eur. J. Neurosci.* [6]	Cultured adult neural stem cells from mice, 3 replicates [6 §Methods]	117 ± 44 nT vs. 55,311 ± 281 nT, in a nanocrystalline shielding box [6 §Methods]	15 minutes to 48 hours	Fewer dividing cells after 24 hours, tied to GSK-3β phosphorylation; proliferation back to control levels within 24 hours of return to the normal field [6 §Results]

Fields are the papers' stated means with their uncertainties (± SEM where the paper says so). "Double-wrapped" coils run current both ways so that the control coils carry the same current as the test coils but produce no net field [4 §Methods].

What the mice did worse, and what stayed normal

Worse after 8 weeks
In the 2021 study the exposed mice "exhibited no preference for objects during both the novel object location (NOL) ... and novel object recognition (NOR) tests", along with reduced freezing behaviour to contextual ... but not cue stimuli" in a fear-conditioning test, with 9 mice per group [2 p. 8][2 Fig. 5]. The 2022 studies found the same object-test deficits with 10 per group (p = 0.0001) [3 Fig. 1][4 Fig. 8], and both found less time in the centre of an open field (p = 0.0002) [3 §3.1][4 Fig. 6]; the 2021 study had found no anxiety change [2 Suppl. Fig. 4].

Unchanged
Distance travelled and locomotor activity [2 Suppl. Fig. 4][3 Fig. 1][4 Fig. 5]; body weight and the volume of the dentate gyrus [2 Suppl. Fig. 4][4 §Methods][5 Fig. 6]; food intake, weight and serum thyroxine over 8 weeks [5 Fig. 1C]; apoptosis of newborn neurons [2 Fig. 1]; and the expression and activity of the enzymes that remove superoxide [2 Suppl. Fig. 5]. Memory in the cue test, which depends on the amygdala rather than the hippocampus, was also unchanged [2 Fig. 5].

OUR ANALYSIS
This is what the episode summarized as "the brain stops working right" [17 02:32]. The papers report specific deficits in male laboratory mice, after eight weeks in a field with 99.5–99.94% of Earth's removed, with most of their measures normal and recovery on return to the normal field [2 Fig. 6][2 Suppl. Fig. 11]. The only human evidence is a minute exposure with "increased error rates and ~1.5% increase in average task completion time" [7]. None of the papers makes the claim about human brains.

3 · REACTIVE OXYGEN SPECIES

ROS fell in the stem cells and rose in the tissue around them

The abstract says both things in consecutive sentences [1]. The episode kept the rise, "a wild surge" [17 02:19], which is the half that the laboratory does not tie to lost neurogenesis.

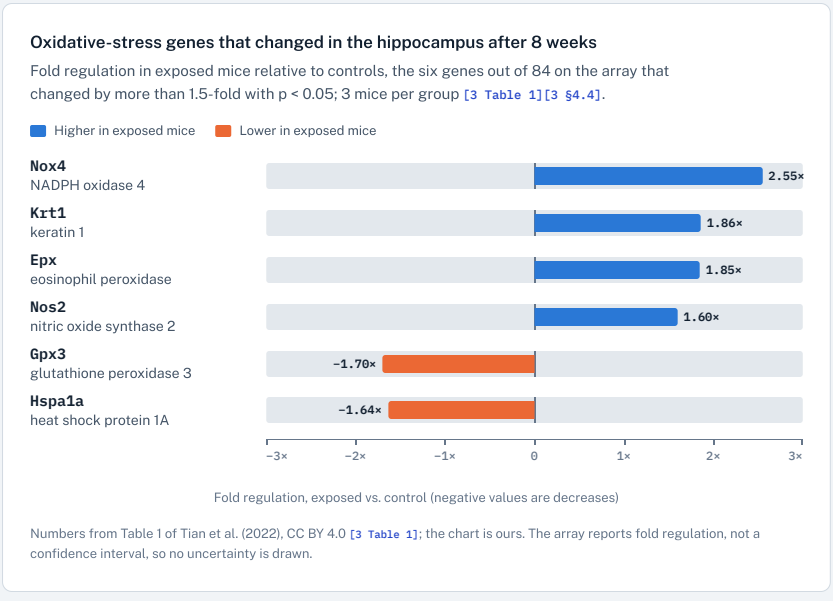
In the neural stem cells: lower
In 2021 the laboratory sorted the dentate gyrus's stem cells from reporter mice after 8 weeks and sequenced their RNA; among the down-regulated genes were those for "cellular response to oxidative stress, and ROS metabolic processes" [2 p. 4][2 Fig. 3]. A superoxide-sensitive dye confirmed it: its signal was "significantly decreased in the DG, as well as in GFP+ qNSCs" of exposed mice, 400 cells from four mice per group [2 p. 4][2 Fig. 4].

