

POST

NASA News: "Webb Space Telescope reaches destination . . . 1 million miles from earth " ---What will it see???????????????

January 25, 2022

Bang? Universe? Bang? Universe? Bang? Universe? Bang? Universe?

What's one more universe! ...


... "To think that our big bang was the only bang that's ever occurred would seem at this point to be a bit narrow-minded, anthropocentric, and in contradiction to the continual iconoclastic evolution in our cosmological understanding."- Jed Anderson, EnviroAI

—"Metaverses ... universes ... multiverse ... More room for humanity to roam and play in! Awesome!"

- Jed Anderson, EnviroAI





 NPR

The James Webb telescope reaches its final destination in s...

16 hours ago

THE HILL

NASA's James Webb space telescope reaches final orbit | TheHill

42 mins ago



The New York Times

James Webb Telescope Arrives at Destination in Space: Updat...

2 hours ago



CNN

Telescope reaches its final destination a million miles from Earth

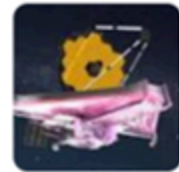
19 hours ago



S Space.com

James Webb Space Telescope arrives at new home in space

21 hours ago



What patterns will Webb help us find?

James Webb Space Telescope successfully arrived at its viewing destination ([It's not only a time machine ... but a simplicity machine \(see below\).](https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63PgLS-vCJNK3FCCf43VjHnjMnT9cVoNLdvVomWKN5a-g1XCuDkoVYtu-_PTV1ijzP7YOLNq-wBGsZL1RBDxXyK8L-B_x5f4Zac9eogphGM8rmK3dft-pYQJ--GX2-lNTvEo63sDLyTurkAOHLXpxZi7XBgYiBrpP7Bx&c=&ch=) 1 million miles from earth (the Hubble Space Telescope is only 340 miles from earth).</p></div><div data-bbox=)

What patterns is AI helping us find?

And speaking of simplicity, interesting article a few days ago on artificial intelligence in cosmological pattern recognition.

---“It's simple. It's simple. It's simple. It's just a LOT of simplicity.” - Jed Anderson, EnviroAI

[astrophysics \(https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63PgcltorFiiiDdxLJ74WkuKyunornzE-vp7oZ1V9Zd9AsacLCvfiG6rlcqJKoIqDY1EpPCb7sgod3egPI4vRkYGMGg1rMt9Nca8nuwcLoHWZxjVRPvGYTD-xTk49abXPtsxob26RWBb2gbq_3K-oYrBJ22dSvqbQcu54y2ye2bqNRiTj7BxS7ysiA==&c=&ch=\)](https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63PgcltorFiiiDdxLJ74WkuKyunornzE-vp7oZ1V9Zd9AsacLCvfiG6rlcqJKoIqDY1EpPCb7sgod3egPI4vRkYGMGg1rMt9Nca8nuwcLoHWZxjVRPvGYTD-xTk49abXPtsxob26RWBb2gbq_3K-oYrBJ22dSvqbQcu54y2ye2bqNRiTj7BxS7ysiA==&c=&ch=))

Any Single Galaxy Reveals the Composition of an Entire Universe

January 20, 2022

In computer simulations of possible universes, researchers have discovered that a neural network can infer the amount of matter in a whole universe by studying just one of its galaxies.

A group of scientists may have stumbled upon a radical new way to do cosmology.

Cosmologists usually determine the composition of the universe by observing as much of it as possible. But these researchers have found that a machine learning algorithm can scrutinize a single simulated galaxy and predict the overall makeup of the digital universe in which it exists— a feat analogous to analyzing a random grain of sand under a microscope and working out the mass of Eurasia. The machines appear to have found a pattern that might someday allow astronomers to draw sweeping conclusions about the real cosmos merely by studying its elemental building blocks.

“This is a completely different idea,” said Francisco Villaescusa-Navarro (https://r2o.r6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDildNWEIy_dSjMSom_AXqNsEeuyk63PgBNjCafN5w-dQyn7ugbENKwiL_b3TNTT5FuJPsezUhGfP_c9dWu9clYmlS-1xnfa4fvsYuAszFICA_YLmVgJ-f2SOmoV3lk5Y5cOuxX1XTNY=&c=&ch=)), a theoretical astrophysicist at the Flatiron Institute in New York and lead author of the work. “Instead of measuring these millions of galaxies, you can just take one. It’s really amazing that this works.”

It wasn’t supposed to. The improbable find grew out of an exercise Villaescusa-Navarro gave to Jupiter Ding, a Princeton University undergraduate: Build a neural network that, knowing a galaxy’s properties, can estimate a couple of cosmological

attributes. The assignment was meant merely to familiarize Ding with machine learning. Then they noticed that the computer was nailing the overall density of matter.

“I thought the student made a mistake,” Villaescusa-Navarro said. “It was a little bit hard for me to believe, to be honest.”

The results of the investigation that followed appeared in a January 6 preprint (http://r20.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63Pg35K5CgCEV_lbE7Lg5HxBPnvcQA11KOcg1L9U6FAi_lw7HmXE7cnkRAT6af97eI2LVpHL3b8fhZpkIoUWzsfSs_sgvnxUpFh3&c=&ch=) that has been submitted for publication. The researchers analyzed 2,000 digital universes generated by the Cosmology and Astrophysics with Machine Learning Simulations (CAMELS (https://r20.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63Pgs_5zoPlfhWg8_Ps6z023Nd8x2GL-4Jg5HCG-yQrsuXYk34IPzpKVhht9TC_zdsCLyKmpsGaH5UQIpDZeMA2t_Unmxn7_cawH&c=&ch=)) project. These universes had a range of compositions, containing between 10% and 50% matter with the rest made up of dark energy, which drives the universe to expand faster and faster. (Our actual cosmos consists of roughly one-third dark and visible matter and two-thirds dark energy.) As the simulations ran, dark matter and visible matter swirled together into galaxies. The simulations also included rough treatments of complicated events like supernovas and jets that erupt from supermassive black holes.

Ding’s neural network studied nearly 1 million simulated galaxies within these diverse digital universes. From its godlike perspective, it knew each galaxy’s size, composition, mass, and more than a dozen other characteristics. It sought to relate this list of numbers to the density of matter in the parent universe.

It succeeded. When tested on thousands of fresh galaxies from dozens of universes it hadn't previously examined, the neural network was able to predict the cosmic density of matter to within 10%. "It doesn't matter which galaxy you are considering," Villaescusa-Navarro said. "No one imagined this would be possible."

"That one galaxy can get [the density to] 10% or so, that was very surprising to me," said **Volker Springel** (https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63Pg6OnsScMhYUJx_4ZOb5-qdQV2TIZ-SmkfiJNA5-9r7KAcG1Vb_sWM26fAaIxRVh6ZtIoKbiX9b7f5qCw4g41b1TeAqDkoiBioKLzNVgn2St3kzWhSoox_lg==&c=&ch=), an expert in simulating galaxy formation at the Max Planck Institute for Astrophysics who was not involved in the research.

The algorithm's performance astonished researchers because galaxies are inherently chaotic objects. Some form all in one go, and others grow by eating their neighbors. Giant galaxies tend to hold onto their matter, while supernovas and black holes in dwarf galaxies might eject most of their visible matter. Still, every galaxy had somehow managed to keep close tabs on the overall density of matter in its universe.

One interpretation is "that the universe and/or galaxies are in some ways much simpler than we had imagined," said **Pauline Barmby** (https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63PgdZoAtRCg79JEdEsJe-i9vhCLDcIllo_AZK8OCi_6TYN-bfiotQAtmwI5Gt1bY993bDg-p_mbsvCZXhty5xt71prwyr8heqZlPUBKy9eyCSR-WSi-7_115H-RmoFIFJPKiq4ShbxsHJU=&c=&ch=), an astronomer at Western University in Ontario. Another is that the simulations have unrecognized flaws.

The team spent half a year trying to understand how the neural network had gotten so wise. They checked to make sure the algorithm hadn't just found some way to infer the density from the coding of the simulation rather than the galaxies

themselves. “Neural networks are very powerful, but they are super lazy,” Villaescusa-Navarro said.

Through a series of experiments, the researchers got a sense of how the algorithm was divining the cosmic density. By repeatedly retraining the network while systematically obscuring different galactic properties, they zeroed in on the attributes that mattered most.

Near the top of the list was a property related to a galaxy’s rotation speed, which corresponds to how much matter (dark and otherwise) sits in the galaxy’s central zone. The finding matches physical intuition, according to Springel. In a universe overflowing with dark matter, you’d expect galaxies to grow heavier and spin faster. So you might guess that rotation speed would correlate with the cosmic matter density, although that relationship alone is too rough to have much predictive power.

The neural network found a much more precise and complicated relationship between 17 or so galactic properties and the matter density. This relationship persists despite galactic mergers, stellar explosions and black hole eruptions. “Once you get to more than [two properties], you can’t plot it and squint at it by eye and see the trend, but a neural network can,” said [Shaun Hotchkiss](https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAI0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63Pg6FkRicn6XLHsnb6UOH95EBPMotoLz48R-qnECW39Lb48k4DU_ldj_JKpUImpbGJ9kM1zgP1rlS5h8MFDFWcjKbG39FS0MSJAp46N-mxPR9Aqk5oTX8Ey_DSSsgecoKR3&c=&ch=) (https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAI0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNsEeuyk63Pg6FkRicn6XLHsnb6UOH95EBPMotoLz48R-qnECW39Lb48k4DU_ldj_JKpUImpbGJ9kM1zgP1rlS5h8MFDFWcjKbG39FS0MSJAp46N-mxPR9Aqk5oTX8Ey_DSSsgecoKR3&c=&ch=), a cosmologist at the University of Auckland in New Zealand.

While the algorithm’s success raises the question of how many of the universe’s traits might be extracted from a thorough study of just one galaxy, cosmologists suspect that real-world applications will be limited. When Villaescusa-Navarro’s

group tested their neural network on a different property—cosmic clumpiness—it found no pattern. And Springel expects that other cosmological attributes, such as the accelerating expansion of the universe due to dark energy, have little effect on individual galaxies.

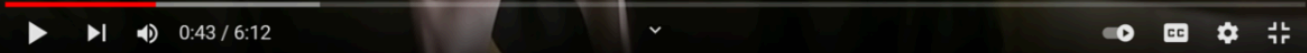
The research does suggest that, in theory, an exhaustive study of the Milky Way and perhaps a few other nearby galaxies could enable an exquisitely precise measurement of our universe's matter. Such an experiment, Villaescusa-Navarro said, could give clues to other numbers of cosmic import such as the sum of the unknown masses of the universe's three types of neutrinos.

But in practice, the technique would have to first overcome a major weakness. The CAMELS collaboration cooks up its universes using two different recipes. A neural network trained on one of the recipes makes bad density guesses when given galaxies that were baked according to the other. The cross-prediction failure indicates that the neural network is finding solutions unique to the rules of each recipe. It certainly wouldn't know what to do with the Milky Way, a galaxy shaped by the real laws of physics. Before applying the technique to the real world, researchers will need to either make the simulations more realistic or adopt more general machine learning techniques—a tall order.

"I'm very impressed by the possibilities, but one needs to avoid being too carried away," Springel said.

But Villaescusa-Navarro takes heart that the neural network was able to find patterns in the messy galaxies of two independent simulations. The digital discovery raises the odds that the real cosmos may be hiding a similar link between the large and the small. "It's a very beautiful thing," he said. "It establishes a connection between the whole universe and a single galaxy."

Steven Weinberg - How Many Universes Exist?



How many universes? Interview (https://r20.rs6.net/tn.jsp?f=001DjkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNNwTnN-II4_NboAyQ8HmgWDCMEnXCbZ3nIAOuJcunm5ZBIcSk3qaG_Ic6qYwoOacurc96IDqSoUTp6C8sCwoqfbtdaRHIMPZg==&c=&ch=) **with** Steven Weinberg, recently deceased University of Texas Professor and Nobel Prize Winner in Physics.

☰ Max Tegmark - Do Multiple Universes Surely Exist?



