

**International Workshop**  
***“Dreaming and Its Relation to Natural and Pathological  
Alterations of Consciousness”***  
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# **The Dream Catcher Project: Searching for Dreams in EEG**

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# The Dream Catcher

- Thought experiment
- A.Revonsuo / Inner Presence
- Neural correlates of dreaming
- Neurophenomenology





# Theoretical approach

*“The Dream-Catcher Test is the Turing Test for consciousness science. Once the methodology exists that is capable of passing the test, empirical consciousness science will have taken a quantum leap. Passing the test means that the pessimist philosophers who maintain that no amount of brain data can tell anything about consciousness have been decisively defeated. Moreover, philosophers who maintain that the contents of consciousness are externally based and therefore not to be found in the brain, will also have to reconsider their views.”*



## The Other Night

„The new images of the activity of the brain in sleep are beautiful pictures of the night of sleep and of the dream seen from the perspective of this night, but they give no picture of the dream seen as a dream. The better the scientific imaging gets, the clearer it becomes that we will never be able to see the dream in it. No scientist will ever be able to tell what his or her experimental subject dreamed from the images of the brain activity of that subject in sleep“ (8).

(Herschel Farbman, *The Other Night: Dreaming, Writing, and Restlessness in Twentieth-Century Literature*, 2008)



# The (Hard) Problem

Where is the *subjective* (if) within the *objective*?

REM sleep  $\neq$  dreaming

Brain area? ("dream generator")

Frequency?

Synchronization?

**EEG is like eavesdropping a gigapolis  
with a few microphones!**



# My involvement...

## PhD thesis: “Altered States of Consciousness as Virtual Realities”

- Lucid dream content distinction
- Lucid dream online course
- Dream sleep vs. Non-dream sleep





# Experimental setup / EEG

**Location:** UTU Dream Lab

**Paradigm:** Early Night Serial Awakenings (*Noreika et al.*)

**Subjects:** 9

**Awakenings:** lots of...

**Lab nights in total:** lots of...

**A/D Rate:** 2000

**Pass filter:** 0.05 - 100 Hz

**Electrodes:** 19 from 10-20 system, 6 from 10-10 system

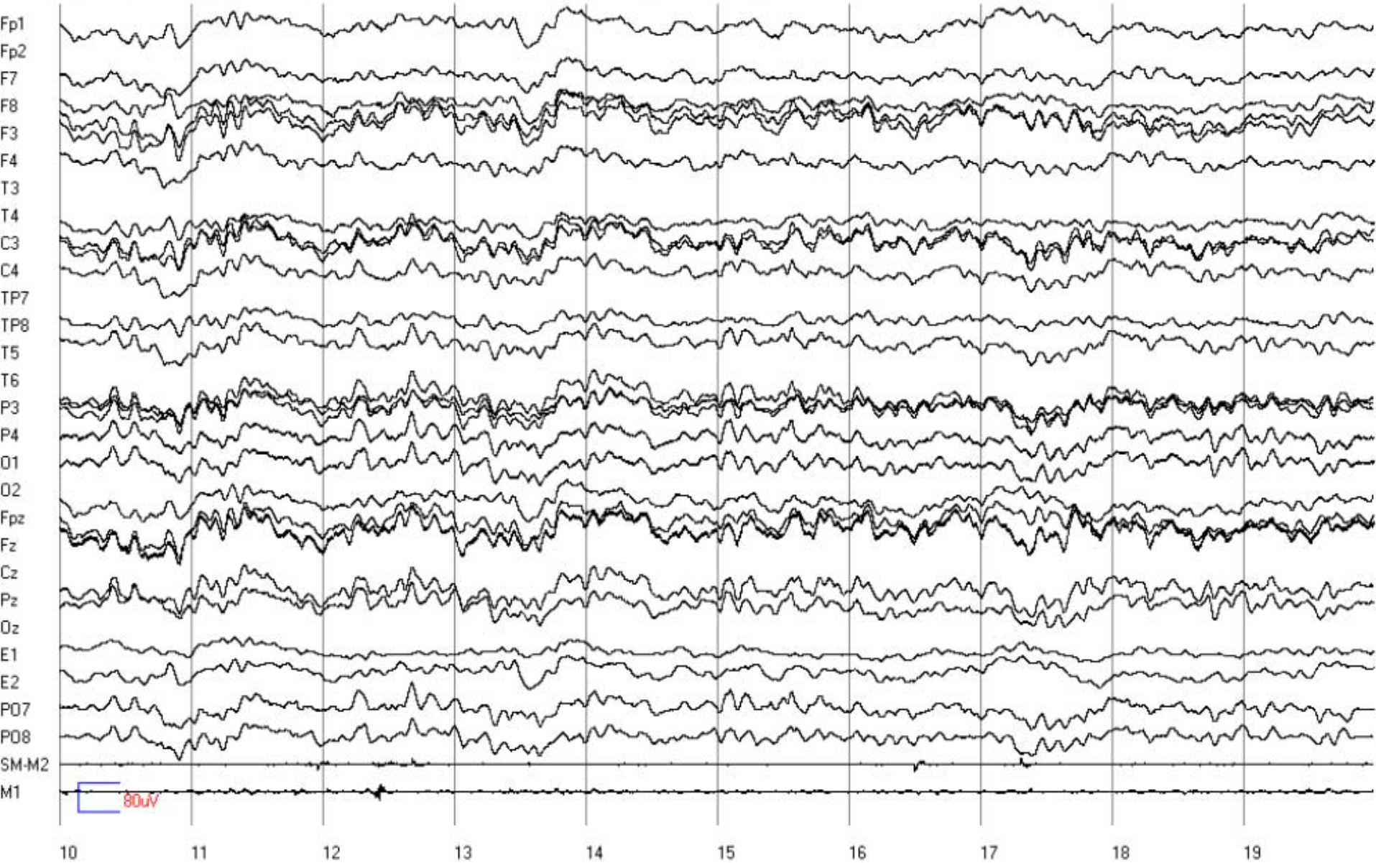
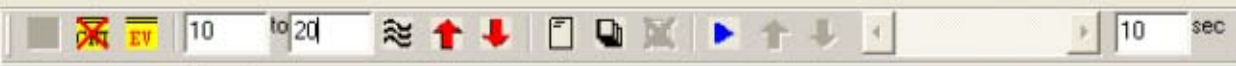
**EOG:** Electrodes E1, E2

