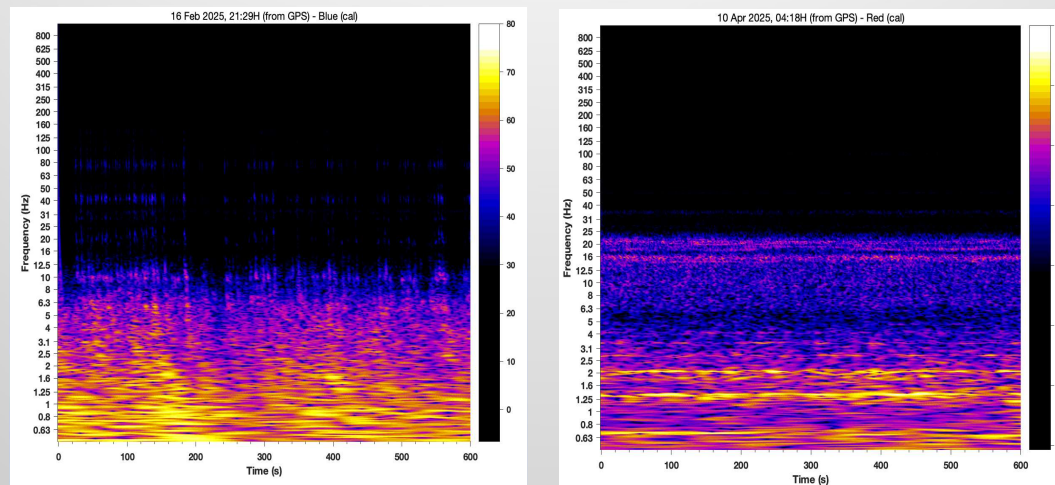


Environmental Acoustic Pollution: A neglected pollutant of critical importance to a Just Transition



Dr Lynette Robertson

Independent & Freelance Researcher & Data Analyst (Nature Harmonics)

International Acoustics Research Organisation (IARO) Citizen Scientist

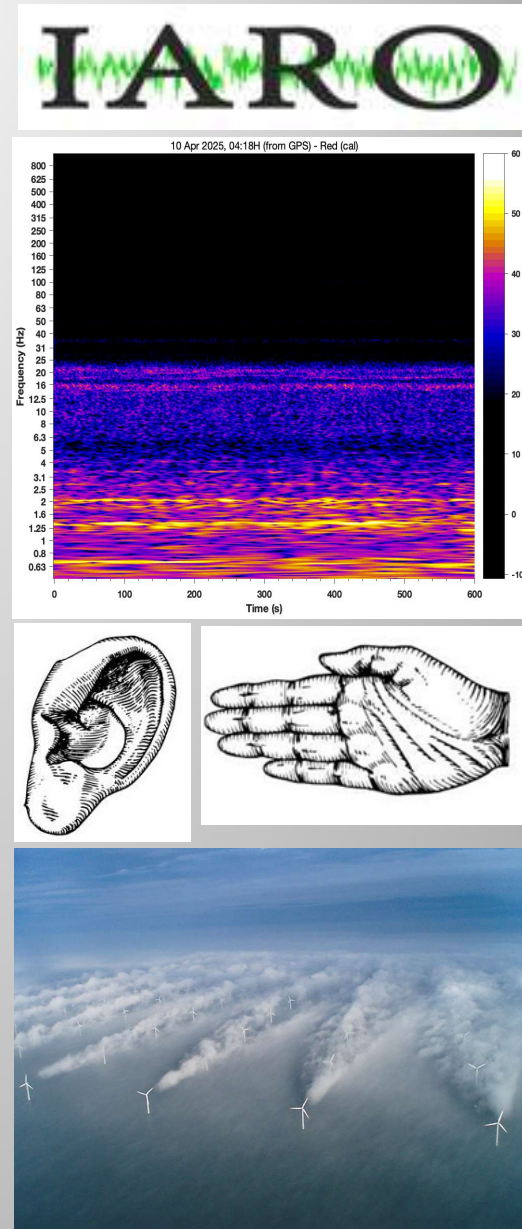
SENSING TRANSITION WORKSHOP

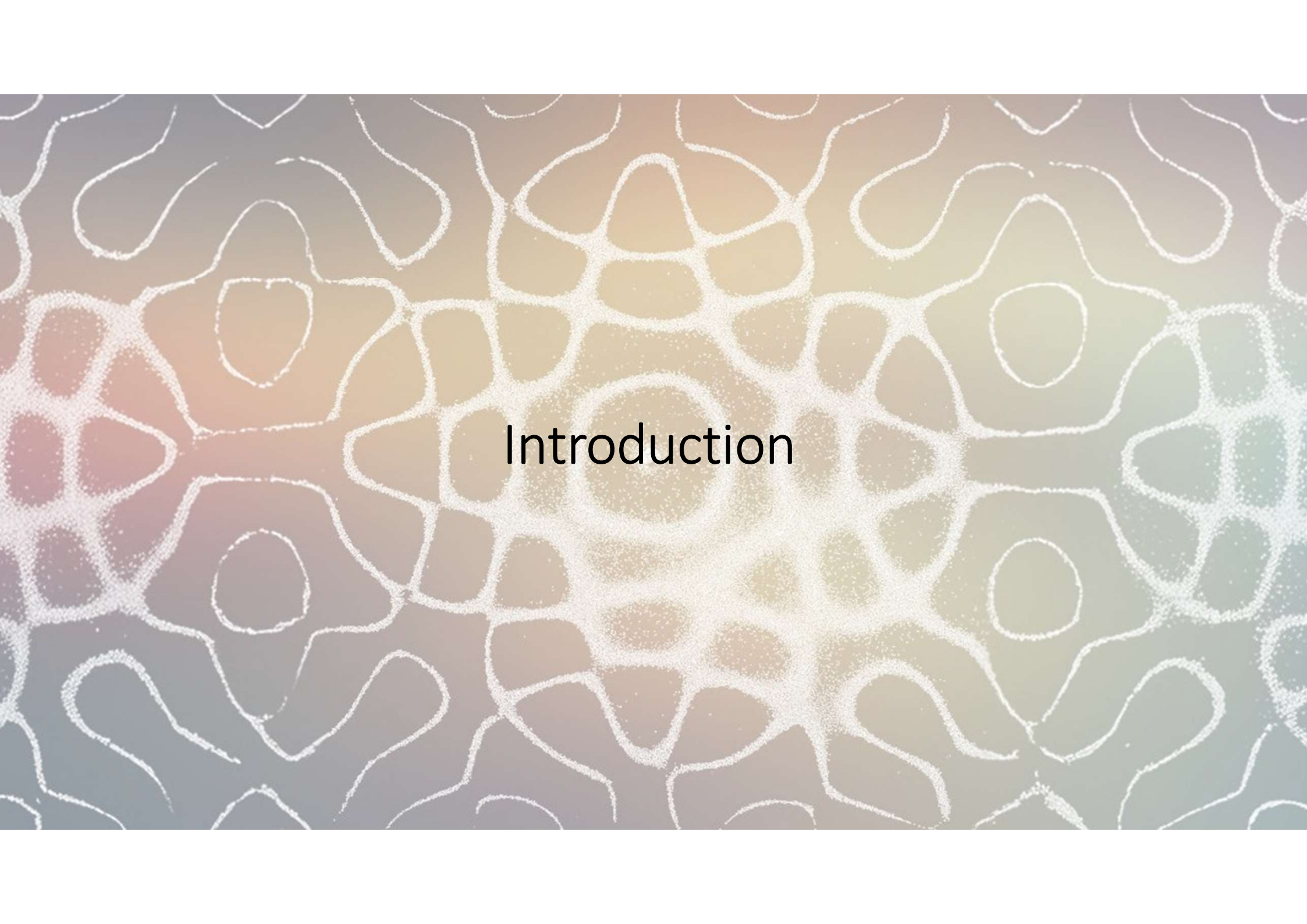
Old Torry Community Centre | Peacock & The Worm, Aberdeen, 29 - 30 June 2026

Overview

- **Introduction:** Neglected pollutant
- **Terminology, Definitions, Distinctions**
- **Current work:** Field recordings (IARO 'SAM Scribe' System)
- **Environmental Acoustic Pollution Human Health Impacts**
 - Sensing Sound
 - Human Diversity & Environmental Sensitivity
 - Adverse Impacts
- **Energy Transition Reflections**

How does this work explore environmental and energy-related issues that are often **hidden, taken for granted, or hard to understand?**

