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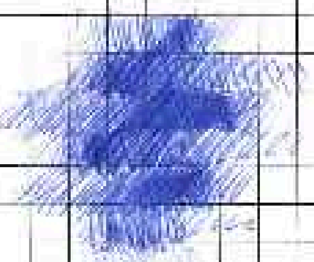
Project No.

TITLE Deconvolution of XB140118_1E1_7_3D.asc Book No.

From Page No.

This is an attempt to deconvolute an old vector scan measured by Dr Monika Dosen and Philipp Knapp on 2014-01-18. This is an asymmetric vector scan, showing secondary distortion:



PBS buffer + [illegible]

(target was a cell) Monocyte

$E = 670\ mV$ vs. Ag/AgCl meaning H_2O_2

The data is in the format:

0	;	0.00E+00	,	1.23E-12
1	;			
2	;			
3	;			
4	;			

number of measurement — column separator — x-coordinate in (m)! — comma separator — current in (A)

The data is not in chronological order!

This should be the correct one:

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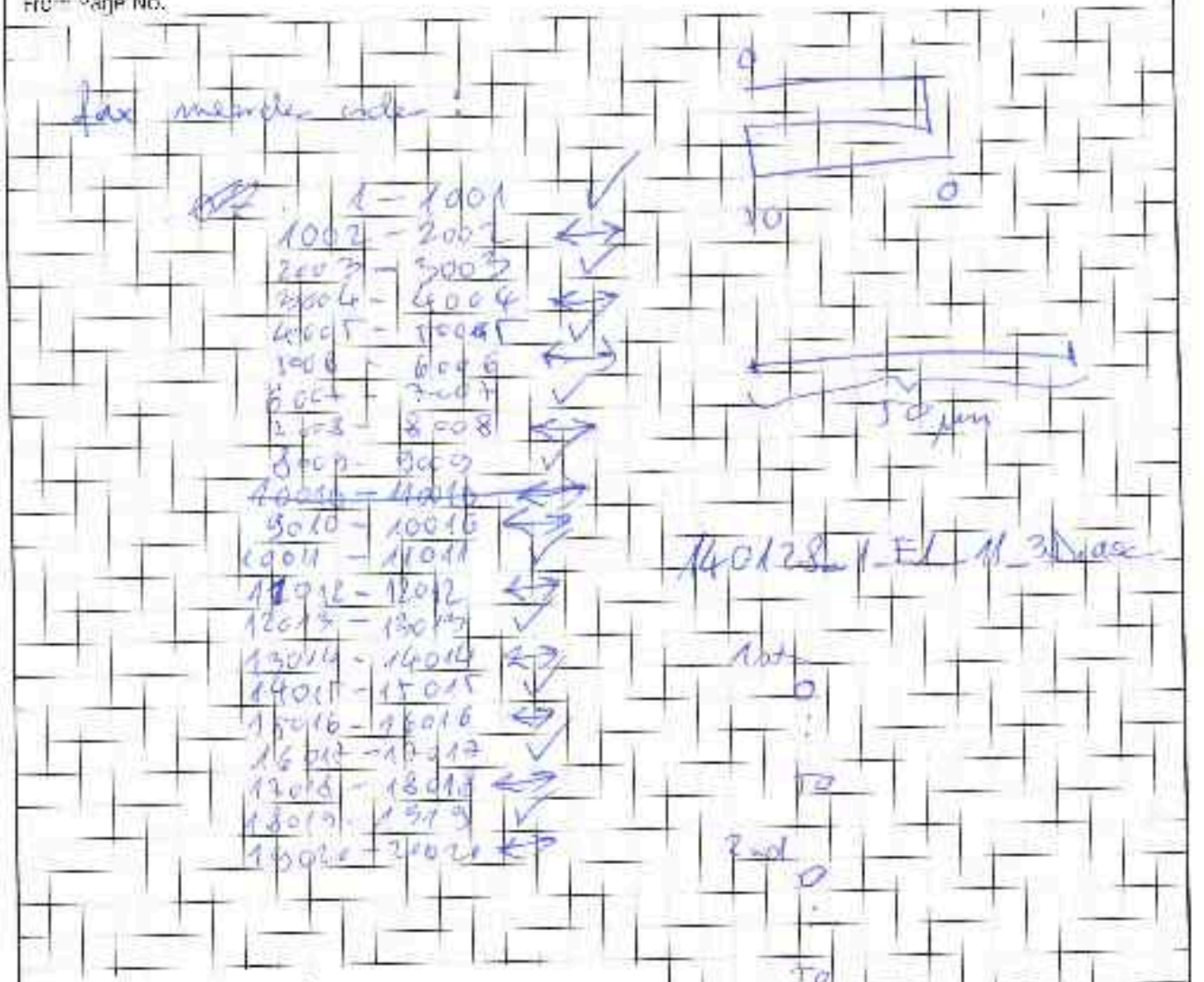
HEKA

Project No.

Book No.

TITLE

From Page No.




```
program deconvolution
implicit none

integer :: s,d,
real i, j, rc, e0, conv

rc=0.58;

open(1,file='1.txt')
open(2,file='11 deconvoluted.txt')
read(1, *) i, j, e0
do
   read(1, *, iostat=stat) i, j, conv
   if (stat /= 0) exit
   write(2, *) i, j, ((conv - e0*rc)/(1-rc))
   e0=conv
end do
close(1)
close(2)

end program deconvolution
```

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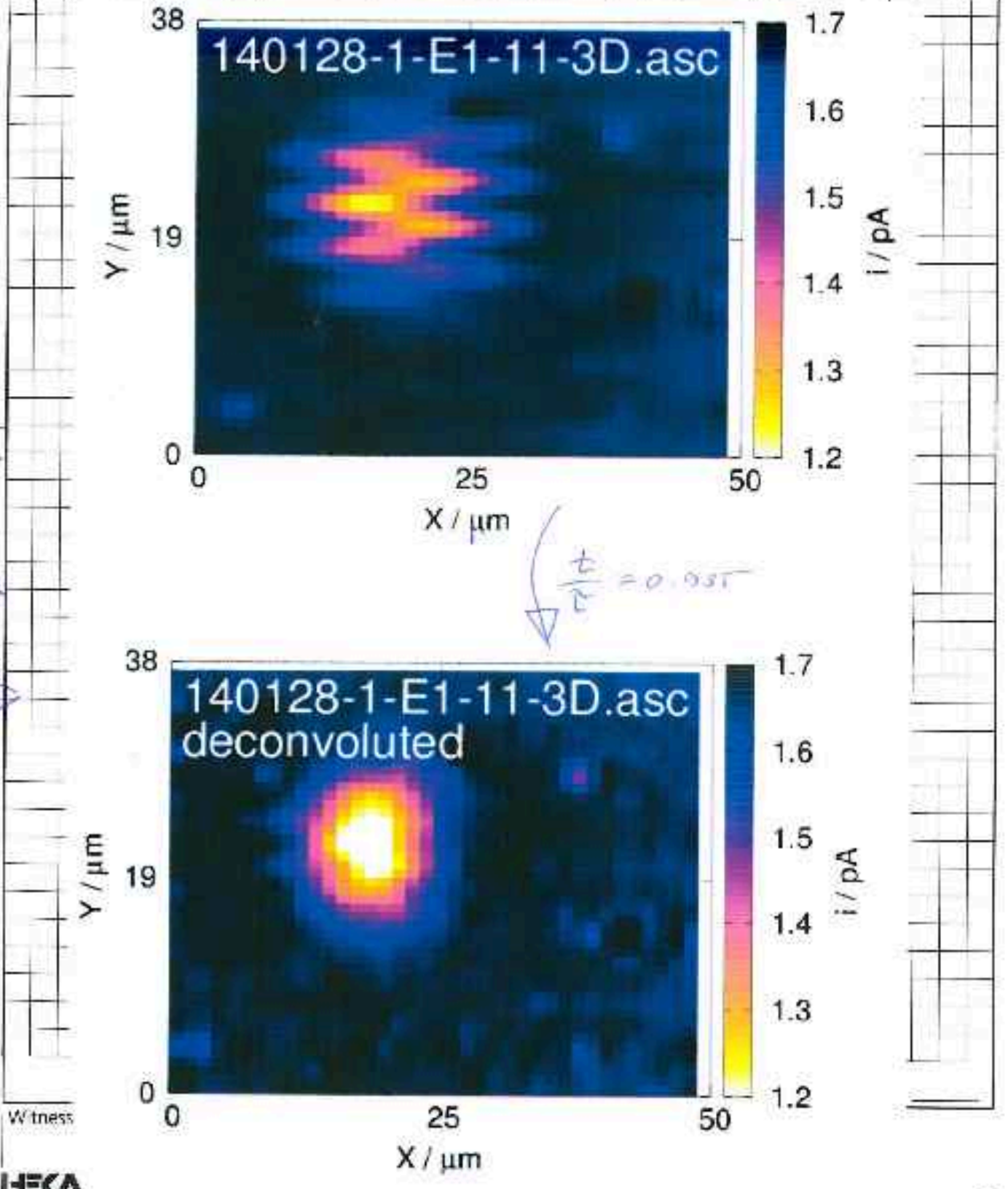
140128-1-E1-11-3D.asc
38
19
0
Y / µm
0
25
50
X / µm
1.7
1.6
1.5
1.4
1.3
1.2
i / pA
140128-1-E1-11-3D.asc
deconvoluted

