



# The Context Gap

An industry perspective on what's missing between the model and the decision

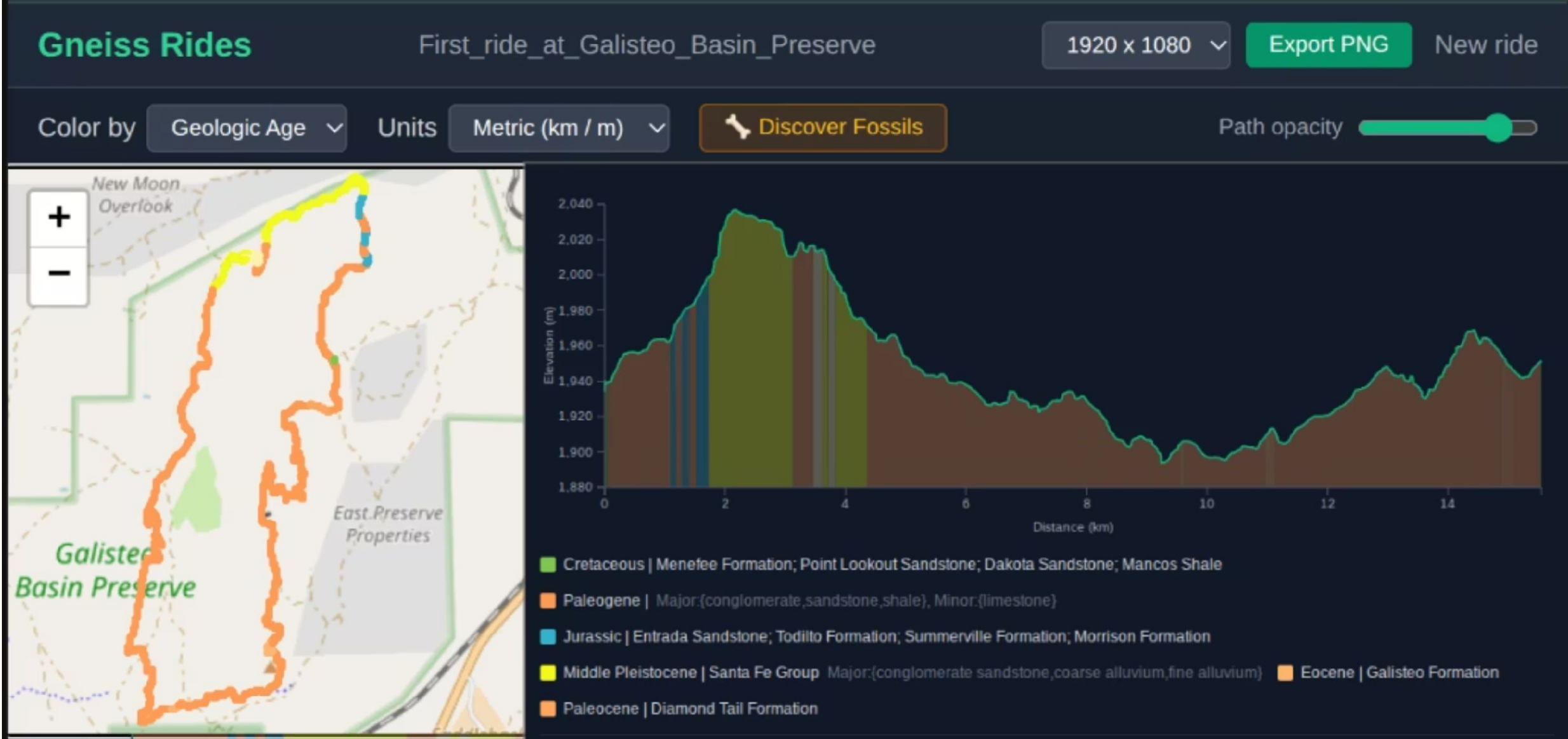
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**Nate Suurmeyer** — Head of Innovation, ThinkOnward

**Envitrace AI for Earth Sciences Workshop 2026** · Santa Fe, New Mexico

# Proof I Build Things (Sometimes)

Most of what I've built lives behind IT policies, NDAs, and data silos.



# What I Want You to Take Away

## Part 1 — Honest Learnings

What's actually happening with AI inside oil and gas — the messy, unglamorous reality most conference talks skip.

## Part 2 — Two Roles Worth Protecting

Geoscientists as domain experts who build the right context — and as creative practitioners who build their own tools.



# The State of Play: AI in Oil & Gas Geosciences



## Data management is still a primary concern

Manual processes and lots of demand. Too much institutional knowledge is being quietly lost.



## People are stretched thin

The intent is there. The time isn't. Scattered experimentation is no substitute for deliberate practice.