0:31 / 7:01

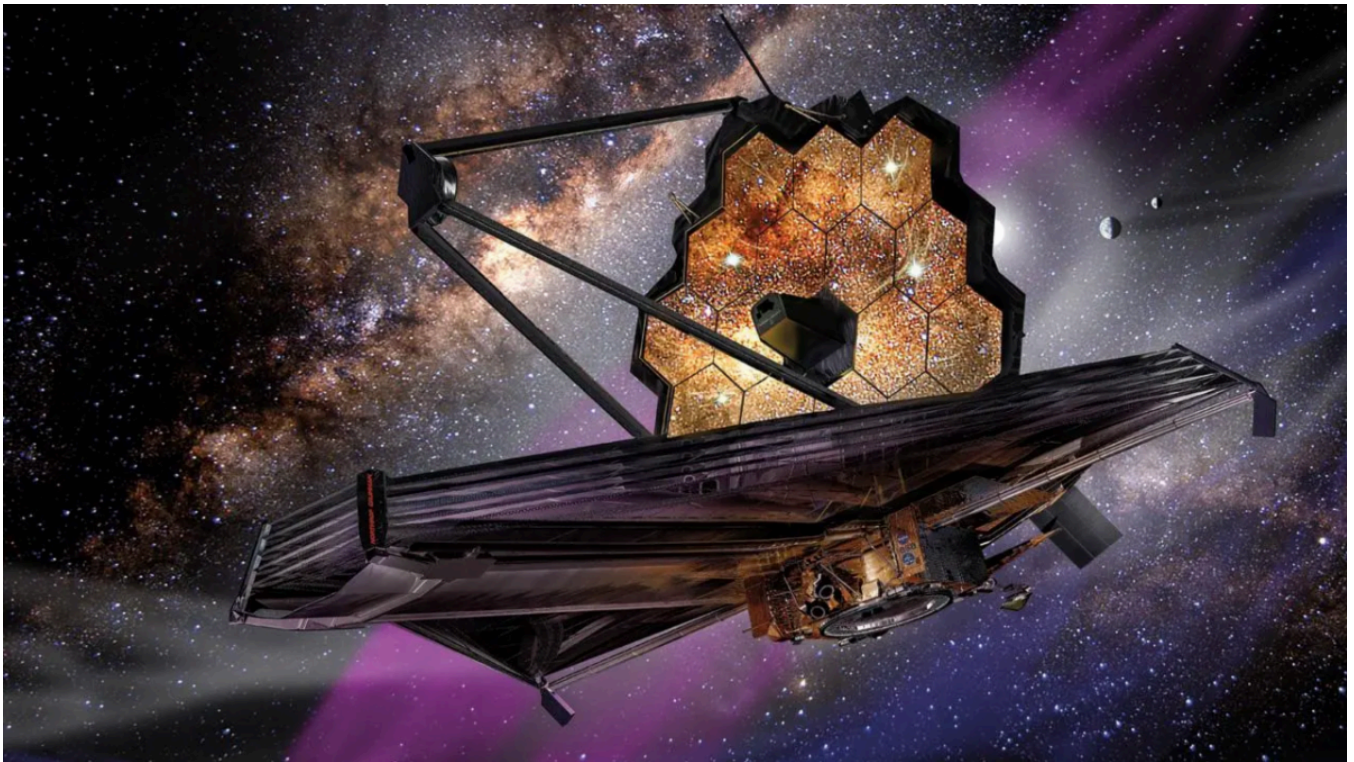


How many universes? Interview ([https://r20.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqPFUQRmr_ZQjhImIQxZuQteAiULH2Wam3HmsHg7vLcy-3raqWFMX82lr-fK4b-J_2C-JZDoydxEsZfoM_fu6GAkHQjCn6IPlAlqUrQhvWvSprOQRXLj2iI2YHR2tDJewahb6gQYWwnzJOlhk-B2sHFgFKspLSw331A==&c=&ch=\)](https://r20.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqPFUQRmr_ZQjhImIQxZuQteAiULH2Wam3HmsHg7vLcy-3raqWFMX82lr-fK4b-J_2C-JZDoydxEsZfoM_fu6GAkHQjCn6IPlAlqUrQhvWvSprOQRXLj2iI2YHR2tDJewahb6gQYWwnzJOlhk-B2sHFgFKspLSw331A==&c=&ch=)) **with Max Tegmark,**
MIT Professor of Physics.

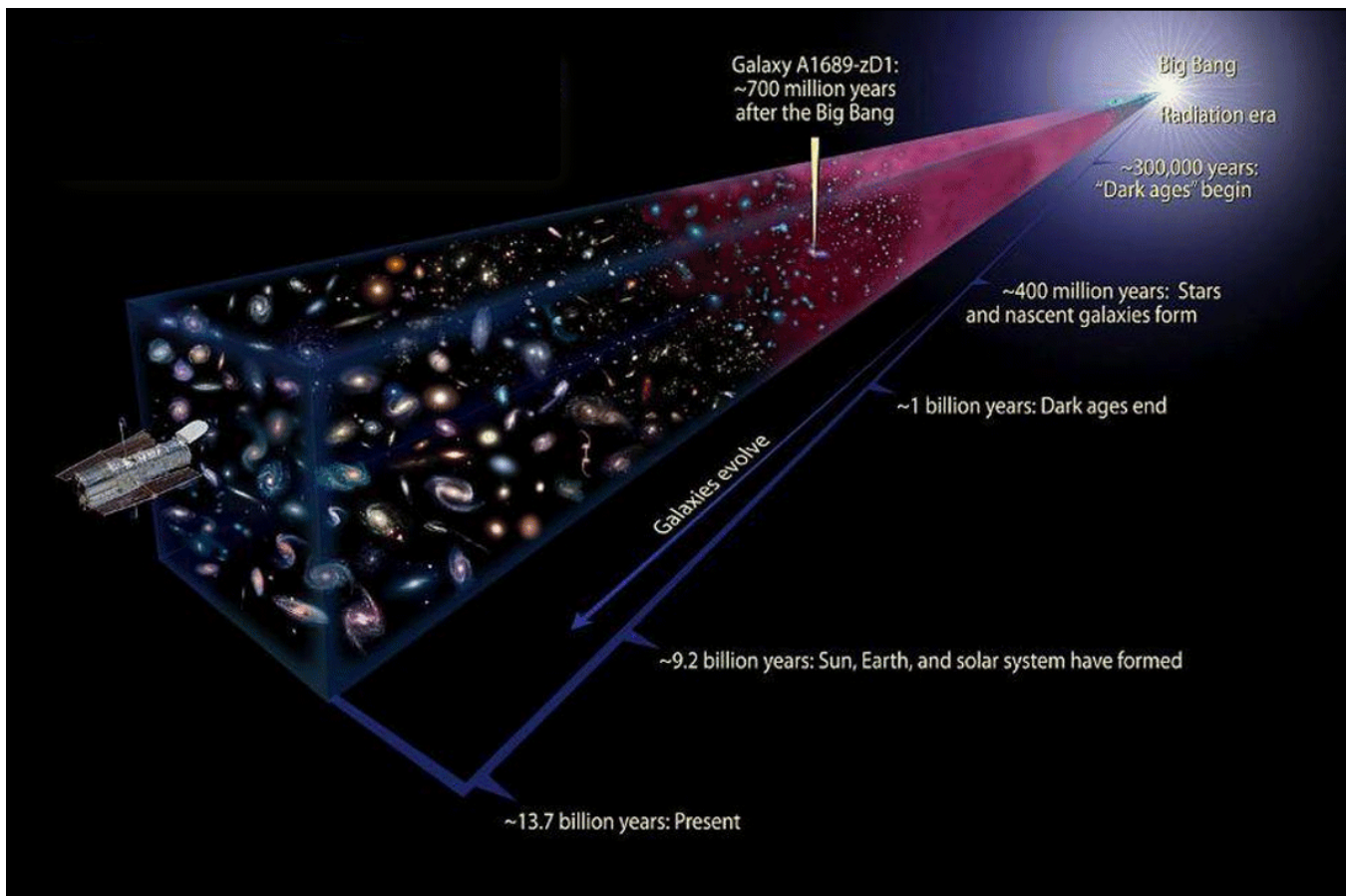
James Webb Space Telescope

---“Simplicity machine.”

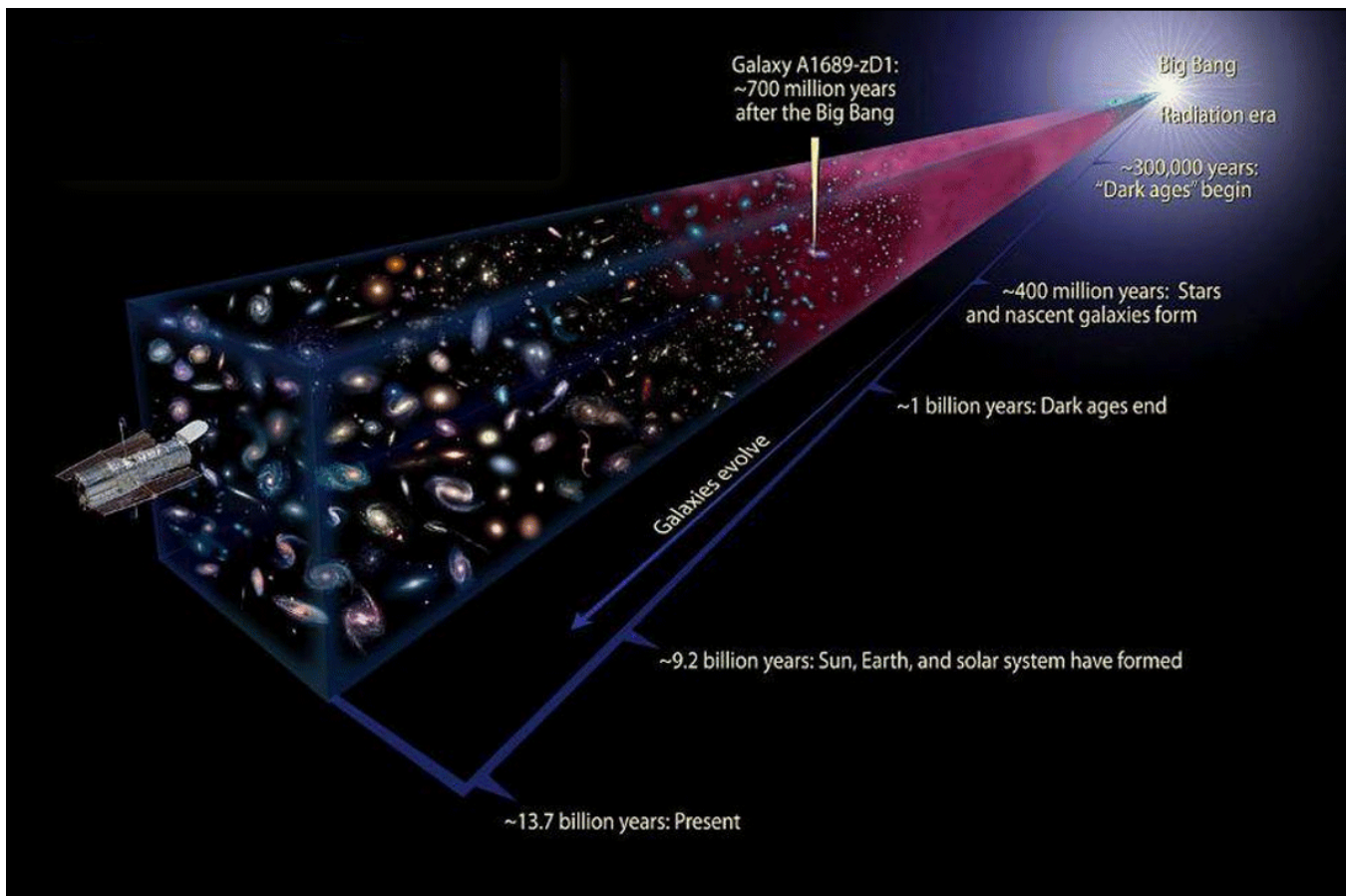
- Jed Anderson



---“Looking back 13.8 billion years to find out what is controlling the happening of now. It’s simpler.” - Jed Anderson