Then came the test that makes this the mechanism. A daily dose of DDC, which blocks the enzyme that removes superoxide, pushed the stem cells' ROS back up to control levels and restored proliferation, new neurons, dendrites and the memory scores [2 pp. 6–8][2 Fig. 5]. Returning the mice to the normal field did the same, and apocynin, which lowers ROS production, blocked that recovery [2 Figs. 6–7].

Across the hippocampus: higher
In 2022 the same dye, applied to the whole hippocampus of 4 mice per group, gave a higher signal after 8 weeks, p = 0.0374 for the hippocampus, 0.0481 for CA and 0.0301 for the dentate gyrus [3 Fig. 2b]. An 84-gene array on 3 mice per group found four pro-oxidant genes up and two antioxidant genes down [3 Table 1].

In 2024, flow cytometry on dissociated hippocampal cells (3–4 mice per group) found a higher ROS signal only "at week 8, but "no difference ... in the fourth and sixth week", with a lower active-mitochondria signal from week 6 [5 §Results][5 Fig. 2]. In the representative plots at week 8, cells with active mitochondria and high ROS rose from 7.73% to 17.0% of the total [5 Fig. 3]. The 2022 paper calls its result "different from the low ROS levels found in the hippocampal adult neural stem cells" [3 §3].

Oxidative-stress genes that changed in the hippocampus after 8 weeks
Fold regulation in exposed mice relative to controls, the six genes out of 84 on the array that changed by more than 1.5-fold with p < 0.05; 3 mice per group [3 Table 1][3 §4.4].



Numbers from Table 1 of Tian et al. (2022), CC BY 4.0 [3 Table 1]; the chart is ours. The array reports fold regulation, not a confidence interval, so no uncertainty is drawn.

OUR ANALYSIS
Where "wild surge" goes wrong
Three things are missing from the episode's phrase [17 02:19]. First, the direction: in the cells the abstract is about, ROS went down, and raising them was the cure [2 Fig. 5]. Second, the size: the whole-hippocampus rises are significant at p = 0.03–0.05 with four mice [3 Fig. 2b], appear only at week 8 of three time points [5 §Results], and the 2024 paper notes that its baselines differ between batches [5 §Results]. Third, the field's own uncertainty: the laboratory's 2026 review says that "in vivo studies have provided evidence of both elevated and suppressed ROS levels following HMF exposure" [9 §Mitochondrial signaling], and its 2024 review that the differing results "may be related to the differences in magnetic field conditions, duration of exposure, cell type, or method of HMF generation" [8 §4]. The 2021 paper also notes that its dye "only detects superoxide but not all ROS" [2 p. 10].

The abstract's step from "increases the global ROS levels" to "chronic neuroinflammation" rests, in print, on altered microglial shapes shown as images and a higher astrocyte count (p = 0.0008, 4 mice) at 8 weeks [4 Figs. 5–6]. The inflammatory signals were never measured [4 §Discussion], and its step from stem-cell ROS to "suppressing mitochondrial oxidative phosphorylation" has no published measurement at all that we could find. The laboratory's 2024 review offered that step as a hypothesis, "We speculate that the shift between glycolysis and oxidative phosphorylation is a response to HMF" [8 §5], and its in-vitro mechanism paper points instead to the phosphorylation of GSK-3β and mTOR [6 §Results].