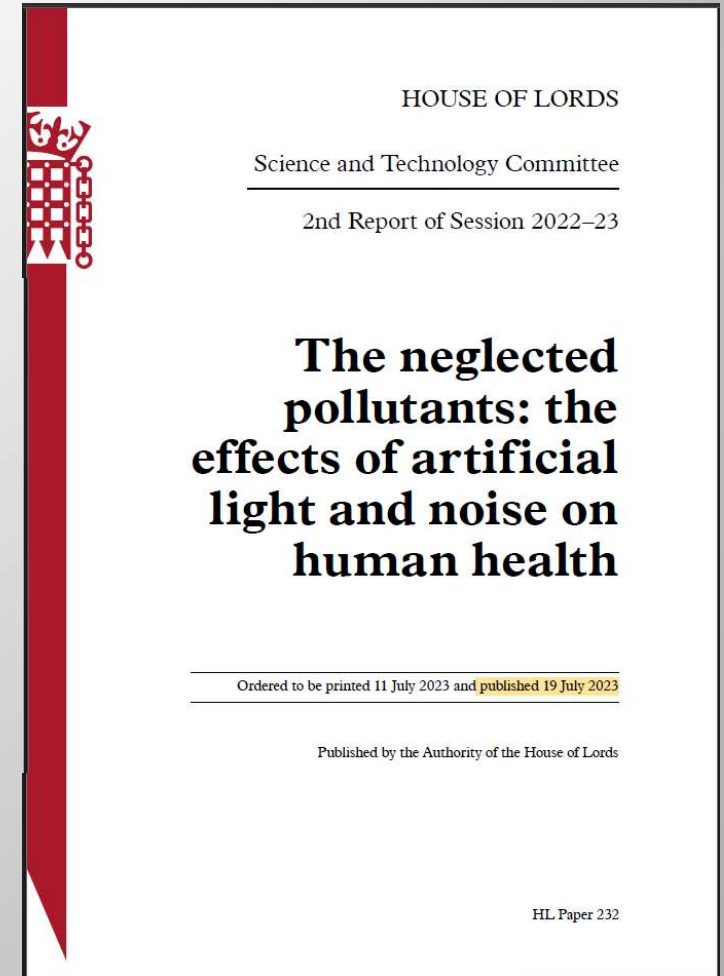


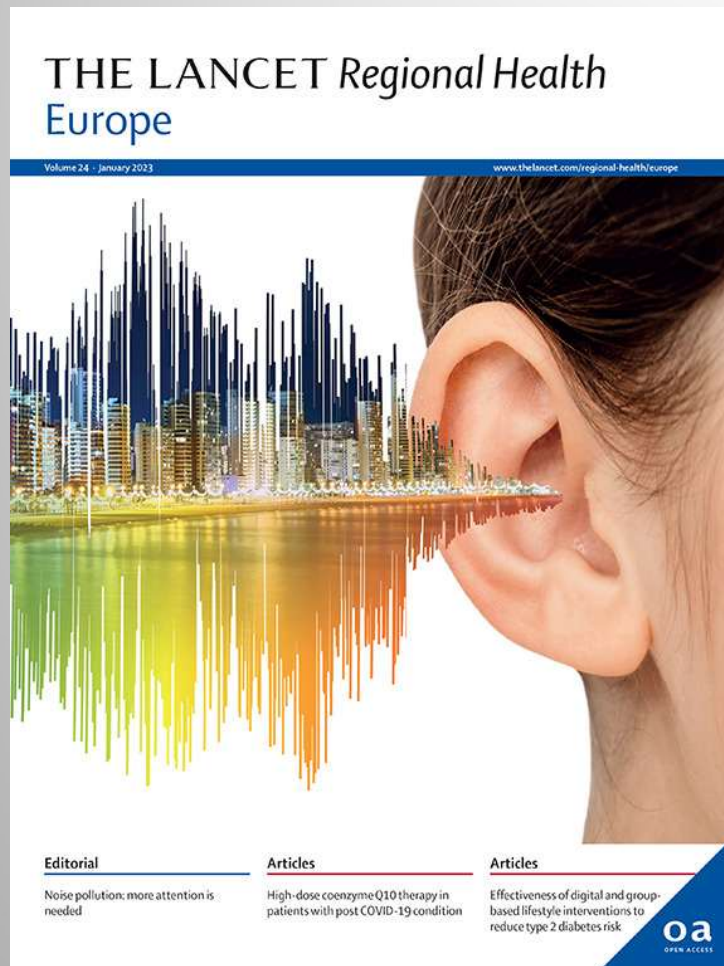


Introduction

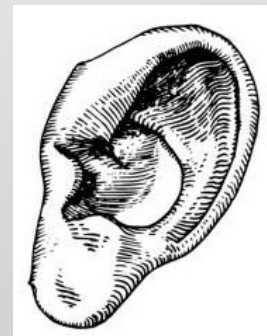
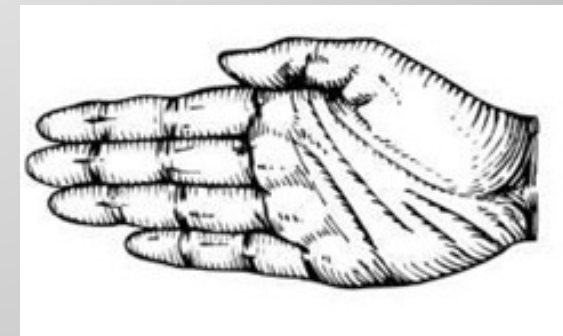
Noise: A 'neglected' pollutant

- House of Lords Science and Technology Committee (2023) report
- Noise Action Week ... (2026)
 - 'Emerging' issues
 - Heat Source Pumps
 - Renewables
- Upcoming Webinar (July 6):
'Neglected pollutants 3 years on'
(Institute of Environmental Sciences)

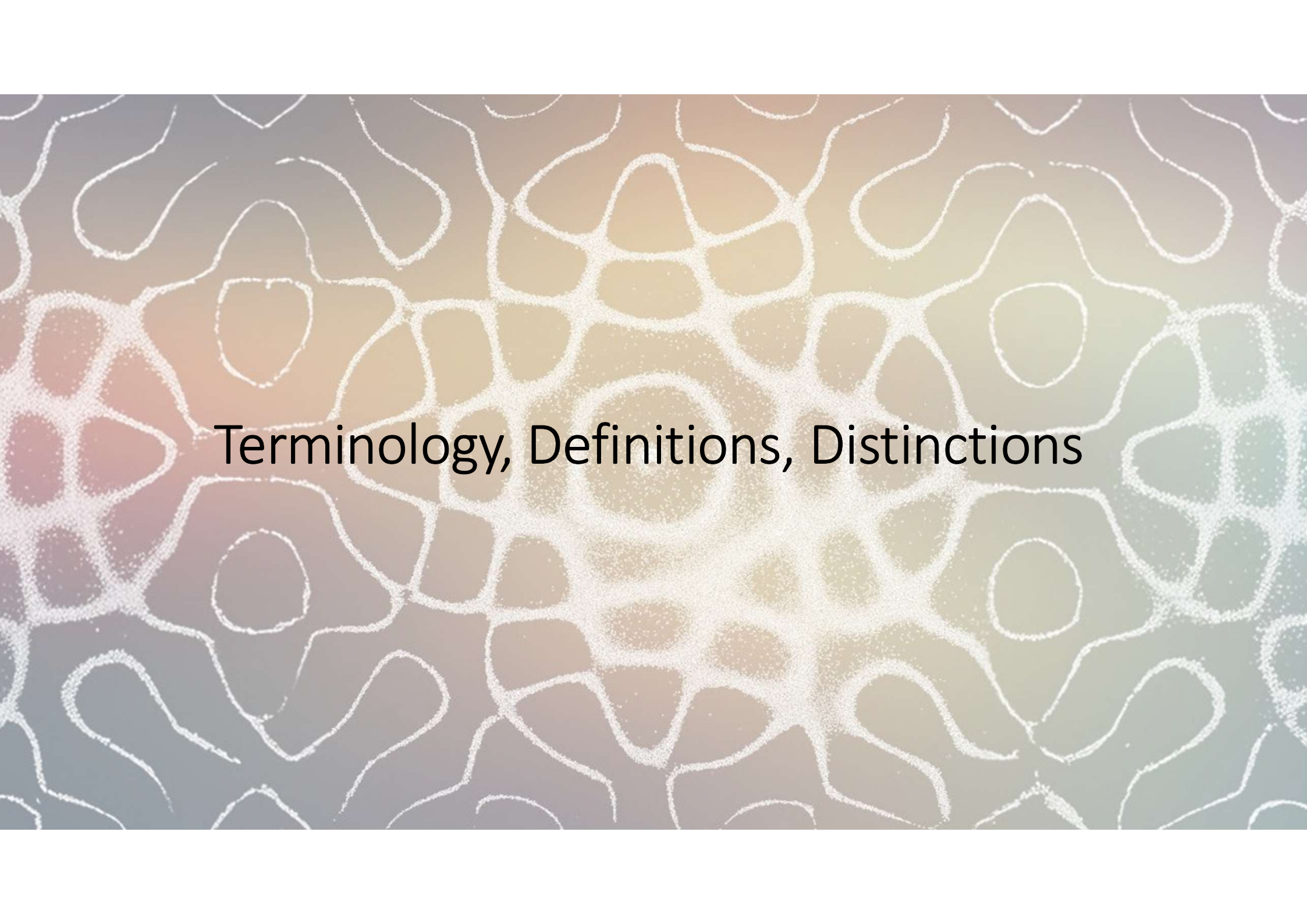




- LANCET Editorial: ‘Noise pollution: more attention is needed’ (Biswas et al, 2023)
- **Invisibility** of noise: “cannot be seen, tasted, or smelled”