## A persistent skills mismatch

Specialist AI Teams have technical capability but lack domain context. Domain experts have the context but lack technical depth.



## Promising AI tools for key workflows

There's not enough time to understand tools deeply — which **creates a trust gap** that stalls adoption.

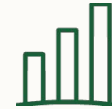
# AI Products in O&G Geoscience Today



## Seismic Interpretation

Faults, horizons, geobodies. Most vendors, most mature.

Mature and ubiquitous – yet still prone to failure when the geology gets complicated.



## Well Log & Petrophysics

Facies prediction, log classification, rock typing.

Solid workhorse. Less flashy, more reliable.



## Basin Modeling & Play Based Analysis

Play fairway, prospect risking. Few vendors, mostly pilots.

Promising but underserved.



## RAG & GenAI Search

LLM-powered search across reports and legacy data.

Highest ceiling, most policy friction.

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## Homebrew Python / ML

Always happening in the background. Unique to the individual, frequently crunched by corporate IT. Where the real creativity lives.

# Interesting, but Not Yet Transformational



## The Trust Problem

**Answers without understanding.**

"ChatGPT can give you a summary of War and Peace. But you will not *understand* War and Peace."



## The Workflow Problem

**Digital paper.**

Most AI geoscience products are converting manual workflows into digital format.



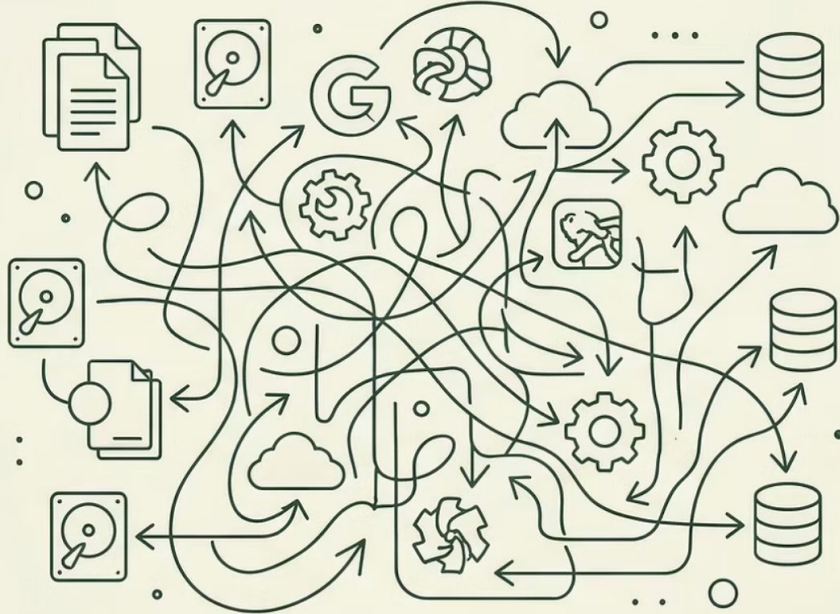
## The Context Problem

**The missing thirty years.**

The junior, the senior, and the Flat Spot

# We Are Moving From a "How" World to a "What" World

## How World



**Most of your energy goes here.**

## What World





CONTEXT

# What Will Matter Most:

Prompts have a use, but they have a limit. The real shift is from **who has the best prompt** to **who has the best context**.

Generic model reasoning isn't the bottleneck. Whether the AI understands your domain well enough to act correctly inside it – that's the bottleneck.

## 📄 Knowledge Layer

*What things are*

- Seismic attributes
- Facies classification
- Horizon picking
- Bad data

## 📄 Context Layer

*Why it matters here*

- Basin history
- Interpretive reasoning
- Analog selection
- Risk framing

# What Is a Context Layer?

**Entities**  
Wells, maps,  
documents



**Steps**  
Workflow actions and  
flow

**Decisions**  
Judgment calls with  
criteria

**Rules**  
Constraints and  
conventions

## Memory, Not Just Instructions

A prompt tells the model what to do *right now*.