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TITLE

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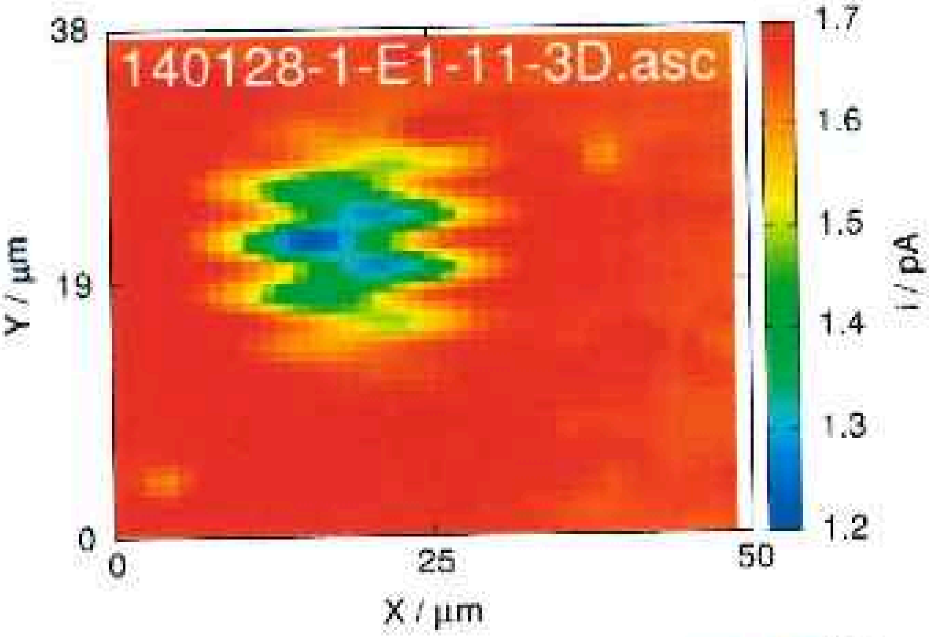
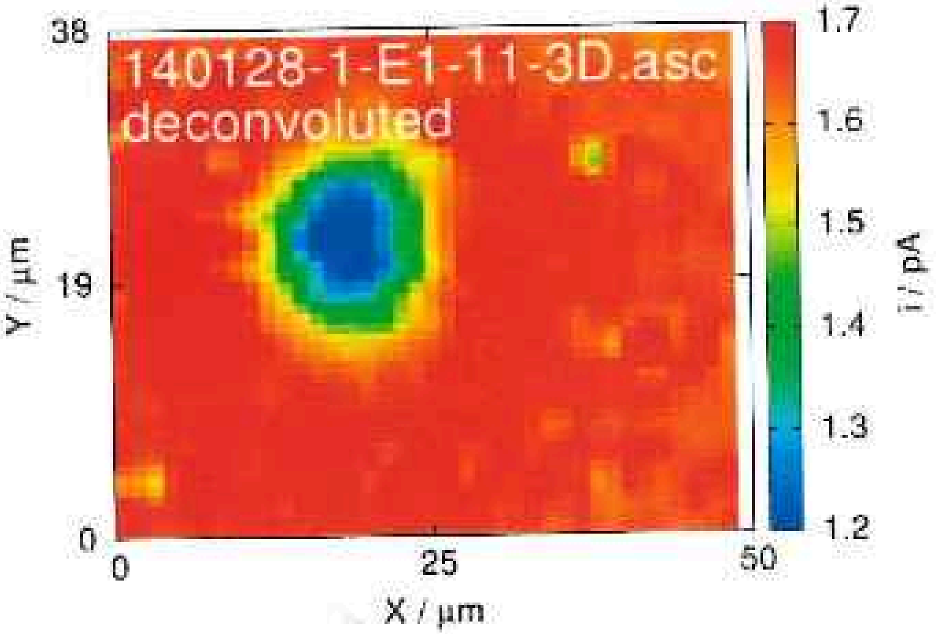
for clear view: red palette rgbformulae 22, 13, -31





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$K_3[Fe(CN)_6]$

Project No.

TITLE

Book No.

From Page No.

Labseminar 2018 (Biophysics)

Monday at 11.00 Auditorium CIPMM

Remarks

January, 8th	-----	August, 6th	Dalia
January,15th	~~Markus~~	August, 13th	Girish
January, 22nd	~~Leticia~~	August, 20th	Diana
January, 29th	Katerina	August, 27th	Reinhard
February, 5th	~~Bin~~	September, 3rd	Janina
February, 12th	no seminar	September, 10th	Lea
February, 19th	Kim	September, 17th	Anni
February, 26th	~~Arne~~	September, 24th	Maylin
March, 5th	Renping	October, 1st	Lucas
March, 12th	~~Eva~~	October, 8th	Carsten
March, 19th	~~Mona~~	October, 15th	Nikolina
March, 26th	no seminar	October, 22nd	Monika
April, 9th	~~Monika~~	October, 29th	Michelle
April, 16th	general points	November, 5th	Phillip
April, 23rd	~~Maik~~	November, 12th	Adrian
April, 30th	no seminar	November, 19th	Julia
May, 7th		November, 26th	Sylvia
May, 14th	~~Jie Zhu~~	December, 3rd	Barbara N.
May, 28th	~~Ewa J.~~	December,10th	
June, 4th	~~Denise~~	December,17th	
June, 11th	~~Romy~~		
June, 18th	~~Vanessa~~		
June, 25.-Aug, 3.	no seminar		

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Project No. _____

TITLE 10 µm Pt disk electrode preparation

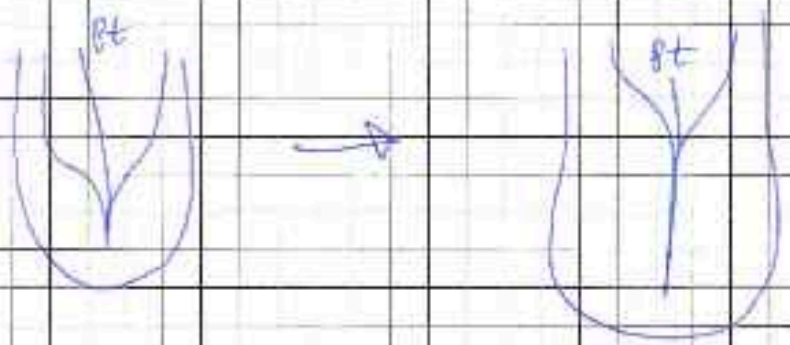
Book No. _____

From Page No. _____

I wanted to show Monika and Phillip how do we prepare the UMEs in Pécs.

First, we needed a d_g = 2 mm di = 1 mm borosilicate capillary at one end.