4 · TIME AND REVERSIBILITY

The effects build over weeks, and undo within weeks

The abstract says only "long-term" [1]. The papers give a timetable, and a second one for recovery, which the episode's "compounding the longer the situation unfolds" leaves out [17 02:45].

WEEKS 2–4
Fewer dividing cells, in one coil system
In the 2021 Helmholtz coils, dividing cells in the dentate gyrus were already fewer at week 2 [2 Fig. 1d]. In the 2022 double-wrapped coils, nothing had changed at week 4 [4 Fig. 2], and at week 4 the active-mitochondria and ROS signals were unchanged too, apart from a marginal mitochondria result (p = 0.0499) [5 §Results].

WEEK 6
Fewer active mitochondria, ROS unchanged
The active-mitochondria signal was lower, the ROS signal was not, and the share of cells with active mitochondria and high ROS was significantly *lower* than in controls [5 Fig. 2C–D][5 Fig. 4D].

WEEK 8
The full picture
Fewer dividing and type-1 stem cells [2 Fig. 1][4 Figs. 2–3], a higher ROS signal across the hippocampus [3 Fig. 2b][5 Fig. 2F], worse memory scores [2 Fig. 5][3 Fig. 1][4 Fig. 8], more astrocytes and altered microglia [4 Figs. 5–6]. At 12 weeks, fewer new neurons and new astrocytes [4 Fig. 4].

BACK IN THE NORMAL FIELD
Recovery within 2–8 weeks
After 8 weeks of exposure, dividing stem cells recovered within 2 weeks of return, new neurons by 4 weeks, dendrites fully by 8 weeks, and the memory scores by 4 weeks [2 Fig. 6][2 Suppl. Fig. 11]. Cultured stem cells recovered within 24 hours [6 §Results].

OUR ANALYSIS
What "compounding" leaves out
Inside these experiments, more weeks did mean more change, which is why the episode's claim is partly true. But the 2024 paper found the same drift in the control mice: "Similar trends in the percentage of Mito+ cells or ROS+ cells were also observed in the GMF group" [5 §Results][5 Fig. 5], so part of the week-by-week change is age or batch, not the field. Everything measured in 2021 reversed on return to the normal field [2 Fig. 6], and the laboratory's own perspective says the effects "can potentially be alleviated by return to a normal GMF environment" [7]. Across about a hundred hypomagnetic-field experiments, an analytical review found the correlation between effect size and duration of exposure "close to zero" [10 Conclusion].

What the laboratory concludes about time
The 2024 paper's conclusion: "These changes are dependent on the duration of the magnetic field exposure. The exposure time window for active mitochondria number was significantly earlier than the ROS levels in the hippocampus" [5 §Conclusion]. Its abstract adds that "prolonged exposure to HMF exacerbates these changes" [5 Abstract]. Its authors also speculate that the drift in both groups "might not be directly related to the increasing age of the animals, but rather influenced by other factors such as mental disorders" [5 §Discussion].

5 · EARTH'S FIELD

Nothing here is about Earth's field changing

The episode introduced the abstract as being about "low field strength like we're entering as Earth's magnetic field is tanking" [17 02:15]. The abstract names one setting: "future manned deep-space missions" [1]. The papers add magnetically shielded rooms on Earth [2 p. 2][4 §Introduction].

In the presenter's words

From the automatically generated transcript, which writes "hippocample" for hippocampal and "locus curerilius" for locus coeruleus.

