

Slide 1 – title

SUMMARY

The workshop aims to begin equipping participants to explore relations between both the material and immaterial through an experimental interface/situation between the earth and psyche, through both the stimulation of the brain and the possibility, should anyone want to develop more, audio outputs generated from the geology of Taipei.

we'll at least be building electronic circuits and hand wind copper coils to:

construct a 'geo-amplifier circuit' to amplify/send any signals inducted from local or found geology for their transduction to the brain to experience any affect from the short circuiting together of brains and geology

Hopefully we'll also explore and share our own ideas of earth-brain relations and phenomena to expand on the themes of the workshop which I'll now talk a little about ...

Slide 2 - Solaris (Tarkovsky ocean slide)

A common reading of Stanislaw Lem's 1961 novel *Solaris* - themes from which this workshop is loosely based on - is that it is about the problem of whether human beings will ever be able to contact or understand other forms of intelligence, and thus somehow transcend the anthropomorphic and anthropocentric mirroring inherent in human cognition as hardwired into human brains.

In the novel, after a century of attempts by the most advanced human scientists to understand the mysterious and sentient ocean-planet, *Solaris*, the results produced only present a chain-reaction of paradoxes. The instruments that the early Solaris scientists take to space to measure the planet's phenomena return to them physically transformed by Solaris; the researchers thus cannot know what it is they have measured, nor whether they themselves are being measured and manipulated by the planet itself.

The book deals with themes of **uncertainty and the limits of human thinking** as we look to cross to find and communicate with other planets but from the limited hard wiring of our cognition. Lem says that *Solaris* presents phenomena that seem to suggest 'a kind of rational activity, but the meaning of this seemingly rational activity of the Solarian Ocean is beyond the reach of human beings'.

Slide 3 - Solaris (Clooney ocean slide)

actually, how humans deal with **uncertainty** is to correlate their experience of the world with some system of conditioned response logic, whether magical, as here in the ritualised mining of black flint, where the stone is made to correspond to systems of both practical and sacred meaning in ways common to many neolithic cultures across the world:

Slides 4, 5, 6 - Grimes Graves (intriguing finds from many of the pits suggest that mysterious rituals accompanied the everyday task of mining, pointing to rituals and ceremonies. Chalk platforms were found, with arrangements of pottery and antler picks. Two highly decorated pots had been placed on one such platform at the base of a shaft, and in another pit seven antler picks were found on a platform. Many mines contained carved balls, chalk cups, phalluses and other objects, which would not have served any practical purpose.)

or more violently as with contemporary science and technology where, for example, the stochastic behaviours of certain minerals are **temporarily** ordered into the niche arrays of our algorithmic computers:

Slides 7, 8, 9, 10 - computer geology, motherboard, decaying computers

but since quantum physics contemporary science has described the world as a source of paradox in which complementary, but contradictory, interpretations of a non-human reality are in abundance.

This struggle with uncertainty has at least revealed the myth that all human and non-human lifeforms are co-ordinated and work together under some self-consistent, determining logic, whether as in magical pre-scientific traditions such as alchemy, animism and religion, or within the logic of any totalising rationalist and positivist science that says it will make a better world (MIT).

When Max Planck said that with quantum physics science has been purged of all its deterministic logic actually the price paid is that in such a newly de-anthropomorphized universe, humans always "confront themselves alone", as Heisenberg observed, and mirror their own image in the self perpetuating technological circuits they enact across the earth. This is the epistemo-ontological problem *Solaris* confronts head on:

Slide 11, 12 – video clips from Solaris re. mirror

The mirror image manifested in our cycles of science and technology reinforce the contemporary human domination of the Earth as our '**planetary laboratory**'. as described by the German philosopher Günther Anders in his 1956 book, *The Outdatedness of the Human Species*.