Then, I put in the 8 cm 10 µm Pt wire, and seal it with a propane-butane burner:



Then, I pushed solder into the capillary / close to the Pt wire. After that I melted it in the same flame

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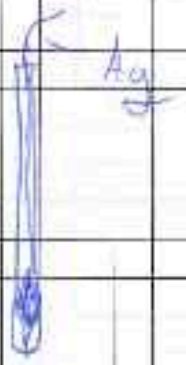
HEKA

Then, while the solder was still molten, I pushed in an Et à cm silver wire to provide electric connection to the potentiometer



Then, I ground the sealed end to expose the Pt-wire.

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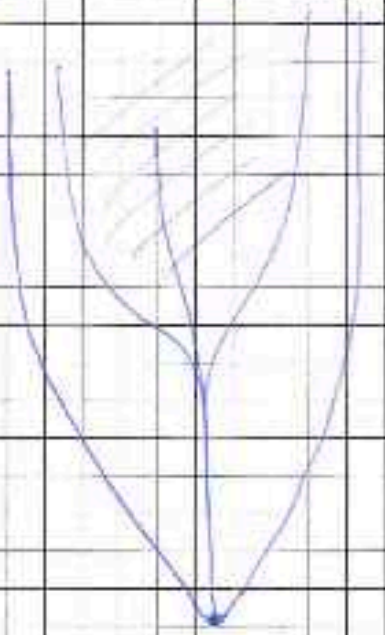
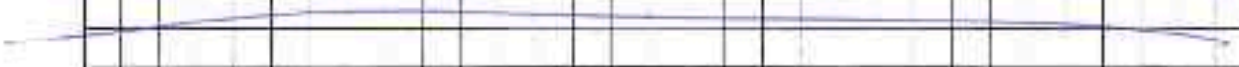
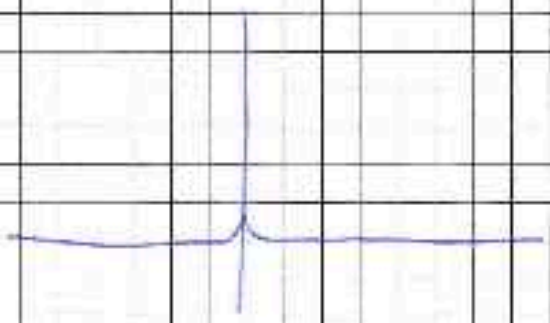
Then, I ground the bundle.



Tested with CV in 2 mM formaldehyde / 100 mM KCl.





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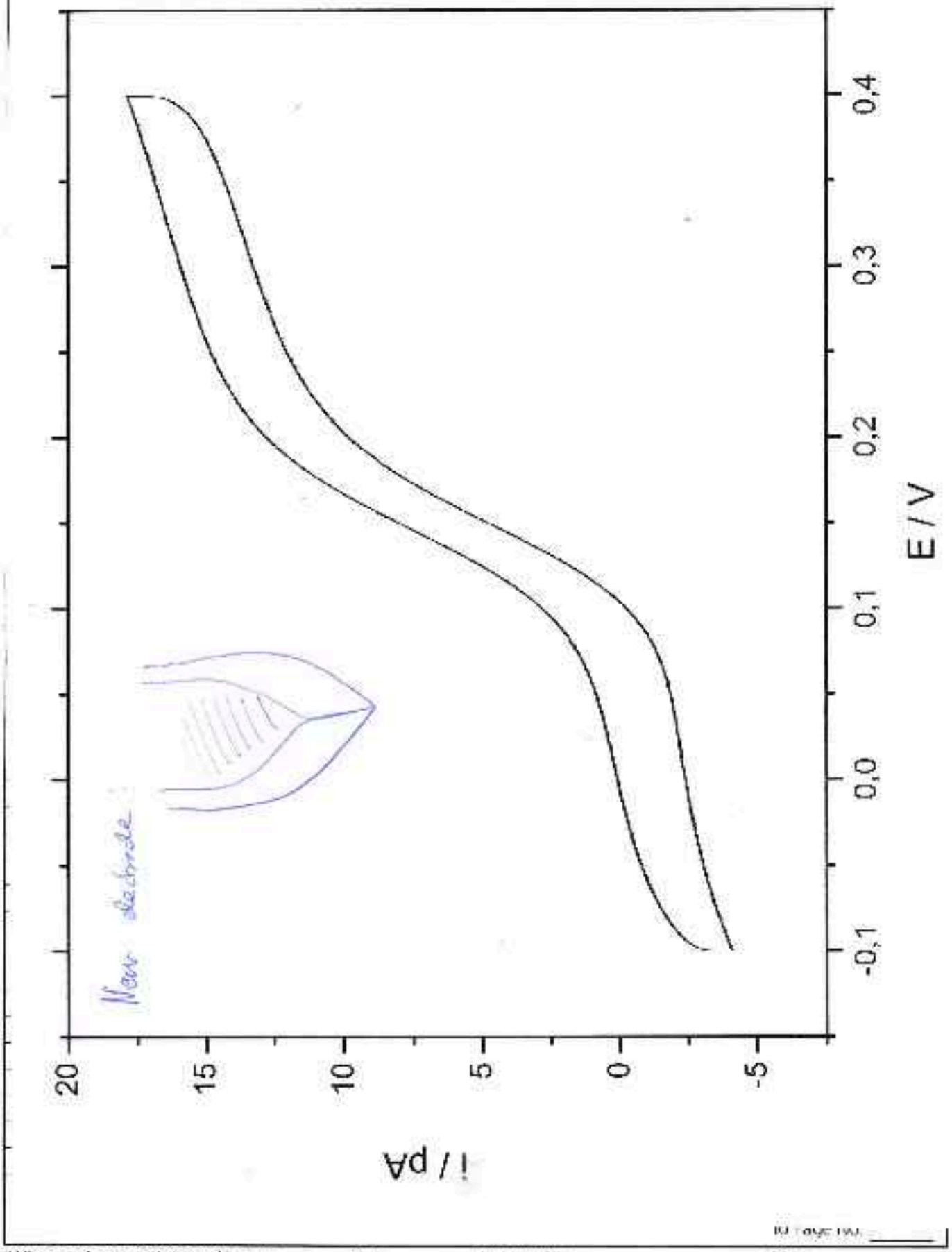
TITLE

Book No.



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Project No.