> *"Up next we've got a triple on hypomagnetic fields. Low field strength like we're entering as Earth's magnetic field is tanking, all hit the wild surge in reactive oxygen species and brain impact, neurogenesis, hippocample activity, and the locus curerilius."*
> S0 News, 02:13–02:28 [17 02:13]

> *"Each looks at different subjects, different specific markers, but all showed that when you take away the magnetic field, the brain stops working right. The mitochondria aren't working right. The waste removal system isn't working right. The chemical army in your blood isn't working right."*
> S0 News, 02:28–02:45 [17 02:28]

> *"And these effects are compounding the longer the situation unfolds. I'm sure it's just a coincidence that America is losing protection from Earth's magnetic field the fastest in this ongoing pole shift. And we appear to be losing our damn minds."*
> S0 News, 02:45–02:58 [17 02:45]

OUR ANALYSIS
Today's field, and an excursion's
At Earth's surface the field is about 23–67 μT [12 Table 1]: 80 to 2,200 times the coils' 0.29 μT and 31 nT, and about 4.6 to 13 times the abstract's own 5 μT threshold. Even the weakest spot on the planet, about 23 μT in the South Atlantic Anomaly, is 4.6 times that threshold. The axial dipole, the main part of the field, is about 9% weaker than it was in 1840 [13 p. 1], not 99.5% weaker. Nothing in the abstract or the five papers says the field is heading anywhere; see our review of the field's decline.

A magnetic excursion is a different matter. At the Laschamp excursion's low, about 41,000 years ago, the global dipole fell to about 2–5% of today's [14 §4.2][15 §3]. Today's dipole moment of 7.7×10^{22} A m^2 [14 §4.2] gives a dipole-only surface field of about 30 μT at the equator and 60 μT at the poles; 2–5% of that is 0.6–3 μT, before the non-dipole part of the field, which today adds a few microtesla. So an excursion low could bring surface fields into the abstract's hypomagnetic band in places, while still being several to a hundred times the coils' fields. The geological record shows no excursion starting now; see our check on whether one is due.

What the laboratory says about reversals
Its reviews do look back at the geological past. The 2024 review: during reversals "the dipole field strength can decrease by up to 90% at Earth's surface ... exposing all life to the HMF and a strong radiation environment for thousands of years" [8 §1]. The 2026 review: "During these reversals, its intensity can drop to less than 10% of the normal level. Some research suggests a potential link between geomagnetic reversals and mass extinctions" [9 §Introduction]. Neither says anything about the present decline. In the same EGU session, the same group presented an abstract on the South Atlantic Anomaly, where the surface field "can be 47.8% weaker than the global average" [16]: a halving, not a thousandfold removal.

What they say the work is for
The 2021 paper: organisms "can be exposed to a hypomagnetic field ... e.g., in some artificial environments such as magnetically shielded rooms and during long-term deep space flights", and "HMF and space ionizing radiation are two main space flight factors" [2 p. 2][2 p. 13]. The laboratory's 2024 perspective is titled "Potential health risks of hypomagnetic field for manned deep-space explorations" [7], and its 2024 review puts the field in interstellar space at 2–8 nT, on the Moon at 9–300 nT and on Mars at 10 nT–5 μT [8 §1].

Three things the episode said that are not in this source

"the locus coeruleus"
The episode listed it among the things all three papers "hit" [17 02:26]. It appears nowhere in the abstract, the five papers or the laboratory's three reviews [1][2][3][4][5][6]. If it comes from anywhere, it is one of the episode's other two hypomagnetic sources.

"The waste removal system isn't working right"
Nothing in the abstract or the papers concerns waste clearance [17 02:39]. The one disposal pathway the laboratory measured, the mitophagy genes PINK1, LC3 and Parkin, was unchanged [5 Fig. 6]; microglia, which clear debris, were described as activated, not failing [4 Fig. 5].

"The chemical army in your blood isn't working right"
The only blood measurement in these papers is serum thyroxine, which did not change [17 02:41][5 Fig. 1C]. The phrase may describe another of the episode's sources, a preprint on blood flow in six volunteers; it does not describe this one.

6 · LIMITS

Solid mouse work from one laboratory, with small groups and open questions

Our assessment of how far the published evidence goes, which is also the measure of what the abstract and the episode build on it.

One laboratory, male mice
Every mouse study is from the same group [2 p. 1][5 §Methods], and every mouse was a male C57BL/6J [2 p. 14][3 §4.1][4 §Methods]. The 2022 paper says female mice and other strains are for "future studies" [3 §3]. No independent laboratory has repeated the neurogenesis result.