'**Planetary laboratory**' here means that a form of auto-destructive feedback is played out across the Earth by science and its technologies which subject it to analysis and control to manifest the self-same scientific image of the Earth, such that science both supplies the means of understanding the planet while simultaneously producing its own planetary-wide phenomena for further study and assessment which manifests a gap that has developed between humanity's technologically enhanced capacity to create and destroy and our cognitive ability to imagine what is destroyed.

And so with this mirror image in place it remains extremely problematic whether the seemingly unbridgeable divide between human thinking and other nonhuman or anomalous expressions of the earth or universe will ever produce 'an appropriate widening of our conceptual framework' as Niels Bohr hoped for.

And arguably contemporary science and technology has furthered the alienation of humans from their host planet, the earth, in ways more radical than any previously conceived in human culture - whether we will see the beginning of a dialectical process of a more conceptual horizontalisation in which entities better co-exist or just the end of history where the dominance of our thinking just pushes us down into an enormous abyss, we'll pretty soon find out.

So what we will try and do in this workshop is make a space for aesthetic operations that are removed from the brutality of those dominant technological circuits of our time and try and refocus on earth not as simply a resource but as a **Solaris-like existence** that not only confronts the limits of our thinking, but perhaps directly influences the matter of our thinking in ways we cannot completely understand.

To do this we'll be picking up on a strand of work I and others have been executing on and off over the last few years called **Psychogeophysics**, which is historically derived from the Situationist method of psychogeography.

Slide 13 - Guy Debord Paris map

Psychogeography has been defined as a playful examination of the total effects of geography and place on the individual and Guy Debord, one of the main proponents and theorists of the Situationist International said in 1955 that Psychogeography is 'the study of the precise laws and specific effects of the geographical environment, consciously organized or not, on the emotions and behavior of individuals'.

Slide 14 – Psychogeophysics + Tempelhof

Psychogeophysics extends such research to embrace aspects of geophysics, which is defined as the quantitative observation of the earth's physical properties, and combines them with qualitative interactions with and interventions in local, spectral, and organic ecologies.

Slide 15 Gnu plot (Martin Howse)

so some of the Psychogeophysics project encompasses things like archaeological geophysics

but with the understanding that when executed all measurements and mapping of any previous traces always implies a collision between interpretation (fiction), measurement (science), and from which we can exploit as a critique the gaps in understanding that lie between the two.

Slide 16 - Dōgen Zenji

Slide 17 - Dowsing

In other parts of Psychogeophysics wider cycles beyond the immediacy of the mirroring of the scientific image have been examined with speculative circuits made between the sun, earth and brain and its variants of this kind of experimentation that we will be executing in this workshop.

The first experiment I'd like us to do is the simple method of **dowsing** – dowsing is a divination technique which registers a two-state world of something being present or not present, usually ground water, buried metals or

ores, gemstones, oil, grave sites, shell middens, and other objects and materials without the use of scientific apparatus. Its a useful to collapse the contemporary into the ancient and will be using it on the field trip to try and decide where we will set up the other apparatus we will build today.

STOP to build rods and test (eg. maybe with hidden HDDs outside)

Restart

Slide 18 - Solaris 1968 clip how Solaris influences humans

so for our contemporary brains, computation is an immersive and more or less universal medium.

However, computation is not limited to human intention and performativity, nor languages, and beyond any one layer of execution there are other hidden materialities and production essential for it to execute.

and perhaps as our dowsing experiment has indicated, one other truly universal medium in which all terrestrial things are immersed, is the electromagnetic spectrum as derived from the sun and the earth in combination. And of course its from somewhere within this medium that computational technology is able to act across the social, the environmental, and the brain.

So the device I'm hoping we'll build short-circuits the chains of production that extend between the earth, technology and the brain and helps mirror the extraction-usage-waste cycle that the technology produced by the scientific-image produces.

