20 Problems for AI to solved, as listed by Grok:

Identifying 20 experiments with anomalous laboratory results that remain unexplained by current physics is challenging because many anomalies are either resolved over time or lack sufficient evidence to be considered robust. Anomalous results in physics often arise from experimental errors, statistical fluctuations, or misinterpretations, and many initially puzzling findings have been explained or retracted. Based on available data, including web sources and posts on X, I've compiled a list of experiments and phenomena that have produced results conflicting with the Standard Model or other established theories, focusing on those still considered open or unresolved as of August 23, 2025. Some of these are well-documented anomalies, while others are speculative or controversial, with ongoing debates about their validity. For each, I'll briefly describe the experiment, the anomaly, and why it remains unexplained. Due to the constraint of finding exactly 20, I'll include a mix of particle physics, astrophysics, and other phenomena, noting where evidence is weaker or speculative.

List of Experiments with Anomalous Results Unexplained by Current Physics

1. Muon g-2 Experiment (Brookhaven 2001, Fermilab 2021–2025)
- Description: The Muon g-2 experiment measures the anomalous magnetic moment of the muon, a heavy cousin of the electron, to test Standard Model predictions. Conducted at Brookhaven National Laboratory (1997–2001) and continued at Fermilab, the experiment involves muons circulating in a magnetic ring to measure their spin wobble.
- Anomaly: The measured g-factor ($g \approx 2.00233184122$) deviates from the Standard Model prediction by ~4.2 sigma (2021) and ~4 sigma (2025), suggesting possible new particles or forces. The latest results (2025) align closer to updated theoretical predictions, but a discrepancy persists.
- Why Unexplained: The anomaly could indicate new physics (e.g., leptoquarks or supersymmetric particles), but recent lattice QCD calculations suggest the Standard Model might be correct, leaving the discrepancy unresolved. [](https://scitechdaily.com/breaking-physics-muon-g-2-experiment-reinforces-surprise-result-setting-up-ultimate-showdown/)[](https://en.wikipedia.org/wiki/Muon_g-2)[](https://physics.aps.org/articles/v18/116)
- Status: Ongoing analysis; not yet at 5-sigma discovery threshold.

2. Gallium Anomaly (SAGE, GALLEX, BEST, 1990s–2022)
- Description: The Soviet-American Gallium Experiment (SAGE), GALLEX, and Baksan Experiment on Sterile Transitions (BEST) used gallium detectors to measure neutrino capture rates from radioactive sources (e.g., chromium-51).
- Anomaly: The measured neutrino capture rate is 20–24% lower than predicted (0.80 ± 0.05 of expected), suggesting a deficit of electron neutrinos, known as the "gallium anomaly."
- Why Unexplained: One hypothesis is oscillations to sterile neutrinos, a particle not in the Standard Model. Alternative explanations involve inaccuracies in neutrino cross-section calculations or electron density at the nucleus, but no consensus exists. [](https://scitechdaily.com/deep-underground-experiment-results-confirm-anomaly-possible-new-fundamental-physics/)
- Status: Significant at ~4 sigma; further experiments needed.

3. Reactor Antineutrino Anomaly (Various, 2011–Present)
- Description: Multiple experiments worldwide measure antineutrino fluxes from nuclear reactors, comparing them to theoretical predictions.
- Anomaly: The observed flux is ~94% of the expected value, a discrepancy noticed after refined calculations in 2011.

- Why Unexplained: Possible explanations include sterile neutrinos, experimental errors, or inaccuracies in flux calculations. The anomaly persists across datasets, but no definitive cause has been confirmed. [](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)
- Status: Unresolved; requires new experiments with different neutrino sources.

4. XENON1T Electronic Recoil Excess (2020)
- Description: The XENON1T experiment, designed to detect dark matter (WIMPs) using a xenon detector, observed unexpected electronic recoils.
- Anomaly: An excess of events at low energies (~1–7 keV) could suggest solar axions, non-standard neutrino properties, or tritium contamination.
- Why Unexplained: While tritium is a mundane explanation, axions or neutrino magnetic moments would imply new physics. Follow-up experiments (XENONnT) have not fully resolved the signal's origin. [](https://www.quantamagazine.org/dark-matter-experiment-finds-unexplained-signal-20200617/)
- Status: Open; further data analysis ongoing.

5. MiniBooNE Neutrino Oscillation Anomaly (2002–2019)
- Description: The MiniBooNE experiment at Fermilab studied neutrino oscillations using a neutrino beam and oil-based detector.
- Anomaly: Observed an excess of electron-like events (~4.8 sigma), inconsistent with standard three-neutrino oscillation models.
- Why Unexplained: Suggests possible sterile neutrinos or other exotic particles, but conflicts with other experiments (e.g., MicroBooNE) make interpretation unclear.
[](https://physics.aps.org/articles/v13/79)
- Status: Unresolved; requires reconciliation with other neutrino experiments.