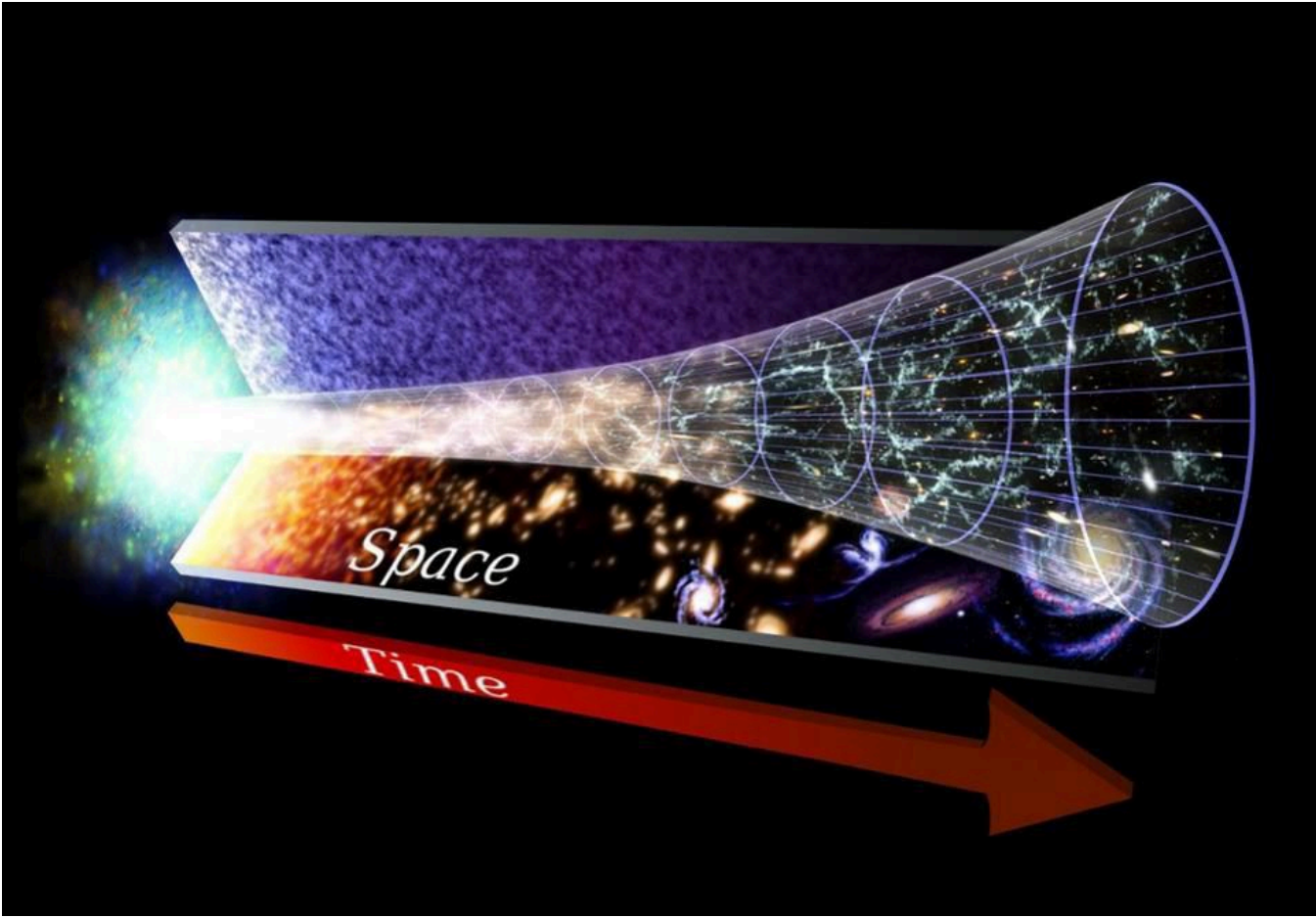


I'll explain why I think of the James Webb Space Telescope not only as a "time machine" as many people call it, but a "simplicity machine."



If you think of the universe as a computer, the longer the computer has run, the more data it generates, and the more difficult it becomes to sift through piles of data and phenomena to find the underlying patterns and laws.

But if you instead looked back when the computer had only run a couple times ... finding the underlying simplicity in the laws and patterns is much, much easier.



Here for example you can see Stephen Wolfram running very simple code 500 times ... and the extremely complicated resulting phenomena.

[Perhaps the easiest way to realize the complexity of phenomena from simple code is life. All life is just A-C-T-G. It's just the same 4 amino acids (DNA) in different combinations run trillions and trillions of times (evolution). That's it. It's so mind-

bogglingly simple it's difficult to perceive its simplicity.]

The screenshot shows a Wolfram Desktop window with the following content:

- Input: `RulePlot[CellularAutomaton[30]]`
- Output: A sequence of eight 2x2 grids representing the neighborhood rules for CellularAutomaton[30].
- Input: `ArrayPlot[CellularAutomaton[90, {{1}, 0}, 300]]`
- Output: A large fractal pattern, specifically a Sierpinski triangle, generated by CellularAutomaton[90].
- Video feed: A small window showing Steven Wolfram speaking.

It's another one of these very simple things.

National Aeronautics and Space Administration



W E B B



THE JAMES WEBB SPACE TELESCOPE

www.exoplanets.nasa.gov
www.nasa.gov

See if you can find the pattern in this code:

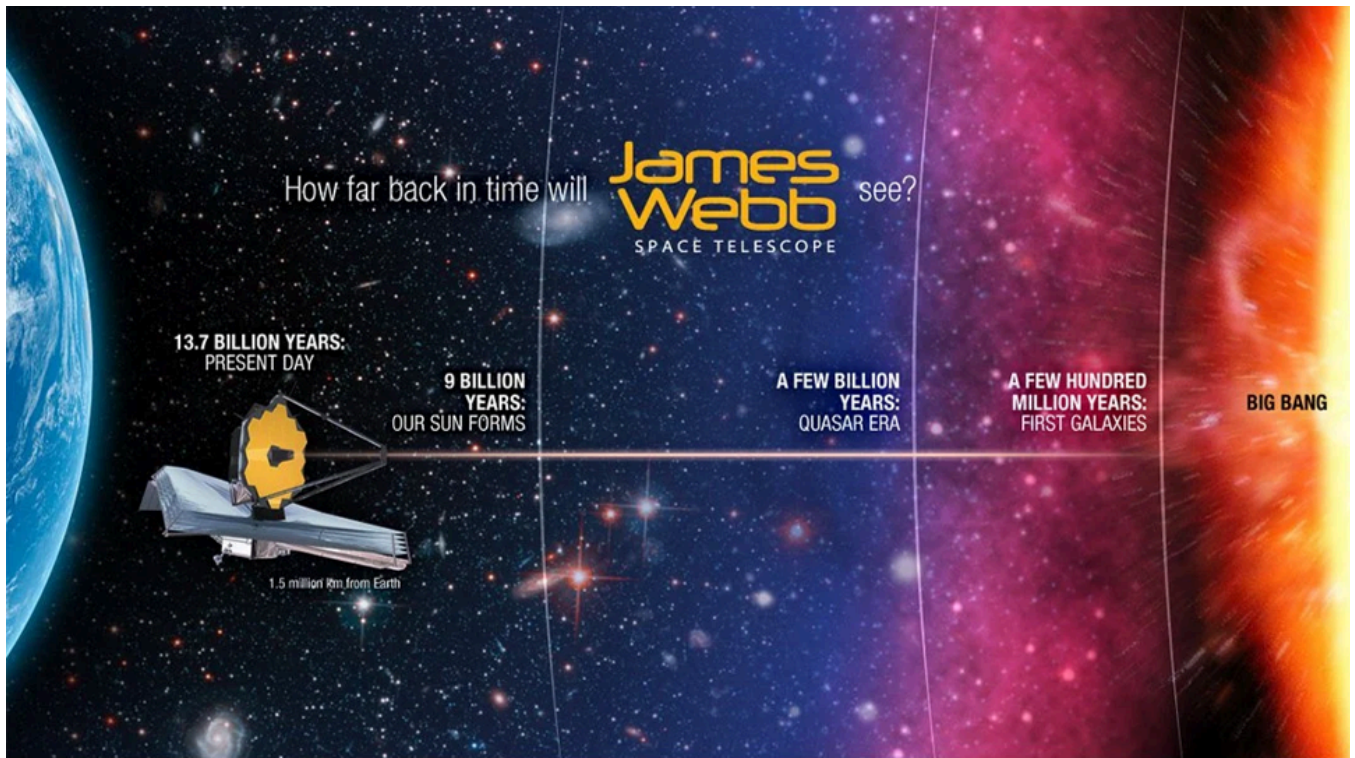
213151819141

Pretty easy huh? The pattern or rule is that every other number is a 1. But if I added just 2 or 3 more rules and ran this code trillions of times for 13.8 billion years, it would be very difficult for anyone or any computer at this point in history to find the

original pattern, rule, or code.

“But ... if you looked at computer code after it only had been run a couple times, it would be much easier to find the simplicity in the underlying patterns and rules.”

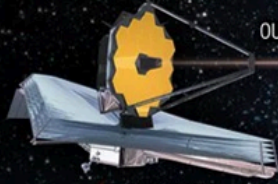
- Jed Anderson, EnviroAI



How far back in time will **James Webb** see?