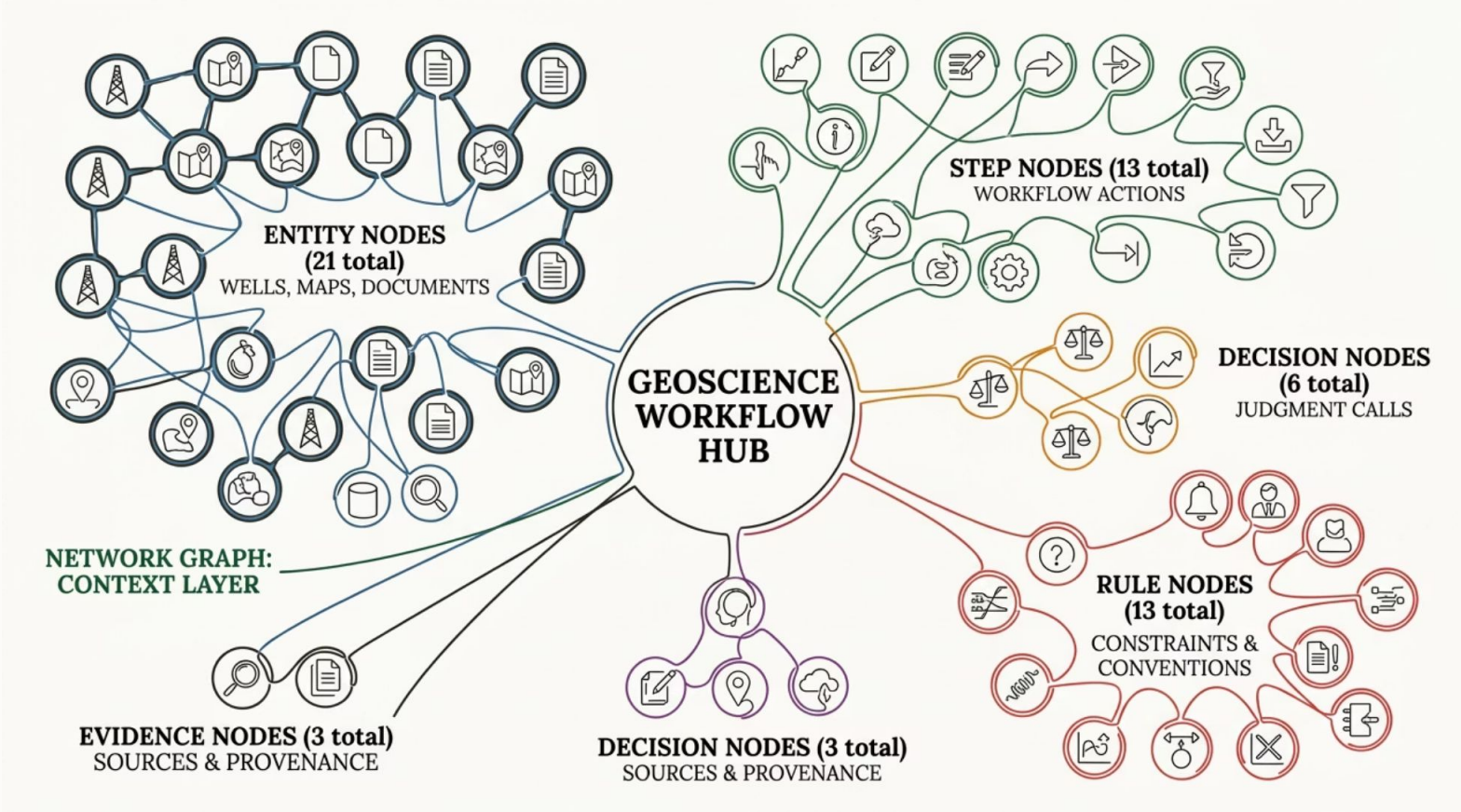
A context layer gives it the memory to understand *why*.

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RAG retrieves relevant documents.

A context layer retrieves relevant **reasoning**.

# Example: The Map-Making Context Graph



## Making Great Geoscience Maps

One geoscientist's accumulated judgment — turned into a structured graph an LLM can query.

Ask "What should I consider for a prospect map?" and it returns the relevant neighborhood — not a generic answer, but the specific workflow, decisions, and rules that matter.

21  
Entities

13  
Steps

6  
Decisions



# The Graph Becomes an AI Context Layer

`query_context("prospect map")` → structured domain knowledge for any LLM prompt

## What the Query Returns

```
# Query: 'prospect map'  
# 3 matches → 13 nodes within 2 hops  
  
ENTITIES  
  Prospect Map ← structure map centerpiece  
  Block / Lease Data ← control vs. risk  
  Contour Lines ← must be labeled  
  
RULES  
  Never Use Rainbow Color Bars  
  CRS Must Match Interp Software  
  Peer Review Before Printing  
  
DECISIONS  
  Clarity vs. Aesthetics? → clarity wins
```

## Where This Plugs In

### LLM system prompts

Paste query output as context when asking an AI to help with map design or QC review

### Tool plugins for Agents

Wire the graph into mapping tools so the AI copilot knows your team's standards

### Institutional memory

Survives team turnover. Grows with every brain dump.  
Version-controlled in Git.

The method: <sup>Well Name vs. UWI? → names always</sup> **Brain dump** → **Context graph** → **AI-ready knowledge layer**. Repeatable for any expert workflow.

