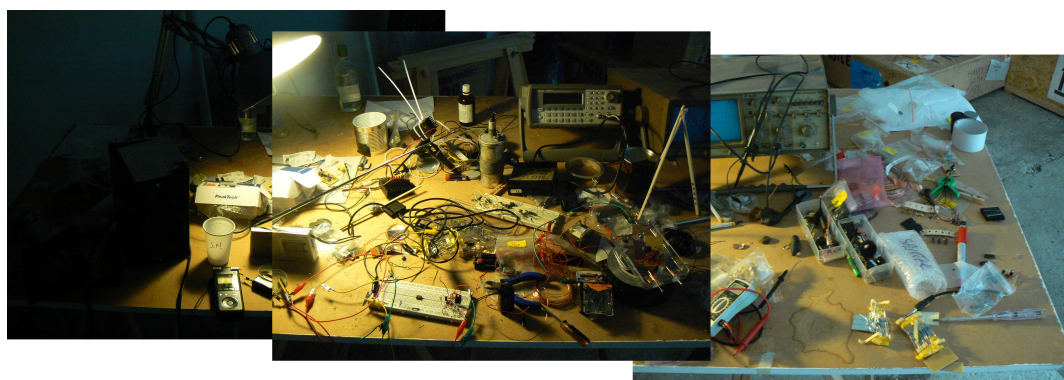


# The Garage Log (May/June 2012)

Martin Howse

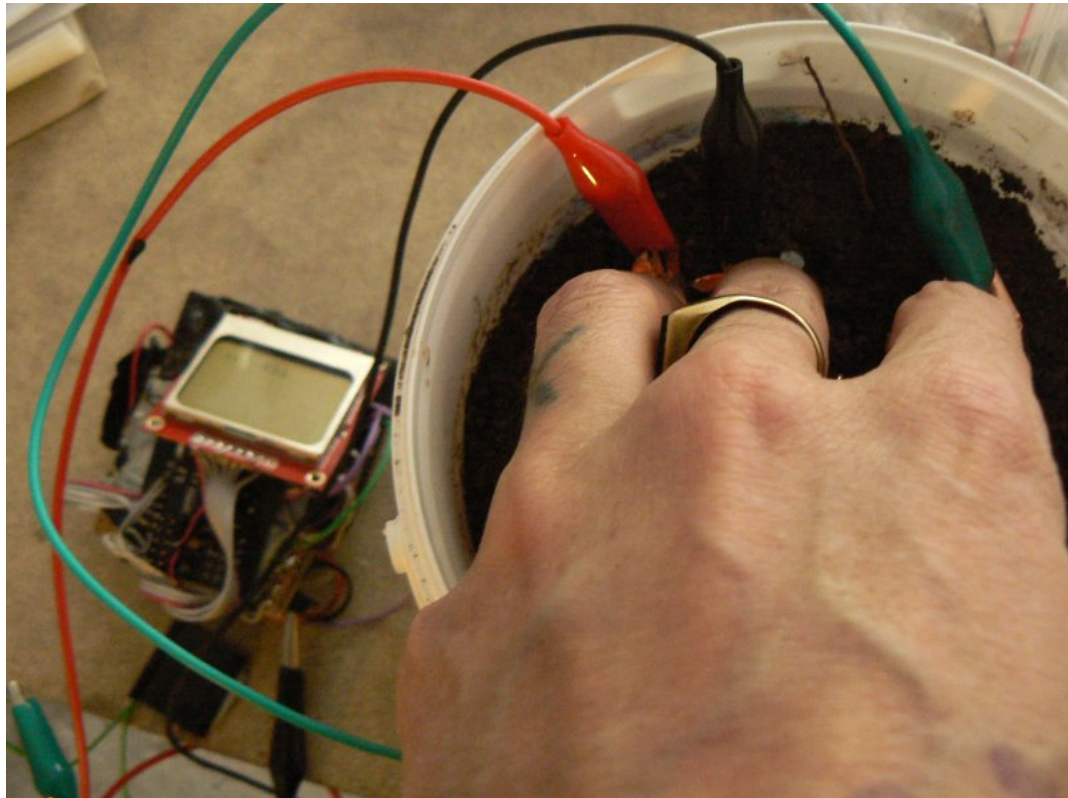
02 July 2012



May 30 2012

[2012-05-30 Wed 18:52] recent earth works

skin;-substrate;-earth



Fixes to hardware and software (for project see details below).

```
/* with Nokia 3310 as output */

/* - notes:
   - 5 pins for NOKIA
   - sce, reset, dc, sdin,sclk
   - 4 pins for bridge (generate/test negative supply for op-amp)
*/

#define F_CPU 12000000UL // 12 MHz

#include <avr/io.h>
#include <stdio.h>
#include <inttypes.h>
#include <avr/delay.h>
```

```

#include <avr/iom8.h>
#include <avr/interrupt.h>

#define byte unsigned char
#define LOW 0
#define HIGH 1
#define LCD_CMD 0
#define LCD_C LOW
#define LCD_D HIGH
#define LCD_X 84
#define LCD_Y 48
#define sbi(var, mask) ((var) |= (uint8_t)(1 << mask))
#define cbi(var, mask) ((var) &= (uint8_t)~(1 << mask))

void LcdWrite(byte dc, byte data);

static const byte ASCII[][5] =
{
    {0x00, 0x00, 0x00, 0x00, 0x00} // 20
    ,{0x00, 0x00, 0x5f, 0x00, 0x00} // 21 !
    ,{0x00, 0x07, 0x00, 0x07, 0x00} // 22 "
    ,{0x14, 0x7f, 0x14, 0x7f, 0x14} // 23 #
    ,{0x24, 0x2a, 0x7f, 0x2a, 0x12} // 24 $
    ,{0x23, 0x13, 0x08, 0x64, 0x62} // 25 %
    ,{0x36, 0x49, 0x55, 0x22, 0x50} // 26 &
    ,{0x00, 0x05, 0x03, 0x00, 0x00} // 27 '
    ,{0x00, 0x1c, 0x22, 0x41, 0x00} // 28 (
    ,{0x00, 0x41, 0x22, 0x1c, 0x00} // 29 )
    ,{0x14, 0x08, 0x3e, 0x08, 0x14} // 2a *
    ,{0x08, 0x08, 0x3e, 0x08, 0x08} // 2b +
    ,{0x00, 0x50, 0x30, 0x00, 0x00} // 2c ,
    ,{0x08, 0x08, 0x08, 0x08, 0x08} // 2d -
    ,{0x00, 0x60, 0x60, 0x00, 0x00} // 2e .
    ,{0x20, 0x10, 0x08, 0x04, 0x02} // 2f /
    ,{0x3e, 0x51, 0x49, 0x45, 0x3e} // 30 0
    ,{0x00, 0x42, 0x7f, 0x40, 0x00} // 31 1
    ,{0x42, 0x61, 0x51, 0x49, 0x46} // 32 2
    ,{0x21, 0x41, 0x45, 0x4b, 0x31} // 33 3
    ,{0x18, 0x14, 0x12, 0x7f, 0x10} // 34 4
    ,{0x27, 0x45, 0x45, 0x45, 0x39} // 35 5
    ,{0x3c, 0x4a, 0x49, 0x49, 0x30} // 36 6
    ,{0x01, 0x71, 0x09, 0x05, 0x03} // 37 7
    ,{0x36, 0x49, 0x49, 0x49, 0x36} // 38 8
    ,{0x06, 0x49, 0x49, 0x29, 0x1e} // 39 9
    ,{0x00, 0x36, 0x36, 0x00, 0x00} // 3a :
    ,{0x00, 0x56, 0x36, 0x00, 0x00} // 3b ;