James Webb
SPACE TELESCOPE

13.7 BILLION YEARS:
PRESENT DAY



1.5 million km from Earth

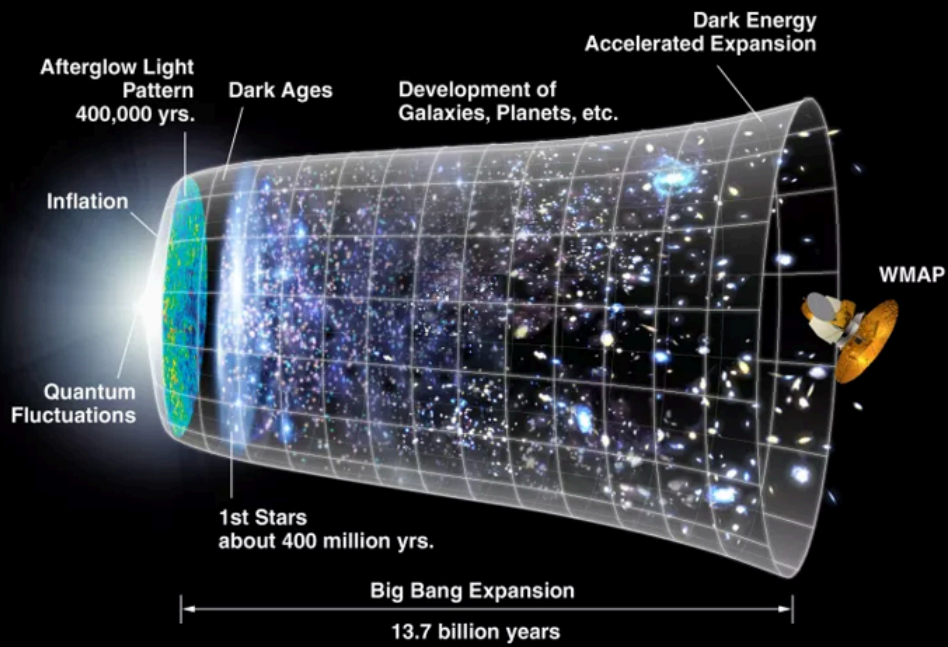
9 BILLION YEARS:
OUR SUN FORMS

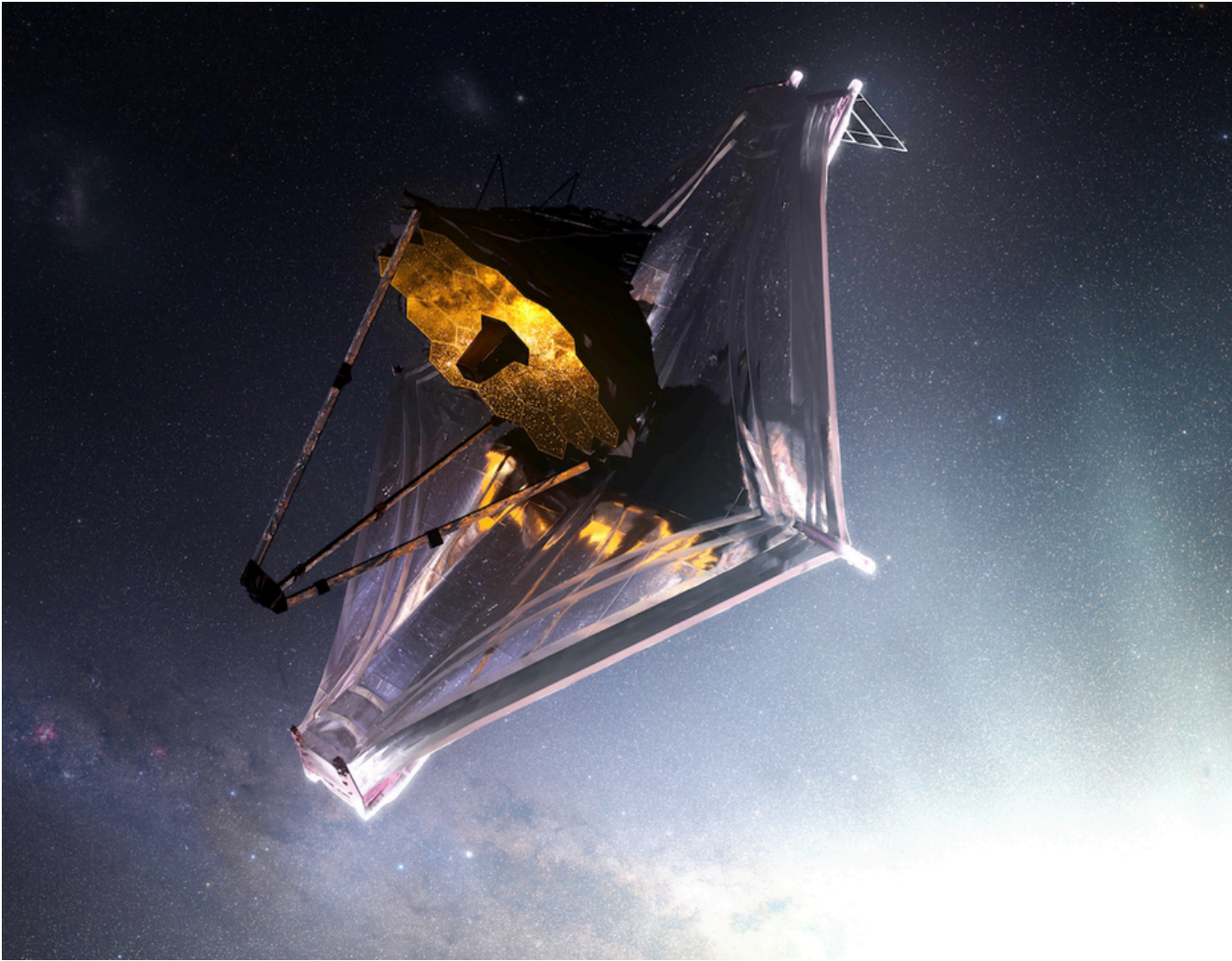
A FEW BILLION YEARS:
QUASAR ERA

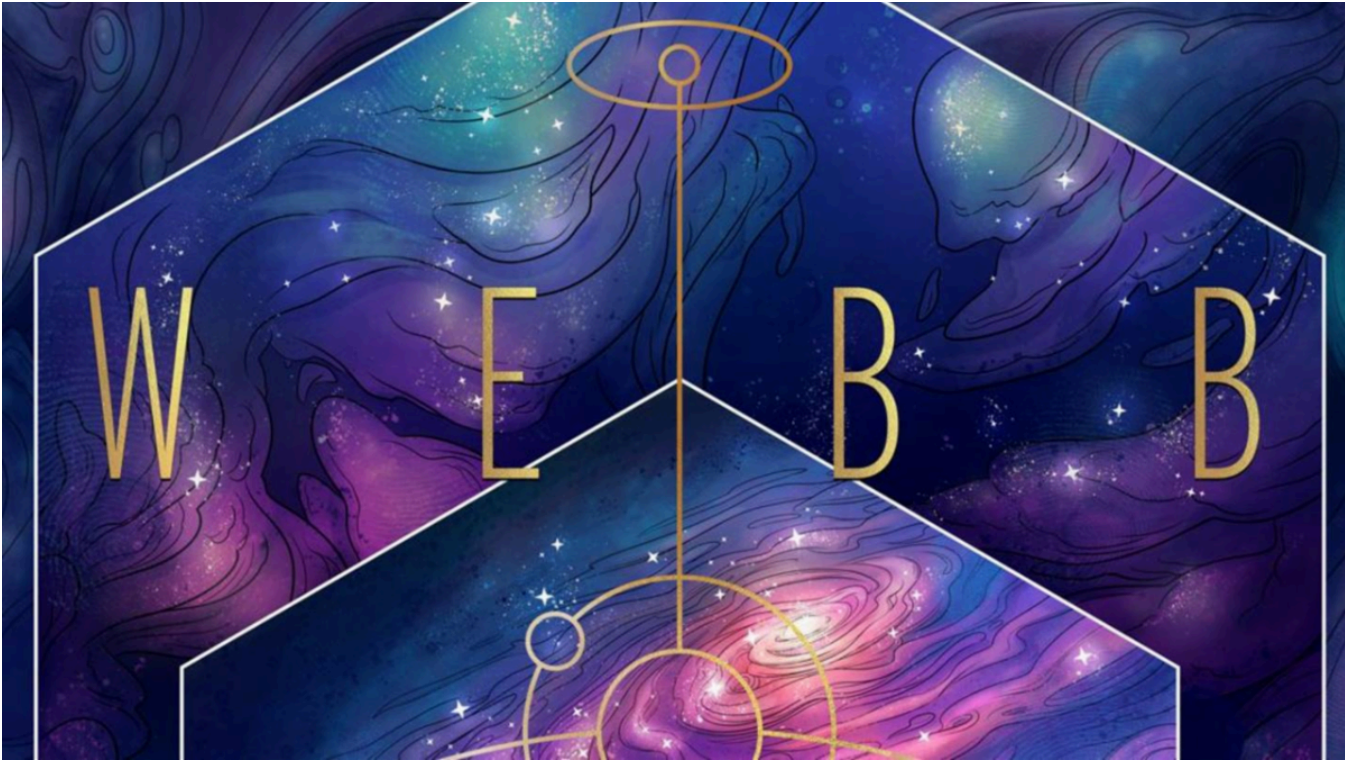
A FEW HUNDRED MILLION YEARS:
FIRST GALAXIES

BIG BANG

---“Exciting days ahead for humanity.” - Jed Anderson, EnviroAI







**Is the universe
simple?**





Simplicity.

---“We are getting back to where we once belonged ... the underlying simplicities driving all this rich complexity.” - Jed Anderson, EnviroAI



---“Once we understand the simplicities, our creativity and imagination can go wild ... and we can begin to “play the universe”. - Jed Anderson, EnviroAI



The Beatles

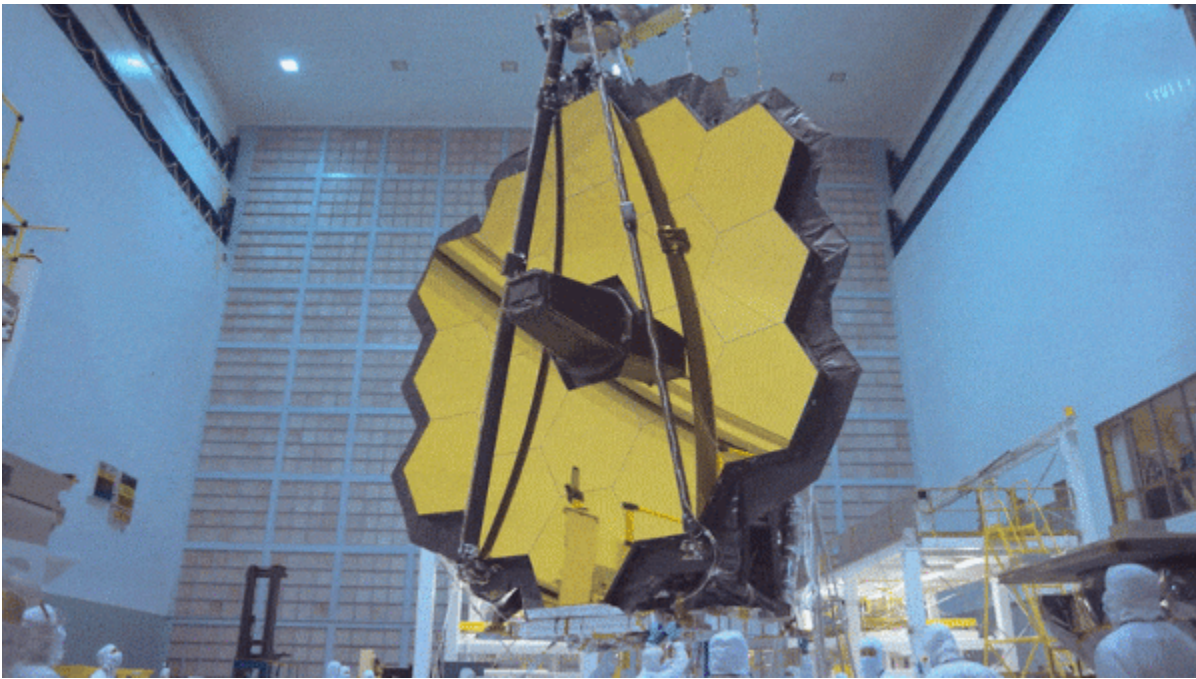
Simple. Simple. Simple.

The song “Get Back” is 2 notes. It’s only 2 two. It’s just two notes. Two notes. A and D. That’s all it is. 440 hertz (A) and 293.665 hertz (D). A and D. IT’S ONLY 2 NOTES!

The Beatles, just like Oscar Peterson and J.S. Bach below, understood the underlying simplicity so well that they could let their imaginations and creativity go wild and begin to “play the universe” ... producing richer and more complex phenomena.



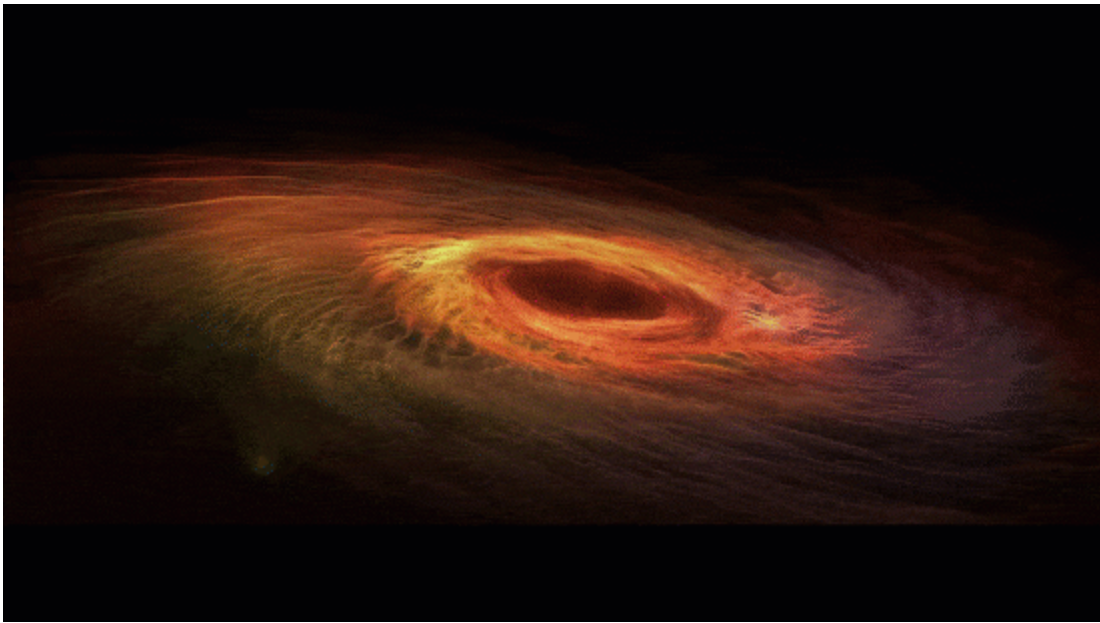
These guys we're a bunch of goof-balls! I love it! What will surprise people in this documentary is how much silly-time was involved in this monumental work, and how much fun they had together and how much they loved each other and loved music.



James Webb Telescope

100x more powerful than the Hubble. Cost = \$10 Billion. Most expensive object ever put into space. It's taken 26 years to build.

I am so incredibly excited! My interest is not so much cosmological as it is understanding the underlying simplicities so we can “play the universe” when it comes to protecting the environment ... Write the environmental protection equivalent of “Let it be” for nature and humanity. A masterpiece to life.



---“The mind-bending discovery of Isaac Newton wasn’t a terrestrial force acting on an apple ... it was looking at the apple and then looking at the moon and everything in the universe, and with a serendipitous epiphany of inextricable simplicity thinking

... “It’s the same! It’s the same force. I can’t believe it! It’s the same force! It can’t be that simple. But it is that simple! It’s the same force!”

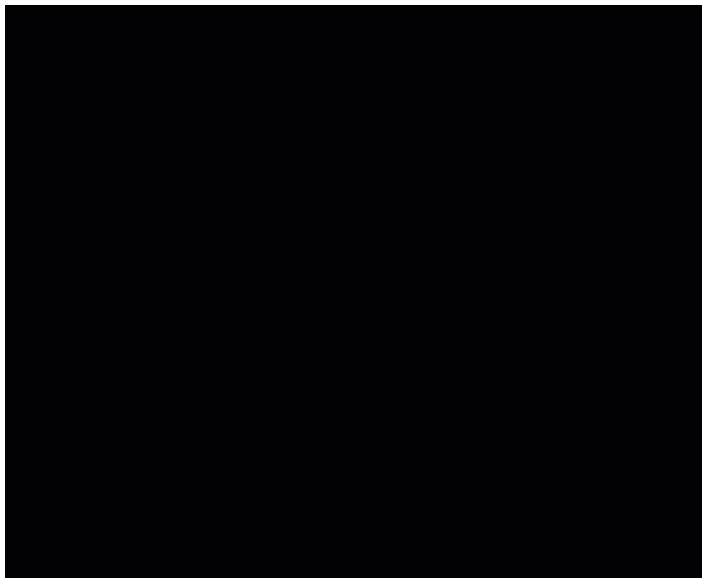
- Jed Anderson, EnviroAI

[The universe is simple - Richard Feynman \(https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqKdPG1BHUvgbWmqEq8SzMW3uCP4Ujr_IN-CcQM9ElIbg4U-93Vpd3k-ArxiIelhdznob79fkt1pYILWeCbvX61fryIoHVvQ_npHlkZotBlVR&c=&ch=\)](https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqKdPG1BHUvgbWmqEq8SzMW3uCP4Ujr_IN-CcQM9ElIbg4U-93Vpd3k-ArxiIelhdznob79fkt1pYILWeCbvX61fryIoHVvQ_npHlkZotBlVR&c=&ch=))



---“It[the universe] is not complicated ... it’s just a lot of it.”