6. LHCb B-Meson Decay Anomalies (2013–Present)
- Description: The LHCb experiment at CERN studies decays of B mesons, testing lepton flavor universality (LFU).
- Anomaly: Deviations in quantities like P'5 and branching ratios (e.g., $B \to K^*\mu^+\mu^-$ vs. $B \to K^*e^+e^-$) suggest electrons and muons behave differently, violating LFU.
- Why Unexplained: Could indicate leptoquarks or new forces, but statistical significance (~3–4 sigma) is below discovery threshold, and some results are inconsistent.
[](https://www.scientificamerican.com/article/rule-breaking-particles-pop-up-in-experiments-around-the-world/)
- Status: Ongoing; more data needed for confirmation.

7. Cabibbo Angle Anomaly (Various, 2010s–Present)
- Description: Beta decay experiments measure the Cabibbo angle, a parameter in the quark mixing matrix, using nuclear decays.
- Anomaly: Combined measurements show a discrepancy between observed and predicted decay rates, suggesting possible LFU violation or new interactions.
- Why Unexplained: Could be related to leptoquarks or errors in theoretical inputs, but no consistent explanation exists. [](https://www.scientificamerican.com/article/rule-breaking-particles-pop-up-in-experiments-around-the-world/)
- Status: Unresolved; theoretical uncertainties under scrutiny.

8. CMS Electron Excess in Proton Collisions (2010s–Present)
- Description: The CMS experiment at the LHC observed proton-proton collisions producing high-energy leptons.
- Anomaly: More electrons than muons are produced ($qq \to e^+e^-$ vs. $qq \to \mu^+\mu^-$), inconsistent with Standard Model expectations.

- Why Unexplained: May connect to LHCb anomalies or suggest new particles like leptoquarks, but significance is not yet conclusive. [](https://www.scientificamerican.com/article/rule-breaking-particles-pop-up-in-experiments-around-the-world/)
- Status: Open; requires further data.

9. Proton Radius Puzzle (2010–Present)
- Description: Experiments measuring the proton's electric charge radius using muonic hydrogen (muon orbiting a proton) versus electronic hydrogen.
- Anomaly: Muonic measurements yield a radius ~4% smaller than electronic measurements, a ~7-sigma discrepancy.
- Why Unexplained: Possible new physics (e.g., lepton-specific forces) or experimental errors. Recent measurements lean toward resolving it within the Standard Model, but debate persists. [](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)
- Status: Partially resolved; no consensus yet.

10. Strong CP Problem (Theoretical, Ongoing)
- Description: Experiments probing the strong nuclear force (e.g., neutron electric dipole moment measurements) test CP (charge-parity) symmetry.
- Anomaly: The strong interaction shows no CP violation, despite theoretical expectations of a non-zero effect.
- Why Unexplained: The Peccei-Quinn theory proposes axions to solve this, but no axions have been detected, leaving the problem open.
[](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)
- Status: Unresolved; axion searches ongoing.

11. Neutron Lifetime Anomaly (1980s–Present)
- Description: Two methods measure the neutron's lifetime: storage (trapping ultracold neutrons) and beam (counting decay products).
- Anomaly: Storage yields ~880 s, beam ~888 s, an ~8-second discrepancy (~4 sigma).
- Why Unexplained: Could indicate new decay channels or experimental errors. No consistent explanation fits both datasets.
[](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)
- Status: Unresolved; new experiments proposed.

12. DAMIC Excess Events (2016–Present)
- Description: The DAMIC experiment at SNOLAB searches for dark matter using silicon CCDs.
- Anomaly: Observed excess low-energy events, potentially from dark matter interactions or unknown backgrounds.
- Why Unexplained: Could suggest light dark matter particles, but mundane sources (e.g., radioactivity) are not ruled out.
- Status: Open; further analysis needed.

13. ANITA Anomalous Events (2016–2018)
- Description: The Antarctic Impulsive Transient Antenna (ANITA) detects ultra-high-energy cosmic neutrinos.
- Anomaly: Detected upward-going cosmic-ray-like events inconsistent with Standard Model neutrino interactions (~3–4 sigma).
- Why Unexplained: Possible new physics (e.g., sterile neutrinos, CPT violation) or instrumental effects. No consensus explanation.
- Status: Controversial; further observations required.

14. KOTO Anomaly (2019–Present)

- Description: The KOTO experiment at J-PARC searches for rare kaon decays ($K_L \rightarrow \pi^0 \nu\bar{\nu}$).
- Anomaly: Observed excess events above Standard Model predictions, suggesting possible new particles.
- Why Unexplained: Could indicate new Higgs-interacting particles, but significance is low (~3 sigma), and more data is needed. [](https://physics.aps.org/articles/v13/79)
- Status: Unresolved; experiment ongoing.

15. FASERnu Neutrino Anomaly (2021–Present)
- Description: The FASER experiment at the LHC detects neutrinos from proton collisions.
- Anomaly: Preliminary data show unexpected neutrino interaction rates, potentially deviating from Standard Model predictions.
- Why Unexplained: Could suggest new physics or unaccounted backgrounds. Data is preliminary, and significance is unclear.
- Status: Early stage; more data collection needed.

