Jordan Dykstra

The Universe Was Orange (2017)

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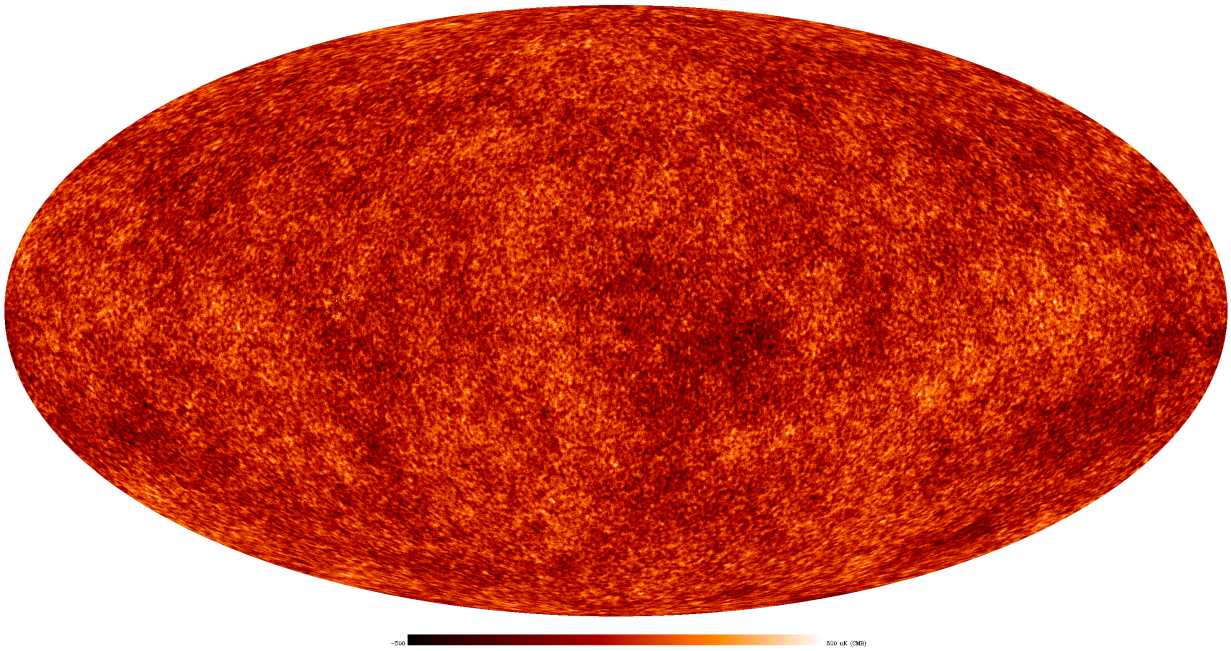
for static stone noise and deviation



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PREAMBLE

"This all-sky [cover image] map shows temperature difference in the **cosmic microwave background (CMB)** measured by *WMAP* (Wilkinson Microwave Anisotropy Probe). The background temperature is about **2.73 K everywhere**, but the **brighter** regions of this picture are **slightly less than 0.0001 K hotter** than the darker regions — indicating that the early universe was very slightly **lumpy** at the end of the ear of nuclei. We are essentially seeing what the universe was like at the surface marked '**380,000 years'.**"[1] (Image: ESA and the Planck Collaboration)

The discovery of the cosmic microwave background was announced in **1965**. Arno Penzias and Robert Wilson, two physicists working at **Bell Laboratories** in New Jersey, were **calibrating a sensitive microwave antenna** designed for satellite communications (***microwaves* fall within the radio portion of the electromagnetic spectrum**). Much to their chagrin, they kept finding unexpected "**noise**" in every measurement they made. **The noise was the same no matter where they pointed the antenna**, indicating that it came from **all directions in the sky** and ruling out any possibility that it came from any particular astronomical object or any places on Earth.