**EMG:** on the chin (SM – submental, M1 / M2 – mental)

**Sample duration:** 60s just before awakening

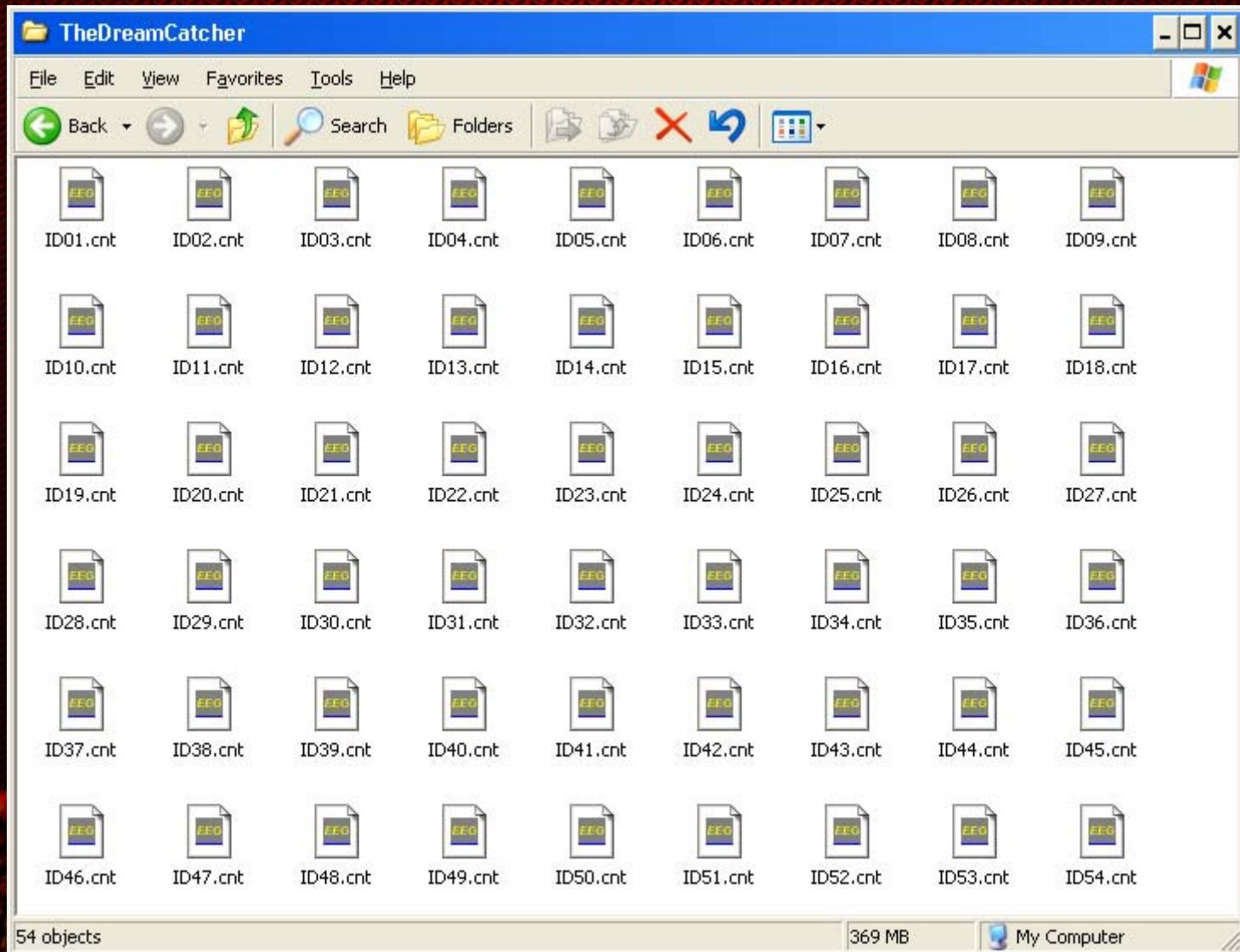
The last 20s epoch before awakening is Stage 2 NREM sleep.