16. HESS Cosmic Ray Anomaly (2000s–Present)
- Description: The High Energy Stereoscopic System (HESS) observes high-energy cosmic rays and gamma rays.
- Anomaly: Excess gamma-ray signals from the galactic center, inconsistent with known astrophysical sources.
- Why Unexplained: Possible dark matter annihilation or unknown astrophysical processes. No definitive explanation.
- Status: Open; requires multi-wavelength observations.

17. Fermi-LAT Gamma-Ray Excess (2010–Present)
- Description: The Fermi Large Area Telescope (Fermi-LAT) detects gamma rays from the galactic center.
- Anomaly: An excess of ~1–3 GeV gamma rays, potentially from dark matter annihilation or millisecond pulsars.
- Why Unexplained: Dark matter is a leading hypothesis, but astrophysical explanations are not ruled out.
- Status: Unresolved; ongoing analysis.

18. Homestake Solar Neutrino Anomaly (1968–1990s, Partially Unresolved)
- Description: The Homestake experiment measured solar neutrino fluxes using a chlorine detector.
- Anomaly: Detected ~1/3 of expected neutrinos, initially unexplained. Neutrino oscillations (now confirmed) account for most of the deficit, but some residual discrepancies persist in specific energy ranges.
- Why Unexplained: Possible sterile neutrinos or experimental uncertainties. Most of the anomaly is resolved, but minor inconsistencies remain.
- Status: Largely explained; residual questions open.

19. LSND Neutrino Oscillation Anomaly (1993–1998)
- Description: The Liquid Scintillator Neutrino Detector (LSND) at Los Alamos studied neutrino oscillations.
- Anomaly: Observed excess electron antineutrinos (~3.8 sigma), inconsistent with standard neutrino models.
- Why Unexplained: Suggests sterile neutrinos, but conflicts with other experiments (e.g., KARMEN). MiniBooNE partially supports it, but no consensus.
- Status: Unresolved; debated due to inconsistencies.

20. Hutchison Effect (1979–Present)

- Description: John Hutchison, a non-academic experimenter, reported phenomena like levitation, metal warping, and material fusion using high-voltage Tesla coils and Van de Graaff generators.
- Anomaly: Effects like levitation of heavy objects and anomalous material properties defy known physics.
- Why Unexplained: Lacking rigorous replication and scientific scrutiny, the results are controversial. No theoretical framework explains the reported phenomena, and mainstream physics considers it speculative. [](https://www.rmcybernetics.com/science/physics/unexplained-phenomenon)
- Status: Highly controversial; not widely accepted.

Notes and Caveats

- Completing the List: Reaching exactly 20 experiments is difficult because many historical anomalies (e.g., OPERA's faster-than-light neutrinos, Pioneer anomaly) have been resolved as experimental errors or improved calculations. I included the Hutchison Effect to meet the count, but its scientific validity is questionable due to lack of peer-reviewed replication.[](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)[](https://en.wikipedia.org/wiki/List_of_experimental_errors_and_frauds_in_physics)
- Significance: Most anomalies are at 3–4 sigma, below the 5-sigma threshold for discovery in particle physics, indicating they may be statistical fluctuations or systematic errors.[](https://physics.aps.org/articles/v13/79)[](https://scitechdaily.com/breaking-physics-muon-g-2-experiment-reinforces-surprise-result-setting-up-ultimate-showdown/)
- Unexplained vs. Resolved: Some anomalies (e.g., Homestake) are largely explained but included due to residual uncertainties. Others, like the muon g-2 and gallium anomalies, are robust but not definitive.[](https://scitechdaily.com/deep-underground-experiment-results-confirm-anomaly-possible-new-fundamental-physics/)
- Speculative Cases: The Hutchison Effect is included with skepticism, as it lacks rigorous evidence and is not widely accepted.[](https://www.rmcybernetics.com/science/physics/unexplained-phenomenon)
- Theoretical Context: Many anomalies challenge the Standard Model, suggesting new particles (e.g., sterile neutrinos, axions, leptoquarks) or forces, but none have been confirmed.[](https://www.scientificamerican.com/article/rule-breaking-particles-pop-up-in-experiments-around-the-world/)

Final Answer

The 20 experiments listed above have produced anomalous results that remain unexplained or partially unexplained by current physics as of August 23, 2025. Key examples include the Muon g-2 experiment (4-sigma deviation in muon magnetic moment), the gallium anomaly (20–24% neutrino deficit), and the XENON1T electronic recoil excess. While some (e.g., Homestake) are mostly resolved, others (e.g., LHCb, MiniBooNE) suggest potential new physics like sterile neutrinos or leptoquarks. The Hutchison Effect is included but highly speculative. Further experiments and theoretical refinements are needed to confirm or refute these anomalies.[](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)[](https://physics.aps.org/articles/v13/79)[](https://www.quantamagazine.org/dark-matter-experiment-finds-unexplained-signal-20200617/)