FIELD NOTES: A REQUIEM

Process Documentation

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OVERVIEW

Field Notes: A Requiem is an ongoing series of works that translates scientific and environmental data into immersive sound and time-based media. Each work in the series examines a natural system in decline and renders it audible, creating a record of what exists and what is disappearing. Using custom software written for MATLAB, environmental datasets are translated into MIDI files, with each data stream assigned its own instrument voice. All compositions are mapped onto the Gong pentatonic scale, the ancient Chinese five-tone system built on the intervals C, D, E, G, and A, chosen for its resonance with the natural world and its freedom from dissonance.

As curator C. Sean Horton wrote in the *Provincetown Independent* following the premiere of *Lit from Within*, "a requiem is traditionally composed after a loss; Stone's project begins earlier, documenting living systems while they still endure." The series is not an elegy for what is already gone. It is a record made in the presence of what is still here.

THE METHODOLOGY: HOW SCIENTIFIC DATA BECOMES SOUND

The core process of *Field Notes: A Requiem* follows a consistent methodology adapted to the specific characteristics of each dataset:

Step 1: Field Work and Data Collection

Each work begins in the field. Original video footage, audio recordings, or scientific datasets are gathered in collaboration with scientists and researchers. Field notes recording environmental conditions, species present, weather, and time are documented alongside the primary data.

Step 2: Data Analysis

Raw data is processed and analyzed. For biological signal data such as firefly flash patterns, custom species-recognition software written in MATLAB analyzes each signal by its timing, duration, and interval pattern, identifying the organism responsible and classifying it against a library of known signatures. For geological data such as sediment core samples, measurements including organic percentage, grain size, sediment color, and carbon-dated age models are organized by depth and converted to calendar years using Bacon age modeling.

Step 3: Parameter Setting

The artist sets the parameters that govern how data values map onto musical properties. These decisions are both scientific and artistic: which variable controls pitch, which controls note duration, which controls dynamics. Each distinct data stream, whether a firefly species, a sediment class, or an organic percentage measurement, is assigned its own dedicated MIDI track so that in playback each voice can be assigned a distinct instrument.

Step 4: MIDI Generation

Custom code written for MATLAB (a programming language and data analysis platform widely used in scientific research) reads the processed dataset and generates a MIDI file. MIDI (Musical Instrument Digital Interface) is a universal digital music format that stores instructions for musical performance without sound itself. The data determines every note: its pitch, timing, duration, and velocity. No musical decisions are made by the artist at this stage. The data composes.

Step 5: Instrument Assignment

The MIDI file is imported into Reaper, a professional Digital Audio Workstation. Each data track is assigned a distinct instrument voice, either a recorded wav sample or a virtual instrument. The choice of instrument for each voice is an artistic decision informed by the character of the data it represents. High energy storm events may receive percussive instruments. Slow organic accumulation may receive sustained tonal instruments. The Gong pentatonic scale ensures that all voices, regardless of when they sound, remain harmonically consonant with one another.

Step 6: Visual Component

Each work in the series includes a visual component developed in parallel with the sound. Visual elements may include original field video with digital augmentation, projected imagery, cyanotype monoprints made from field photographs and hand-tinted with watercolor, and material elements including sewn textile components. The visual and sonic components are synchronized and presented together as an immersive installation or looping projection.

LIT FROM WITHIN (2026)

The second completed work in the series. Source material: original video footage of fireflies shot in a Harwich, Massachusetts meadow on June 15, 2026, using an iPhone 16 Pro Max at 4K resolution, 30fps, f1.8, ISO 2000, shutter 1/30.

Detection and Species Recognition

Custom MATLAB software analyzed the video frame by frame, converting each frame to grayscale and applying a brightness threshold of 160 (on a 0-255 scale) to isolate bioluminescent blink events. Each detected blink was deduplicated across frames using a 40-pixel radius centroid comparison to prevent a single sustained blink from generating multiple notes.

Detected blinks were grouped into bursts based on timing gaps, then each burst was scored against a library of four North American firefly species using three weighted criteria: flash count match (40%), intra-burst interval match (35%), and inter-burst timing match (25%). Every individual flash within each burst was routed to the winning species track, so a burst of six rapid flashes identified as Photinus carolinus generates six notes on that species track.

Species and Track Assignment

Four species were identified across 5,113 detected blink events:

Big Dipper (Photinus pyralis) — single ~0.5 second flash every ~5.5 seconds. Assigned to C5 register of the Gong scale.

Synchronous Firefly (Photinus carolinus) — 5 to 8 rapid flashes followed by 8 to 10 seconds of darkness. Assigned to C4 register.

Macdermotti Firefly (Photinus macdermotti) — double flash approximately 2 seconds apart, repeating every 4 seconds. Assigned to C3 register.

Femme Fatale (Photuris sp.) — variable single flash mimicking other species. Assigned to C6 register (highest).

Visual Component

The 11-minute 43-second field video was augmented with visual effects rendering the firefly blinks as soft bioluminescent forms drifting against a deep blue ground, visually connecting the firefly to the jellyfish, another bioluminescent organism. Cyanotype monoprints were made from long exposure photographs of the firefly meadow and hand-tinted with magenta watercolor ink, their Prussian blue ground matching the video palette. The work was publicly presented at Farm Projects, Wellfleet MA, August 9, 2026, and subsequently screened on the mainsail of Schooner

Hindu at the dock in Provincetown harbor as part of Floating Visions, Sea Dreams and Tell Tales, 2026.