TITLE H_2O_2 chronoamperometric calibration

Book No

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With the new electrode

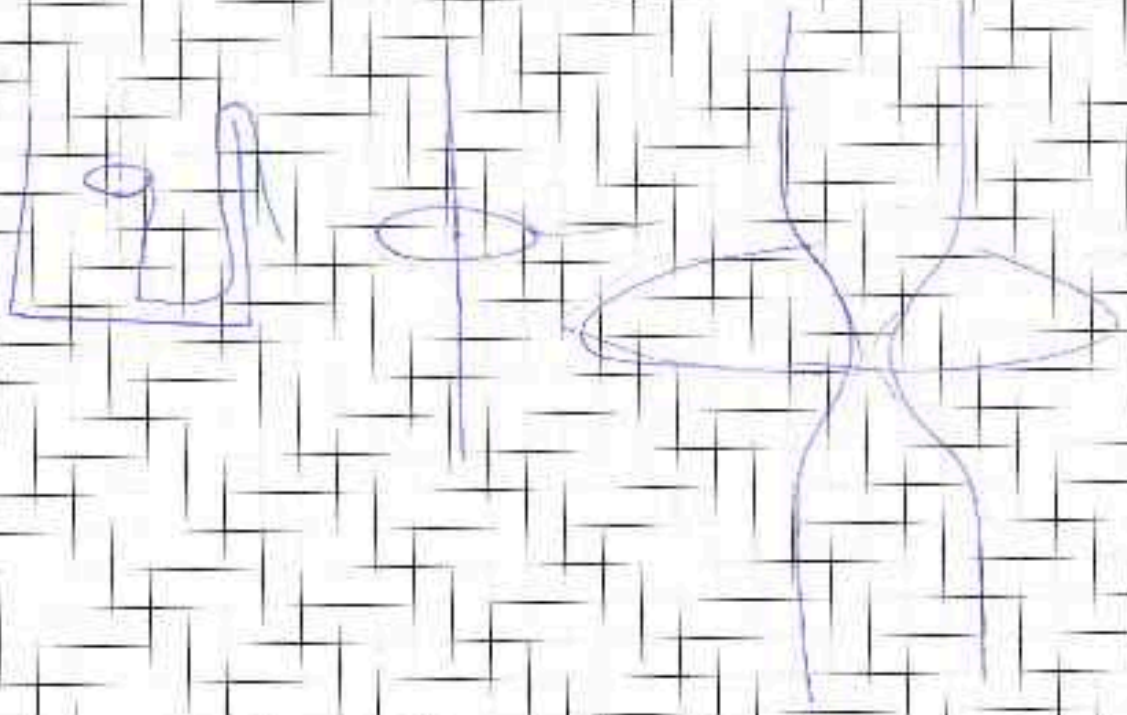
10 to 20 µl 4mM H_2O_2 stock

and 10 ml 1x PBS

increase in H_2O_2 : 5 µl each addition

24.5°C

H_2O_2 stock solution prepared by Phillip



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Date

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Recorded by

Date

HEKA

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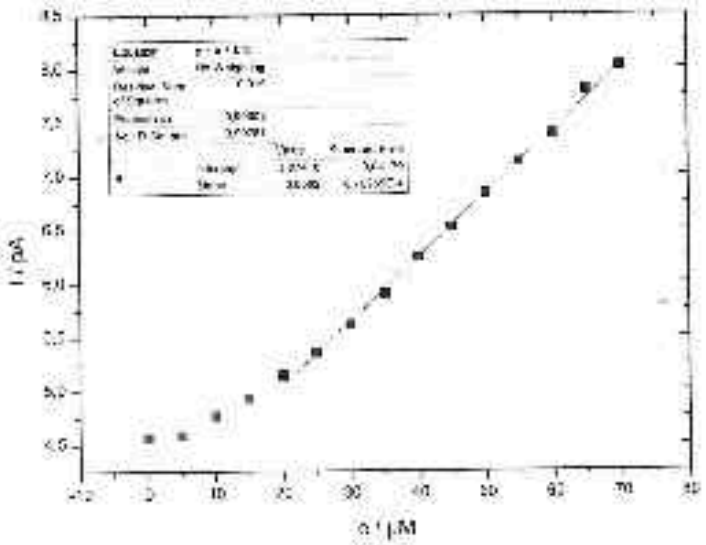

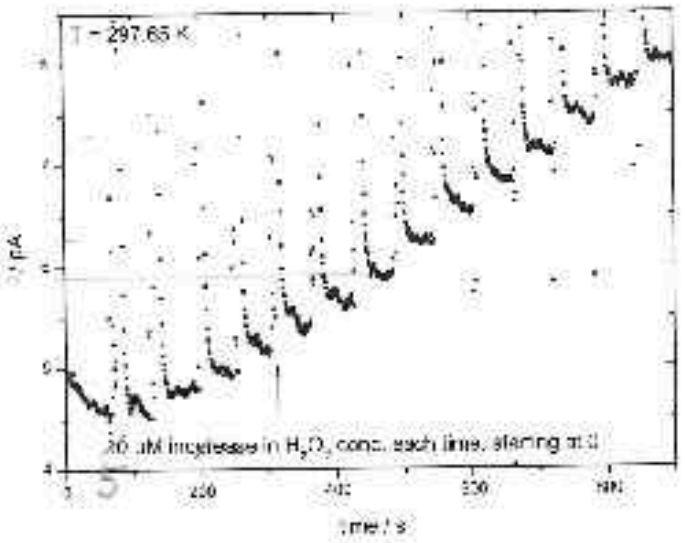

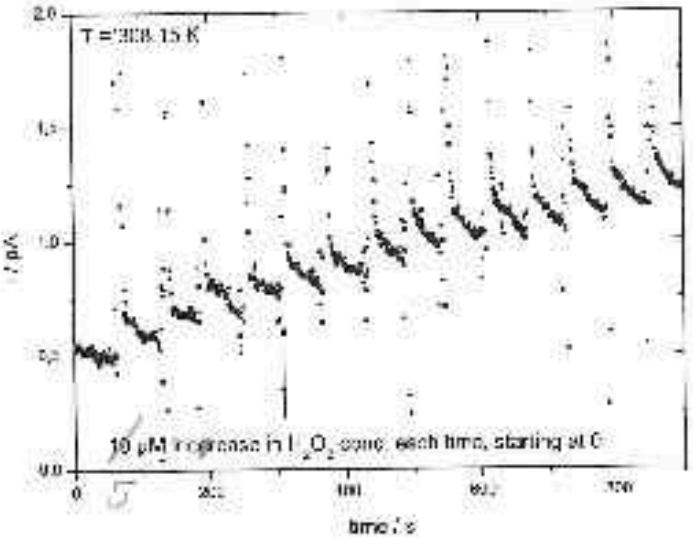

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Recorded by

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TITLE Zeiss Workshop

Book No. ______

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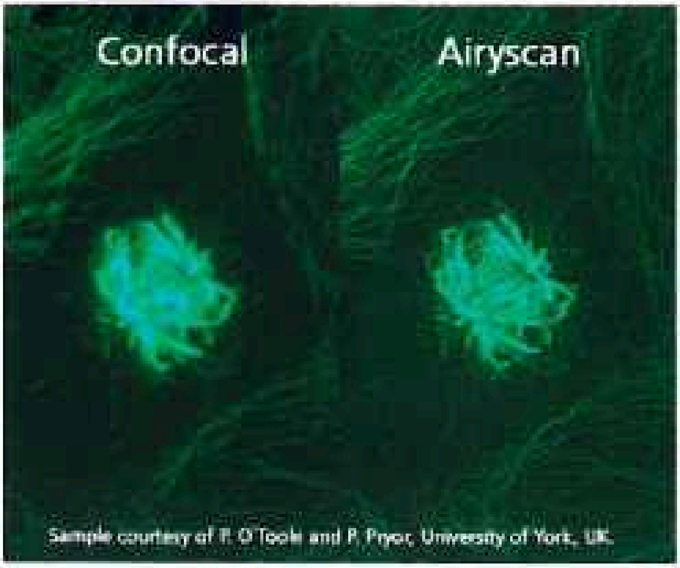

140514_1.dat

① 6 E1-1, maybe (E1.3)

beads

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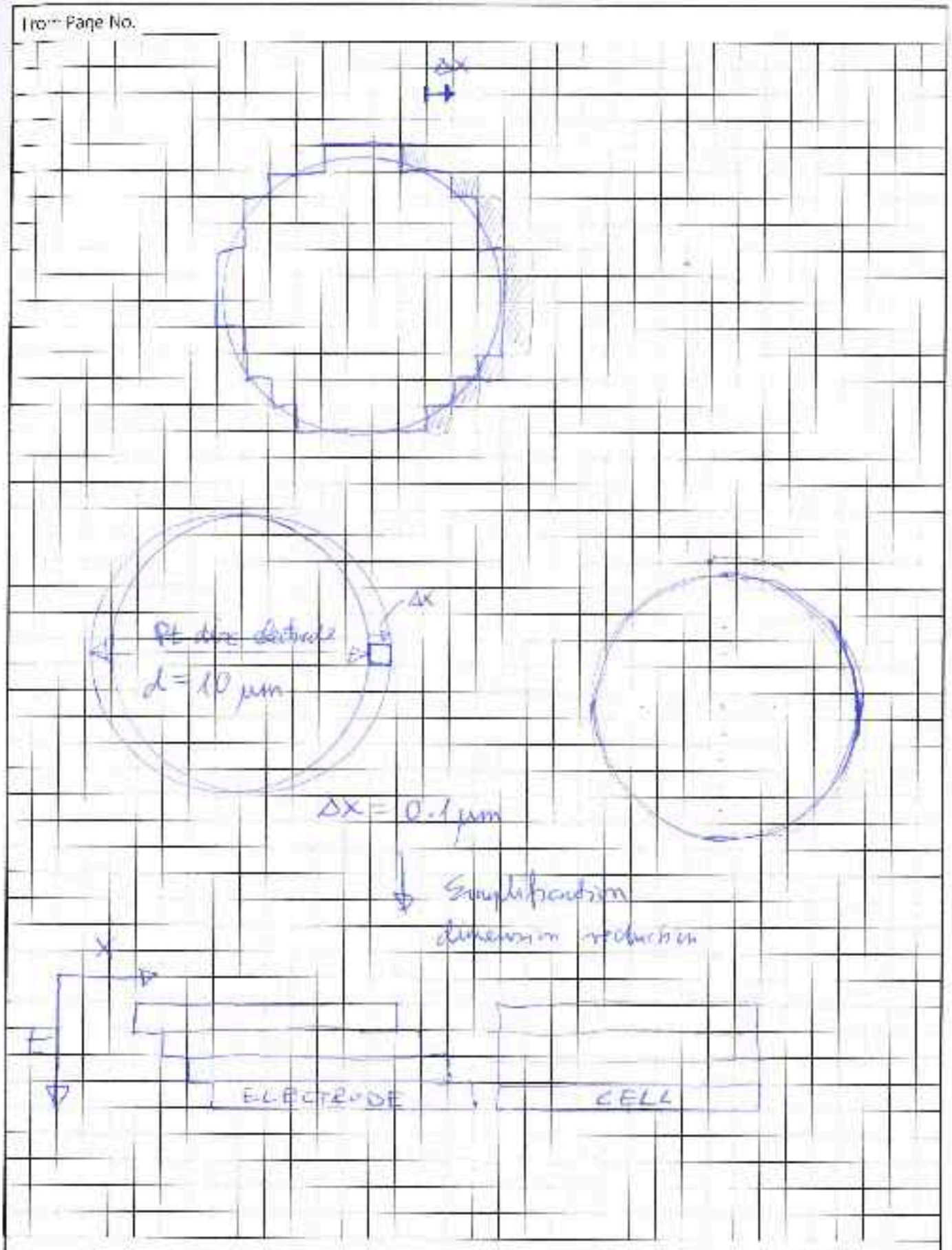
Recorded by