Four mice per cell count
Every histological comparison rests on 4 mice per group [2 Suppl. Table 1][4 §Methods], the flow cytometry on 3–4 and the gene array on 3 [5 §Methods][3 §4.1]. The 2021 paper says that "No statistical methods were used to predetermine sample sizes" [2 p. 15].

Details shift between the laboratory's own studies
Proliferation fell from week 2 in Zhang 2021 [2 Fig. 1d] but from week 8 in Luo 2022 [4 Fig. 2]; both stem-cell types fell in 2021, though its overall test for type-1 proliferation was not significant (P = 0.59), and only type 1 in Luo 2022 [2 Fig. 1f, h][4 Fig. 3]; anxiety-like behaviour was absent in 2021 and present in both 2022 studies [2 Suppl. Fig. 9][3 Fig. 1a][4 Fig. 7]. The authors "could not determine" whether the coil systems explain the differences [4 §Discussion].

Batch effects and a drifting baseline
The 2024 paper's fluorescence baselines differ between exposure weeks "due to different experimental batches", and its controls changed with time in the same direction as the exposed mice [5 §Results][5 Fig. 5].

A field with mixed results
An analytical review of about a hundred experiments found no relation between hypomagnetic-field effects and the field's strength, the exposure's duration or its type [10 Conclusion]. Another CAS laboratory found that 30 days in a 0.03–0.5 μT field *increased* dividing cells in the subventricular zone of adult mice (P < 0.0001) and did not significantly change them in the hippocampus (P = 0.059) [11].

Reversible, and in a field no one on Earth lives in
The deficits undid within weeks of return to the normal field [2 Fig. 6][2 Suppl. Fig. 11], and the coils removed 99.5–99.94% of the local field [2 p. 2][3 §4.1], a condition that exists on Earth only inside shielded rooms [2 p. 2].

What would change this verdict

01
A peer-reviewed paper with the measurements the abstract describes: oxidative phosphorylation in neural stem cells, and inflammatory signalling in the hippocampus, with the sample sizes and statistics.

02
An independent replication of the neurogenesis and memory results in another laboratory, with female mice as well as males.

03
Any measurement showing Earth's surface field heading toward the abstract's 5 μT threshold. The dipole's decline since 1840 is about 9%, and the weakest surface field today is about 23 μT [13 p. 1][12 Table 1].

The abstract's central claim about mice is supported; what would change is how much weight the mechanism and the episode's framing can bear.

Sources

Bracketed numbers refer to this list. The abstract [1] has no pages or figures. For the 2021 paper [2], p. and pp. are the pages of the journal PDF (1–18), Fig. a figure or one of its panels, and Suppl. Fig. and Suppl. Table its supplementary information. For the other papers, § gives a section, Fig. a figure and Table a table. [17] is the episode we checked; times are positions in the video. Links checked October 21, 2026.

1 Ren, J., Luo, Y., Zhang, B., Tian, L., Guo, W., and Pan, Y. (2026). The Effects of Extremely Low Geomagnetic Field Intensity on the Mammalian Central Nervous System. EGU General Assembly 2026, Vienna, May 3–8, 2026, abstract EGU26-15577 (conference abstract, not peer reviewed). Updated March 14, 2026. Open access, CC BY 4.0.

2 Zhang, B., Wang, L., Zhan, A., Wang, M., Tian, L., Guo, W., and Pan, Y. (2021). Long-term exposure to a hypomagnetic field attenuates adult hippocampal neurogenesis and cognition. *Nature Communications* 12, 1174. Published February 19, 2021. Open access, CC BY 4.0.

3 Tian, L., Luo, Y., Zhan, A., Ren, J., Qin, H., and Pan, Y. (2022). Hypomagnetic Field Induces the Production of Reactive Oxygen Species and Cognitive Deficits in Mice Hippocampus. *International Journal of Molecular Sciences* 23(7), 3622. Open access, CC BY 4.0.