---Richard Feynman



Simple start. Simple rules.

As you can see in the graphic below, everything in the universe can be traced back to a very simple start. Simple start. Simple rules. The more we understand the underlying simplicity in everything, the more we can create new phenomena with richer and more complicated attributes.

Reconstructing the Big Bang

The universe's first moments may have imprinted hidden patterns in the sky.

DOLLOPS OF DENSITY

At the universe's birth, pairs of particles continuously popped into existence.



THE BIG SPLITS

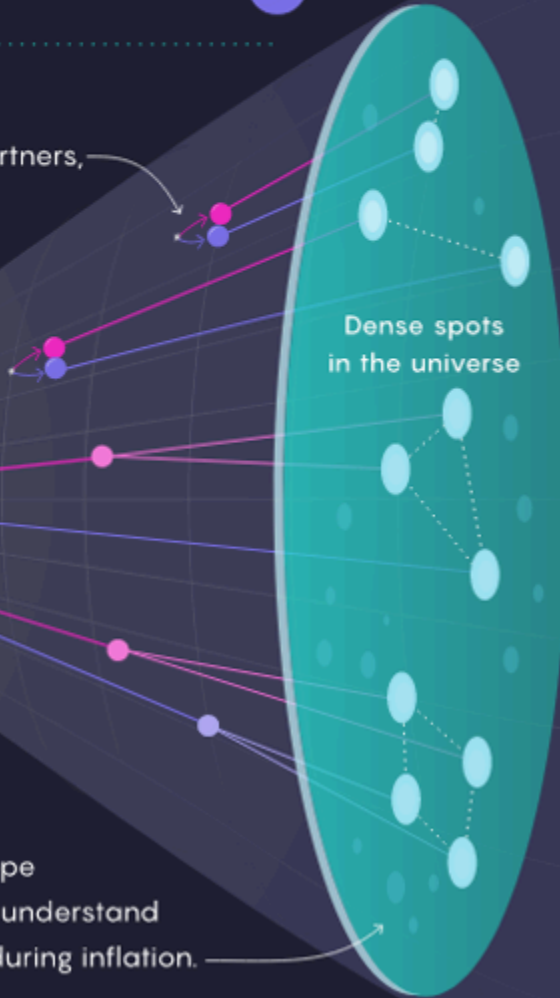
The inflating universe split these partners, creating dense spots that would one day become galaxies and galaxy clusters.

Big Bang



Time →

Exponential expansion



FIXED ENDING

Researchers can see only where the dense spots ended up. They hope to use the details of this pattern to understand the mysterious processes at work during inflation.



---“The more we understand the simplicity in everything around us ... the more we can produce richer and more complex phenomena.” - Jed Anderson, EnviroAI

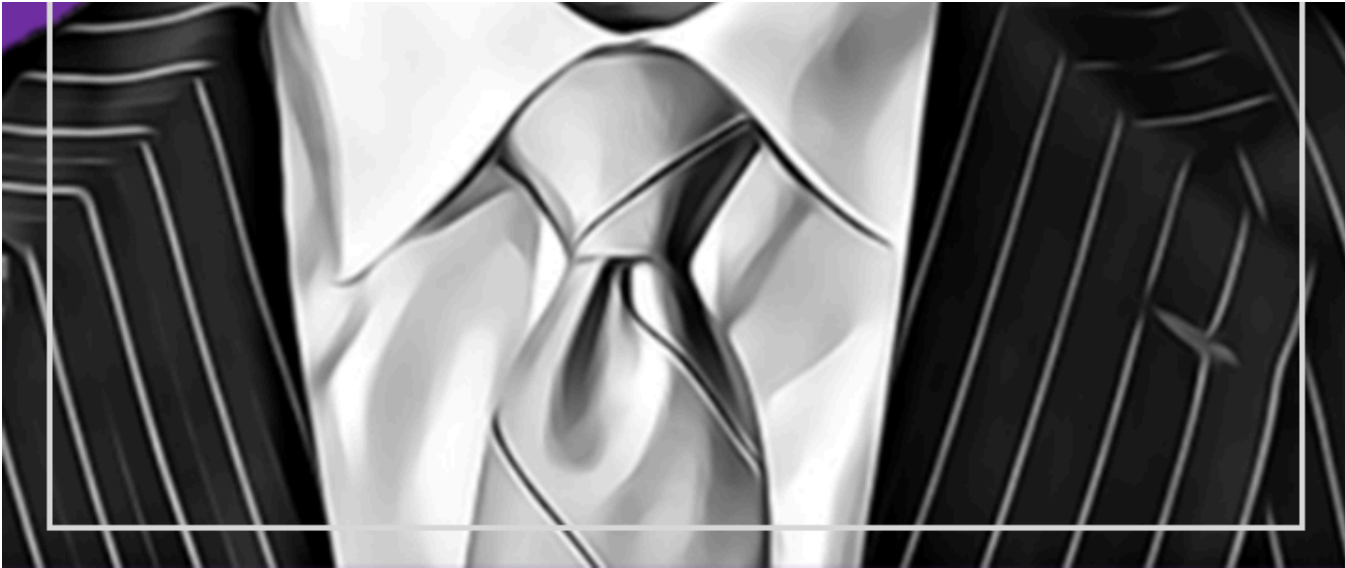


Oscar Peterson's ability to recognize patterns in nature and creatively rearrange them was scary. Scary. Oscar was a genius. Remember when you watch this solo, Oscar is only manipulating 12 notes. That's it. Just 12 notes. It's because Oscar understood the simplicity that he was able to produce such complex phenomena (see below). Genius.

I personally think this is the greatest solo of all time (https://r20.rs6.net/tn.jsp?f=001DJkXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqNCgnI2S93KUcCmfNho1ZblgrMAyoXCUMSnS3Vd2Ode1OYRImT6zE9KqIucCj6a5aohuzUHQBNGSvVVDbgA7xoHl23d6QgH1RA==&c=&ch=). The chord and style changes are dizzying. Just try watching Oscar's brain as he is imagining and working through this. It leaves you breathless. And the reaction of the jazz greats he is playing with is priceless. Priceless. They seem to almost not believe what they are hearing.

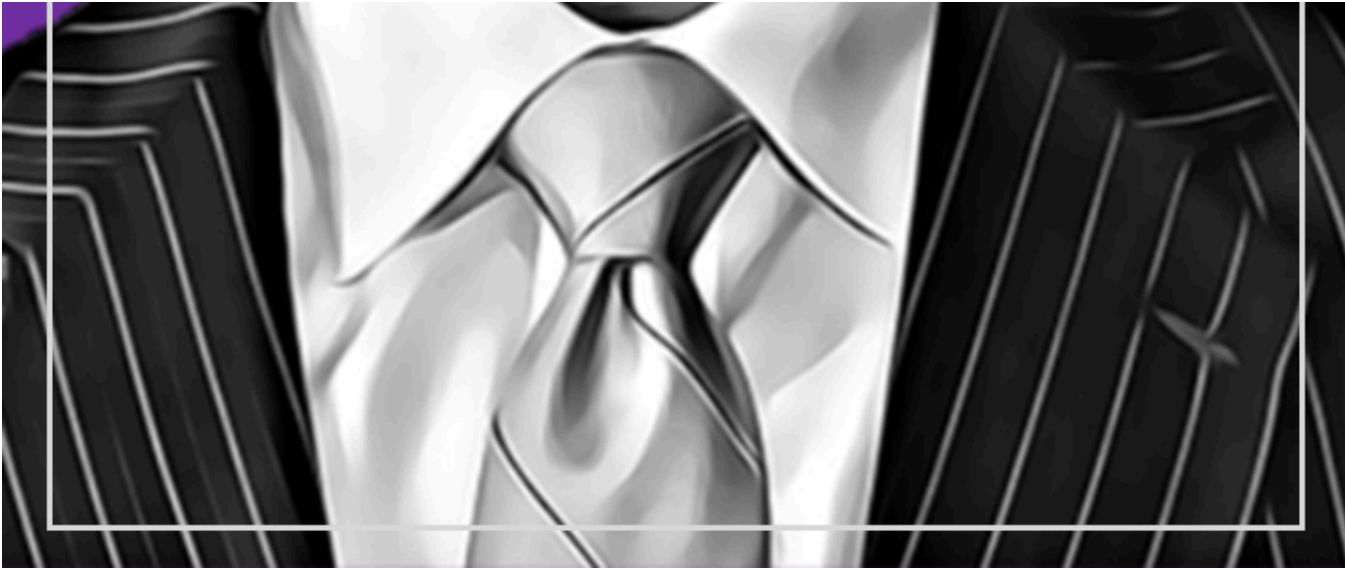
**How simple can we
make protecting
nature?**





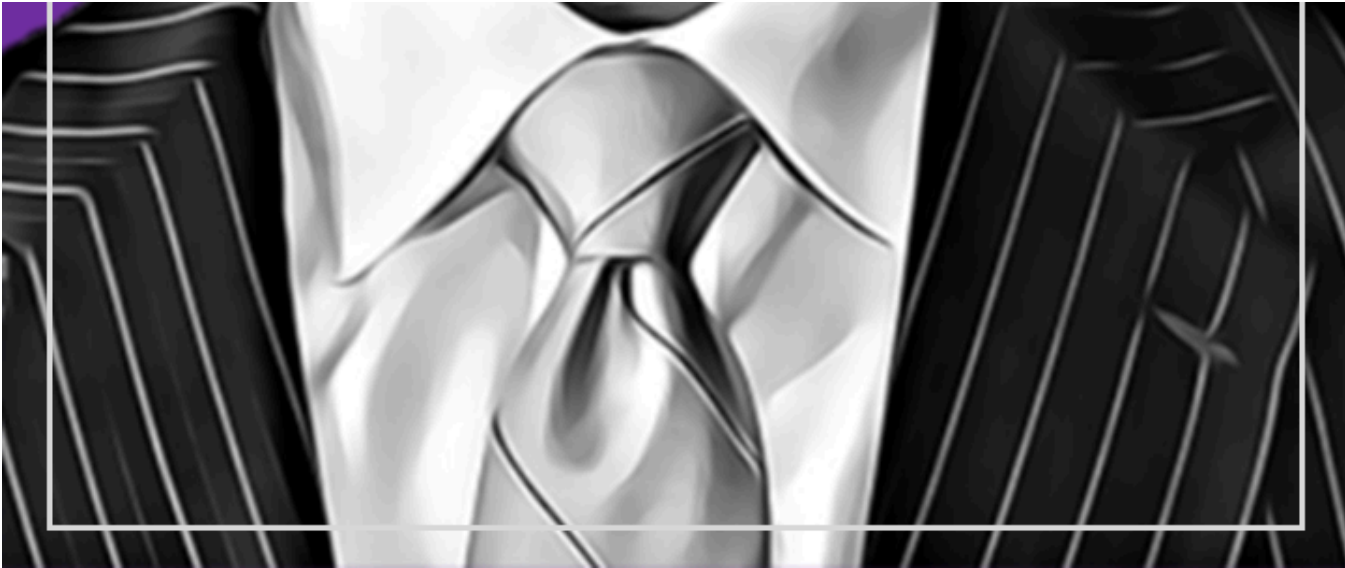
SIMPLE.





**Protecting
simplicity with
simplicity.**





---“Simplification ... not only of the laws of physics ... but the laws of humankind.” -

Jed Anderson

---“Grace is not doing away with law. It’s fulfillment of law. It’s simplicity of law. ”

---“Law is good. But it is not the end. It’s only purpose is to point toward grace ...
toward something simpler and more profound.”

—“Grace is satisfaction of complicated don’ts with a simple do.”

---“Grace is the ultimate simplicity.”

- Jed Anderson



---“Everything is patterns.

Environmental protection, simply stated, is just identifying and protecting certain patterns in nature.

It really can be stated that simply.”

- Jed Anderson, EnviroAI



Quantum Data

1

Classical Data

(binary computer)

01001010010101
10101101110000
10011110000111
10101011111000
01010111100011
01010101010101
11010110101011

Biological Data

ACTGACTGACTTAGG
ATTCGAGATCCATTC
CTTGAGACCTTTTT
ACCCCTATAGCATCA
TTCCAGGATCTATTAT
CCTATATATAGGGGC
CCATATAAATGGGCT

Human Data

Language data (letters), sensory data (visual images), numeric data (numbers)

CONNECT THE DATA

Connect the data. See the patterns. Protect the patterns.

Notes are data. Music is patterns.