HEKA



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Invented by Date

Recorded by

Project No.

TITLE 140516_1.dat

Book No.

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I1-7

45 µm × 45 µm

2 µm/s

µ step : 2 µm

26 scanlines

x 0-45 (46) rows

y:

Lines in the tube : 1302.6

1302.6 / 46 = 28.3

50 µm | 45 µm × 45 µm

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TITLE _____ Book No.: _____

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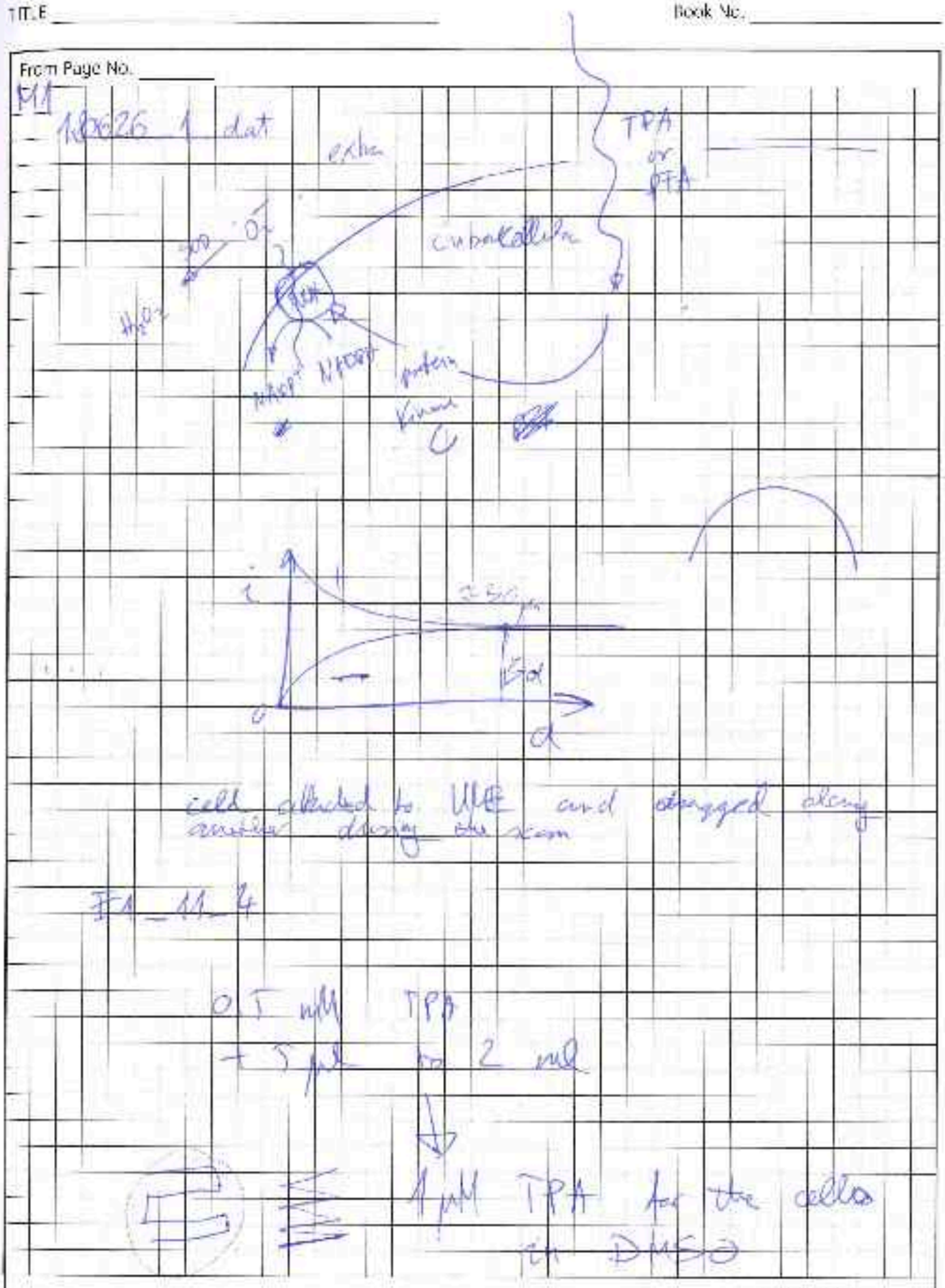

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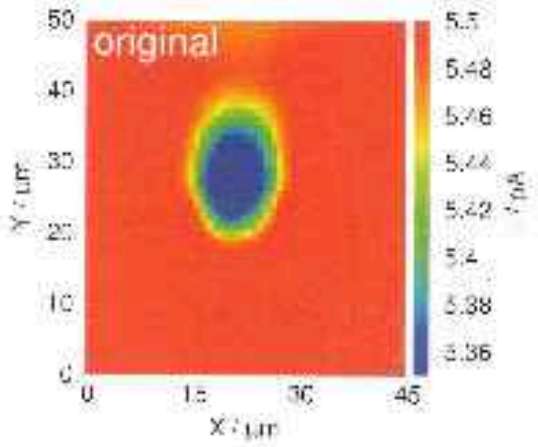
Recorded by