Meanwhile, physicists at nearby **Princeton University** were busy calculating the expected characteristics of the **radiation** left over from the heat of the **Big Bang**.[2] They concluded that, if the Big Bang had really occurred, this radiation should be permeating the entire universe and **should be detectable** with a microwave antenna. On a **fateful** airplane trip home from an astronomical meeting, Penzias sat next to an astronomer who told him of the Princeton calculations. The Princeton group soon met with Penzias and Wilson to compare notes, and both teams realized that the "noise" detected by the Bell Labs antenna **was the predicted cosmic microwave background** — the **first strong evidence that the Big Bang had really happened.** Penzias and Wilson received the 1978 **Nobel Prize** in physics for their discovery.[3]

"During the era [of nuclei, around 380,000 after the Big Bang], a **supercharged particle** with a temperature of **several thousand degrees** permeated all of space. At this temperature, it's too hot for electrons and protons to even **coalesce into atoms**, let alone stars, planets, or galaxies. This ionized soup is called a **plasma**…and it was emitting a thermal distribution of electromagnetic waves. But because there were no neutral atoms yet, the **light** the plasma emitted just **couldn't travel** very far before it would run into an electron…So at this moment, it was as if **flash bulbs** were constantly going off **everywhere in space**, but the light was being snuffed out by **an [orange plasma] fog**."[4]

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[1] Bennett, Donahue, and Schneider, Voit. *The Cosmic Perspective*. 7th ed., Pearson Publishing, 2014, p. 655.

[2] The possible existence of microwave radiation left over from the Big Bang was first predicted by George Gamow and his colleagues in the late 1940s, but neither Penzias and Wilson nor the Princeton group were aware of his work.

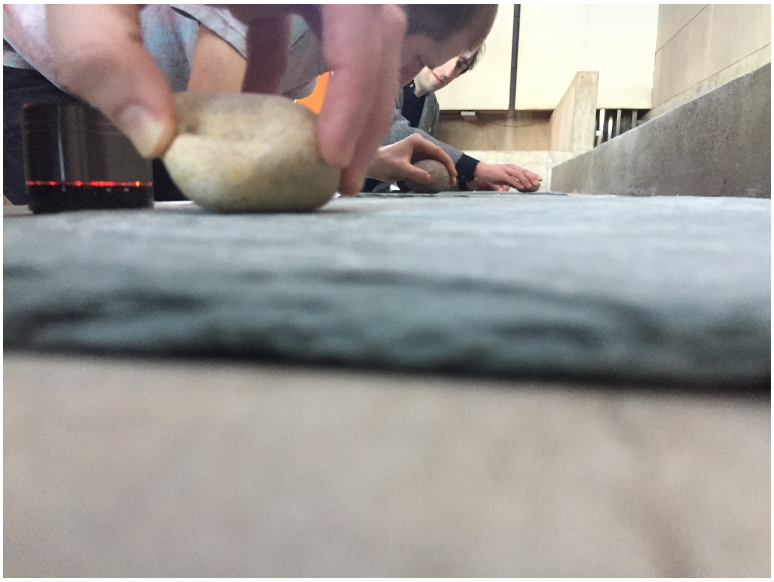
[3] Ibid., p. 654.

[4] "Cosmic Microwave Background Explained | Space Time | PBS Digital Studios.", *YouTube,* uploaded by PBS Space Time, 25 Mar. 2015, https://www.youtube.com/watch?v=3tCMd1ytvWg.

INSTRUCTIONS

Alone, or in a group: Create a static noise sound by rubbing a roughly textured surface with a stone. At some point during the performance, allow an *extremely slight* deviation from the static noise sound — with the relationship of 1/10,000th of the total duration — to speak.

For instance, the debut performance (by Jordan Dykstra, J. P. A. Falzone, Dave Scanlon, and Benjamin Klausner, and as part of John Cage's Musicircus on December 7, 2017 in the choir loft of Crowell Concert Hall at Wesleyan University in Middletown, CT) was 5 minutes in duration. The quartet members each rubbed round stones on a large stone shingle for the entire performance, but at one point there was an extremely short, yet audible, "chirp" — a 2018 Hz sine-tone (the pitch I found my microwave sang when it was done) — which was programmed to play from a small speaker and lasted 0.03 seconds, or 1/10,000th of the entire 5 minute piece.



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