# Two Tools That Actually



Go for a walk with a voice recorder  
Geology is outside so you should be also. The best AI work starts away from the computer — when your thinking is loose and honest.

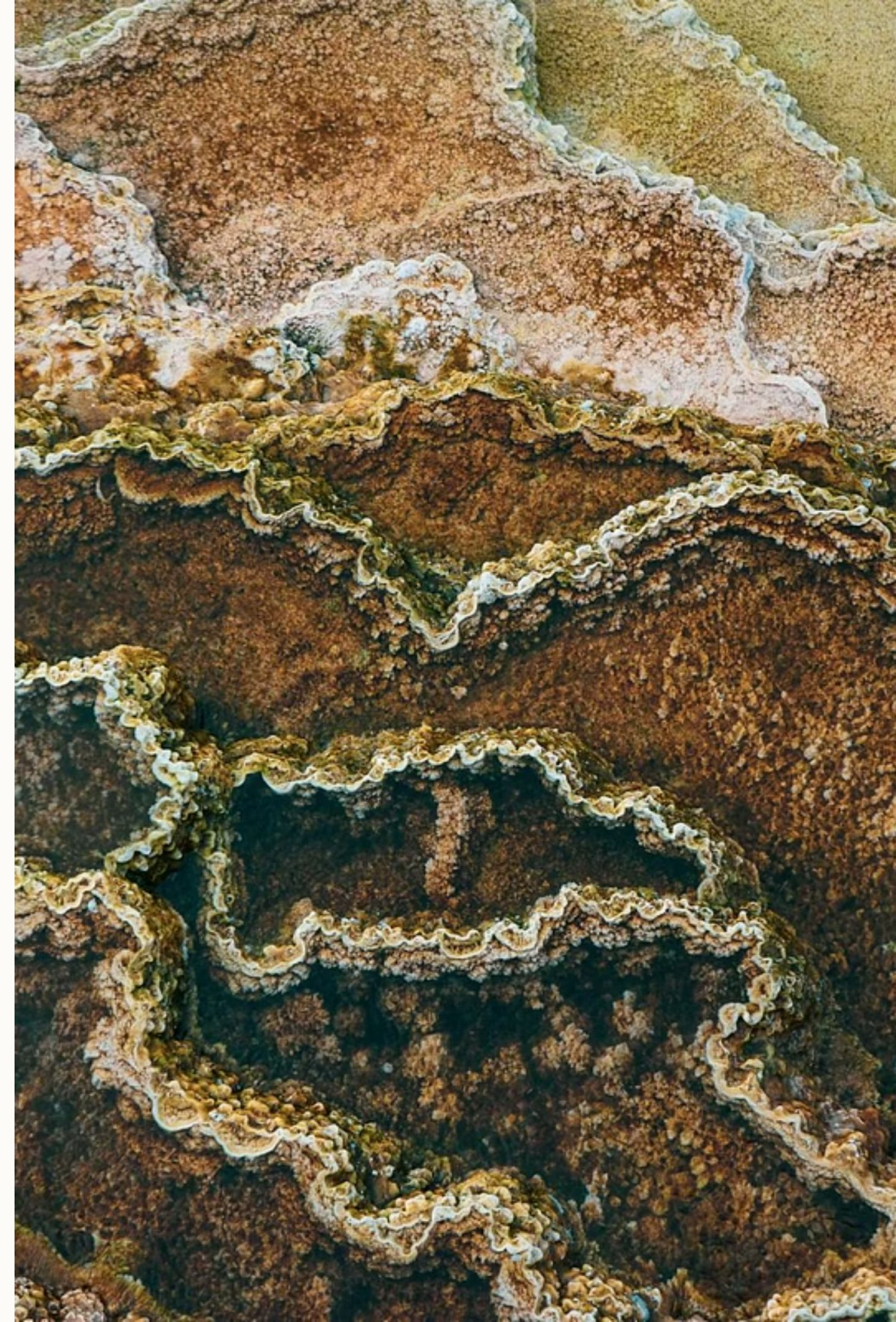


Always check in with your GenAI Helper  
Ask it to come back and ask *you* questions. Make sure it understands what you're going for. *You can be the strongest limiting factor.*

# The Unverifiable Task Is Our Moat

"There's no unit test for geological judgment."

Even Dario Amodei – the CEO of Anthropic – draws a sharp line between tasks AI can verify and tasks it can't. He's 90% confident AI reaches genius-level performance within a decade, but his "one little bit of fundamental uncertainty" is about **unverifiable tasks**.





# Thoughts? Questions?

[github.com/nsuurmey](https://github.com/nsuurmey)

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Envitrace AI for Earth Sciences

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## Key Takeaway

You've Spent Your Career

Building Ideas Out of Incomplete

Data, Through Layers of

Abstraction.

You Can Build Anything.