Slide 19 - Persinger

Its an ad-hoc project extrapolating from neuroscientist (or neurotheologist) **Michael Persinger's** theory that anomalous experiences - such as feeling a spot is haunted by ghosts, or that you've felt the presence of a god or something similar in a special place - are entirely geological, that is from the earth, in their origin. His idea was that its the patterns of electromagnetic interference caused by very weak magnetic fields that play across the brain and that the temporal lobes are the central correlate for such anomalous experiences.

Slide 20 - Persinger building

Persinger is probably best known as being associated with the 'god helmet' as seen here on top of his lab building at Laurentian University. The helmet was supposed to generate complex low intensity weak magnetic fields, approximately a million times weaker than in transcranial magnetic stimulation used to stimulate nerve cells in the brain to improve symptoms of depression.

Slide 21 - DIY Helmet

In an attempt to reverse engineer the helmet from his writing I made a version that was designed to generate field strengths of around 450 nanoTesla (nT).

1 Nanotesla is 0.001 Microtesla and 1 Microtesla is 0.000001 Tesla.

If the magnet in a PA speaker is around 1-2.5 Tesla, the magnetic flux on a neodymium magnet is around 1 Tesla; in comparison 450 nanoTesla is somewhere in the middle of the field strength produced by a toaster at 30cm.

The brain itself produces a field of around 1 picoTesla which is 0.001 Nanotesla

The brain is electro-chemical, and the existence of fundamental commonalities between all human brains by which a similar physical stimulus can affect them is not a new concept. As Persinger says, it is demonstrated daily by the similar shifts in qualitative functions that are evoked by psychotropic drugs.

Just as chemicals change brain states and behaviours, then so can electromagnetism. So in medicine transcranial magnetic stimulation (TMS) pulsed electromagnetic bursts induce electrical currents in the brain that either allow the measurement of the activity and function of specific brain circuits, as in electromyography, or, more experimentally, when pulsed in a repetitive form are used experimental treatment for depression.

These pulses are typically between 1-10 milliTesla (mT), is about the same strength as that of a magnetic resonance imaging (MRI) scan.

However, Persinger believes that its the induction from very low electromagnetic fields that can disrupt a sense of self by interfering with the communication between the cerebral hemispheres and that its these

disturbances that are the likely cause of anomalous experiences, which are, according to him, simply artifacts of temporal lobe function variability.

The suggestion is that this patterning amounts to the potential coding of neuronal aggregates across the two cerebral hemispheres of the brain by weak electromagnetic fields whose intensities are usually less than 1000nT. Other researchers have reported that direct and significant effects upon specific neuro-patterns can be evoked by extremely weak magnetic fields within the range of observable geomagnetic variations, which, for example, changes in melatonin levels observed.

One logical extrapolation to such a neurophysical model of consciousness is that all experiences exist as correlates of complex sequences of electromagnetic patternings that help affect cognition.

Consciousness would then be associated with electromagnetic patterns generated in a neural aggregate with display invariant statistical features and which are independent of the cells contributing to each feature. These sequences might also form highly complex neurocognitive processes that contribute to a sense of self in the aggregation of experiential representations within the brain (cf. binding problem).

Slide 22 – helmet

In my version of Persingers helmet, current from a 9v source is pulsed asynchronously (3ms every 3s) via four 555 timer circuits and driven via mosfet transistors to solenoid coils to create electromagnetic fields in the helmet - a solenoid is a type of electromagnet used to generate a controlled magnetic field. And as I said, each coil is calculated to deliver, through 2cm of skin and skull, a field strength of approximately 450nT to the temporal and occipital lobes, and over time create complex electromagnetic interference patterns.

Slide 23 – Table of telluric current sources

The upshot of the theory is that in perhaps a less dramatic manifestations than for the crew of the space station circling *Solaris*, Earth's 7 billion people and, by default, many of its animals, are programmed or coded by electromagnetic fluctuations within their environment, by subtle changes in

the localised energy fields that they inhabit, the telluric forces and geological energies, all acting as read/write heads and mechanisms of non-linear playback.