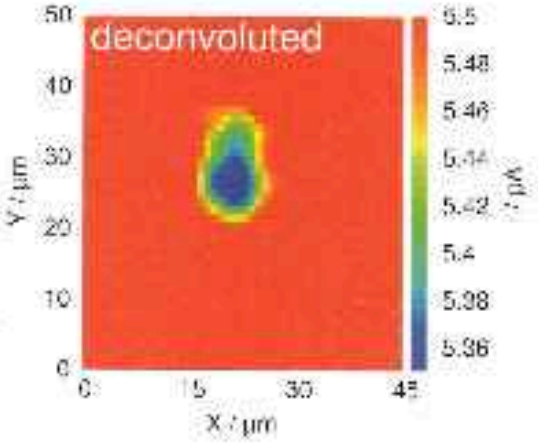


Figure 1

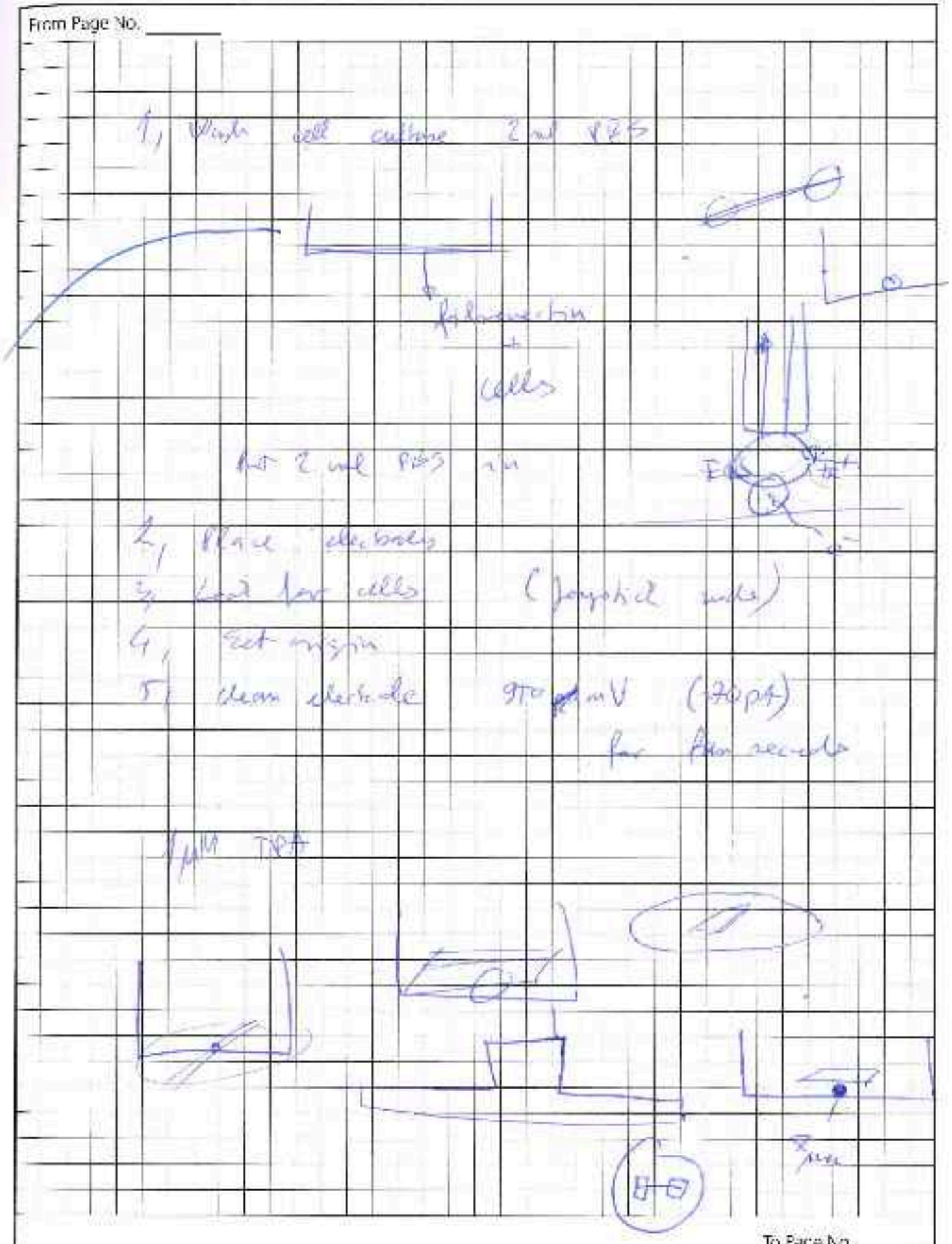
Witnessed and understood by me Date Invent Record

Project No.

TITLE 180627 Perc cell experiment

Book No.

From Page No.



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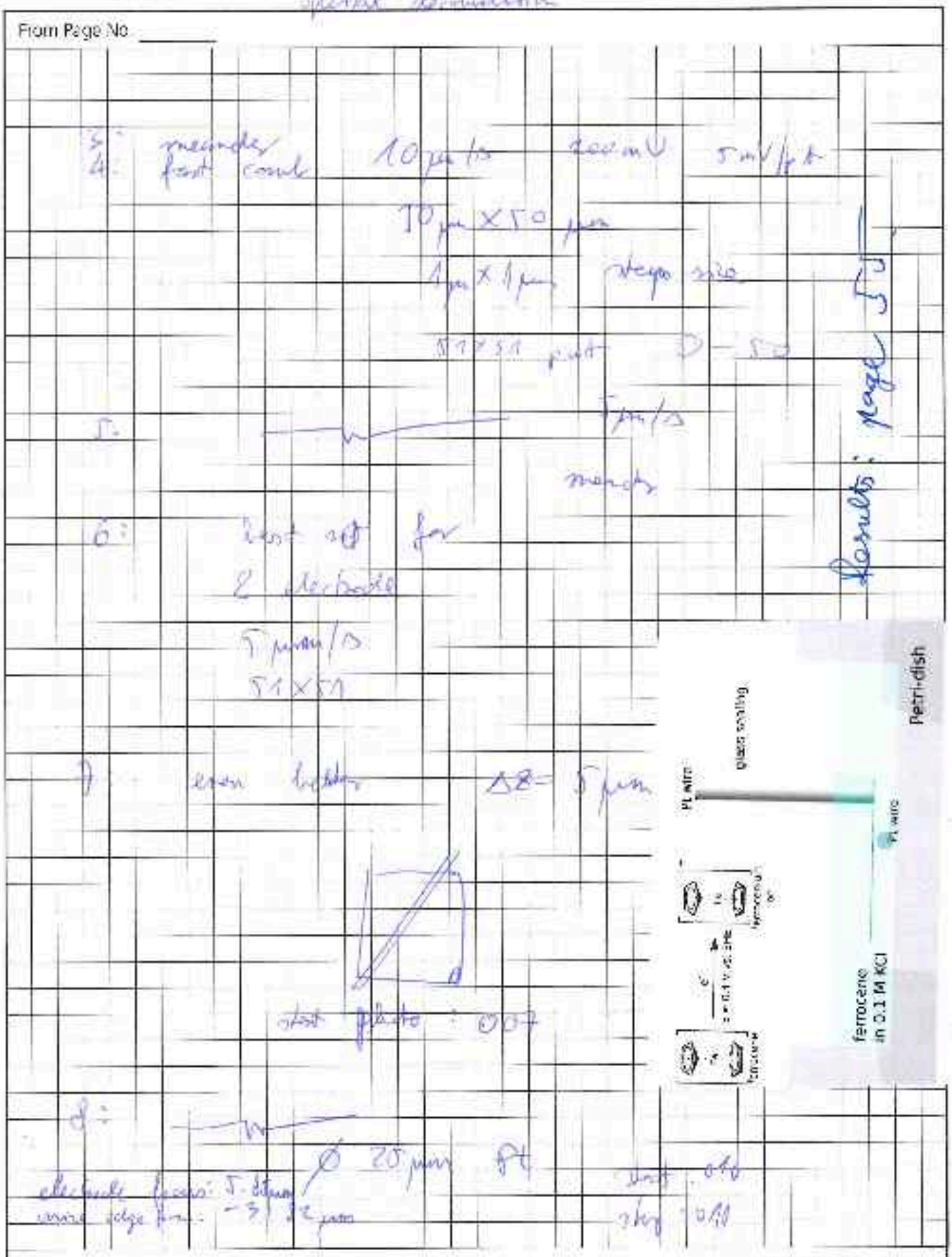
HEKA

Project No.:

Book No.:

TITLE: Pt-wire measurements for spectral deconvolution

From Page No.:



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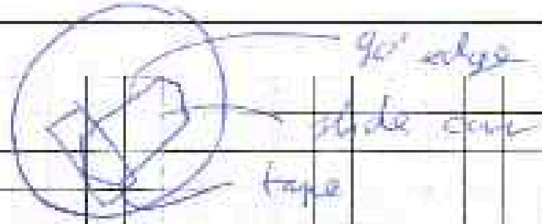
HEKA

Project No.

TITLE: Image of broken microscope slide cover

Book No.

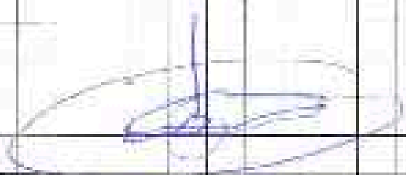
From Page No.