```

```
, {0x08, 0x14, 0x22, 0x41, 0x00} // 3c <
, {0x14, 0x14, 0x14, 0x14, 0x14} // 3d =
, {0x00, 0x41, 0x22, 0x14, 0x08} // 3e >
, {0x02, 0x01, 0x51, 0x09, 0x06} // 3f ?
, {0x32, 0x49, 0x79, 0x41, 0x3e} // 40 @
, {0x7e, 0x11, 0x11, 0x11, 0x7e} // 41 A
, {0x7f, 0x49, 0x49, 0x49, 0x36} // 42 B
, {0x3e, 0x41, 0x41, 0x41, 0x22} // 43 C
, {0x7f, 0x41, 0x41, 0x22, 0x1c} // 44 D
, {0x7f, 0x49, 0x49, 0x49, 0x41} // 45 E
, {0x7f, 0x09, 0x09, 0x09, 0x01} // 46 F
, {0x3e, 0x41, 0x49, 0x49, 0x7a} // 47 G
, {0x7f, 0x08, 0x08, 0x08, 0x7f} // 48 H
, {0x00, 0x41, 0x7f, 0x41, 0x00} // 49 I
, {0x20, 0x40, 0x41, 0x3f, 0x01} // 4a J
, {0x7f, 0x08, 0x14, 0x22, 0x41} // 4b K
, {0x7f, 0x40, 0x40, 0x40, 0x40} // 4c L
, {0x7f, 0x02, 0x0c, 0x02, 0x7f} // 4d M
, {0x7f, 0x04, 0x08, 0x10, 0x7f} // 4e N
, {0x3e, 0x41, 0x41, 0x41, 0x3e} // 4f O
, {0x7f, 0x09, 0x09, 0x09, 0x06} // 50 P
, {0x3e, 0x41, 0x51, 0x21, 0x5e} // 51 Q
, {0x7f, 0x09, 0x19, 0x29, 0x46} // 52 R
, {0x46, 0x49, 0x49, 0x49, 0x31} // 53 S
, {0x01, 0x01, 0x7f, 0x01, 0x01} // 54 T
, {0x3f, 0x40, 0x40, 0x40, 0x3f} // 55 U
, {0x1f, 0x20, 0x40, 0x20, 0x1f} // 56 V
, {0x3f, 0x40, 0x38, 0x40, 0x3f} // 57 W
, {0x63, 0x14, 0x08, 0x14, 0x63} // 58 X
, {0x07, 0x08, 0x70, 0x08, 0x07} // 59 Y
, {0x61, 0x51, 0x49, 0x45, 0x43} // 5a Z
, {0x00, 0x7f, 0x41, 0x41, 0x00} // 5b [
, {0x02, 0x04, 0x08, 0x10, 0x20} // 5c
, {0x00, 0x41, 0x41, 0x7f, 0x00} // 5d ]
, {0x04, 0x02, 0x01, 0x02, 0x04} // 5e ^
, {0x40, 0x40, 0x40, 0x40, 0x40} // 5f _
, {0x00, 0x01, 0x02, 0x04, 0x00} // 60 ‘
, {0x20, 0x54, 0x54, 0x54, 0x78} // 61 a
, {0x7f, 0x48, 0x44, 0x44, 0x38} // 62 b
, {0x38, 0x44, 0x44, 0x44, 0x20} // 63 c
, {0x38, 0x44, 0x44, 0x48, 0x7f} // 64 d
, {0x38, 0x54, 0x54, 0x54, 0x18} // 65 e
, {0x08, 0x7e, 0x09, 0x01, 0x02} // 66 f
, {0x0c, 0x52, 0x52, 0x52, 0x3e} // 67 g
, {0x7f, 0x08, 0x04, 0x04, 0x78} // 68 h
, {0x00, 0x44, 0x7d, 0x40, 0x00} // 69 i
```

```

        ,{0x20, 0x40, 0x44, 0x3d, 0x00} // 6a j
        ,{0x7f, 0x10, 0x28, 0x44, 0x00} // 6b k
        ,{0x00, 0x41, 0x7f, 0x40, 0x00} // 6c l
        ,{0x7c, 0x04, 0x18, 0x04, 0x78} // 6d m
        ,{0x7c, 0x08, 0x04, 0x04, 0x78} // 6e n
        ,{0x38, 0x44, 0x44, 0x44, 0x38} // 6f o
        ,{0x7c, 0x14, 0x14, 0x14, 0x08} // 70 p
        ,{0x08, 0x14, 0x14, 0x18, 0x7c} // 71 q
        ,{0x7c, 0x08, 0x04, 0x04, 0x08} // 72 r
        ,{0x48, 0x54, 0x54, 0x54, 0x20} // 73 s
        ,{0x04, 0x3f, 0x44, 0x40, 0x20} // 74 t
        ,{0x3c, 0x40, 0x40, 0x20, 0x7c} // 75 u
        ,{0x1c, 0x20, 0x40, 0x20, 0x1c} // 76 v
        ,{0x3c, 0x40, 0x30, 0x40, 0x3c} // 77 w
        ,{0x44, 0x28, 0x10, 0x28, 0x44} // 78 x
        ,{0x0c, 0x50, 0x50, 0x50, 0x3c} // 79 y
        ,{0x44, 0x64, 0x54, 0x4c, 0x44} // 7a z
        ,{0x00, 0x08, 0x36, 0x41, 0x00} // 7b {
        ,{0x00, 0x00, 0x7f, 0x00, 0x00} // 7c |
        ,{0x00, 0x41, 0x36, 0x08, 0x00} // 7d }
        ,{0x10, 0x08, 0x08, 0x10, 0x08} // 7e
        ,{0x78, 0x46, 0x41, 0x46, 0x78} // 7f
    };

void delay(int ms){
    while(ms){
        _delay_ms(0.96);
        ms--;
    }
}

void adc_init(){
    DDRC=0x00; PORTC=0x00;
    unsigned char channel = 0;
    ADMUX=(channel & 0x0f);
    // ADCSRA: ADC Control and Status Register
    // ADPS2..ADPS0: ADC frequency Prescaler Select Bits
    // ADEN: Analog Digital Converter Enable, set this before setting ADSC
    ADCSRA |= (1 << ADPS2) | (1 << ADPS1) | (1 << ADPS0); // Set ADC prescaler to 128
    ADMUX |= (1 << REFS0); // Set ADC reference to AVCC
    // ADMUX |= (1 << ADLAR); // Left adjust ADC result to allow easy 8 bit reading
    ADCSRA |= (1 << ADEN); // Enable ADC
    // ADCSRA |= (1 << ADSC); // Start A2D Conversions
}

unsigned int adcread(short channel){

```

```

    unsigned int ADresult;

    ADMUX = (ADMUX & (unsigned int) 0xf0) | (channel & (unsigned int) 0x0f);
    _delay_ms(10);
    ADCSRA |= (1 << ADSC); // Start A2D Conversions
    while (bit_is_set(ADCSRA, ADSC));
    ADresult = ADCL;
    ADresult |= ((int)ADCH) << 8;
    return(ADresult);
}

void LcdCharacter(char character)
{
    LcdWrite(LCD_D, 0x00);
    for (int index = 0; index < 5; index++)
    {
        LcdWrite(LCD_D, ASCII[character - 0x20][index]);
    }
    LcdWrite(LCD_D, 0x00);
}

void LcdClear(void)
{
    for (int index = 0; index < LCD_X * LCD_Y / 8; index++)
    {
        LcdWrite(LCD_D, 0x00);
    }
}

void LcdString(char *characters)
{
    while (*characters)
    {
        LcdCharacter(*characters++);
    }
}

void LcdWrite(byte dc, byte data)
{
    int x;
    if (dc==LOW) cbi(PORTD,5);
    else sbi(PORTD,5);
    cbi(PORTD, 0);
    // shiftOut(PIN_SDIN, PIN_SCLK, MSBFIRST, data);
    for (x=7;x>=0;x--){

```

```

        //      MSB first
        if (((data>>x)&1)==0) cbi(PORTD,6);
        else sbi(PORTD,6);
        sbi(PORTD,7);      // toggle pin 7 SCLK
        cbi(PORTD,7);
    }

    sbi(PORTD, 0);
}

void LcdInitialise(void)
{
    DDRD=0xE3; // SCE as d0, RESET as d1, DC as d5, SDIN as d6, SCLK as d7 - all outs
    DDRC=0x0E; // TODO add pc1/2/3 as charge pump
    cbi(PORTD, 1);
    sbi(PORTD, 1);

    LcdWrite( LCD_CMD, 0x21 ); // LCD Extended Commands.
    LcdWrite( LCD_CMD, 0xBf ); // Set LCD Vop (Contrast). //B1
    LcdWrite( LCD_CMD, 0x04 ); // Set Temp coefficient. //0x04
    LcdWrite( LCD_CMD, 0x14 ); // LCD bias mode 1:48. //0x13
    LcdWrite( LCD_CMD, 0x0C ); // LCD in normal mode. 0x0d for inverse

    LcdWrite(LCD_C, 0x20);
    LcdWrite(LCD_C, 0x0C);
}

int main(){

    int x,y,z,adc,oldlenny,lenny=0,index,count=0;
    unsigned char mybuffer[16];
    // init

    adc_init();
    LcdInitialise();
    LcdClear();

    // pins for 2 bridges +- = PB0-PB3

    DDRB=0x0F;

    /* port rest of soil testing - flip/sample/display */

    while(1){

```

```

// pulse for one second:

for (index=0;index<137;index++){
    sbi(PORTB,1); cbi(PORTB,0);
    _delay_ms(3.64); // 137 Hz
    cbi(PORTB,1); sbi(PORTB,0);
    _delay_ms(3.64); // 137 Hz
}

// readings

for (index=0;index<32;index++){
    sbi(PORTB,1); cbi(PORTB,0);
    _delay_ms(3.64); // 137 Hz
    x = adcread(0);
    cbi(PORTB,1); sbi(PORTB,0);
    _delay_ms(3.64); // 137 Hz
    y = adcread(0);
    if (x>y) adc+=x-y;
    if (x<y) adc+=y-x;
}

z=adc/16;

for (index = 0; index < 504-(lenny*7); index++)
{
    LcdWrite(LCD_D, 0x00);
}

oldlenny=lenny;
lenny=sprintf(mybuffer,"xx: %d    ",z);
LcdString(mybuffer);

adc=0;
count=0;
// pause also for one second
delay(1000);
}

```

#### summary of detection

- voltage difference/high impedance measurement using one op amp (input to +, feedback - to out)
- moisture/resistance (to an impulse): 555/40106

