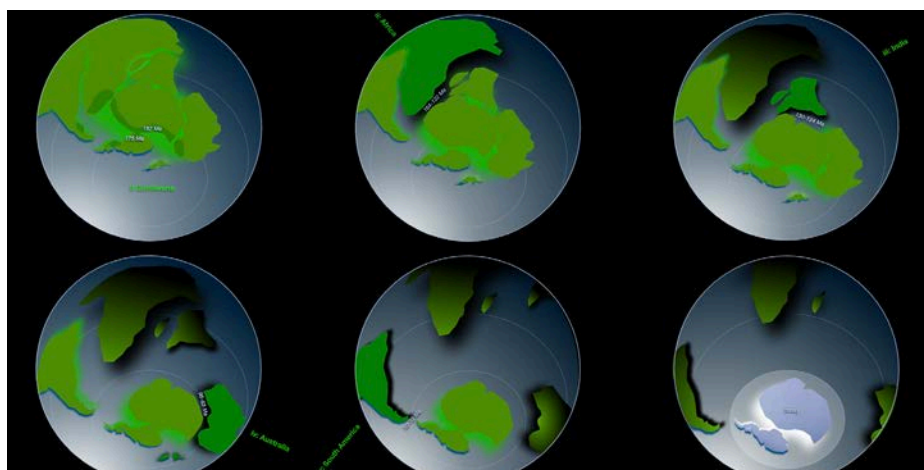


The song of the ice

Earth scientist and musician Steve Garrett on a new project combining music, science, sound and animation to tell the story of the Antarctic ice sheet



Part 1: Gondwanaland breaks up, the continents move away, isolating Antarctica and the ice sheet forms

As a geologist, geophysicist and guitarist, I've always been interested in the links between music and science. My first job was with the British Antarctic Survey (BAS) in the early 1980s, and in recent months I've been working remotely with scientists at BAS to create a new work.

'The Song of the Ice' uses music, science, sound, animation and images to tell the story of the life of the Antarctic ice sheet in three parts, highlighting its long history, dynamic nature, beauty and role as witness to the changing state of our planet. We launched the work via a global live-streamed event to celebrate the 50th anniversary of Earth Day on 22 April 2020 on YouTube.

Part 1 - isolate

The first section describes the last 180 million years (Ma) as other continents move away, isolating Antarctica and ending with the ice sheet forming.

I took a YouTube video 'Plate Tectonics Viewed from South Pole' by Chris Scotese and digitised the outlines of the continents with animation and shading effects to create a new movie playing forward in geological time with 1 second representing about 0.6 Ma.

A different musical theme represents each continent as it breaks away — first Africa, then India, then Australia, then South America, with the circumpolar current and ice sheet forming. Africa and South America share a common theme as they were once connected, whilst India moves quickly, as does the continent itself. Australia has a didgeridoo-like drone creating a dreamlike effect.

Part 2 - grow

This section represents the last 30 Ma — the ice sheet grows and moves, accompanied by the sounds of ice-quakes and images of the ice sheet.

Key partners in this section included Dr Andy Smith and Dr Sofia-Katerina Kufner at BAS who provided geophysical data, Stuart Hamilton at Castlesound Studios who converted these data to meaningful sound, and geologist Chris Bell who processed digitally some of the analogue slides from my Antarctic fieldwork.

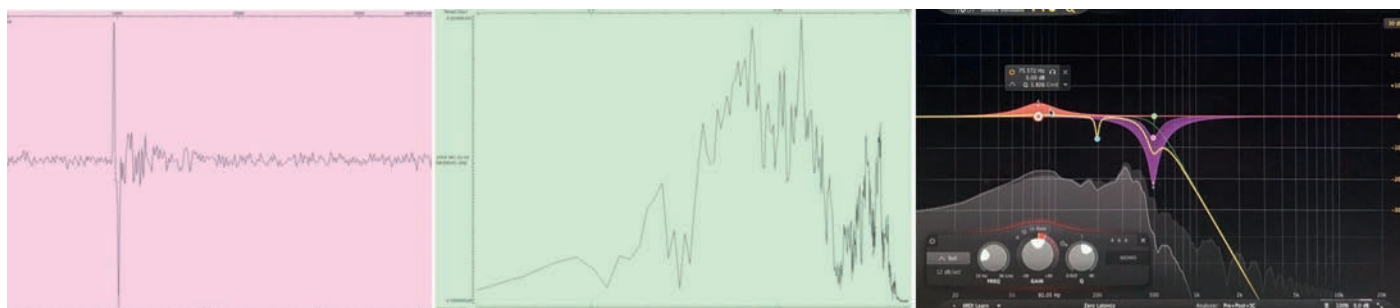
During three summer field seasons (1981-1984) I was fortunate to cover a lot of ground across West Antarctica and the Antarctic Peninsula as part of my job carrying out airborne geophysical (magnetic, ice radar, gravity) surveys - we also photographed some penguin colonies from the air. This gave me a wide variety of landscape images to reflect the beauty of the ice.