- Listen to a Bach fugue. Here is one of my favorites ([https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqGJD49YocOClxsrOUYNyNIfmiHxU9VIW1Y_Om8mOYUIhZC4rIpcDVmkIGMaBWSL8TQEyDAPqCsBev3j06uw7OMBz3OAvURVOJtvsgLySty_MeqQTp_bd11rCsoqjZf5-8Q==&c=&ch=\)](https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAl0oJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqGJD49YocOClxsrOUYNyNIfmiHxU9VIW1Y_Om8mOYUIhZC4rIpcDVmkIGMaBWSL8TQEyDAPqCsBev3j06uw7OMBz3OAvURVOJtvsgLySty_MeqQTp_bd11rCsoqjZf5-8Q==&c=&ch=)!))! **And then learn**

briefly https://r20.rs6.net/tn.jsp?f=001DjKXTn9PHrsAIooJtkMrWFd7PDCXNMakDIldNWEIy_dSjMSom_AXqGJD49YocOClhSAaKEo_JdraUoYvkIK2VrZyISoOvd6g_lnMhopJy3erjeavg_scaAL6MntrwAXSkAEPo8A2Qaor-h7uto7ZUmRB5gIT3uvetM3VmtqEIOS5zQ85RuIb6KK4ZCTvJ4wrk8HL3hg-3s_KQrXwvldG1wtNxc07oy67&c=&ch=.

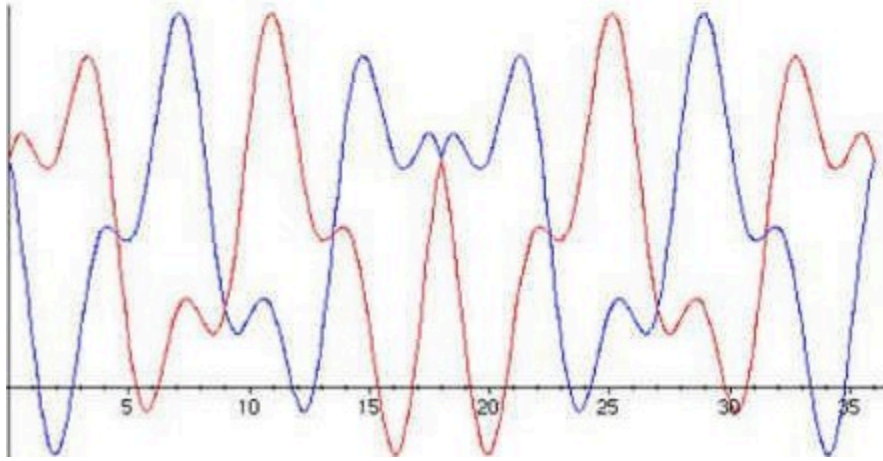
It's math. It's computation. Instead of using numbers, Bach is using notes corresponding to frequencies. Two books I would suggest. One is "Godel, Escher, Bach" by Douglas Hofstadter. The other is "J.S. Bach's Musical Offering" by H.T. David.

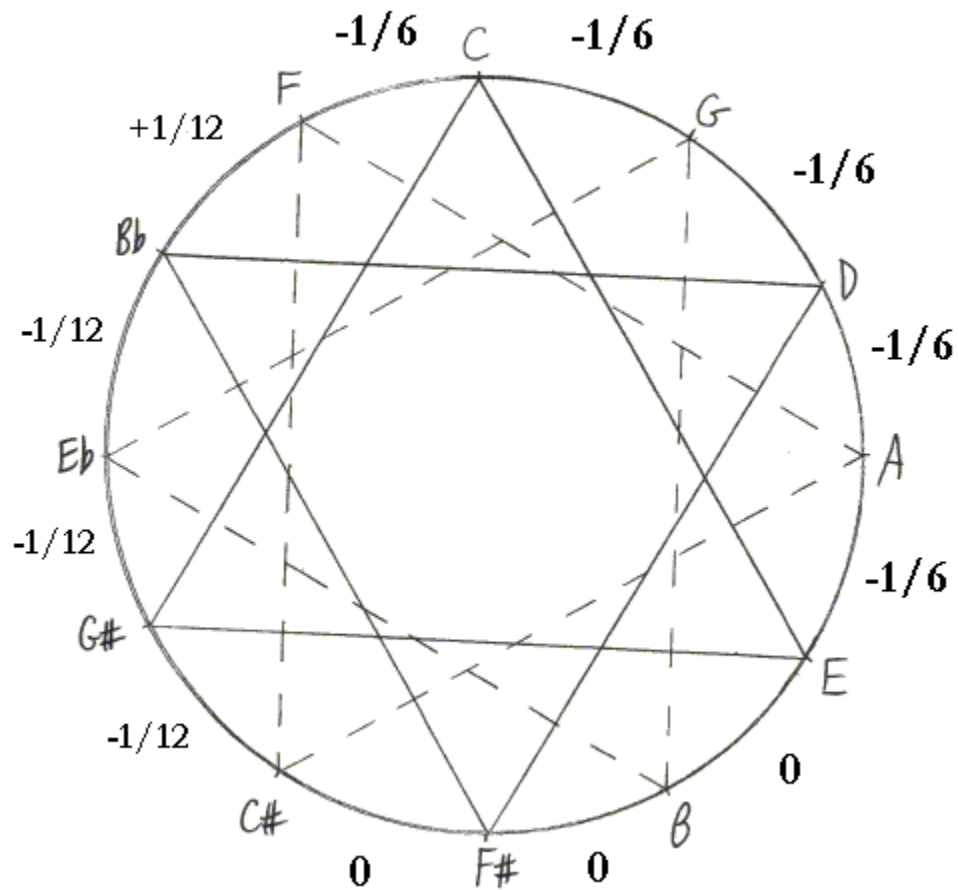
- Einstein said he didn't think in terms of math or words. He thought in terms of music.
- Pythagoras, the founder of mathematics, was said to have discovered mathematics when he noticed similarities between the sound of plucking a lyre string and the resonances made by hammering metal. He found that they created musical frequencies that vibrated with certain ratios that corresponded to patterns.
- "If we had a microscope powerful enough, we could see that electrons, quarks, neutrinos, etc. are nothing but vibrations on minuscule loops resembling rubber bands. If we pluck the rubber band enough times, and in different ways, we eventually create all the known subatomic particles in the universe. This means that all the laws of physics can be reduced to the harmonies of these strings. Chemistry is the melodies one can play on them. The universe is a symphony. And the mind of God, which Einstein eloquently wrote about, is cosmic music resonating throughout space-time." - Micho Kaku

$\pi \int_a^b f(x)^2 dx$ $e^{\sin x \ln(\sin x)}$

$e^{\pi i} + 1 = 0$

$\int \frac{3x^2 + 1}{x^3 + x} dx$





The music of the early universe---“chop-sticks” ...

Allegro

Piano *mf*

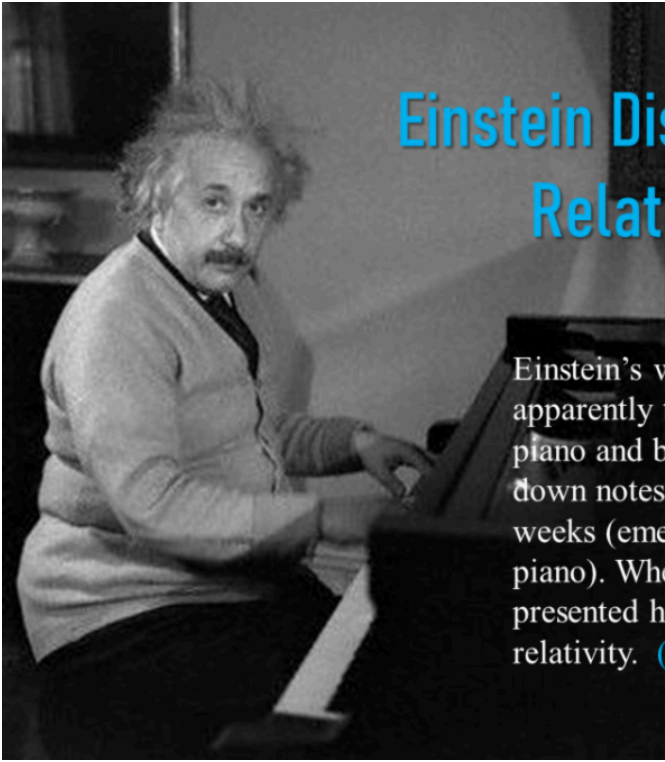
The first system of musical notation is in 3/4 time. The treble clef staff contains a sequence of quarter notes: C, D, E, F, G, A, B, C. The bass clef staff contains a sequence of quarter notes: C#, D#, E#, F#, G#, A#, B#, C. The dynamic marking is *mf*.

5

The second system of musical notation is in 3/4 time. The treble clef staff contains a sequence of quarter notes: C, D, E, F, G, A, B, C. The bass clef staff contains a sequence of quarter notes: C#, D#, E#, F#, G#, A#, B#, C. The system is numbered 5.

Same musical laws playing out 13.8 billion years later ...

... much more complicated resulting phenomena---Chopin's Etude Op. 10., No. 4,
Torrent

A black and white photograph of Albert Einstein sitting at a piano. He is looking towards the camera with a slight smile. He has his characteristic wild, unkempt hair and a mustache. He is wearing a light-colored sweater over a collared shirt and a dark tie. The piano is a dark, upright model.

Einstein Discovered the Theory of Relativity with a Piano

Einstein's wife told the story of one day he was apparently totally lost in thought. He wandered to the piano and began playing while intermittently jotting down notes. He then disappeared into his study for two weeks (emerging only for the occasional return to the piano). When he finally was finished with his muse he presented his working draft of the theory of general relativity. ([link](#))



Using AI and Advancements in Computation to Identify, Simulate, and Protect Patterns in Nature

A [calculation](https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWfd7PDCXNMakDlldNWEIy_dSjMSom_AXqMfdY7V97iR_3YPyqaHpzKYog2W4pX5dswcn4sQRYnCrvBloyQYcpDbhpMlE5n6NRXl6e07pXtifDy7LnpUvgDK4WZofSotlYVDhqCc7ViWJ_WguTBGQk9V7UTfUurxI4Xpac_X5l1M9&c=&ch=) performed by MIT found that the universe has performed the equivalent of 10^{120} ops on 10^{90} bits. The earth's atmosphere contains 1.04×10^{44} molecules. Assuming approximately 4.140×10^{22} atoms in an average mole of air, and a [full-ci](https://r2o.rs6.net/tn.jsp?f=001DJkXTn9PHrsAIooJtkMrWfd7PDCXNMakDlldNWEIy_dSjMSom_AXqMfdY7V97iR_hfmpMxno4hon56GnSuQPqGfbTxP7FknVX7lreagNrWPgVKo8PfRODqV63heyJI8aQwD51B6DOo9b22A2EOs3WkW2j866hKtBQdBZYpYwiPD4MEji9MxiPoJp3HwxPkEV&c=&ch=) in the range of 10^{44} , that's 10^{111} computational variables.

My point is not to show computations, nor certainly the correct computations. My point is to show that nature and environmental protection are computable. The challenge is exponents. Exponents are not complicated. They're just really really big.

Dealing with Exponents ...

Let me quickly explain the exponents involved in computing. Let's take for example a very simple 3 bit system. There are 8 possible three-bit combinations: 000, 001, 010, 011, 100, 101, 110, and 111. That's 2^3 . There are 2 choices for the first bit. 2 choices for the second bit. And 2 choices for the third bit. If instead we use qubits instead of bits, then each of these 8 combinations is associated with a basis vector and so the vector space is 8-dimensional. As the number of qubits grow, the number of basis vectors grows exponentially ... and gets very very big ... very very fast. Once a machine reaches 300 qubits, that computer will be using more than the number of elementary particles in the universe as its computational basis. 2^{300} is a whopping

big number of basis elements. Quantum computing will allow us to work back through the complicated phenomena to find more of the simple equations and computational programs that started and still are guiding the phenomena—and allow us to simulate the protection of natural systems. Quantum computing will deal with the exponents.

---“Protecting nature will become very simple.”