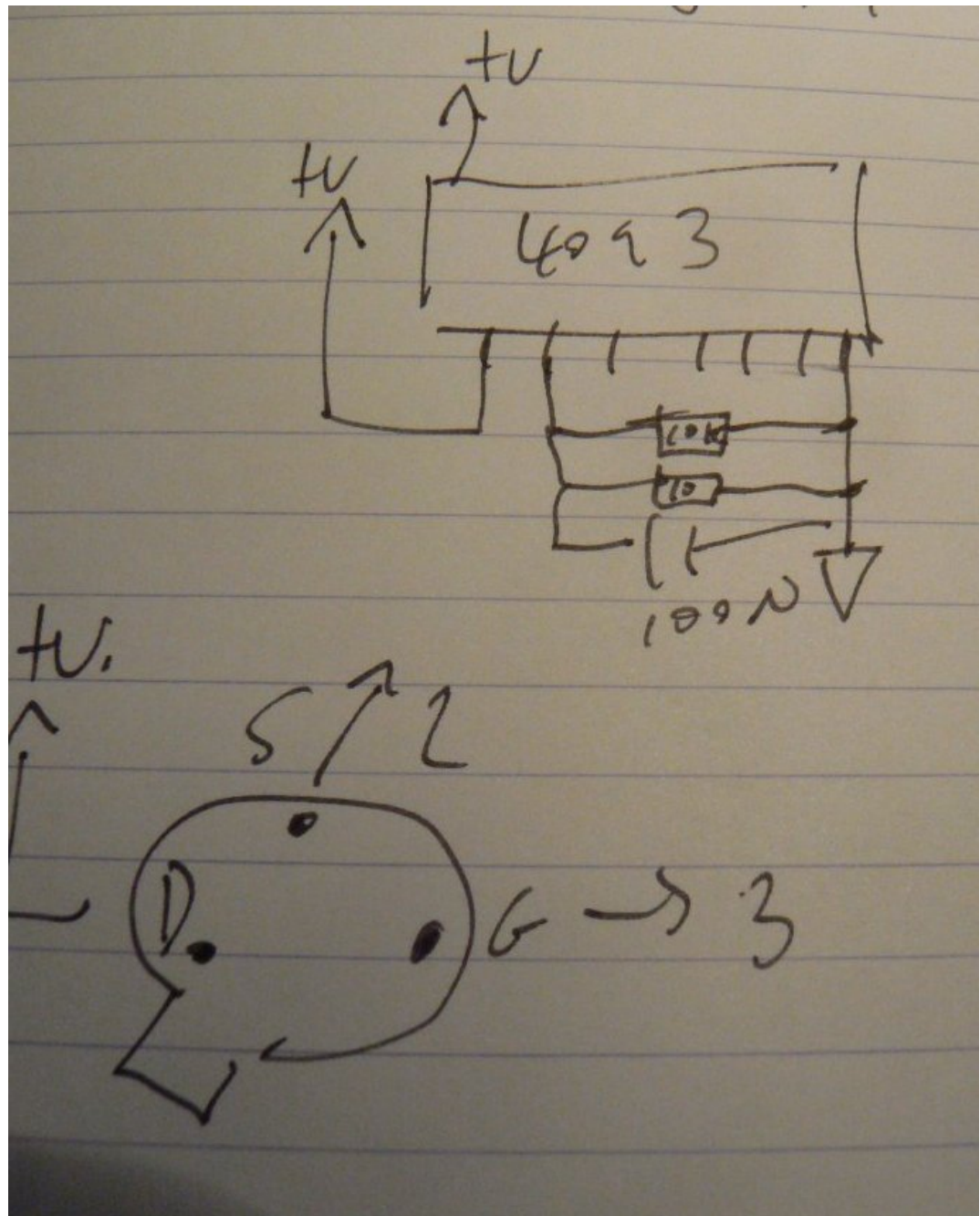
references:



<http://www.arduino.cc/cgi-bin/yabb2/YaBB.pl?num=1255471714/all>  
<http://www.arduino.cc/cgi-bin/yabb2/YaBB.pl?num=1241791578/0>

- temperature (ds1820 ref: <http://www.psychogeophysics.org/wiki/doku.php?id=walkerlog#december5>)

and/or IR sensor LHI 968 as follows:



- embedded piezo crystals
- earthboot audio code in:

/root/collect2012/earth/earthcode/earthboot/LUFA\_091223/Demos/Device/LowLevel/VirtualSerial

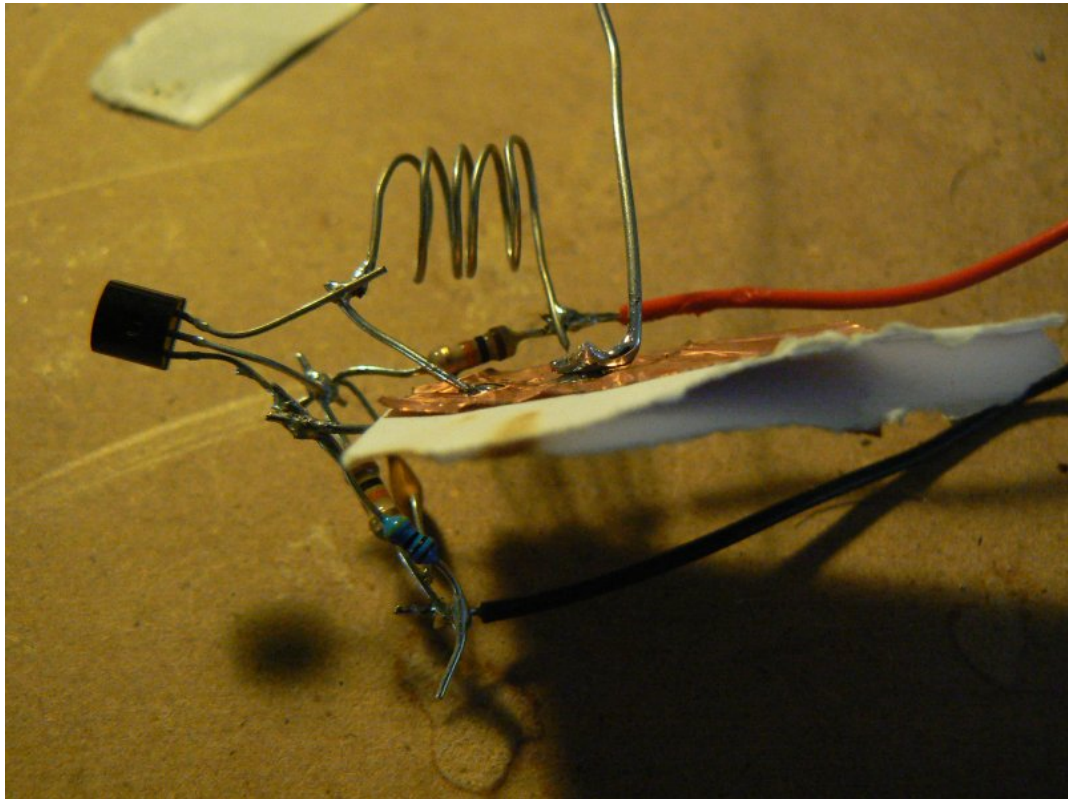
- capacitance/radio transmission

#### and of earth excitations

- electrochemical (impulses)
- chemical, liquid
- heat
- movement, disturbance
- earthworms, creatures, micro-organisms, mycelium intervention