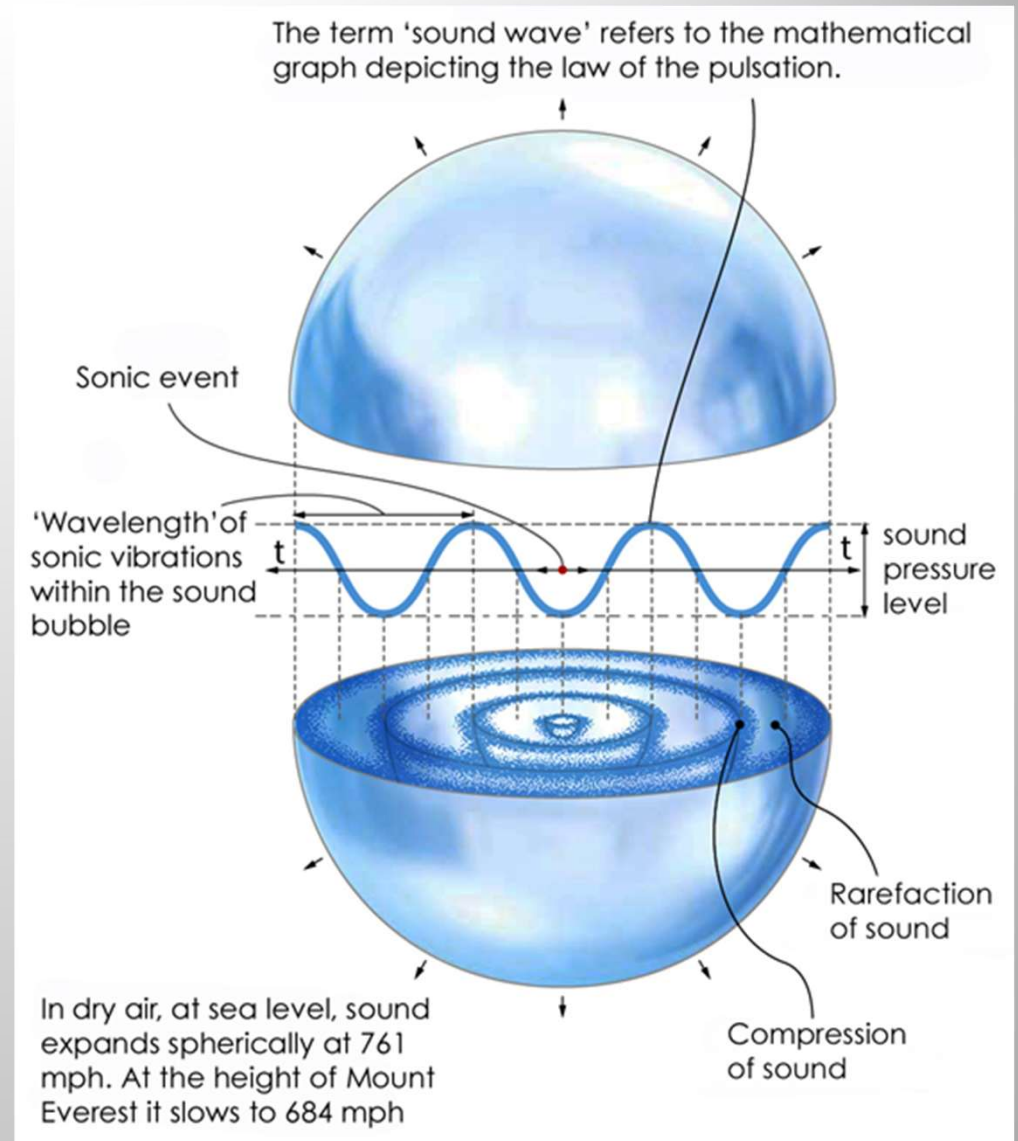
- **Non-material** (LR)



Terminology, Definitions, Distinctions

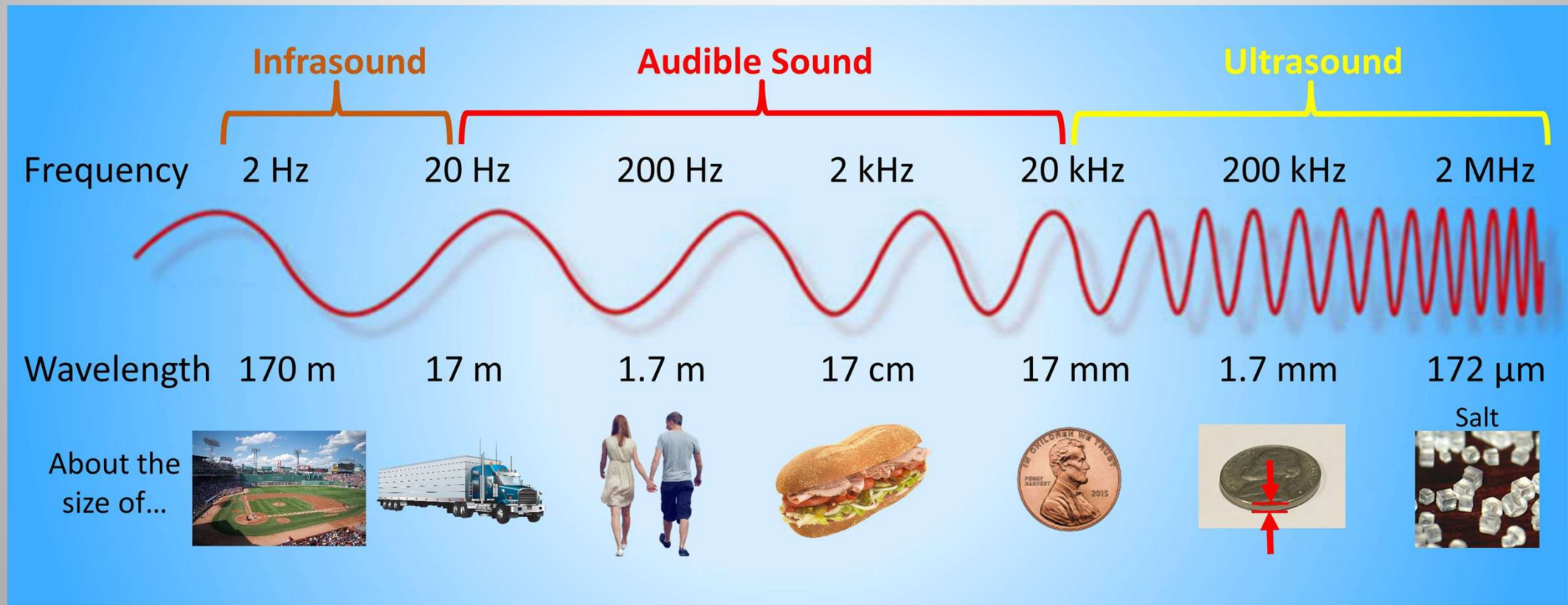
What is Sound?

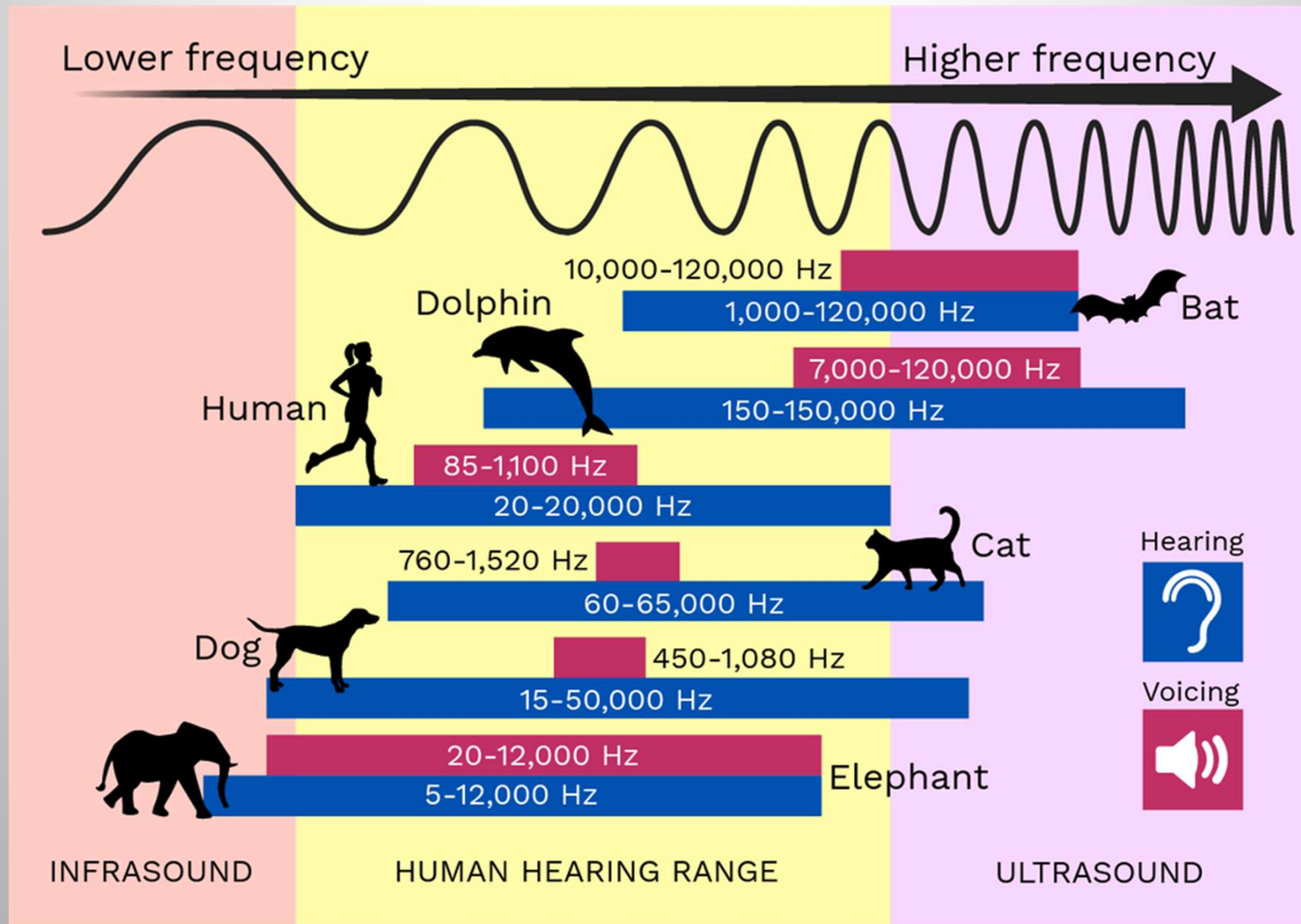
- A **pressure wave** created by (mechanical) **vibration** within a medium (air, water, ground, object)
- Expressed in terms of:
 - **Frequency** - number of cycles (or oscillations) per second, Hertz (Hz)
 - **Sound Pressure Level (SPL)** = energy of the pressure wave, decibels (dB)
- Propagates spherically from a point source