4 Luo, Y., Zhan, A., Fan, Y., and Tian, L. (2022). Effects of hypomagnetic field on adult hippocampal neurogenic niche and neurogenesis in mice. *Frontiers in Physics* 10, 1075198. Open access, CC BY 4.0.

5 Tian, L., Ren, J., and Luo, Y. (2024). The effects of different durations of exposure to hypomagnetic field on the number of active mitochondria and ROS levels in the mouse hippocampus. *Biochemistry and Biophysics Reports* 38, 101696. Open access, CC BY-NC 4.0.

6 Ren, J., Li, F., Shen, J., Tian, L., and Pan, Y. (2025). GSK-3β and mTOR Phosphorylation Mediate the Reversible Regulation of Hypomagnetic Field on Adult Neural Stem Cell Proliferation. *European Journal of Neuroscience* 62(2), e70202. Open access, CC BY 4.0.

7 Tian, L., Ren, J., Luo, Y., Li, Y., Guo, W., Zhang, B., and Pan, Y. (2024). Potential health risks of hypomagnetic field for manned deep-space explorations. *National Science Review* 11(12), nwae395. Open access, CC BY 4.0.

8 Tian, L., Luo, Y., Ren, J., and Zhao, C. (2024). The Role of Oxidative Stress in Hypomagnetic Field Effects. *Antioxidants* 13(8), 1017. Open access, CC BY 4.0.

9 Ren, J., Wang, M., Zhao, C., Luo, Y., and Tian, L. (2026). Mitochondria as key targets underlying hypomagnetic field-induced biological effects. *iScience* 29(1), 114389. Open access, CC BY-NC-ND 4.0.

10 Binhi, V. N., and Prato, F. S. (2017). Biological effects of the hypomagnetic field: An analytical review of experiments and theories. *PLOS ONE* 12(6), e0179340. Open access, CC BY 4.0.

11 Fu, J.-P., Mo, W.-C., Liu, Y., Bartlett, P. F., and He, R.-Q. (2016). Elimination of the geomagnetic field stimulates the proliferation of mouse neural progenitor and stem cells. *Protein & Cell* 7(9), 624–637. Open access, CC BY 4.0.

12 Chulliat, A., Brown, W., Nair, M., Gomez Perez, N., Young, L.-Y., Watson, C., Boneh, N., Beggan, C., Meyer, B., and Paniccia, M. (2025). The US/UK World Magnetic Model for 2025–2030: Technical Report. NOAA National Centers for Environmental Information.

13 Finlay, C. C., Aubert, J., and Gillet, N. (2016). Gyre-driven decay of the Earth's magnetic dipole. *Nature Communications* 7, 10422. Open access, CC BY 4.0.

14 Korte, M., Brown, M. C., Panovska, S., and Wardinski, I. (2019). Robust characteristics of the Laschamp and Mono Lake geomagnetic excursions: results from global field models. *Frontiers in Earth Science* 7, 86. Open access, CC BY 4.0.

15 Larsen, N., Usoskin, I., Mishev, A., Koldobskiy, S., and Väisänen, P. (2026). Reduced geomagnetic shielding during the Laschamps excursion and its impact on cosmic-ray-induced atmospheric radiation. *Journal of Geophysical Research: Space Physics* 131(2), e2025JA034820. Open access, CC BY 4.0.

16 Shen, J., Yue, Y., Rong, Z., Lin, W., Wei, Y., and Pan, Y. (2026). Possible biological effects of geomagnetic perturbations in the South Atlantic Anomaly. EGU General Assembly 2026, Vienna, May 3–8, 2026, abstract EGU26-7258 (conference abstract, not peer reviewed). CC BY 4.0.

17 SpaceWeatherNews (S0) (October 20, 2026). Magnetic Pole Shift Brain Impact, Volcano Warning | S0 News Oct.20.2026. YouTube video. Quoted from the automatically generated transcript; times are positions in the video.