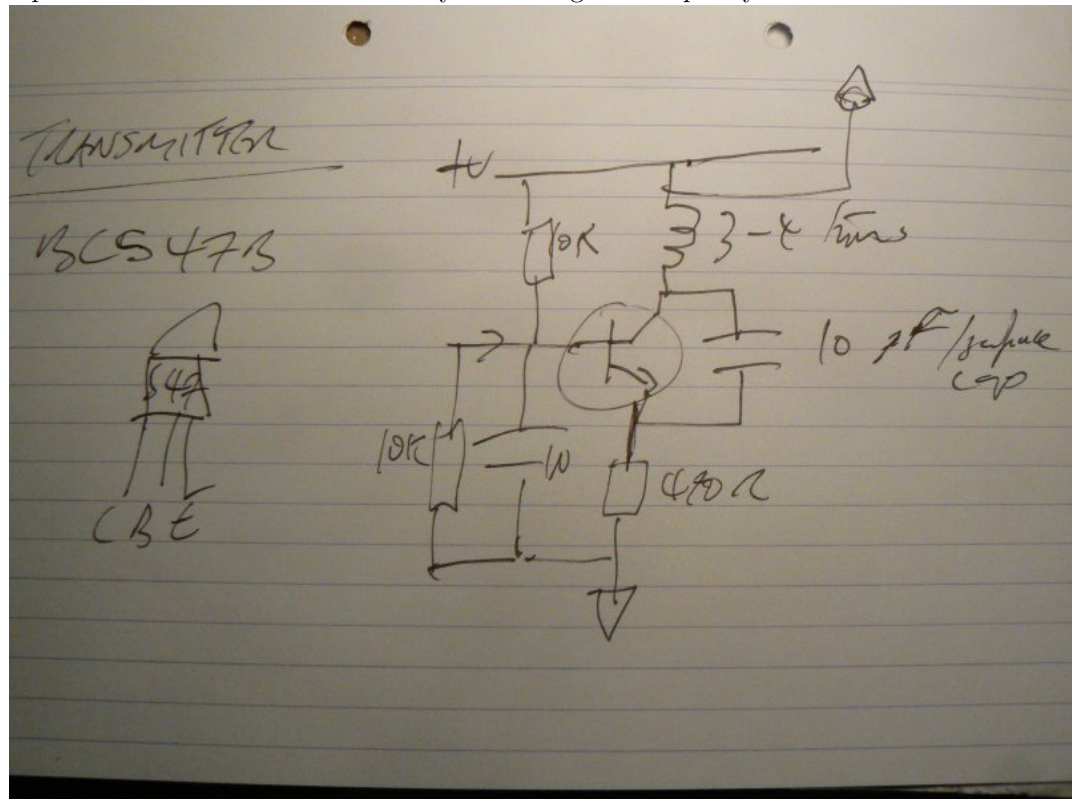
[2012-05-30 Wed 18:10] surface playback

further modification of the transmitter/scratcher

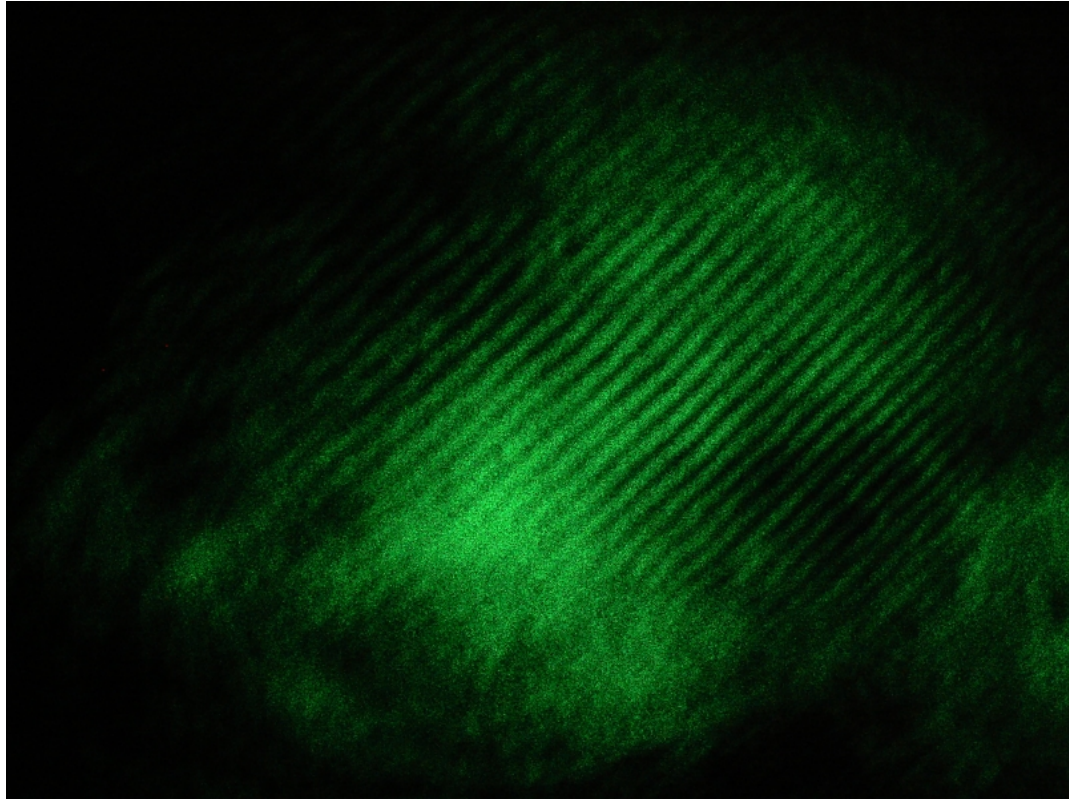


Now using some kind of capacitive pickup; replacing the 10pF capacitor across the collector and emitter of the classic Kogawa-one-transistor-transmitter with a piece of copper and a piece of copper tape separated by thin paper. The

tape is free to move and vibrate and a needle can be soldered here to act as pickup. Vibrations are translated directly into changes in frequency:



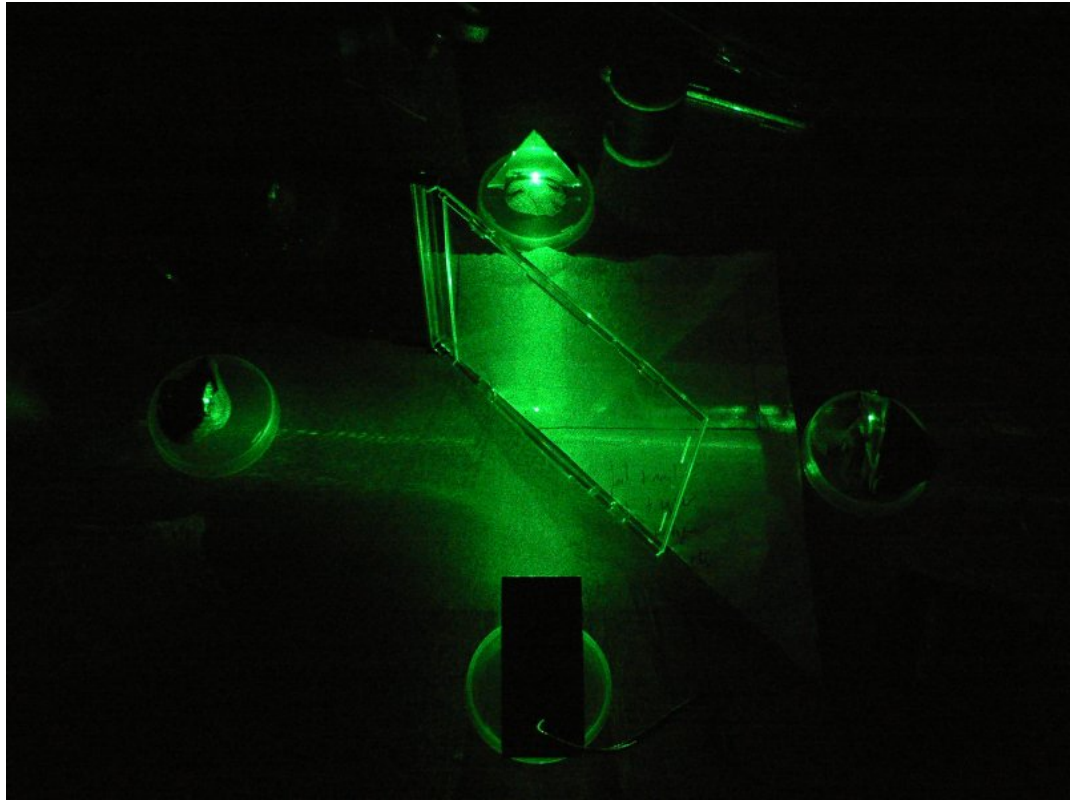
laser/optical interferometer



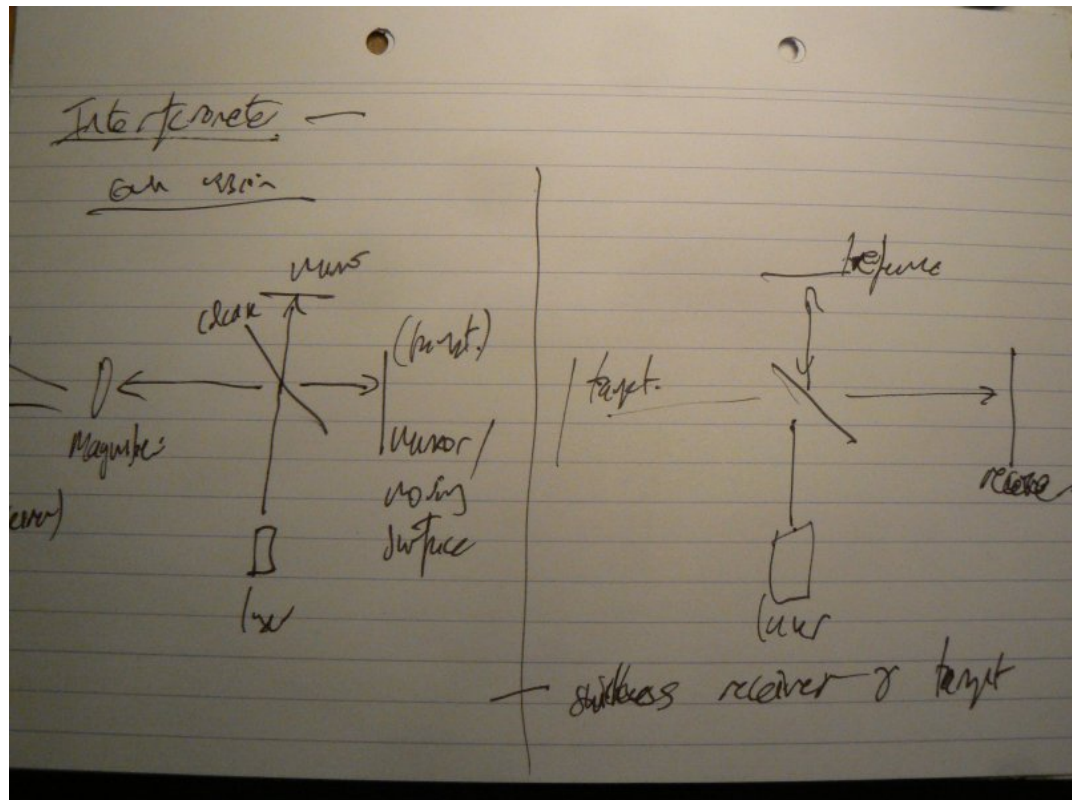
As first part of further investigations into the potential optical playback of surfaces, and following the Michaelson-Morley model (and simple video at: [http://www.metacafe.com/watch/1381543/laser\\_interferometer\\_homemade\\_for\\_20/](http://www.metacafe.com/watch/1381543/laser_interferometer_homemade_for_20/))

With setup visible as follows and interference patterns projected with a simple magnifying/objective lens after careful alignment of beams:





(laser at bottom, mirrors held in clay to top and right, lens to left projecting on the wall)



## software

Following Will Schrimshaw's <http://willschrimshaw.net/strct/geo-traumatic-resonance-research/>

```
#!/usr/local/bin/python
```

```
# convert to greyscale with :
```

```
# convert -colorspace gray test.jpg testout.jpg
```

```
# or see HOWTO for script
```

```
import sys
import Image
import wave
import struct
```

```
arg = sys.argv[1]
im = Image.open(arg) # read file path specified in argument
dimensions = im.size
```

```

row = []
x=0

filt=arg+".wav"
wav_output = wave.open(filt, 'w')
wav_output.setparams((1, 1, 44100, 0, 'NONE', 'not compressed'))

for y in range(dimensions[1]): # for number of horizontal rows in image ...
    pixles = ''
    values = []
    for x in range(dimensions[0]):
        pixval = im.getpixel((x,y))

#         val = (pixval[0]*pixval[1]*pixval[2])%32768 # should be from -32768 to 32768
        val=pixval*128 # for greyscale
        packed_value = struct.pack('h', val)
        values.append(packed_value)
    pixles=''.join(values)
    wav_output.writeframes(pixles)

wav_output.close()

```

### summary

Of surface works:

- variations on interferometer (including simple laser reflection from surface)
- speckles (following C.L Stong: Scientific American February 1972)
- imaging/scanning/photographic/digital/rubbings
- ultrasonics (wavelength at 40 KHz =8.6mm?)
- needle/pickup - piezo(also cushioned in film canister with foam), electro-magnetic, capacitative
- microwave?

## May 31

- some success with simple laser reflection microphone with small panel clay-stuck to front of laser
- how to drive laser(find page, regulator) and use photodiode array from CDROMs?