Slide 24 – Stone Tape

This was the also the underlying concept of a cult BBC tv play in the UK from the 1970s, The Stone Tape.

Btw. a **telluric current** (from Latin *tellūs*, "earth"), or **Earth current**, is an electric current which moves underground or through the sea. Telluric currents result from both natural causes and human activity, and the discrete currents interact in a complex pattern. The currents are extremely low frequency and travel over large areas at or near the surface of the Earth.

Slide 25 – Persinger sketch of peltier effect causing haunted house

Actually this isn't so surprising and another idea, and one not only coming from Persinger, is that generally geological phenomena, such as tectonic plate movement, have behavioural affects – actually this drawing from Persinger's 1972 PhD thesis shows what he thought could be a geological Peltier effect that caused spots to feel spooky – we had an email discussion about testing the idea using a sandwich of iron/copper ore rocks and manganese sulphide rocks..

Slide 26 – Schematic (MH)

This is the device I'd like us to build together. It attempts to make a vitalist snapshot of a more direct linkage between geology and psyche while acting as some kind of manifesto of the multiple modulations of psyche within a single frame.

Whenever electrons flow through a conducting material, a magnetic field will develop around that conductor. Fields have two measures: a field force and a field flux. The field force is the amount of "push" that a field exerts over a certain distance. The field flux is the total quantity, or effect, of the field through space. Field force and flux are roughly analogous to voltage ("push") and current (flow) through a conductor.

The circuit here is an attempt at a more direct linking of environment to

brain and back to environment in the sense of both programming each other

We'll make simple electrodes for telluric or geologic excitation that is, electrodes to isolate part of the earth's geomagnetically induced electric currents such as telluric currents that are understood as induced near the earth's surface especially by the activity of solar radiation in relation to the earth's magnetosphere. The signal from each electrode will be amplified using an opamp, an operational amplifier - the OP27's are used as non-inverting amplifiers (pin 3 the non-inverting input) so any positive input is amplified as a positive output.

The copper electrodes will be buffered by being placed in porous flower pots filled with copper sulphate gel. This ensures both a stability in temperature and chemical environment to prevent extraneous electrical potential being created between them as noise. It also isolates them from fluctuations in the moisture content of the soil that would also lead to unwanted noise.

The electrodes will then be linked to a differential amplifier the AD620 that will register millivolt differences between the two electrodes to produce an output potential hundreds of times larger. The diffamp will also remove noise between the electrodes.

These three elements make the signal source side for the device. We will make at least 4 lots of these.

The signal will then be connected to a Mosfet, a field effect transistor (IRF640) - it has a silicon oxide layer whose oxidation is controlled by the voltage input and acts either as a switch or voltage amplifier - this then drives the signal to the final part of the apparatus, a headband construction of DIY solenoids made from local rocks wound with thin insulated copper wire, from which a magnetic field will be produced with the local geology modulating the signal before delivery to the brain.

A solenoid is an electromagnet designed to generate a magnetic field and is normally a coil round a fixed ferrite core. Normally a magnetometer is used to measure an environment by looking at changes in induced flux by using such a solenoid however we will pull the signals we have amplified from the earth

into solenoids made with local rocks as their cores so as to modulate or change the final signal that plays across the brain.

Voltage is a differential quantity, which appears between two points. In order to deal only with a voltage (an electrical potential) of a single point, the second point has to be connected to a reference point (ground). Usually, the power supply terminals serve as steady grounds; but here we use a voltage divider circuit, the REF circuit on the schematic, to define a steady virtual ground at -4.5v and +4.5v which does not vary when electrical load is attached.

During construction and testing we'll also test the circuits with a 555 integrated chip voltage controlled oscillator (VCO) which supplies a steady tone controlled by the input voltage – when we connect it to the circuits we will hopefully hear how it changes due to the geological signal inputs.

(Mosfet: Gate opens/closes for electron flow/block passage between the source and drain. Electrons flow from the source terminal towards the drain terminal if influenced by an applied voltage.)