The geophysical data we used for this section were 'microseismic' data - 'ice-quakes' - from a fast-flowing major glacier draining the Antarctic plateau. We converted the data into sound files which were processed in the recording studio (dynamic noise reduction, amplitude balancing, filtering and reverb). Large events occur every 60-100 seconds, so to give more frequent events for the listener, 10 minute segments were superimposed.

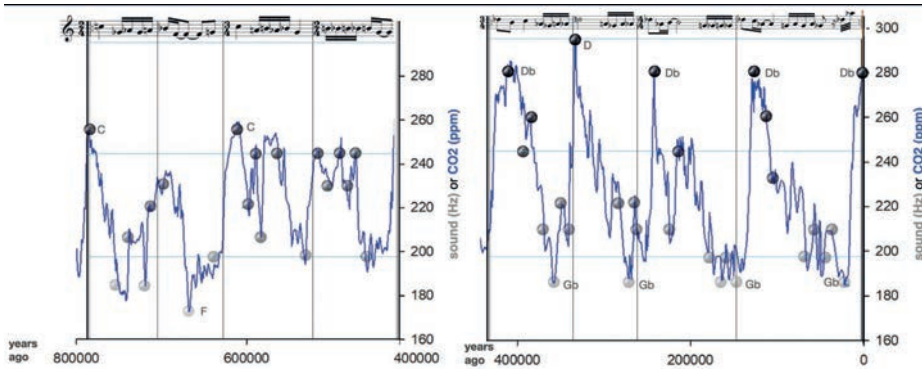
Part 3 - breathe

This section represents the last 0.8 million years — the rise and fall of CO₂ in ice cores converted to sound and music.

The key partner in this section was Dr Robert Mulvaney at BAS, who provided data from the European Project for Ice Coring in Antarctica (EPICA) Dome 'C' ice core data. These data show CO₂ concentrations in parts per million (ppm) from ice core data to 0.8 Ma



Part 2: Microseismic data from a major glacier— amplitude, frequency and processing in the recording studio



Part 3: CO₂ concentrations (ppm) from EPICA ice cores converted to sound (Hz) and music — conditions differ today

ago, with cycles every ~100,000, and CO₂ at 180-300 ppm throughout this time.

For the music, I converted the CO₂ in ppm to sound in Hz. I found that 180-300 Hz sits nicely in the mid range of the guitar and composed tunes which sample the graph of CO₂ concentrations. The current CO₂ concentrations of >400 ppm produce a note at >400 Hz which is different to the rest of the tune, heralding the Anthropocene.

It was looking at and listening to these data that had the most impact on me personally during the creation of the work. The last note sends a message and asks a clear question — it is different, so what will our response be?

It clearly had an impact on others involved with the project too – as Sofia-Katerina Kufner

said, 'I have spent the last ten years of my life looking at ice- and earthquake data. Suddenly I can hear them.' Robert Mulvaney added 'For many years I have presented the ice core CO₂ graph with the sound of popping bubbles of ancient air being released from deep ice core samples. I can't help admitting that the music of graph is more evocative, particularly with regard to the alarming recent rise in CO₂.'

What next?

I'm interested in using this work to help communicate polar, Earth and climate science to as broad an audience as possible. If you'd like to explore possibilities, please send me a message via my website at <https://www.stevegarrettguitar.com/connect>.

Steve Garrett is guitarist and Earth scientist. Born London, he has lived in the UK, Antarctica, USA & Canada and now calls Scotland home. He has worked for the British Antarctic Survey and Chevron in Earth science and technology. His diverse experiences are reflected his recordings which have been well received by jazz, folk and roots magazines and radio programmes across the UK.

ONLINE RESOURCES

<https://youtu.be/8r3xdrp5GGI> : 'The Song of the Ice' 40 minute livestream Earth Day launch event

<https://www.youtube.com/c/SteveGarrettguitar> : YouTube channel including 'The Song of the Ice' separate video/music and introductory talk.

<https://stevegarrettguitar.bandcamp.com> : music and ice-quakes, free download and streaming.

<https://www.bas.ac.uk/media-post/earth-day-2020-the-song-of-the-ice> : press release.

Images from across the Antarctic Peninsula and West Antarctica capturing the beauty of the ice sheet