- started rochelle salt crystals with 350g water and 455g rochelle salt. heating in bath of warm water and stirring, then removed with lid on to cool. also poured off some diluted salt into dish for seeding

(should have added pinch of salt to cooled solution but done now on 1 June)

- note: need motor drivers for slow scan device (using mega168 arduino so pay attention to arduino.conf)

TODO: fungal exp (container, data/audio CD/DVD material) DONE, piezo-laser movement (growing), find and document CDROM test/audio points

## 1 June

- added pinch salt to saturated solution and shake (leave now for 2-3 days and shake twice a day)

further:

After 2-3 days unscrew the lid and carefully pour off the clear solution into your saucepan, try and pour off all the water leaving behind the crystal sludge, as I call it, at the bottom. Scrape out all the crystal sludge, and leave it on a saucer or whatever to dry, once it has dried all the small crystals can be crushed back into powder and used again another time. Now originally we used 200g of water and so checking the [B] quantity in the recipe, we find that for Alum we need 4g per 100g of water - so we need to measure out 8g. This we add to the clear solution already in the saucepan and heat it gently as before until all the Alum has dissolved. Wash out the jar with hot water, to clean and warm it. Then pour the hot solution into it and screw the lid on. Now as the solution cools down the extra salt that was just added remains dissolved in the water, this is now a super-saturated solution and is our growing solution. While waiting for it to cool, the seed can be prepared. Tie a slip knot around your chosen seed. Get the circle of card you cut out earlier and push the other end of the thread through the small hole in the centre so that the crystal is now dangling below the card. You will need to adjust the length so that as before the crystal is about 2cm above the bottom of the jar, once you've got the right length tape the thread on top of the card to stop it moving, and cut off any excess. Once the solution has cooled down so its barely warm, unscrew the lid and lower the crystal into the jar, try and keep it in the centre so not touching the sides. The circle of card will now sit on the top rim of the jar, and if you've got the length right the crystal will be sitting 2cm or so above the bottom

from:

<http://www.brew-wood.co.uk/crystals/methods.htm#sealed>

- for laser driver we need 10 OHM resistor
- build own photodiode array (failed on recycle)

- nearly completed scanner device but need working arduino, also works perhaps better with PWM on ENABLE

ref: <http://www.me.umn.edu/courses/me2011/arduino/technotes/dcmotors/L293/L293.html>

- fungal DVD/CDs: 3 pots with agartine at bottom (dissolved in 200ml water) and CD/DVD at top facing down (to be sprayed regularly). CDs: ISLAND-xxxxx, blank, SALO DVD

testing GA1A2S100SS light sensor. facing pins are 1,2,3=VCC, GND, OUT (responds well to laser reflection). maybe decouple for noise?

## 4 June

- agartine not setting but damp enough. one dryer one sprayed
- crystals hard on bottom of jar. pouring off liquid and dissolving rest of packet of rochelle salt (maybe 40g). seed crystal attached to thread in this one
- laser driver with CDROM salvaged lasers and LM317 following:

<http://www.rog8811.com/laserdriver.htm>  
but no luck with 2 salvaged lasers

- slow scan: seperate motor supply Vcc on pin 18 of l293ne, capacitor on arduino/atmega8 power supply
- revisiting:

```
python surface2.py > ~/pipe
```

which is working with top 3 rows of pixels

```
play -t raw -r 44100 -u -b -c 1 ~/pipe
```

again to test =

```
mplayer tv:// -tv driver=v4l2:width=640:height=480
```

[TODO: test with interferometer setup]

## 5 June

- finished slow scan. add in GA1A2S100SS light sensor. facing pins are 1,2,3=VCC, GND, OUT
- for earth voltage measurements we need to be able to cope with +- and log these with mega32u4/laptop or SD setup!
- ADC advice for high imp. input=

slow down the ADC, read say 10 values and average, DIDR0 to disable digital inputs, put a greater capacitor on ADC input (say 100nF) reduces imp

- CDROM (green to GND for psu)

## 6 June

### working on earthboot device/VirtualSerial/ for use with telluric measurement

1-(to program with dfu first reset nearest USB connector and then release further reset)

2- using code in:

~/collect2011/psych/crystalworld/earthcode/earthboot/LUFA\_091223/Demos/Device/LowLevel/VirtualSerial

3- no need to set baud/speed of /dev/ttyACM0

4- what exactly is measuring?

as when short we get 1016, with fingers across close to 512

- this is as is 2s compliment and we need to do:

```
if (adc > 0x1ff) {
    conv = adc - 0x3ff;
} else {
    conv = adc;
}
calc_volts = conv*AREF/512
```

[but note that sprintf doesn't handle the float and prints as question mark]

(to print float see: <http://www.arduino.cc/cgi-bin/yabb2/YaBB.pl?num=1164927646>)

)

tested with 1x amplification (also as we lose precision for 200x) and testing batteries we read close to multimeter

5- could change earthboot (for 8 bit we set ADLAR and read ADCH)

6- so now decide to use elektor diff amp scheme as input

## **further**

- burnt out GA1A with laser. now using other light amo

to test piezo speaker with “voltage amplifier” - try with larger

- mirror tonoscope ref:

<http://www.jstor.org/discover/10.2307/1415605?uid=3737864&uid=2129&uid=2&uid=70&uid=4&sid=56237>

- ideas:

latent image, alpha particles/magnetic field and photographic film,  
Photomagnetism and prussian blue family

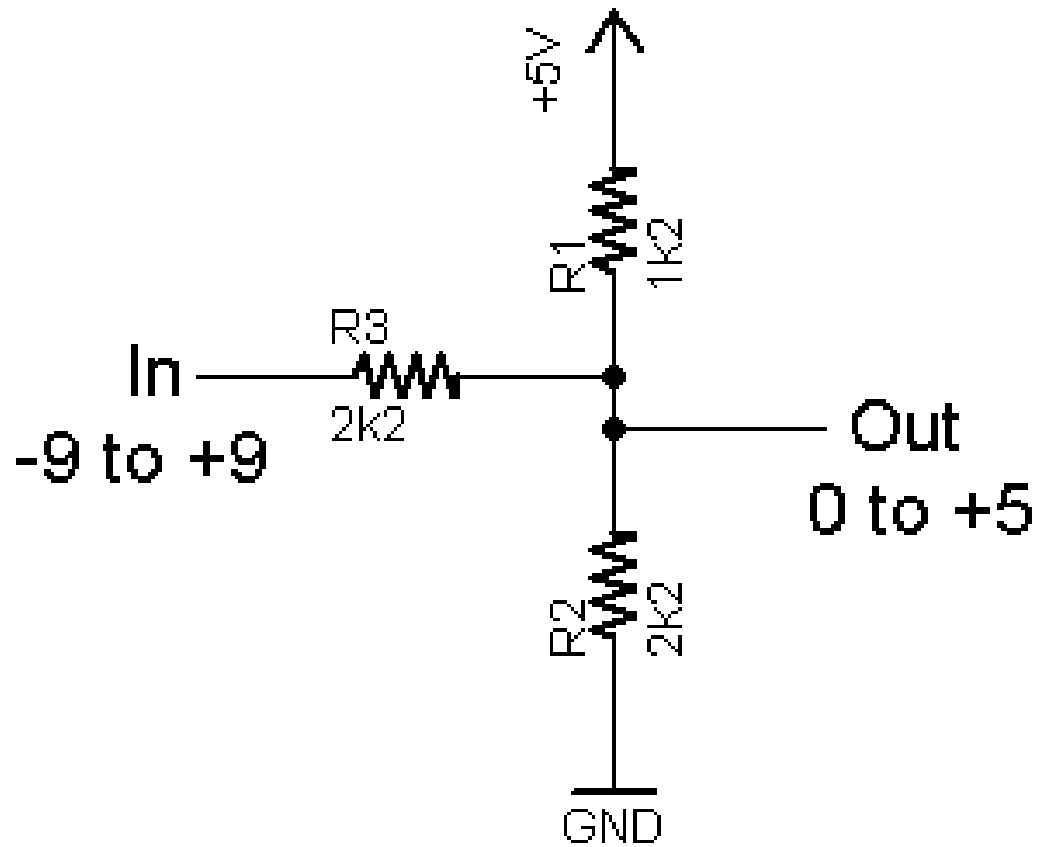
- working on diana image process in:

```
~/collect2012/diana/paris22may/imagebw
:wav_output.setparams((1, 2, 44100, 0, 'NONE', 'not compressed'))
samplewidth was wrong (as should be 2)!
```

## **7 June**

### **earth measurement device**

- differential amp with 1M amp on end stage
- powered from 5v earthboot. 6 pin connector from closest to point=  
GND,POWER,ADC5,4,1,0