Source: John Stewart Reid / Cymascope.com

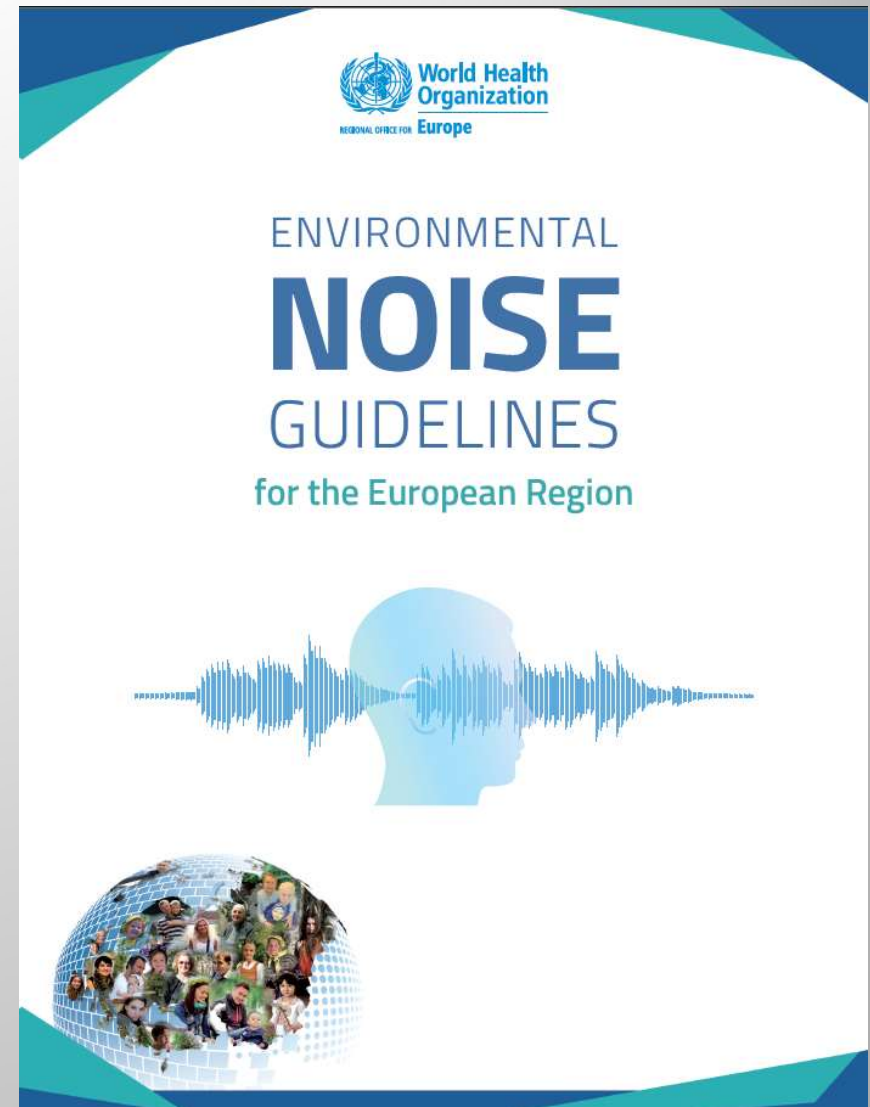
Acoustic Spectrum: Sound Categories (Human Hearing)



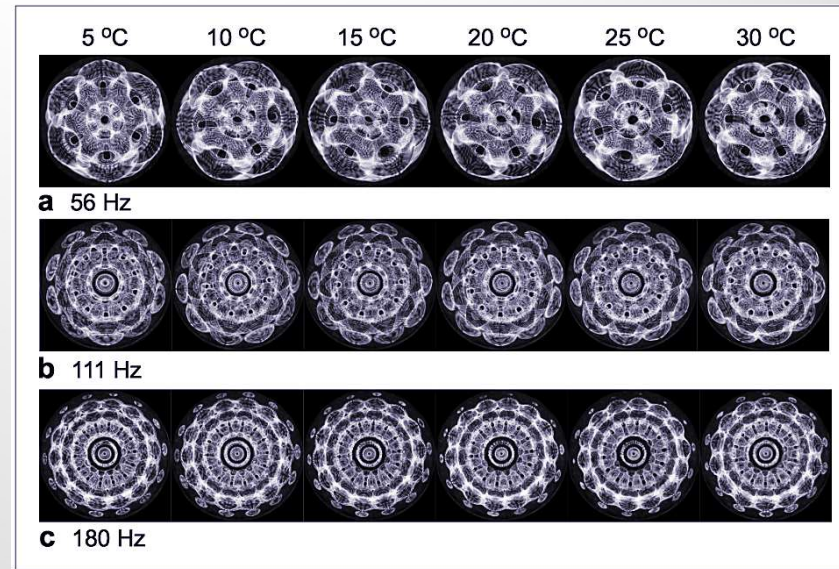


Noise / Acoustic Pollution

- “Unwanted sound” (World Health Organisation, 1999)
- **Environmental Noise** (‘Residential’ or ‘Community’): “noise from all sources with the exception of workplace noise” (WHO, 2018)
 - Transportation (road, rail, air)
 - Wind Turbines
 - Leisure
 - Residential/community
- *Sound that disturbs or reduces the level of coherence in the acoustic field* (LR)