2mM ferrocene in 0.1M KCl

E1_2 — 50x70 µm µm 10 µm/s meander

1 µm x 1 µm



E1_3 — fast cont

E1_4 — fast cont 5 µm/s

start cont picture: 004

E1_5 — meander 50 µm/s

E1_6 — meander 100 µm/s

	m.	f.c
21	15 ✓	16 ✓
5	13 ✓	4 12 ✓
10	2 19 M	3 11 ✓
50	5 10	
100	6	

E1_13: finish 0.6

E1_17: finish: 8

E1_32: finish 13

5 µm/s

101x101

1 µm x 1 µm res

E1_33: finish 14

~~101~~ x101

1x1

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180628

Project No.

TITLE Vildana's presentation #2

Book No.

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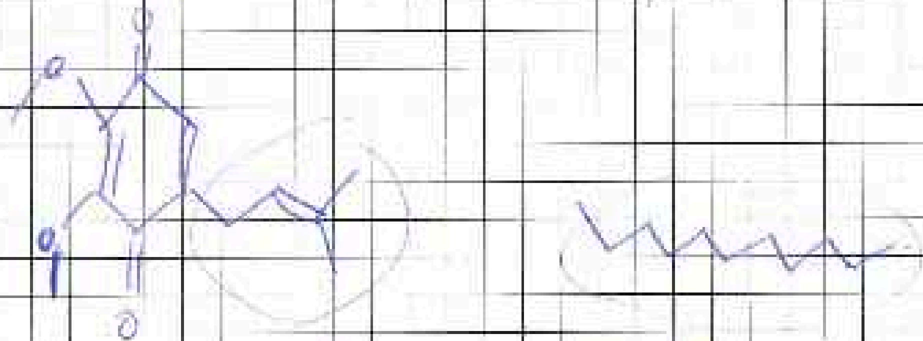
Ca²⁺ affinity of decylubiquinone in organic solvents

(Valentin Mirceski (SWV)
Lovric was his supervisor)



Coenzyme Q₀ decylubiquinone

Coenzyme Q10

aprotic solvent → non-proton donating solvent

= anodic SVW → SWV
= activity instead of conc. temp.

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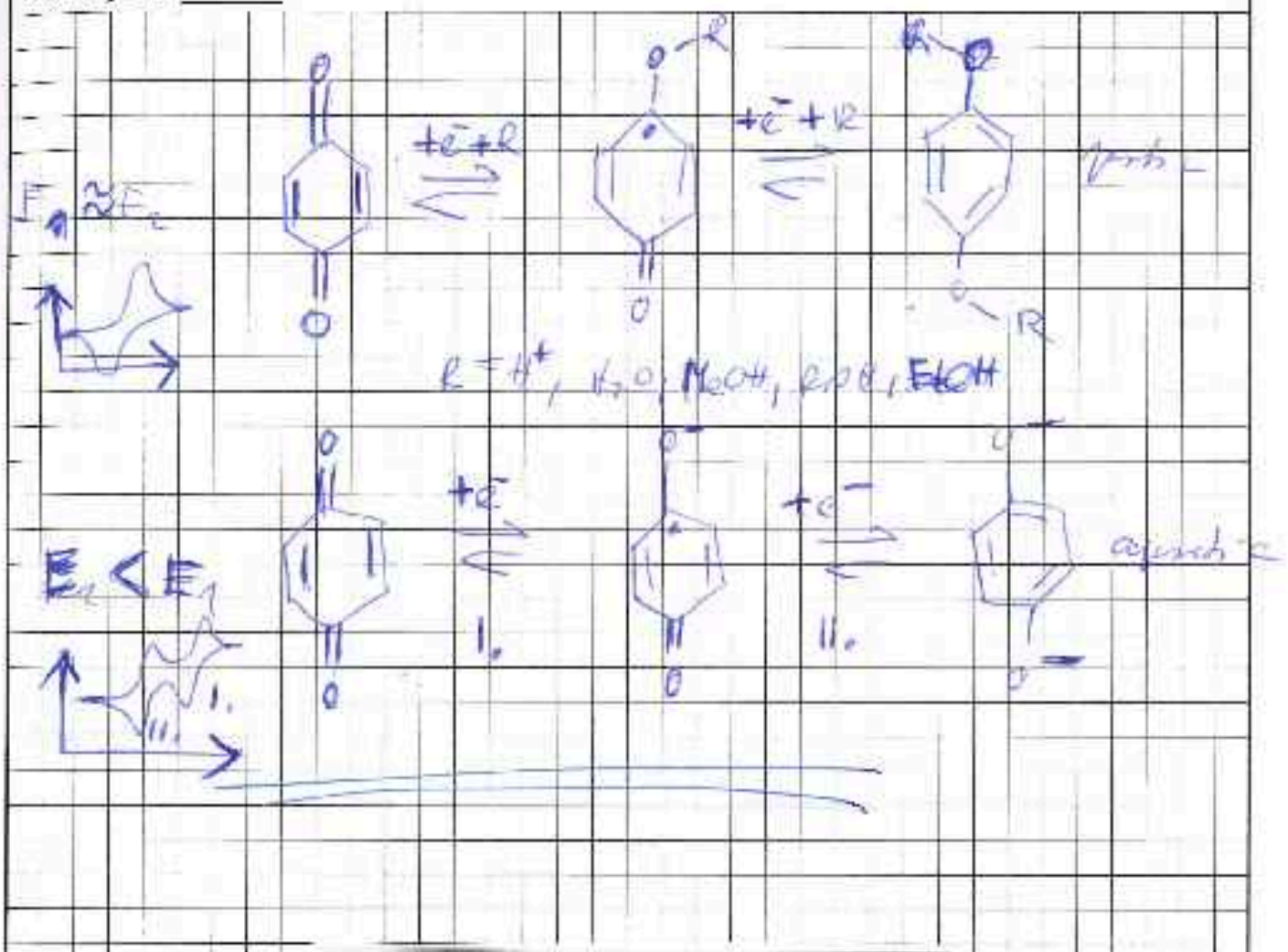