# 54 EEG data sets / 60 sec





# Spectral analysis

M.Oravec, MSc thesis findings

(N = 9)

Bands: delta, theta, alpha, beta & gamma

Pools: frontal, parietal, occipital, central & temporal

Dreaming x band x pool: N/S ( $F_{2,18} = 1.75$ ,  $p = .200$ ).

In dreaming (vs. non-dreaming):

**Beta decrease** ( $F_{2,15} = 9.10$ ,  $p = .003$ )

central ( $t(8) = -4.93$ ,  $p = .001$ )

parietal ( $t(8) = -5.44$ ,  $p = .001$ )

occipital ( $t(8) = -3.66$ ,  $p = .006$ )

(frontal and temporal: N/S)

(hemispheres: N/S)



# Dream Catcher Experiment (2008): 5-step gradual removal of blindness

**Step 1: 54 data sets are provided**

*ID01 ... ID54*

**Step 2: + Pairs of dream and dreamless sleep**

*ID01-P11 ... ID54-P23*

**Step 3: + Subject information**

*ID01-P11-S8 ... ID54-P23-S3*

**Step 4: + Groups of cases within each subject**

*ID01-P11-S8-G03 ... ID54-P23-S3-G16*

**Step 5: + Conditions of data set**

*ID01-P11-S8-G03-C1 ... ID54-P23-S3-G16-C1*



# The V-team

Valdas Noreika

## Method:

Spectral analysis (esp. Beta decrease)

Findings: none (chance level)





# The F-team

Andrew & Alexander Fingelkurts

## Methods:

- a) Composition of EEG oscillations and their temporal characteristics
- b) Local and remote functional connectivity

Findings: none (chance level)





# Why Is There Nothing, Rather Than Something?

$p < 0.05$ : 38+ right •  $p < 0.01$ : 40+ right •  $p < 0.001$ : 44+ right

**The subjective experience of dreaming...**

**... is not in the brain?**

**... is in the brain, but not in EEG?**

**... is in EEG, but not in our data?**

**... is in our data, but needs complex/novel analysis?**

**... *[your guess here]***



# Revival of the DC challenge?

- A public competition?
- Signal analysis teams?
- Novel methods?
- \$\$\$ cash prize?

Data available online:  
[consciousness.utu.fi/dc](http://consciousness.utu.fi/dc)





# Experimental method #1: Neural Networks?

**Neural networks**

**Learnable classification**

**Quantifying some parameters from the data**

**Setting weights with these**

**Training with one half of the samples**

**Testing with the other half of the samples**



# EEG tools: avg\_q

**-avg\_q by Dr. Bernd Feige (Freiburg)**

**A configurable processing queue which consists of a sequence of data reduction 'methods' (algorithms)**

**Each method is applied sequentially to epochs of incoming data, resulting from the previous method**

**54-page manual**



# Experimental method #2: Audiolizing?

**Back to the sci-fi roots of DC!  
Even more experimental!  
(or just playing around?)**

**Could it be possible to detect a difference by  
hearing?**

**Sample range 0.5-12 Hz - infrasound**

- 1) sample multiplication**
- 2) Amplitude Modulation**
- 3) Frequency Modulation**



# Contact (1997)





# Contact (1997)







**Danke!**

**Tack!**

**Tänan!**

**Kiitos!**

**Ačiū!**

**Thank you!**

**Köszönöm!**