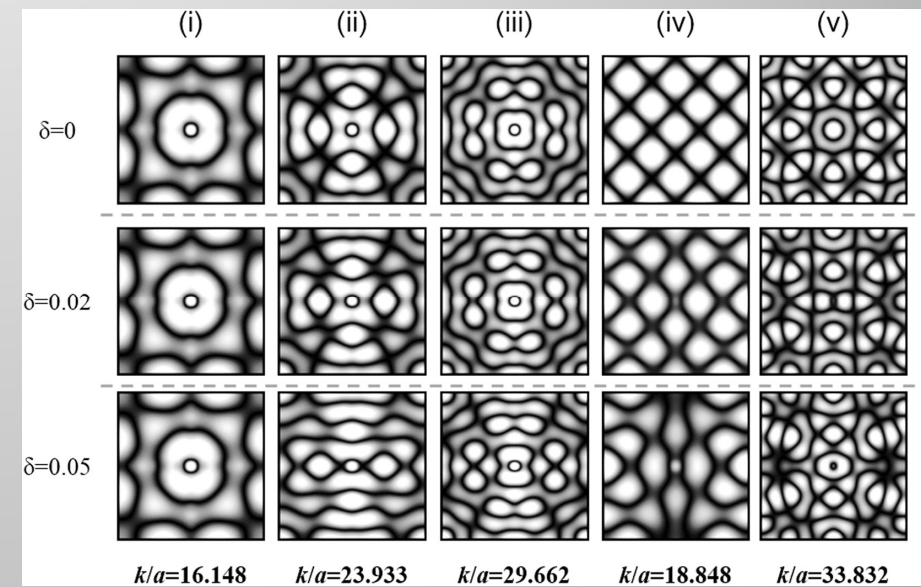


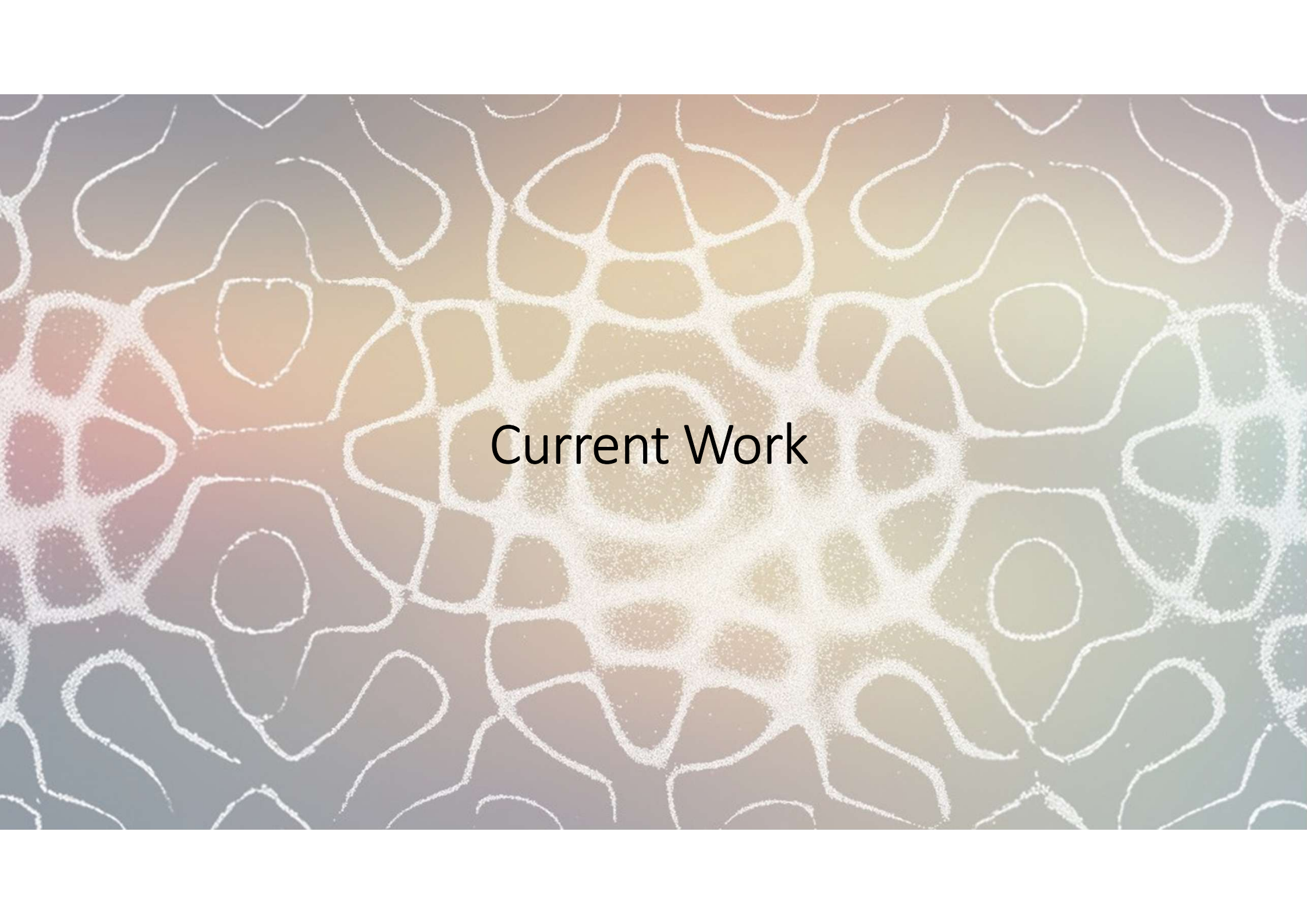
Cymatics



Sheldrake &
Sheldrake
(2017)

Tuan et al
(2018)

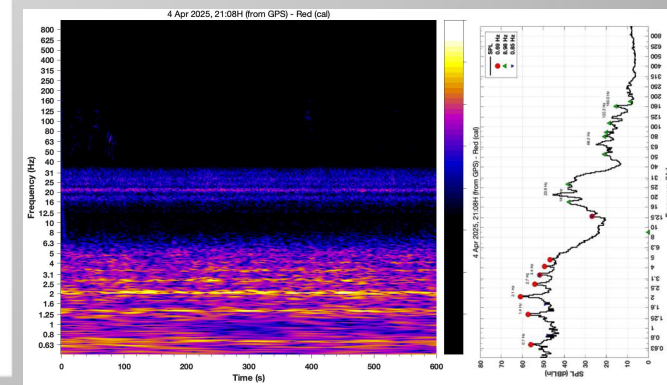




Current Work

Field recordings: IARO 'CSI-ACHE' Research (iaro.org.nz)

- International Acoustics Research Organisation
Citizen Science Initiative for **Acoustical Characterisation of Human Environments**
- Data collection (Shetland)
 - Inform ongoing discussion on need for improved regulation
 - Scientific research
- Community Support for Wind Farm Impacted Residents



Shetland: Viking Energy Windfarm Impact – Sally Huband

Viewpoint / Injured by Viking's subaudible noise pollution

Westside resident Sally Huband has been forced to sell her house in East Burrafirth to escape subaudible acoustic emissions from the Viking turbines. Here she details her – so far – unsuccessful attempts to get the industry to act on the issue.



Contributed
14 February 2025 08:38



4489
Shares



Community / 'Sally's experience is not unusual' – calls for turbines closest to homes to be decommissioned



Hans J Marter
4 April 2025 09:51



2323
Shares



“WE need to explore with SSE decommissioning some of the closest turbines to human dwellings and, in one instance, a school.”

That was the conclusion from Westside resident Sally Huband at the end of a two hour meeting into the health impacts of low frequency noise from wind turbines.

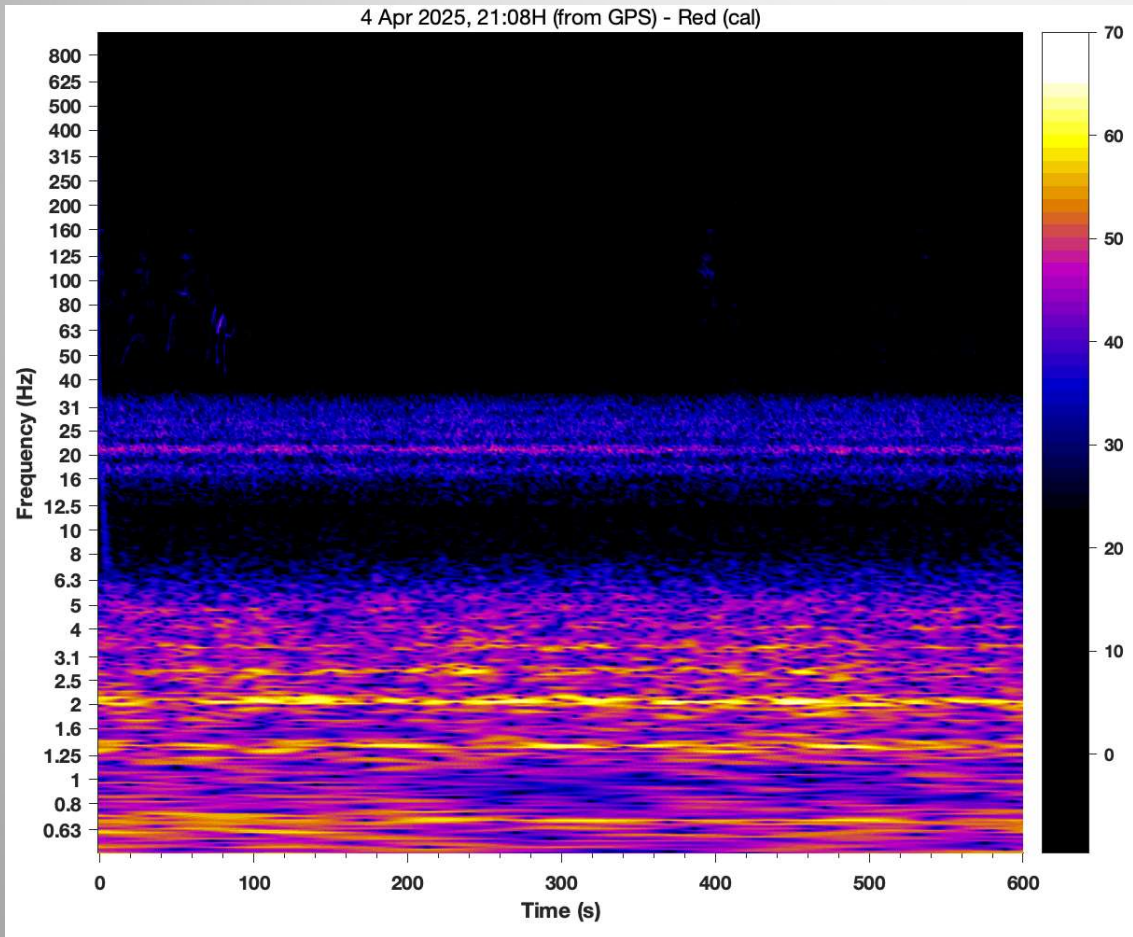
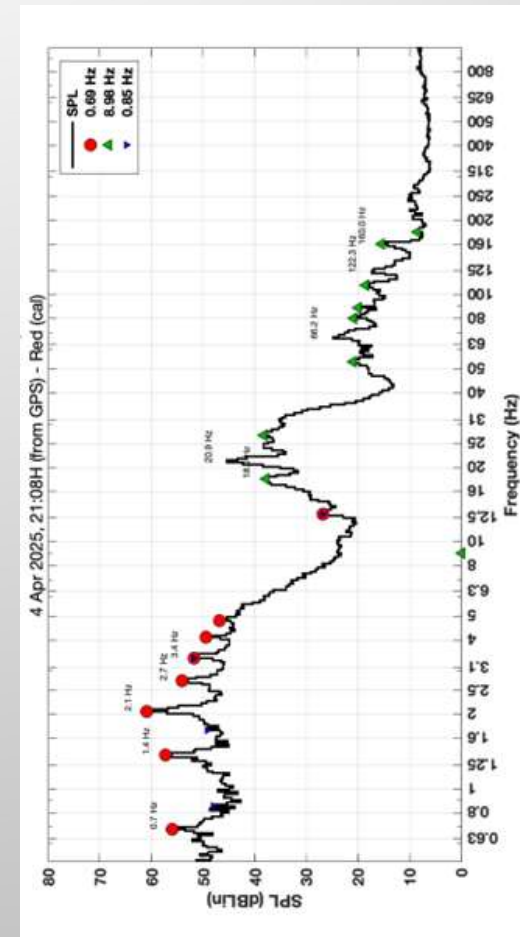
Shetland News:

<https://www.shetnews.co.uk/2025/02/14/injured-by-vikings-subaudible-noise-pollution/>

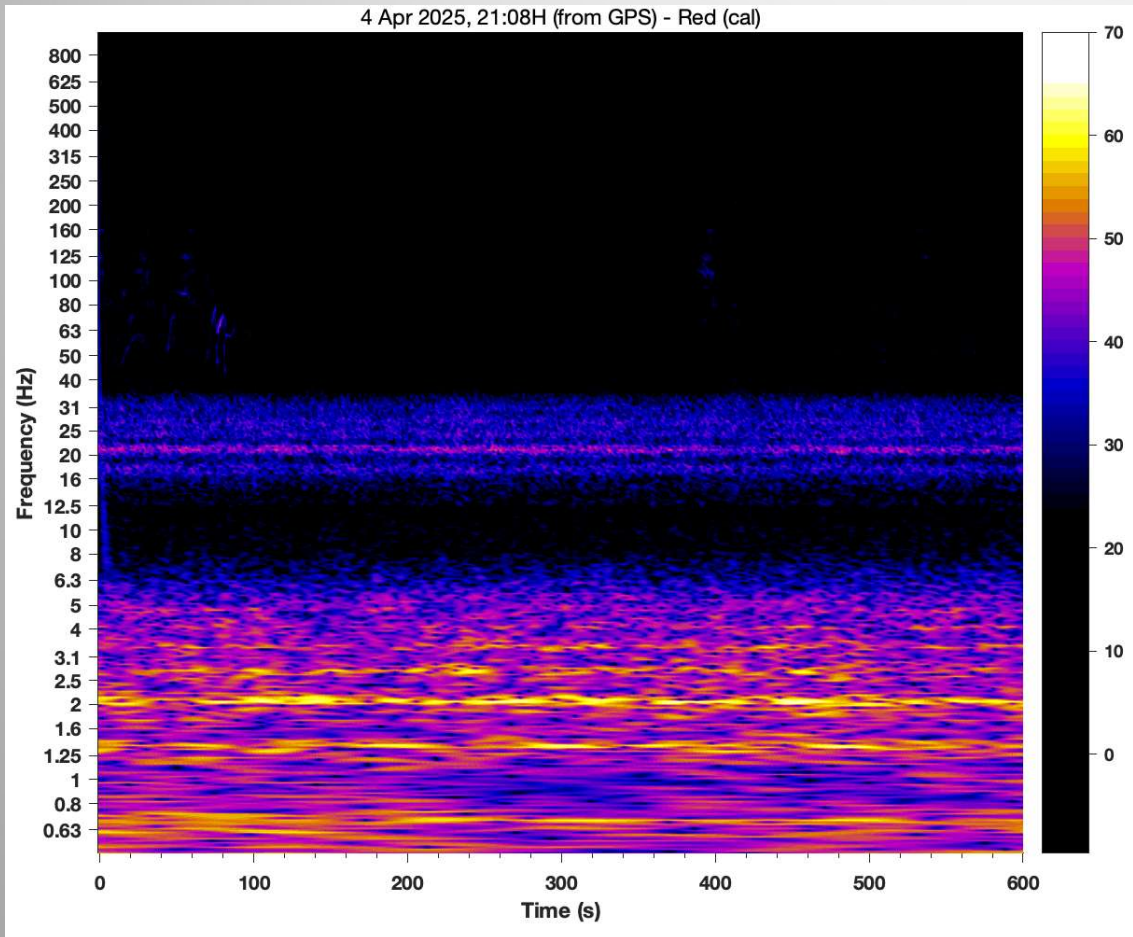
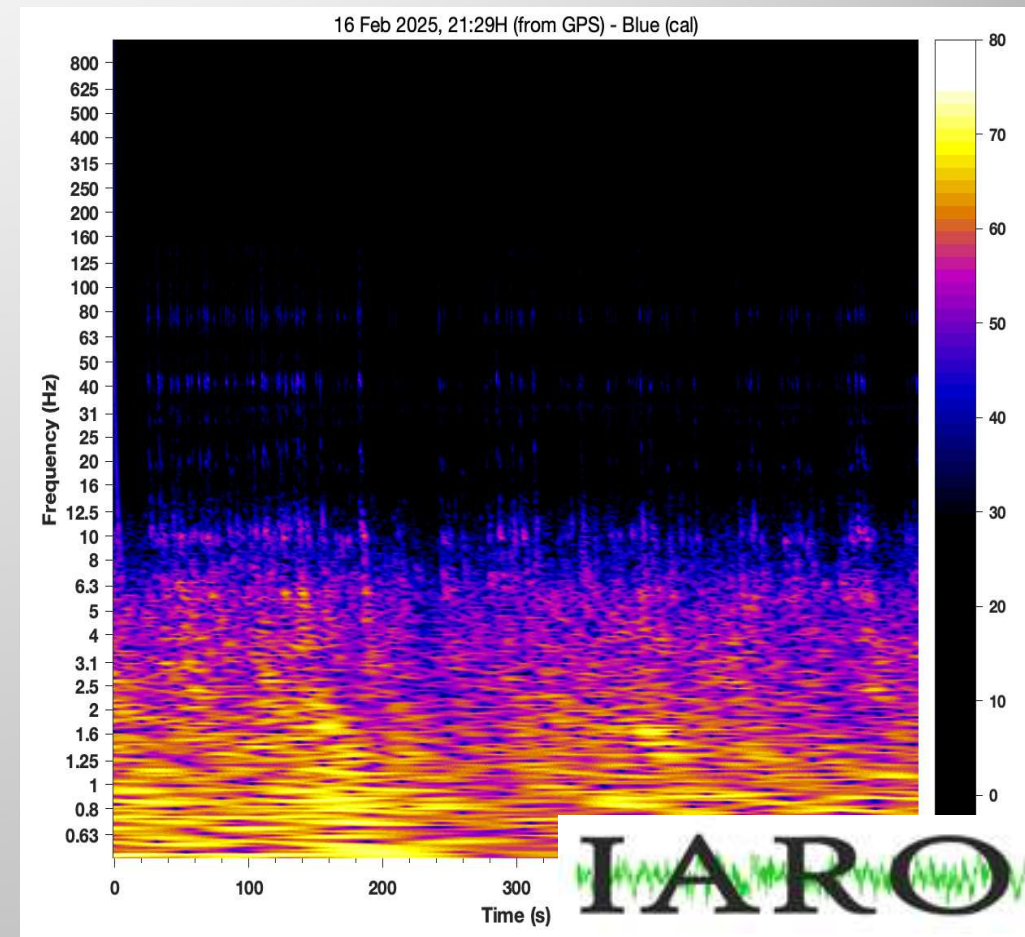
Shetland News:

<https://www.shetnews.co.uk/2025/04/04/sallys-experience-unusual-calls-turbines/>

Field recordings: IARO 'CSI-ACHE' Research (iaro.org.nz)

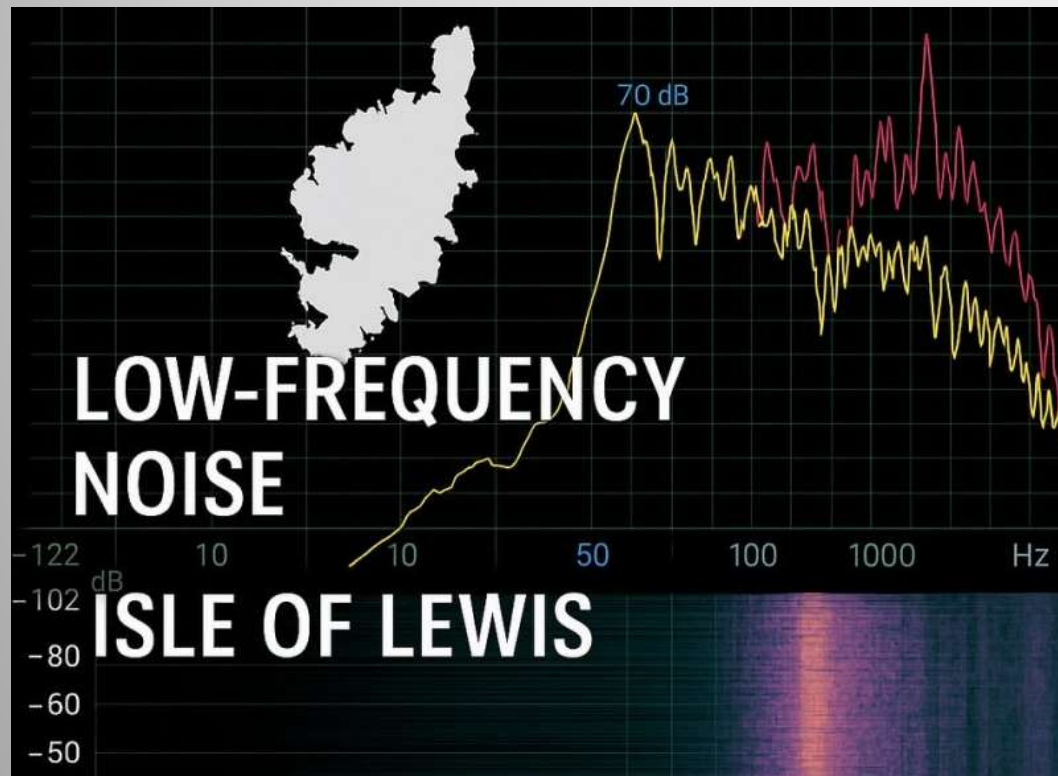


Field recordings: IARO 'CSI-ACHE' Research (iaro.org.nz)