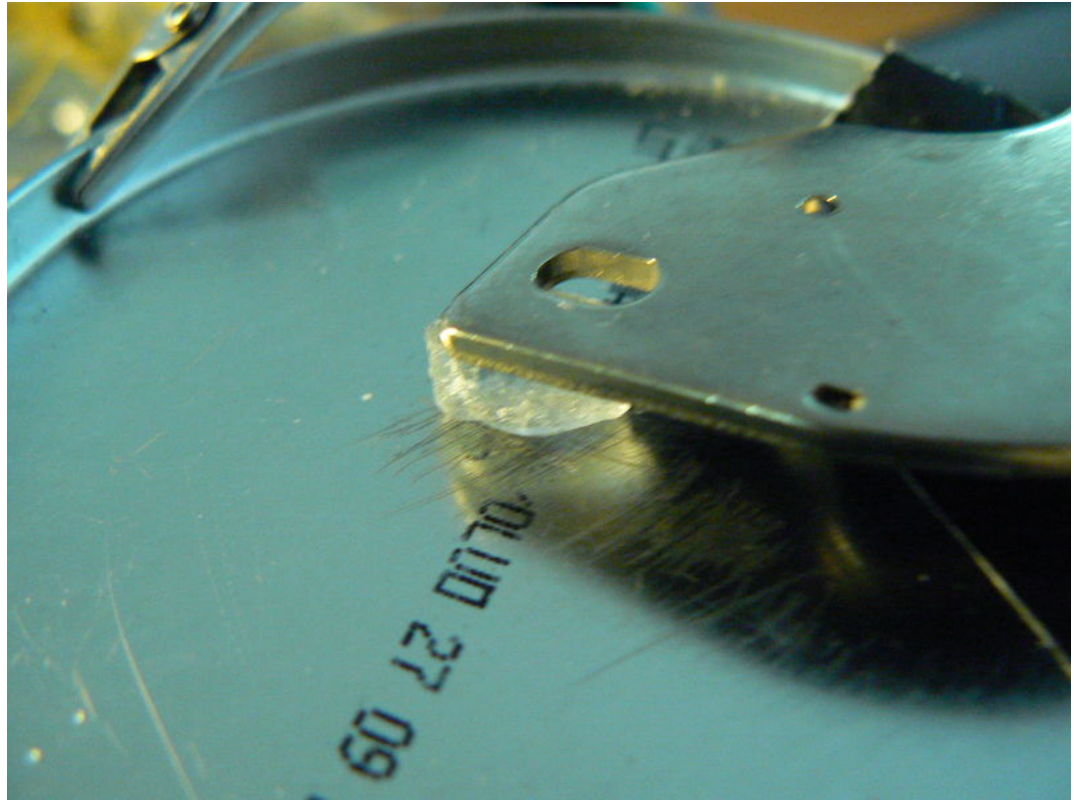


2k  $\Omega$  divider (top 1k/bottom 2k)  $\rightarrow$  ADC

- recode just for ADC0 input (so no 2s comp)
- ADC0 working fine (tested) but signal from diff amp makes no sense (perhaps as designed only for AC)

piezo/rochelle





- some success with piezo/rochelle speaker driving signal through 3W amplifier and then through transformer

[transformer wired with input on smallest marked resistance (smallest coil) and output on widest output (largest coil) - outputs around 250 V AC]

also to note that from upwards of 30Hz transformer operates but is also transmitting signal (so what we heard on solar cell or with ultrasonics is transmission).

still no movement of laser

last attempt with ignition coil (after same amp): 93.wav recorded with 40 Hz signal (100mV or less) - so some movement at low frequencies (but amplifier seems to have stopped working)

also seems to work fine with larger crystals

## laser experiments



with double-lens/widener and film strip (larger format) in front - large scale moving scatter/interference patterns responding to very small movements  
scanning not so successful (tracks?)

## op-amps exp. towards understanding earthboot

- using op07 in diff amp config and single supply (with +input to divider)  
we measure 3.75v as difference/output with no voltage diff on input

battery power is exactly 7.6 - so around half - which is midpoint of battery = 0v

attempting measure different battery we get 2.78 or 4.83v (around 1v from midpoint)

if we ground our multimeter to the midpoint (divider on pin 3) we get 0v and then we measure -0.67 - 0.69 from battery (with meter=1.37) which is around half



## 8 June

earthboot

try:

galvanometer (wire coil, adapted cdrom)

(and some way of recordings: photographic film)

An instrumentation (or instrumentational) amplifier is a type of differential amplifier that has been outfitted with input buffers

(examples: ad620)

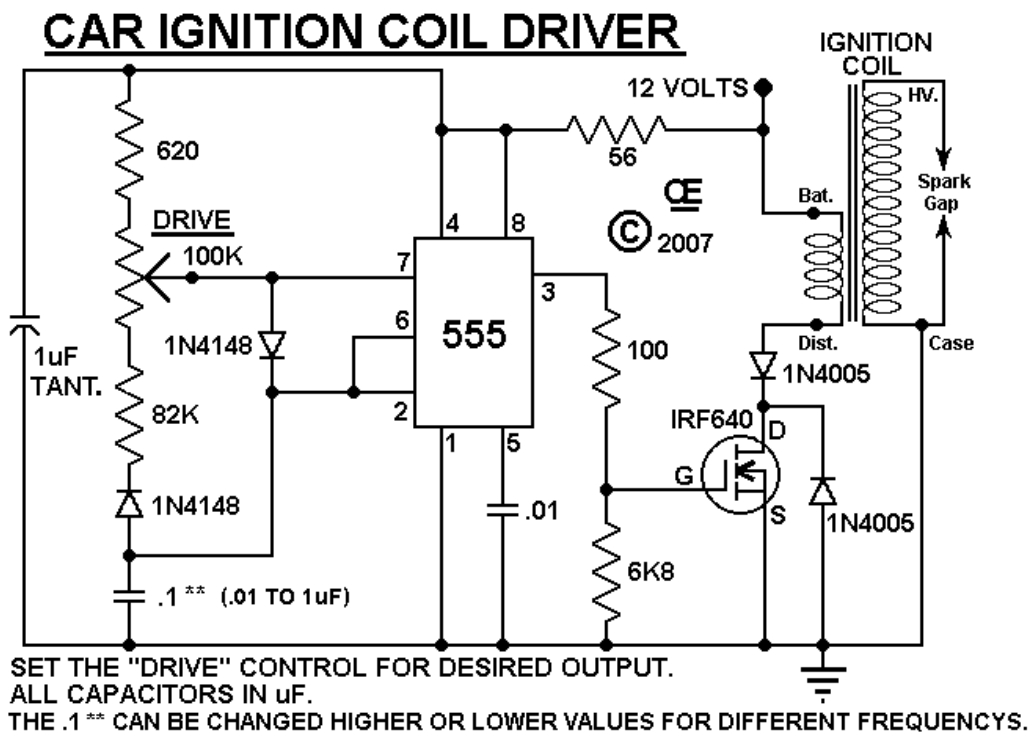
op-amps exp. towards understanding earthboot - continued...

now corrected yesterday's circuit - as forgot that should be 100K from +input of op07 to our divider...

so now: powered from single ended 7.8v supply we have 3.92 when there is no signal and with 1.37 v battery we measure in both directions:

2.21 (diff=1.71) and 5.63 (diff=1.71) which is a bit more than battery (unmatched resistors?)

piezo



try to drive now with 555 and 12v supply with IRF640 (but we need some diodes) - build 555 at least!

thinking of similar setup for kirlian

(also note that according to: [http://wiki.4hv.org/index.php/Ignition\\_coil](http://wiki.4hv.org/index.php/Ignition_coil)):

The most common version tries to use the 555 to turn on a 2n3055 Transistor, but it can't fully turn on such a large transistor so EDY19 created sort of a darlington triplet that works.

file:notedocs/Ignitioncoiltransistor.gif

see also: <http://old.4hv.org/index.php?board=18;action=display;threadid=2708>

### negative/laser scan



seems to work OK with amped photo-amp (uncovered and with filter of tracing paper) in dark room, with small red laser through CDROM focus unit and negative held very close to spot - photo-amp maybe few cm away.

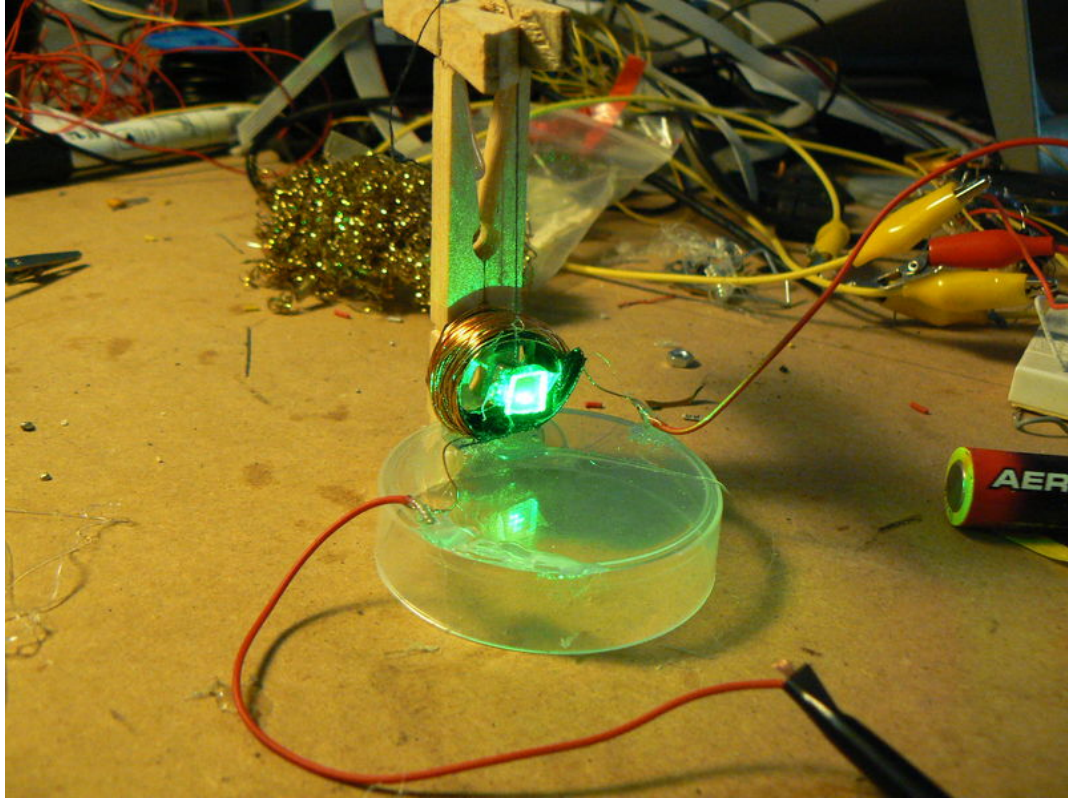
Q: how to move scan or image through - by hand (made like small platform with small laser underneath)...