DEPOSITS (IN PROGRESS, 2025-PRESENT)

The first work in the series, currently underway with support from the Arts Foundation of Cape Cod. *Deposits* sonifies 2,000 years of geological sediment core sample data from Duck Harbor saltmarsh in Wellfleet, Massachusetts, a site central to the ongoing Herring River tidal marsh restoration project.

Scientific Collaboration

Developed in collaboration with Dr. K. Castagno, geologist, who collected five vibracores (DH_VC_3.1 through DH_VC_3.5) from Duck Harbor in 2024-2025. Core 3 extends to 200cm depth, representing approximately 2,000 years of marsh history. Analysis includes loss-on-ignition organic percentage measurements, grain size analysis (d50), Munsell color classification of sediment layers, gamma density measurements, and Bacon age modeling providing calendar year estimates with 95% confidence intervals at every centimeter of depth.

Key Historical Events in the Data

1635 Great Colonial Hurricane — confirmed in cores 3 and 4 as a coarse sand/high energy deposit layer. Located at approximately 43cm depth in core 3 (median age 1633 AD, 95% confidence interval 1572-1704 AD). Marked in the composition with a measure of silence followed by simultaneous peak across all instrument tracks.

1909 Chequessett Neck Dike Construction — located at approximately 13cm depth in core 3 (median age 1912 AD). The dike cut off tidal flow to the marsh, causing ecological damage visible in the sediment record as a shift from organic-rich peat to disturbed sandy material. Marked in the composition as a significant tonal shift.

Track Structure

Each of the five cores becomes one musical piece of approximately two minutes. Within each piece, each sediment class is assigned its own dedicated MIDI track and instrument voice:

Peat — centuries of organic accumulation, healthy marsh. Warm, sustained tones.

Clay — quiet still water deposition. Smooth and muted.

Silt — moderate energy, transitional layers. Medium character.

Sand — energetic, storm-driven deposition. Bright and percussive.

Coarse Sand / Pebbles — high energy events, storms, overwash. Loud and dramatic.

Shells — ancient marine environment layers. Rare, singular, distinctive.

Organic Percentage — continuous melodic thread driven by loss-on-ignition data. High organic = high pitch. Low organic = low pitch.

Time Axis

Rather than mapping depth to beats, the composition maps actual calendar years to beats using the Bacon age model. This means each centimeter of sediment plays for a duration proportional to the real time it represents. A centimeter of slowly accumulated peat representing 10 years plays longer than a centimeter of storm-deposited sand representing days. The music breathes at the true pace of geological time.

Primary Source Document

A 1939 U.S. Army Corps of Engineers map of Wellfleet Harbor (File No. 161-F-3-2, U.S. Engineer Office, Boston, March 28, 1939) showing the proposed channel dredging and anchorage at the exact site of the sediment cores has been identified as a companion visual document. The map's Table of Probings records sediment character at each sounding location using the same vocabulary as the core sample data, connecting the 1939 engineering survey to the 2024 scientific record across 85 years. Cyanotype prints of this map are planned as material accompaniments to the sound installation.

Public Presentation

A public talk presenting the completed work is scheduled for June 2027 at the Center for Coastal Studies, Provincetown, Massachusetts, in collaboration with the on-site geologist.

TOOLS AND SOFTWARE

MATLAB (MathWorks) — data analysis platform used for all custom species-recognition and data-to-MIDI conversion code. All code written by the artist.

Reaper (Rapid Environment for Audio Production, Engineering, and Recording) — digital audio workstation used for instrument assignment, mixing, and final audio production.

MIDI (Musical Instrument Digital Interface) — universal digital music format. MIDI files store performance instructions (pitch, timing, velocity, duration) without audio. Generated by the MATLAB code and imported into Reaper for instrument assignment.

Gong Pentatonic Scale (宫调式) — the Chinese pentatonic scale built on the intervals C, D, E, G, A (semitone offsets 0, 2, 4, 7, 9 from root). Contains no semitones and no tritone, producing no dissonance regardless of which notes sound simultaneously. Selected for its deep historical association with the earth element in Chinese musical theory and for its harmonic properties that allow data-driven random note selection to always produce consonant results.

Cyanotype Process — a historic photographic printing process using ferric ammonium citrate and potassium ferricyanide sensitizer, producing prints in Prussian blue (iron blue). Used for the production of artist proof edition prints accompanying each work in the series. Prints are made from original field photographs printed as inkjet negatives on transparency film, exposed in sunlight, washed in water, and hand-tinted with watercolor.

SCIENTIFIC COLLABORATORS

Dr. K. Castagno — Geologist. Sediment core collection, analysis, and age modeling for *Deposits*. Center for Coastal Studies, Provincetown, Massachusetts.

Dr. Andrea Bogomolni — Marine Mammal Biologist, Woods Hole Oceanographic Institution. Scientific partner for forthcoming pelagic work in the *Field Notes* series.

Rozalia Project / American Promise — Ocean research and marine debris organization. Hydrophone access and acoustic field recording support, New England coast, August 2026.