- Jed Anderson, Creator, EnviroAI

Nature = Simple Equations

Mathematical equations that explain nature we are finding are very simple:

Einstein's Special Relativity Equation

$$E=mc^2$$

Shrodinger's Equation (Probability Waves – Quantum)

$$i\hbar(\partial/\partial t)\Psi=\hat{H}\Psi$$

Nature = Simple Computations

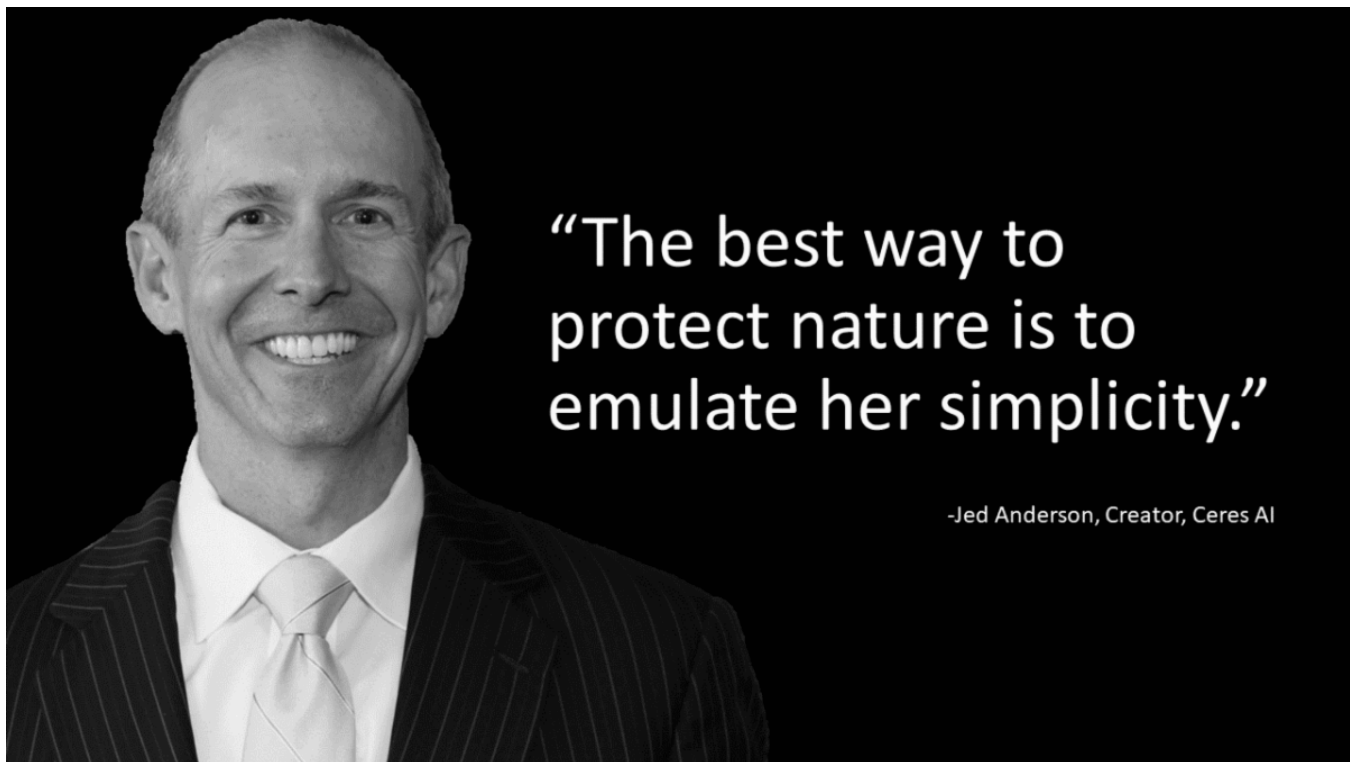
Computational programs that explain nature we are finding are very simple:

1
RulePlot[C

SIMPLICITY

- “Nature operates in the shortest way possible.”---Aristotle
- “Phenomena complex—laws simple.”—Richard P. Feynman
- “When the solution is simple, God is answering.” —Albert Einstein
- “Nature is pleased with simplicity. And nature is no dummy.” — Isaac Newton

- “The main purpose of science is simplicity and as we understand more things, everything is becoming simpler.” – Edward Teller
- “Nature does not multiply things unnecessarily; that she makes use of the easiest and simplest means for producing her effects” –Galileo



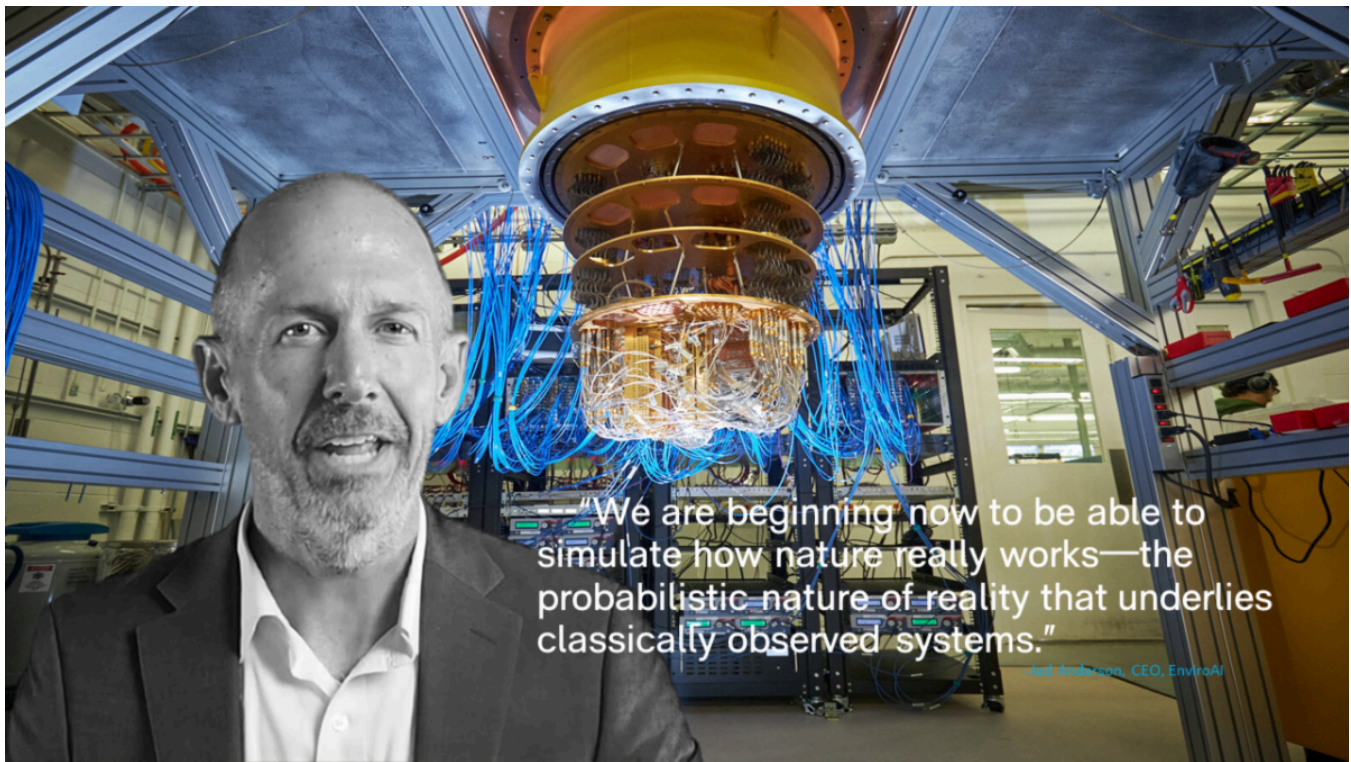
- “To be simple is to be great.” –Emerson
- “Rudiments or principles must not be unnecessarily multiplied –Immanuel Kant
- “There is no greatness where there is not simplicity.” – Leo Tolstoy
- “All the great things are simple.” –Winston Churchill
- “Out of clutter, find simplicity.” –Albert Einstein

- “AI is about making machines more fathomable and more under the control of human beings, not less. Conventional technology has indeed been making our environment more complex and more incomprehensible ...” - Donald Michie
- “Plurality should not be assumed without necessity.” —William of Ockham
- “Knowledge is a process of piling up facts; wisdom lies in their simplification.” ~ Martin H. Fischer
- “Complexity is your enemy. Any fool can make something complicated. It is hard to make something simple.”---Richard Branson.
- “The definition of genius is taking the complex and making it simple.” —Albert Einstein

---“Phenomena in nature is complicated . . . but the underlying equations and computations for understanding and better protecting nature are exceedingly simple.”

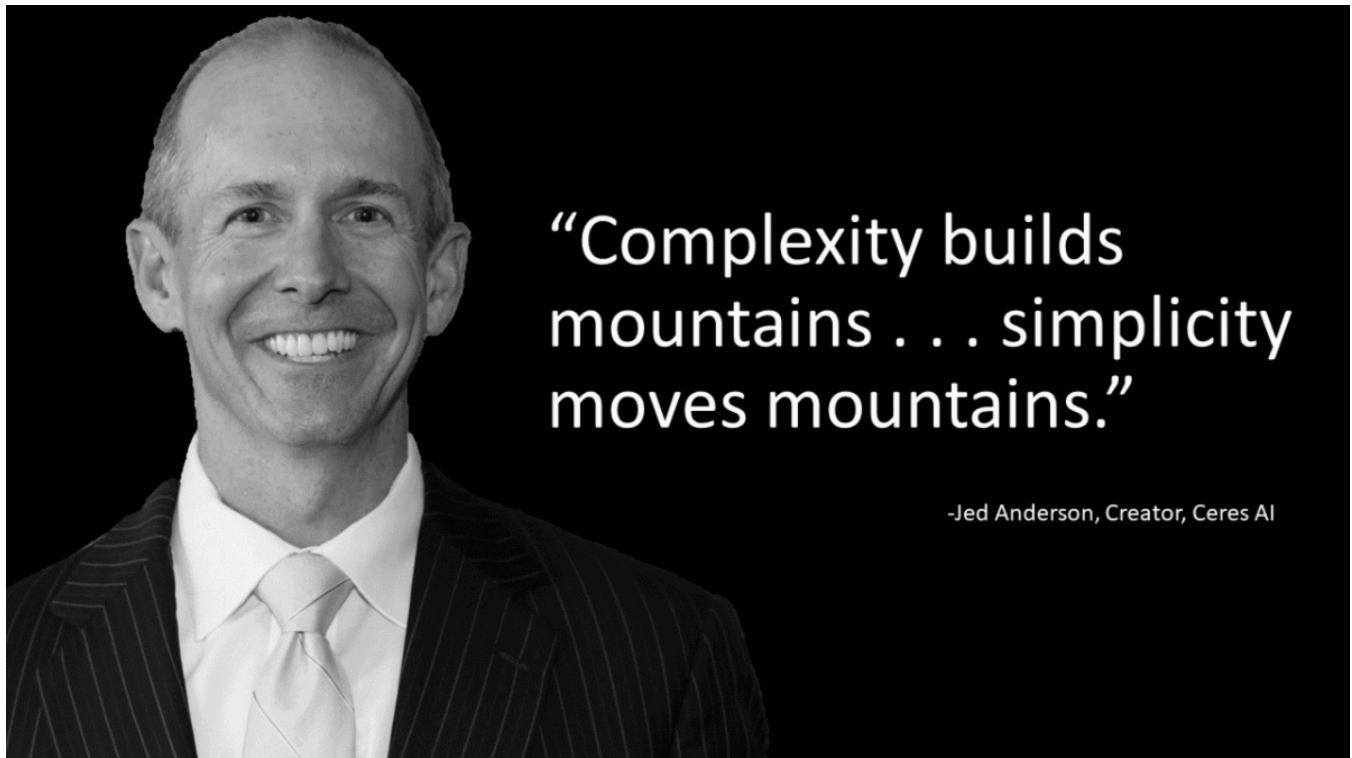
— Jed Anderson, Creator, EnviroAI





- “Beauty of style and harmony and grace and good rhythm depend on simplicity”—Plato
- “Simplicity is the ultimate sophistication.” – Leonardo da Vinci
- “Simplicity is the key to brilliance.” –Bruce Lee
- “Out of intense complexities, intense simplicities emerge.” –Winston Churchill
- “Simplicity, simplicity, simplicity!” –Henry David Thoreau
- “Simplicity is the glory of expression.” ~ Walt Whitman
- “Nothing is more simple than greatness; indeed, to be simple is to be great.” ~ Ralph Waldo Emerson
- “The great artist and thinker are the simplifiers.”—Henri Frederic Amiel
- “It is vain to do with more what can be done with less.” ~ William of Occam

- “Clutter and confusion are failures of design, not attributes of information.” ~ Edward Tufte
- “The most complicated skill is to be simple.” – Dejan Stojanovic
- “Fools ignore complexity. Pragmatists suffer it. Some can avoid it. Geniuses remove it.” – Alan Perlis



- “Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things.” – Isaac Newton
- “It is always the simple that produces the marvelous.” – Amelia Barr
- “Simplicity is a prerequisite for reliability.” – Edsger Dijkstra
- “Almost all quality improvement comes via simplification of design, manufacturing, layout, processes, and procedures.” – Tom Peters