### refs

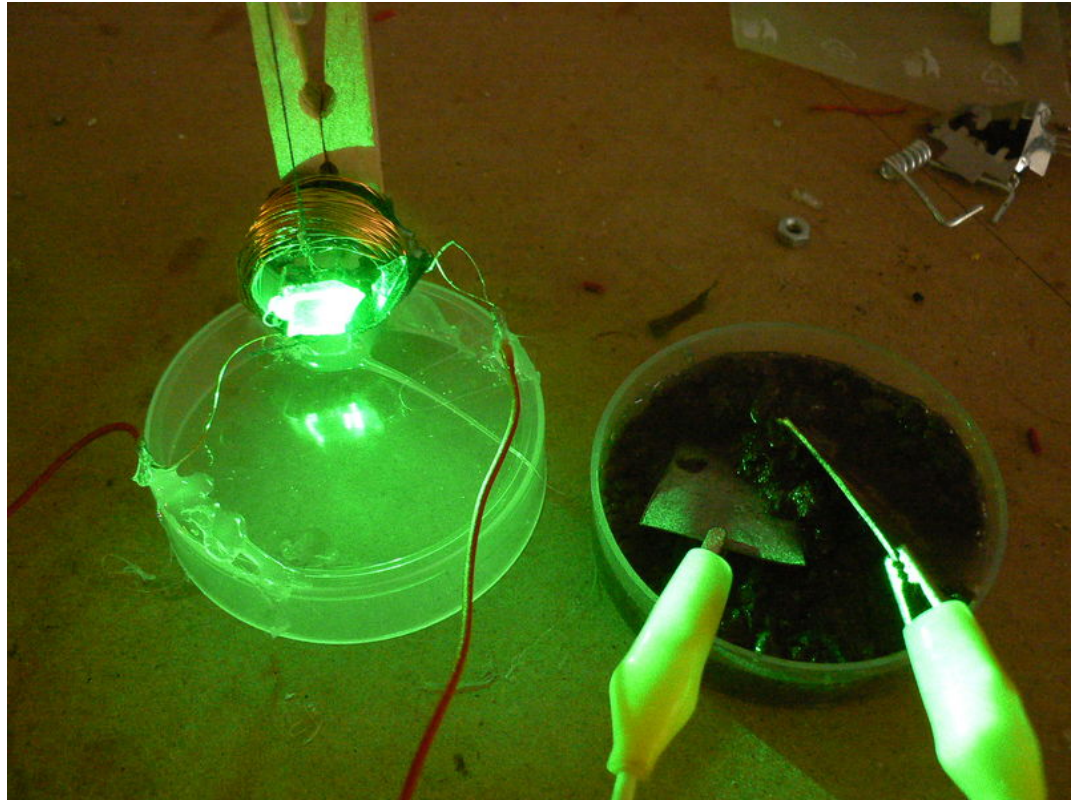
earth res: <http://www.liv.ac.uk/Geomagnetism/schools/res.htm>



## galvanometer



simple test with cardboard wire coil, magnets, thread, mirror and laser  
response down to 50mV - testing with signal generator at 10 Hz and at 1 or  
2 Hz we have some movement at 10mV



also responding to tiny earth/vinegar copper/aluminium battery (though fast exhausted)

how to damp movement? (perhaps revise CD case magnetometer as galvanometer)

and to record the movements of the galvanometer?

## 14 June

### earth

after attempting gnuplot live plots (test script in newbuff but freezes after a few seconds)

using plotting\_data\_monitor.py in

`/root/collect2011/psych/walker/psychogeophysics-walker/software/plotmon/`

altered so has smaller x scale and looks at ttyACM which is where earthboot is...

(first remember to expand window of app)

tests so far:

- both wires held together (values quite close around 840)
- apart - 0 to around 840
- 1.5v battery 0 or 840 depending on orientation

(so 840 looks like saturation, with 0 as peak?)  
check with earth battery//check code

- remember need to adjust -5/+5 scale

thus added 5k incoming to 10/10k +5v/GND divider to input

10 mV at 1 Hz signal is sampled very jagged (slowed down ADC and added averaging)

- could be noise on signal line, try also to reduce amplification (at moment we have 1k resistor)

now test with no resistance on ad620 between 1 and 8 for gain=1 (and we have peak 250 to 670 for -5v to +5v at 1 Hz)

but with 1 Vpp we have 0 to 670 and under 1 Vpp we have jagged peak-to-peaks. why?

- there was a bridge between 1 and 8 on the board - now rectified and works fine although 10Vpp gives 25-670 values (so half of range) which could be because of our bridge
- try again with 1k (gain=50x) = with 1Vpp we get 0-670, but with 100mVpp funny spikey signal

(for earth version use switchable gains and put in box)

## 15 June

### hv/piezo

rough balance but hard to appreciate any movement

- notes for KIRLIAN/HV supply (switch between 3x different caps, and have 2x var resistors for interval/speed), large heatsink for IRF640, can test diff transformers...
- performance seems to degrade over time (sparks grow shorter) with short pulses. overheating of IRF/555 and 555 can't sustain short pulses (1 or 1/2 sec bursts)
- testing with finger over plate and thin film - is quite buzzy on the finger (to reduce incoming voltage?)

- for piezo, sometimes seems move if we have weighting right but hard to say... sparking across piezo (try lowering voltage)

$V_s/V_p = N_s/N_p$

voltage in sec/in primary = turns in sec/turns in prim

so if no. of turns in sec is greater (higher ohms) than primary then we STEP

UP!

primary=less ohm, secondary=more ohms/turns

**else**

HV/piezo: some kind of balance, also check

PLANS:

- wrap up earth measurements (cased) and field test
- also try new kirlian setup and case also

(1x small metal cases, 1x plastic)

furtherEXP:

- kirlian film
- holography

## 27 June

[back from London]

### piezos and HV

definitely some sound only with rochelle crystal (small and large uniform ones on the side)

### new idea(s)

#### silver-electro-earth-photo-soup

Thinking on (also Paskian) possibilities of some kind of light sensitive CPU soup using silver nitrate (CPUs, processors in nitric a la Pask), growing silver crystals, silver chloride, electrodes. Some current flow controlled through soup by processors.

Also to be embedded (perhaps a sandwich of porous unglazed ceramics and glass) in the earth.

Need more detail on photochemistry.



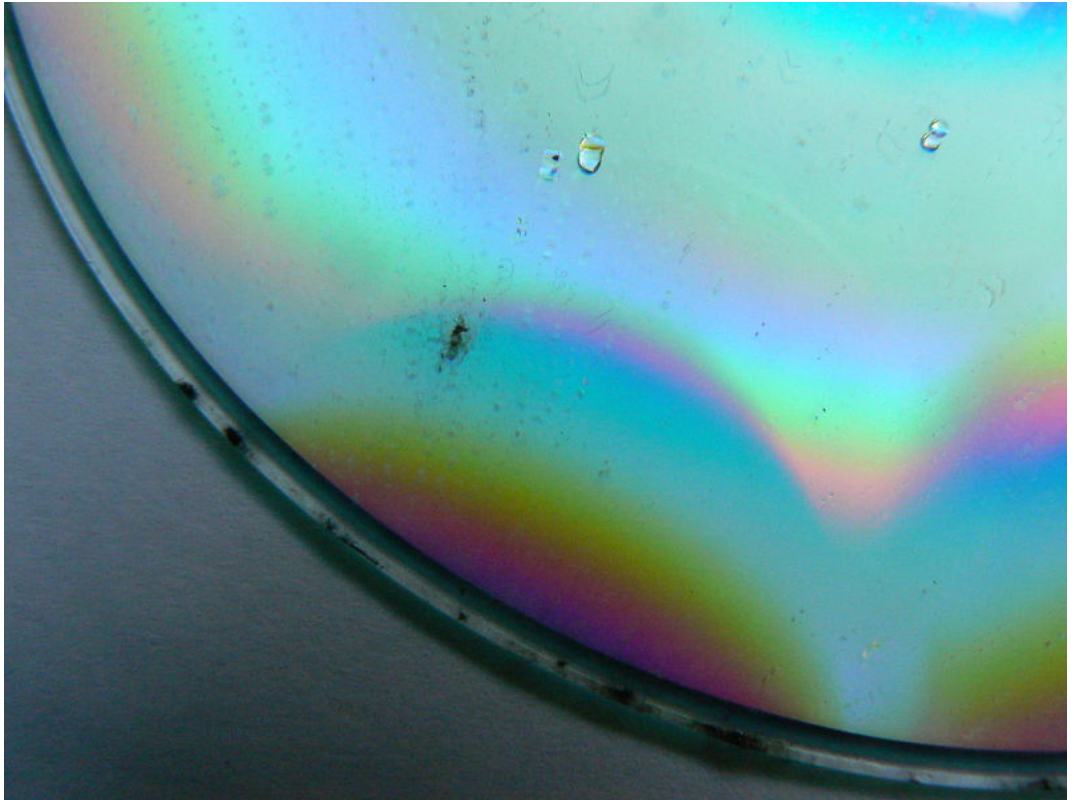
fungal CD/DVD results from 31st:

- SALO DVD



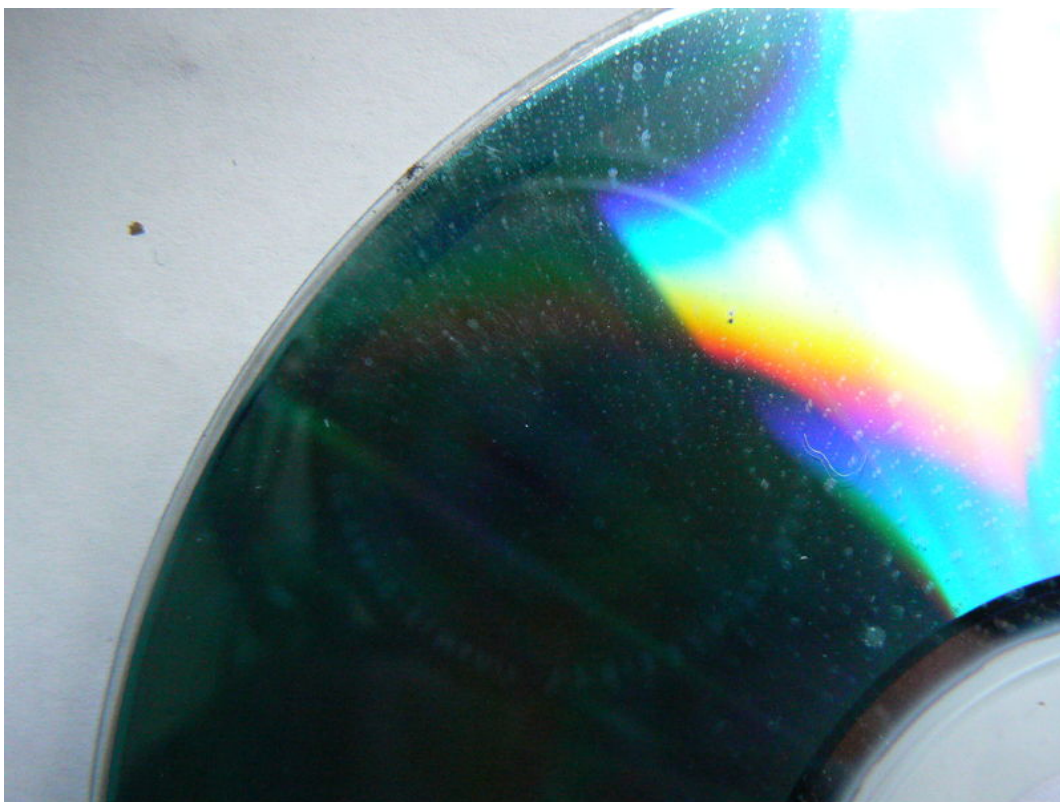
- blank CD





Some evidence of black mould mostly at edge but also few specks inside CD.

- pre-recorded ISLAND CD



As above - black mould.

### piezo

- still no clear results with mirror and rochelle salt crystals (crystal sandwiched between copper foil, voltage applied across, mirror balanced on top)...

what are ways of amplifying movement of crystal (if for 10cm crystal can move 0.1mm as read somewhere online)

### silver investigations...

we need distilled water!

Silver nitrate, 0.1 M, 0.1 N. Dissolve 16.987g of  $\text{AgNO}_3$  in distilled water. Dilute to 1 liter.

Silver nitrate, 0.5 M, 0.5 N. Dissolve 84.935g of  $\text{AgNO}_3$  in distilled water. Dilute to 1 liter.

Silver nitrate, 1 M, 1 N. Dissolve 169.87g of  $\text{AgNO}_3$  in distilled water. Dilute to 1 liter.

SILVER NITRATE: from cpu parts: add pcb/cpu parts to 70% nitric acid  
+ medium heat to accelerate reaction (2 hrs) (room temp. = 10 days)



- we can grow silver crystals on copper (copper in silver nitrate solution)

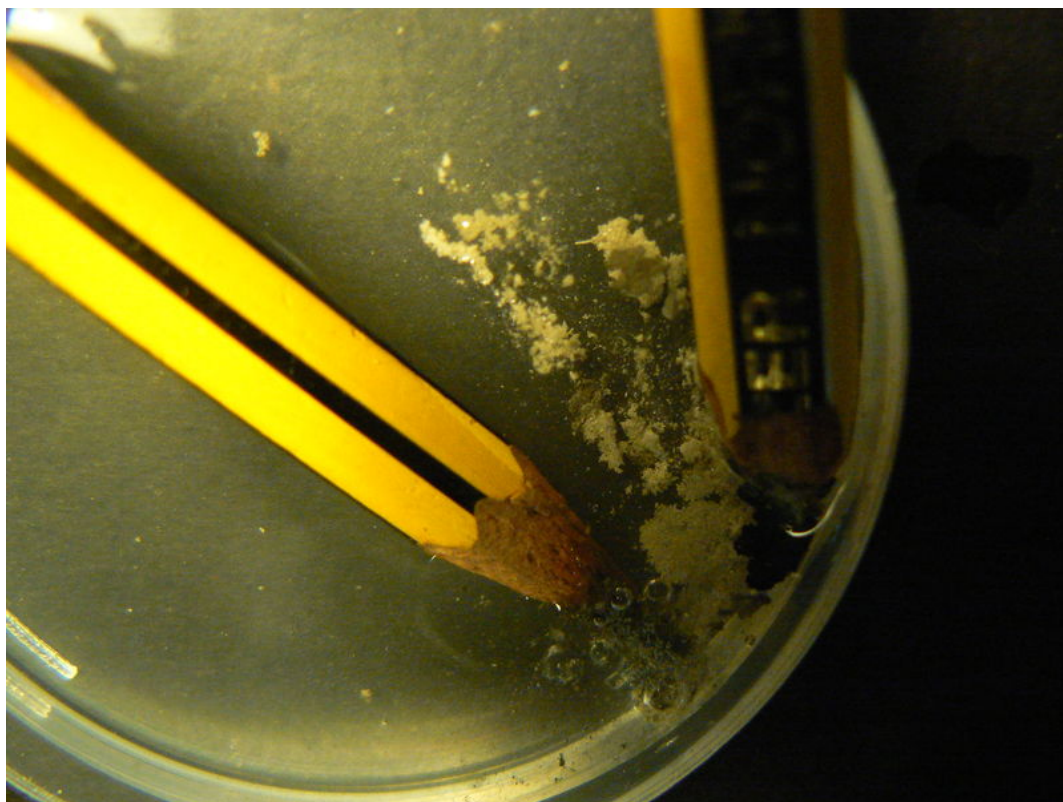
or via electrolysis on silver or platinum electrodes







Using 2 silver electrodes (do we need silver only on anode) with silver deposited on the cathode. (silver nitrate was 1.6 grams in 100ML distilled water).



now using two carbon (pencil electrodes) and works a bit slower but fine  
tested above with 9v battery, now with 12v PSU

**28 June**

**29 June**

Fixing up 2x pre-amps for solar, kirlian (to finish).

**playing with sound from silver nitrate crystal formation/electrolysis**

tracks 116-124

- variations of:

4093 with resistance in silver nitrate(SN), power also into SN, 555 into SN

555 alone with control also in SN



last (124) track - with piezo in SN (copper of piezo to GND of 12V PSU, crystal to +V and with cap from crystal to audio IN)

#### **other option**

laser through crystal formation live (picked up by solar/diode)

#### **TODO :**

some kind of tripods/fixing things, document month, finish and test kirlian, shielding for photodiode and some kind of stable setup

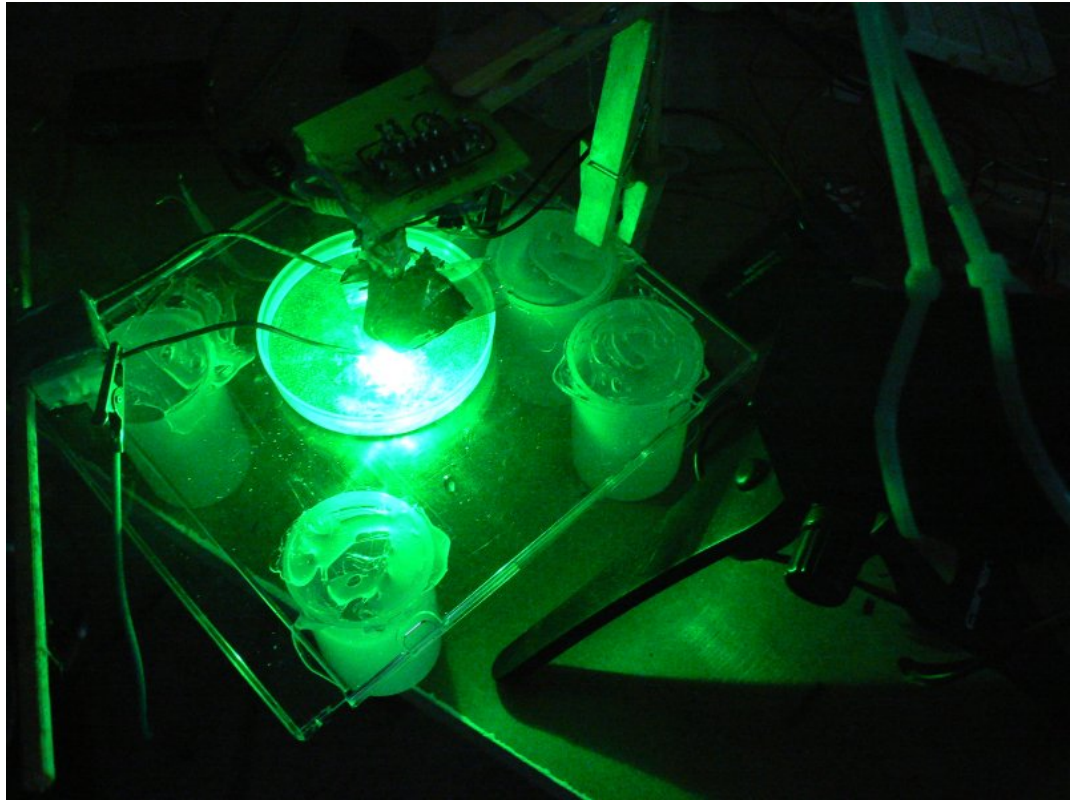
## **2 July**

Finished and tested kirlian with switched caps - just need PSU and socket

CDROM laser attempting to pick up silver crystal formation (in petri dish - laser is beneath) - so far I think silver nitrate solution is too poor ... and too much noise on photodiode... (but did reduce 50 Hz by wrapped copper foil around plastic tube containing photodiode and connecting this to GND!)

(track 126)





Testing with green laser reflecting now - more succesful but lots of feedback  
(how to isolate for performance?):  
(track 130)