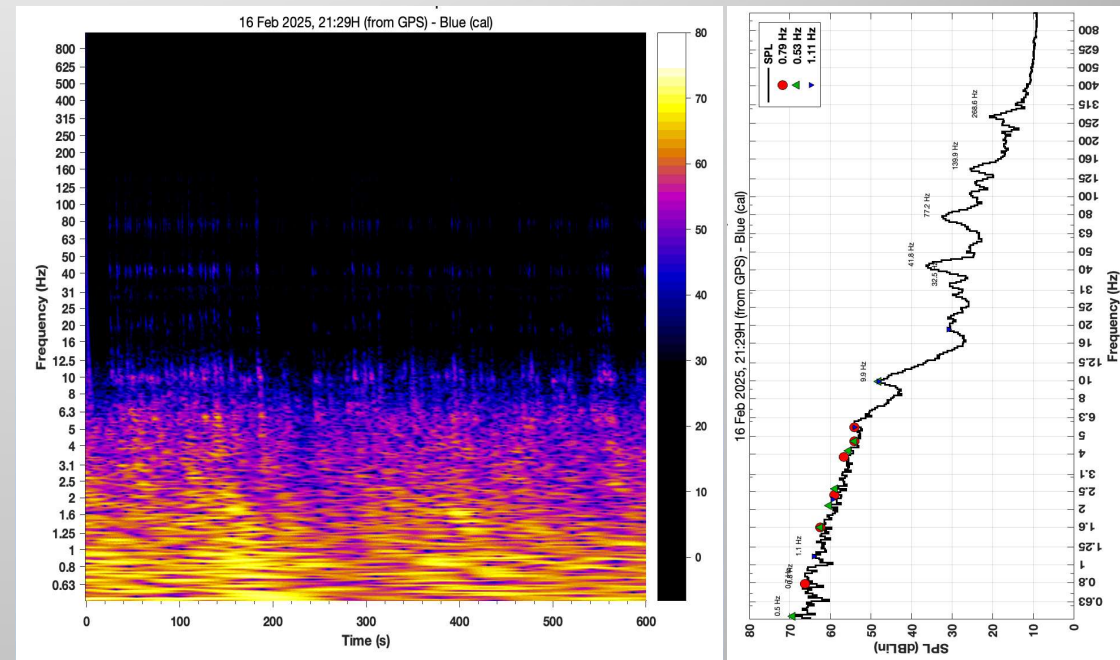


Field recordings: IARO 'CSI-ACHE' (iaro.org.nz)

- Hebridean 'Hum' (Isle of Lewis)



- Natural geophysical phenomenon: Schumann Resonances
 - Geomagnetic disturbance (Solar Activity)
 - Earthquakes



SAM Scribe / SRA Recording System



- Twin channel research grade recorder
- Flat response mics (Primo)
- Sampling rates: 11, 22, 44.1 kHz
- Full spectrum: 0.1 Hz – 20 kHz
- No frequency filters (A, C or G weighting)
- High resolution: 1/36 Octave frequency bands (vs 1/3)



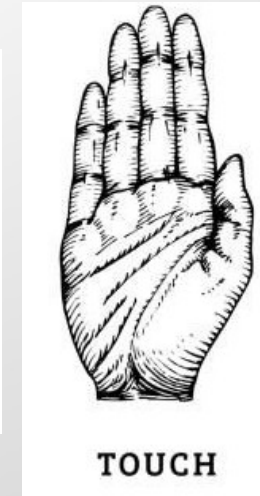
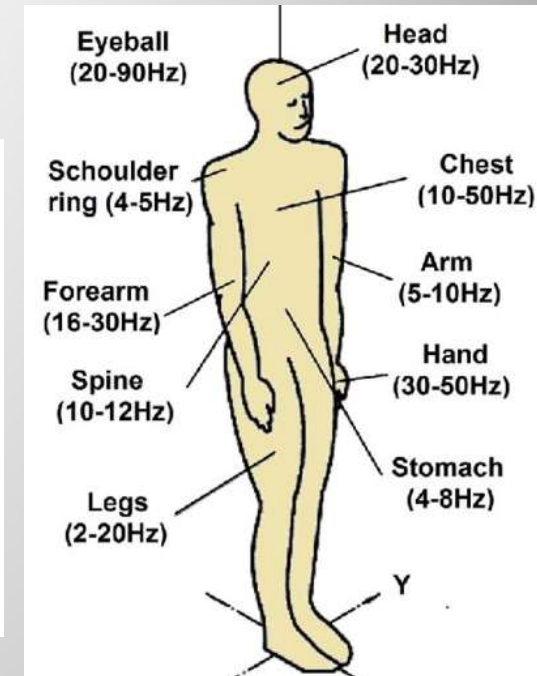


Acoustic Pollution & Human Health Impacts

How do we SENSE sound / vibration ?

- **Hearing**

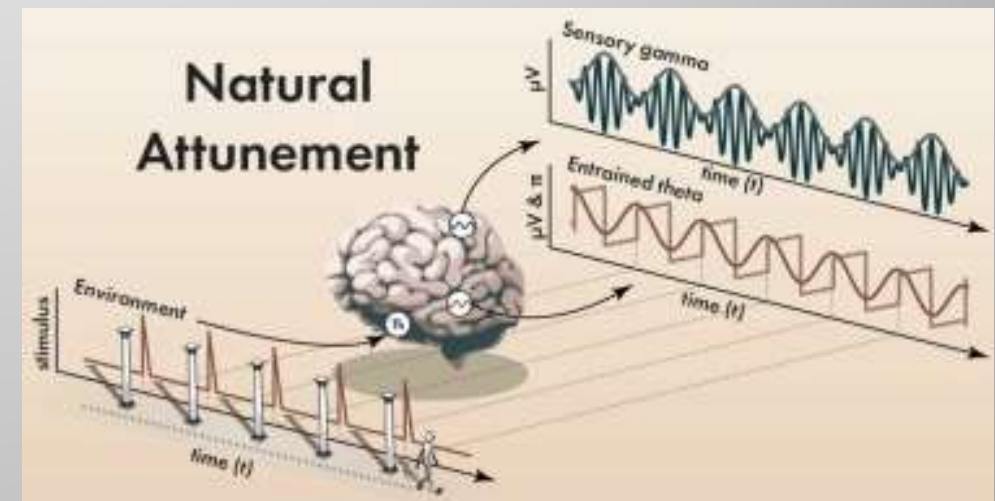
- Ears: Audible sound
- Inner Ear / Vestibular System: Proprioception + spatial awareness



- **Touch**

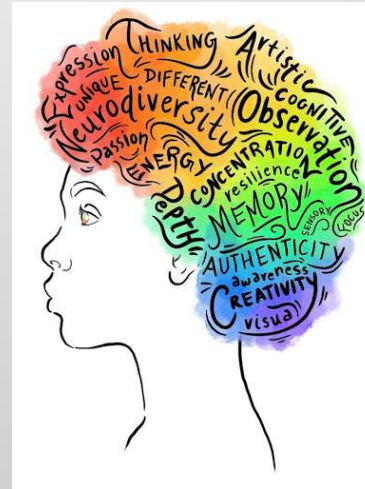
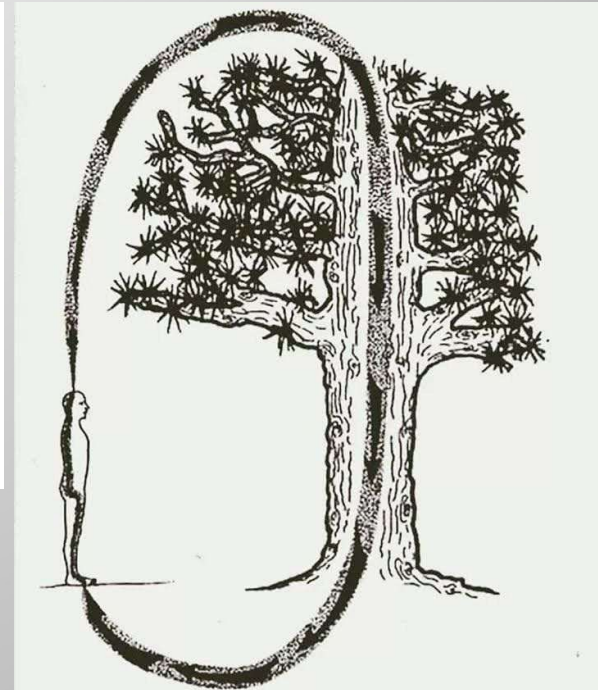
Skin & bones (mechanotransduction; collagen piezoelectric)