METHOD

How this was checked

On October 21, 2026, we checked every statement, number, quotation and citation on this page against its source: the abstract page itself and its session listing; the full texts of the four mouse studies and the in-vitro study behind it, with the 2021 paper's supplementary information; the laboratory's three reviews; the two outside papers; the World Magnetic Model report; and the episode's transcript, about 110 items in all. Every DOI of the papers we checked was resolved through Crossref; the companion EGU abstract [16] was read on the conference session page, and the four sources on Earth's field [12][13][14][15] are reused from our earlier pages. MDPI's site blocked direct downloads, so two of its papers were read in the full-text versions held by Europe PMC. No earlier version of this page existed; it was built from a verification report on the abstract and the papers. A fresh reviewer then read the built page against the sources and recomputed every chart value and calculation; all reproduced. That check corrected the abstract's length (183 words, not 240), the timing of the new-neuron result in the 2022 Frontiers study (12 weeks, not 8), a 2022 paper quoted as if it commented on 2024 results, the "0 papers" statistic, which now says only that neither mechanism has been measured, the attribution of the interstellar and Moon field values, a mismatch between "5 to 13 times" and "four to five times", a request for a sham-coil control that three of the four studies already had, and a dozen smaller wording and citation fixes. The change log lists them.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources. They include the ratios between the laboratory fields and Earth's, the share of the local field the coils removed, the dipole-only estimate of the field at an excursion low, our search for peer-reviewed support of the abstract's two mechanism statements, and our reading of how each paper's statistics bear on the abstract's and the episode's claims.

No raw data are public beyond the 2021 paper's source-data file, which we did not use, so we re-ran only the arithmetic: the field ratios reproduce from the values the papers state, and the gene chart repeats the numbers in the 2022 paper's Table 1. The P values for stem-cell superoxide and for the memory tests in the 2021 paper are printed inside its figure panels rather than in its text, so the page gives the tests and sample sizes instead; the microglia result in the 2022 Frontiers paper is shown as images without statistics, and the page says so.

This page was researched and written with Claude, an AI assistant made by Anthropic, and then re-checked against its sources in a separate verification pass.

The verdicts on this page

FALSE	The evidence contradicts the claim.
MISLEADING	Contains something true but leaves a false impression, usually by leaving out key context.
OVERSTATED	Has some basis but claims much more than the evidence supports.
PARTLY TRUE	Part of the claim holds up and part doesn't.
TRUE	The evidence supports the claim.

All ten verdicts, and how we check

CORRECTIONS

Corrections and changes

If we get something wrong, we fix it and record the change below with the date. If a correction changes a verdict, the log says what the old verdict was.

Change log

Oct 21, 2026 — Published on factchecked.science after a full check against the sources. Built from a verification report on the EGU 2026 abstract, the four peer-reviewed mouse studies and the in-vitro study it rests on, the laboratory's reviews, and the S0 News episode of October 20, 2026 that cited it; the five verdicts are on the site's scale, one on the abstract's central claim and four on the episode's statements about it. A fresh reviewer's check then changed the following: the abstract is 183 words, not 240; the 2022 Frontiers study's fall in new neurons is at 12 weeks, with fewer dividing cells at 8; the 2022 IJMS paper is quoted on its own result only; the "0 papers" tile now says that neither mechanism has been measured, and the page adds that the laboratory's 2024 review offered the oxidative-phosphorylation idea as speculation; the interstellar (2–8 nT), Moon (9–300 nT) and Mars values are attributed to the 2024 Antioxidants review; today's field is about 4.6 to 13 times the 5 μT threshold; the independent-replication item no longer asks for a sham-coil control, which three of the studies had; the section 6 item on shifting details names each study and carries its own references; the verdict panel no longer implies that all three studies ran a fear-conditioning test; five of the six authors, not six, are at the Chinese Academy of Sciences; the dek's "hundreds to thousands" is now 80 to 2,200 times; and the Crossref sentence in "How this was checked" says which sources were resolved.

Fact-Checked Science is independent. It isn't affiliated with the channels, presenters or authors whose claims it checks.

Last updated Oct 21, 2026