- “Simplicity is the most difficult thing to secure in this world; it is the last limit of experience and the last effort of genius.” – George Sand
- “Order and simplification are the first steps toward the mastery of a subject.” – Thomas Mann
- “Simplicity is the outcome of technical subtlety. It is the goal, not the starting point.” – Maurice Saatchi
- “The greatest ideas are the simplest.” – William Golding
- “People often associate complexity with deeper meaning, when often after precious time has been lost, it is realized that simplicity is the key to everything.” – Gary Hopkins
- “Growth creates complexity, which requires simplicity.” – Andy Stanley
- “Our life is frittered away by detail. Simplify, simplify.” – Henry David Thoreau
- “It is not a daily increase, but a daily decrease. Hack away at the inessentials.” – Bruce Lee
- “Complexity is impressive, but simplicity is genius.” – Lance Wallnau
- “Complexity is enemy of execution”. – Anthony Robbins
- “Simplicity will stand out, while complexity will get lost in the crowd.” – Kevin Barnett
- “Very often, people confuse simple with simplistic. The nuance is lost on most.” – Clement Mok

- “Anything simple always interests me.”—David Hockney
- “I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity.”—Oliver Wendell Holmes
- “Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius...and a lot of courage to move in the opposite direction.”
~ E.F. Schumacher
- “The simple thing is the right thing.” ---Oscar Wilde
- “To simplify complications is the first essential of success.”—George Earle Buckle
- “You know you’ve achieved perfection in design, not when you have nothing more to add, but when you have nothing more to take away.”—Anotine de Saint-Exupery
- “A complex system that works is invariably found to have evolved from a simple system that worked. A complex system designed from scratch never works and cannot be patched up to make it work. You have to start over, beginning with a working simple system.”—John Gall
- “Although there are no textbooks on simplicity, simple systems work and complex don’t.” --Jim Gray
- “Simplicity does not precede complexity, but follows it.”- Alan J. Perlis
- “The simplest things are often the truest.”—Richard Bach

- “A lady once offered me a mat, but as I had no room to spare within the house, nor time to spare within or without to shake it, I declined it.” —Henry David Thoreau
- “Five lines where three are enough is stupidity. Nine pounds where three are sufficient is stupidity.”—Frank Lloyd Wright
- “Don’t be fooled by the many books on complexity or by the many complex and arcane algorithms you find in this book or elsewhere. Although there are no textbooks on simplicity, simple systems work and complex don’t.” —Jim Gray
- “When you first start off trying to solve a problem, the first solutions you come up with are very complex, and most people stop there. But if you keep going, and live with the problem and peel more layers of the onion off, you can often times arrive at some very elegant and simple solutions.”—Steve Jobs
- “I do believe in simplicity. [...] When the mathematician would solve a difficult problem, he first frees the equation of all incumbrances, and reduces it to its simplest terms. So simplify the problem of life, distinguish the necessary and the real. Probe the earth to see where your main roots run.” —Henry David Thoreau
- “Complexity is a sign of technical immaturity. Simplicity of use is the real sign of a well-designed product whether it is an ATM or a Patriot missile.”– Daniel T. Ling
- “[T]he grand aim of all science...is to cover the greatest possible number of empirical facts by logical deductions from the smallest possible number of hypotheses or axioms.”—Albert Einstein

- “Simplicity is the law of nature for men as well as for flowers.” —Henry David Thoreau
- “In building a statue, a sculptor doesn’t keep adding clay to his subject. Actually, he keeps chiselling away at the inessentials until the truth of its creation is revealed without obstructions.”—Bruce Lee
- “Simplifications have had a much greater long-range scientific impact than individual feats of ingenuity. The opportunity for simplification is very encouraging, because in all examples that come to mind the simple and elegant systems tend to be easier and faster to design and get right, more efficient in execution, and much more reliable than the more contrived contraptions that have to be debugged into some degree of acceptability.... Simplicity and elegance are unpopular because they require hard work and discipline to achieve and education to be appreciated.”— Edsger W. Dijkstra
- “I’ll tell you what you need to be a great scientist. You don’t have to be able understand very complicated things. It’s just the opposite. You have to be able to see what looks like the most complicated thing in the world and, in a flash, find the underlying simplicity. That’s what you need: a talent for simplicity.”— Mitchell Wilson
- “Science may be described as the art of systematic over-simplification.”— Karl Popper
- “The ability to simplify means to eliminate the unnecessary so that the necessary may speak.” —Hans Hofmann

- “The field of Artificial Intelligence is set to conquer most of the human disciplines; from art and literature to commerce and sociology; from computational biology and decision analysis to games and puzzles.” –Anand Krish
- “A year spent in artificial intelligence is enough to make one believe in God.” – Alan Perlis
- “The whole world is certainly heading for a great simplicity, not deliberately, but rather inevitably. The simplicity towards which the world is driving is the necessary outcome of all our systems and speculations and of our deep and continuous contemplation of things. For the universe is like everything in it; we have to look at it repeatedly and habitually before we see it. It is only when we have seen it for the hundredth time that we see it for the first time. The more consistently things are contemplated, the more they tend to unify themselves and therefore to simplify themselves. The simplification of anything is always sensational. [...] Few people will dispute that all the typical movements of our time are upon this road towards simplification. Each system seeks to be more fundamental than the other; each seeks, in the literal sense, to undermine the other. In art, for example, the old conception of man, classic as the Apollo Belvedere, has first been attacked by the realist, who asserts that man, as a fact of natural history, is a creature with colourless hair and a freckled face. Then comes the Impressionist, going yet deeper, who asserts that to his physical eye, which alone is certain, man is a creature with purple hair and a grey face. Then comes the Symbolist, and says that to his soul, which alone is certain, man is a creature with green hair and a blue face. And all the great writers of our time represent in one form or another this attempt to reestablish communication with the elemental, or, as it is sometimes more roughly and fallaciously expressed, to return to nature. [...] But the giants of our time are undoubtedly

alike in that they approach by very different roads this conception of the return to simplicity. Ibsen returns to nature by the angular exterior of fact, Maeterlinck by the eternal tendencies of fable. Whitman returns to nature by seeing how much he can accept, Tolstoy by seeing how much he can reject.” – G.K.

Chesterton

The *EnviroVerse*



This?



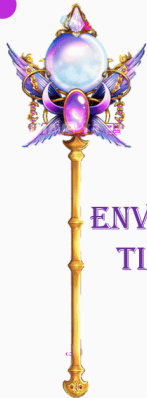


I wonder what this contaminated site looked like in 1989?

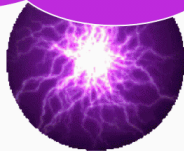




**What should I buy
at the EnviroVerse
virtual store?**



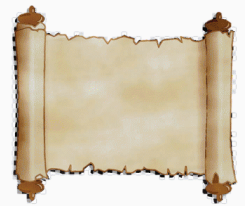
**ENVIRONMENTAL
TIME TRAVEL
STAFF**
\$549



**ENVIRONMENTAL
MODELLING ORB**
\$1,250



**REVEALING
WAND**
\$755



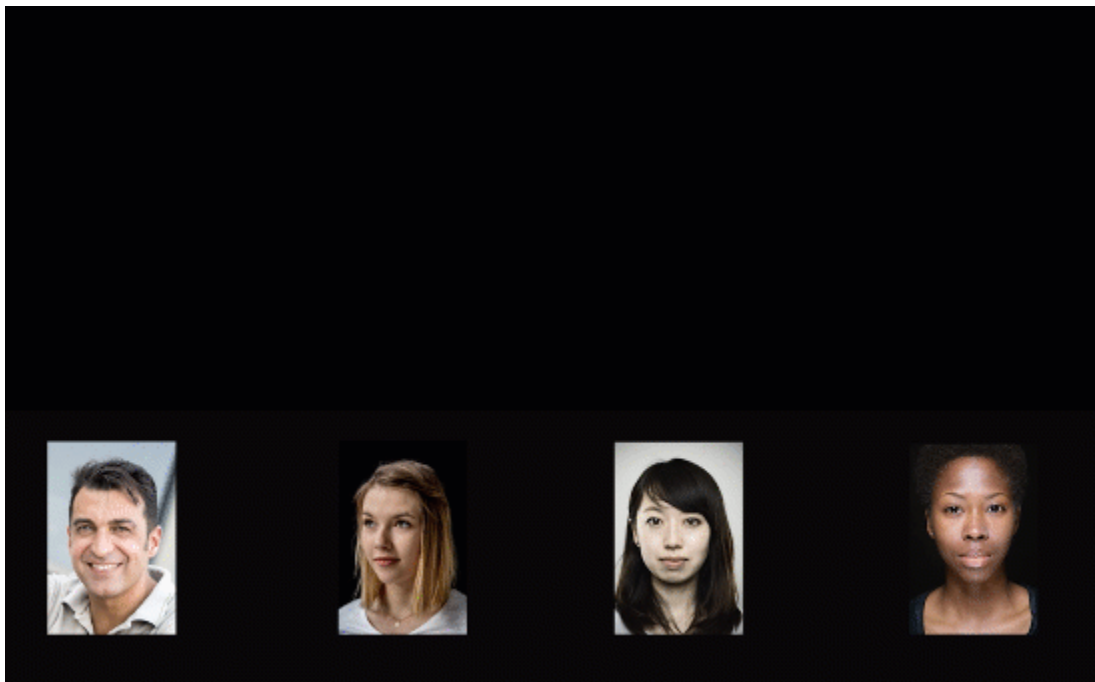
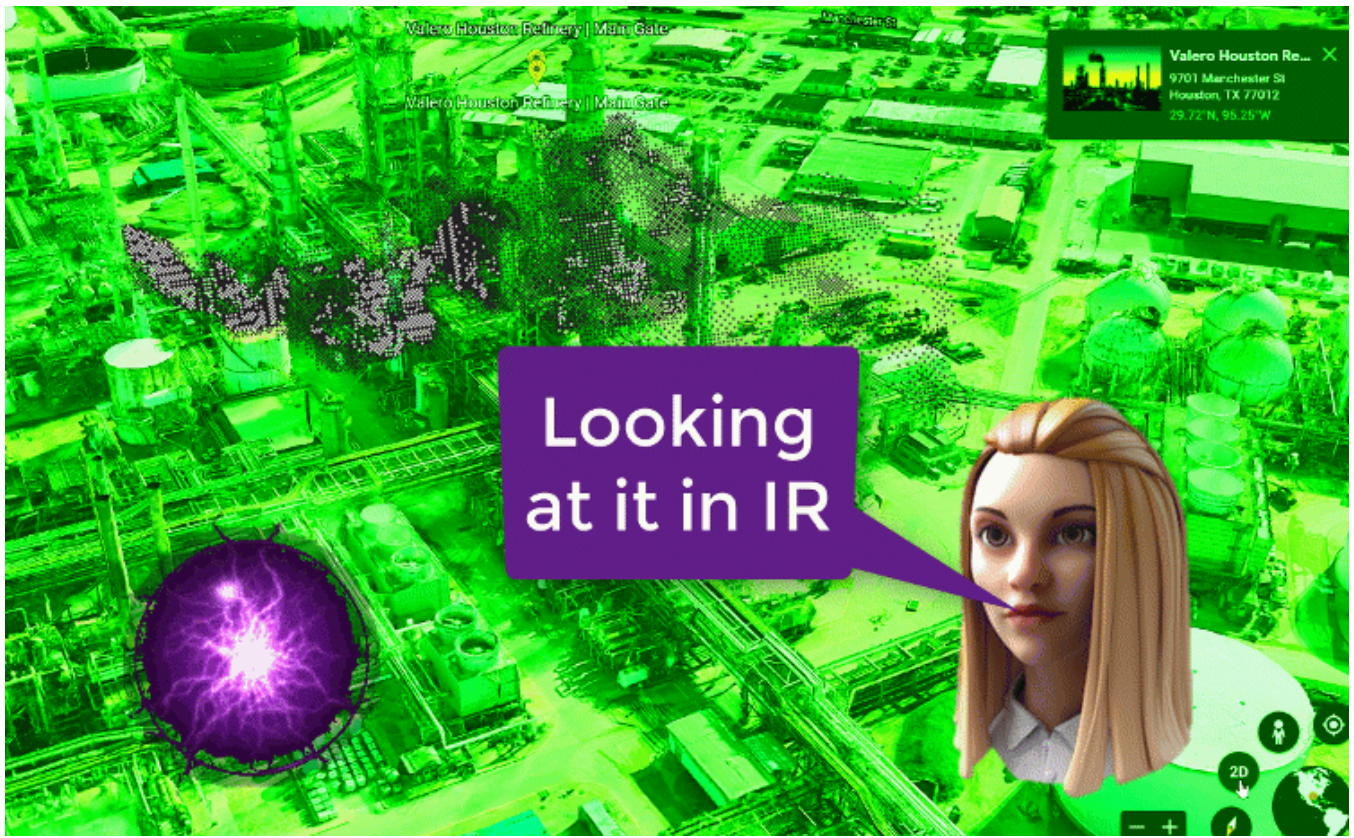
**ENVIRONMENTAL
DOCUMENTS
AI READER**
\$255



VIRTUAL DRONE
\$275



**HORN OF
NOTIFICATION**
FREE



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