- **Entrainment and synchronisation to rhythmic environmental stimuli (System or Information Science perspective)**



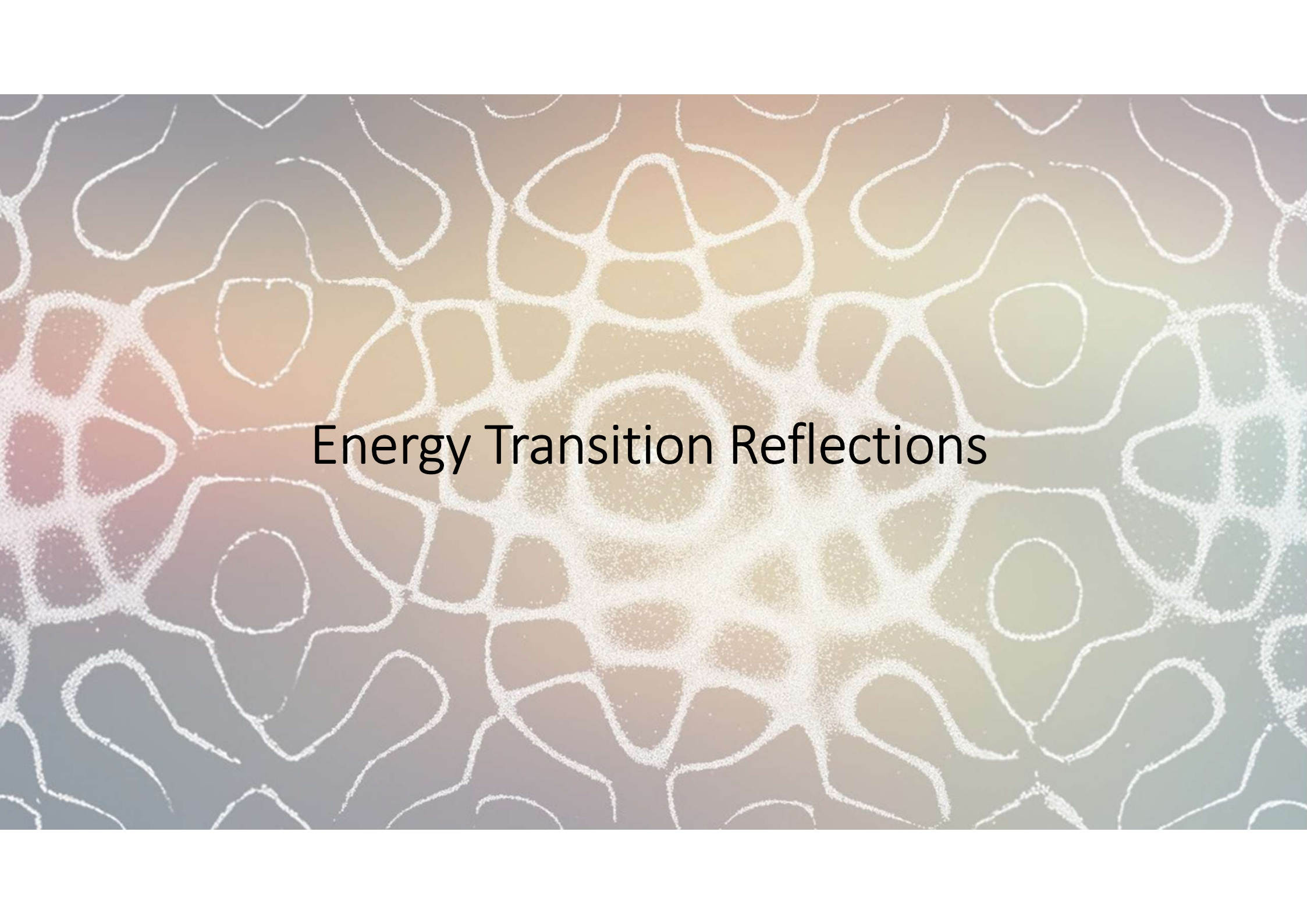
Diversity in Human Constitution

- Aural Diversity
- Neurodiversity
- High Sensory Perception
- Enviro Sensitivity: “how deeply a person registers and processes external stimuli”
 - Personality / preferences
 - Exposure to natural environments
 - Cultivated e.g. Meditator



Environmental Noise Human Health Impacts (WHO, 2018)

- Direct mechanical pathway
 - **Hearing impairment, tinnitus**
- Chronic noise exposure activates a stress response
 - **Mental Health/Psychological Impact:** 'Annoyance' – contributes to mental health conditions (-> diminished work/school performance)
 - **Cardiovascular health:** elevated blood pressure, increased risk of heart disease
 - **Sleep disturbance** (-> fatigue, cognitive impairment)
 - **Cognitive impairment**
 - **Obesity and metabolic effects** (e.g diabetes)
 - **Adverse birth outcomes**



Energy Transition Reflections

Energy Transition Reflections

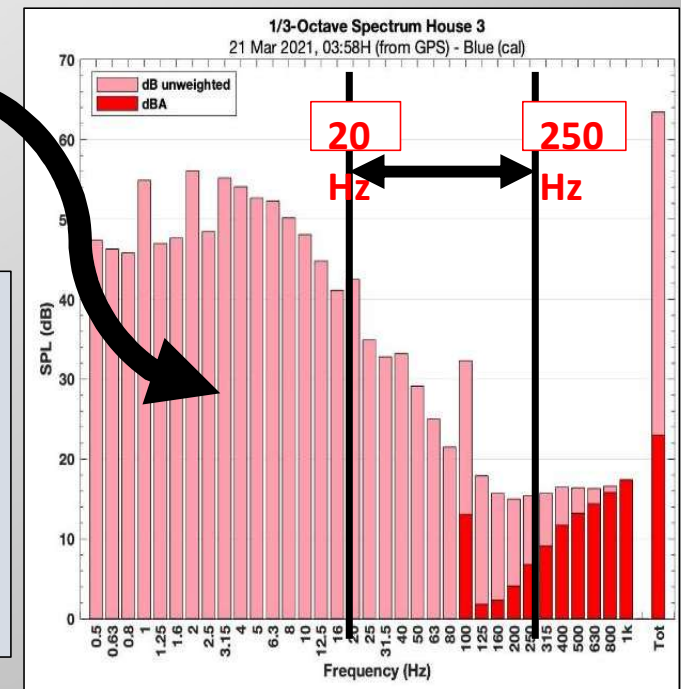
- How does this work explore environmental and energy-related issues that are often **hidden**, **taken for granted**, or **hard to understand**?



Infrasonic
region

RED:
with **dBA filter**

PINK:
no dBA filter



International Acoustics Research Organisation

Energy Transition Reflections

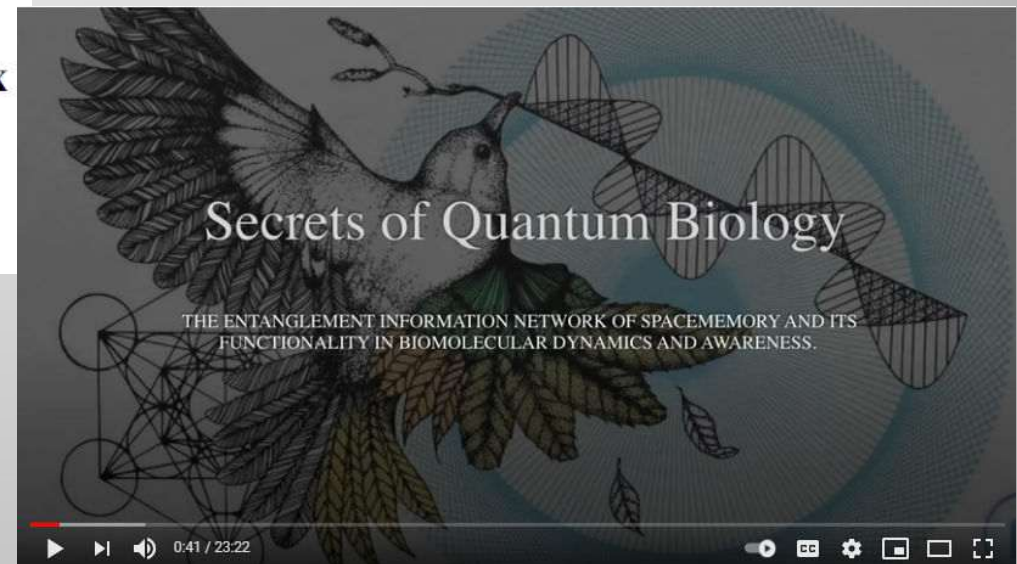
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Nat Hazards (2014) 70:501–525
DOI 10.1007/s11069-013-0827-3

ORIGINAL PAPER

**Infrasound, human health, and adaptation:
an integrative overview of **recondite hazards** in a complex
environment**

Michael A. Persinger



Thank you

lynette@natureharmonics.co.uk

Kathrin Haltiner
Sustainable Shetland



International Acoustics Research Organization