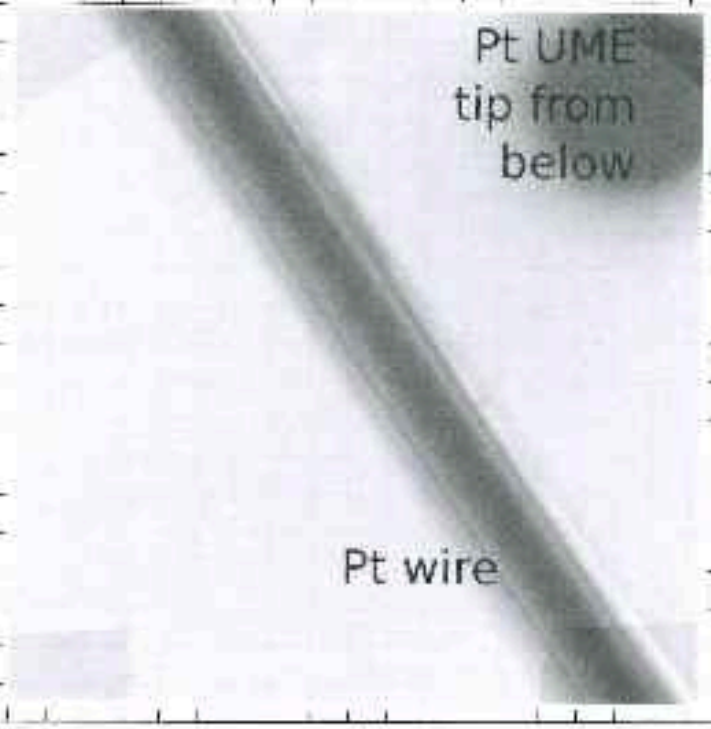

related to on page 19

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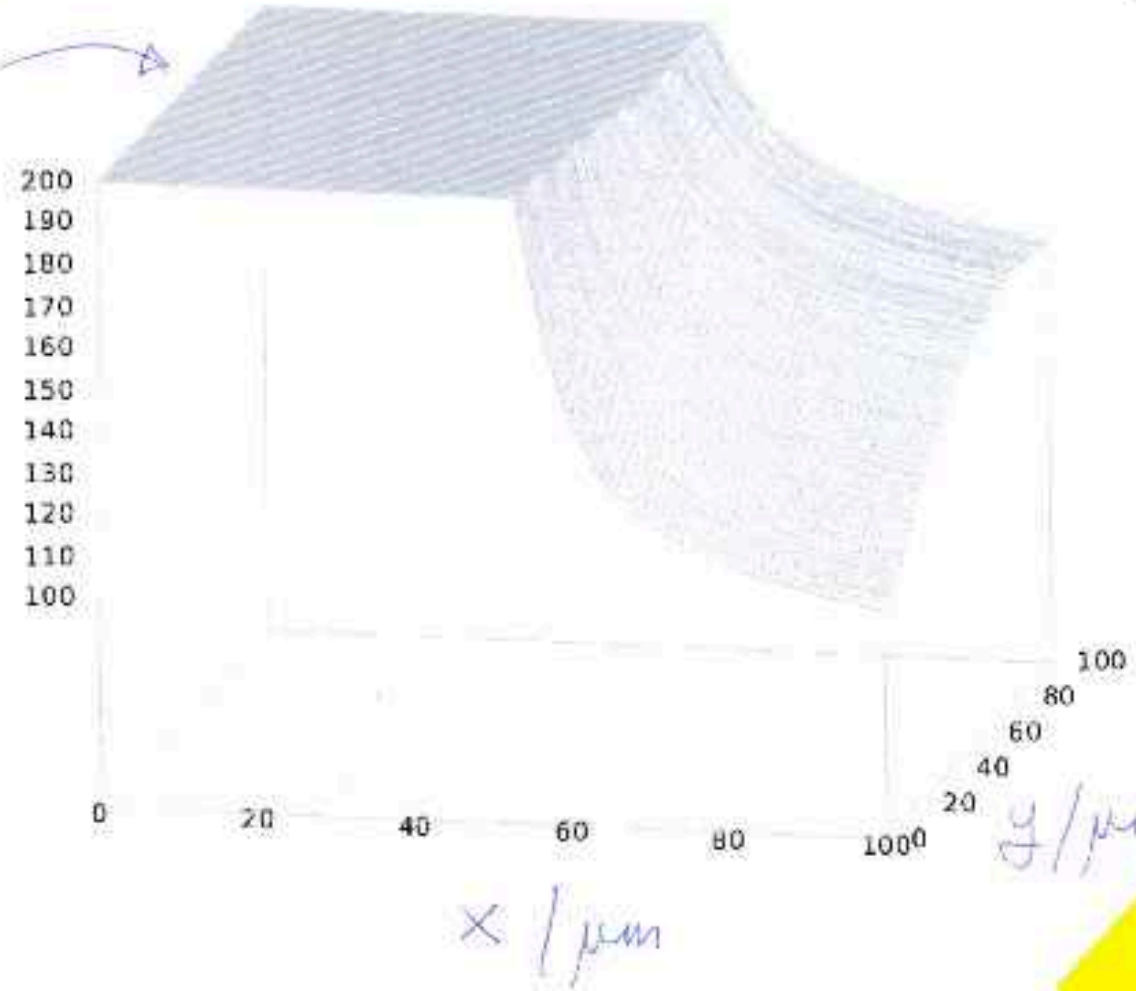
current is out of range!

'32_xyz_separated_lines.txt'



All of the scans from 130628 are clipped at ~200 pA!

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Project No.

TITLE Soda-lime glass pulling

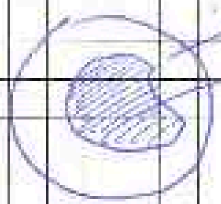
Book No.

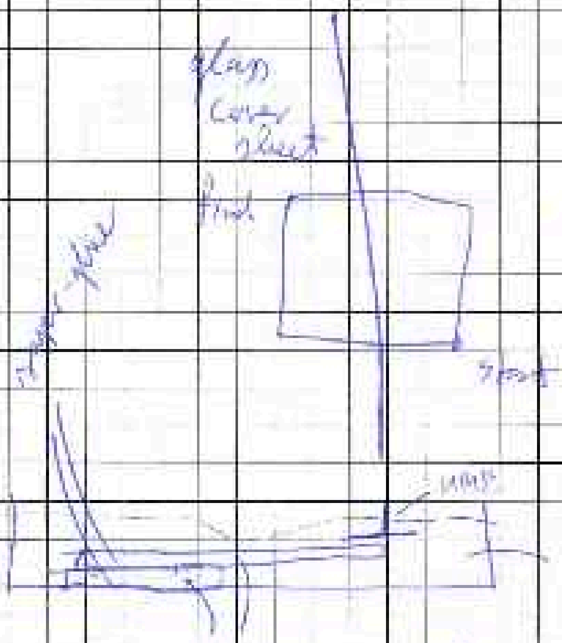
From Page No.

Sutter Instrument P-1000

Program 88

180704 Scanning with electrode # 9 prepared yesterday





161 points × 101 points

100 µm × 100 µm

~~10 µm~~ 5 µm/s

fast comb scanning deposition

2 mM ferrocene in 0.1 M KCl
E = 300 mV vs. Ag/AgCl grating

h=100 µm glass cover sheets

gain: 20 mV / pA

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continued from previous page 2

– 130704_E1_1 finish: cell 130704_003.TIF

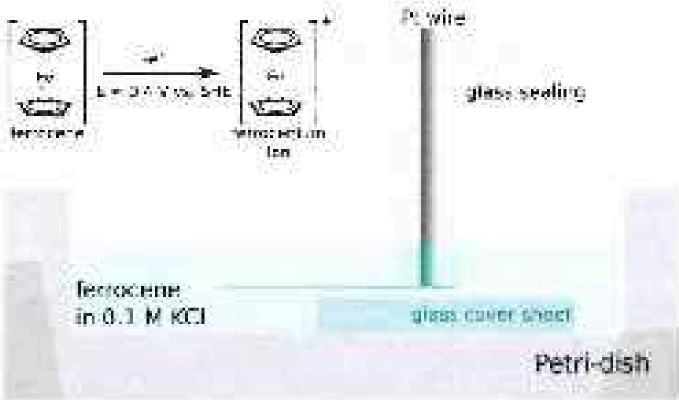
10×1001
100×100

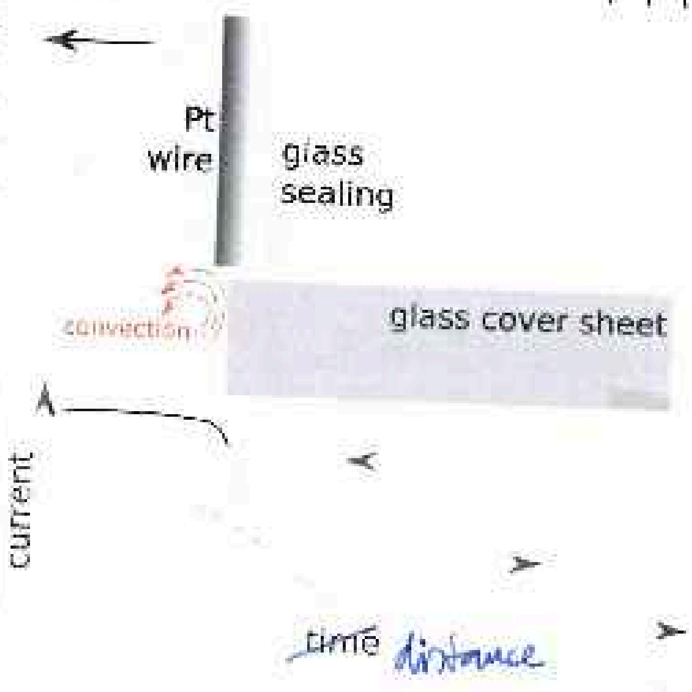
5 µm/s
fast cont

– 13070404_E1_2
10 µm/s meander

speed \ algorithm	fast cont	meander
5	1	
10		2
20		
50		3
100		4

Results on page 5X





Project No.

TITLE: Autonomy microelectrode tests

Book No.

From Page No.

Thermal instruments pH meter

pH 211

Microprocessor pH meter

(citrate) (phosphate)

E/mV pH

4 7

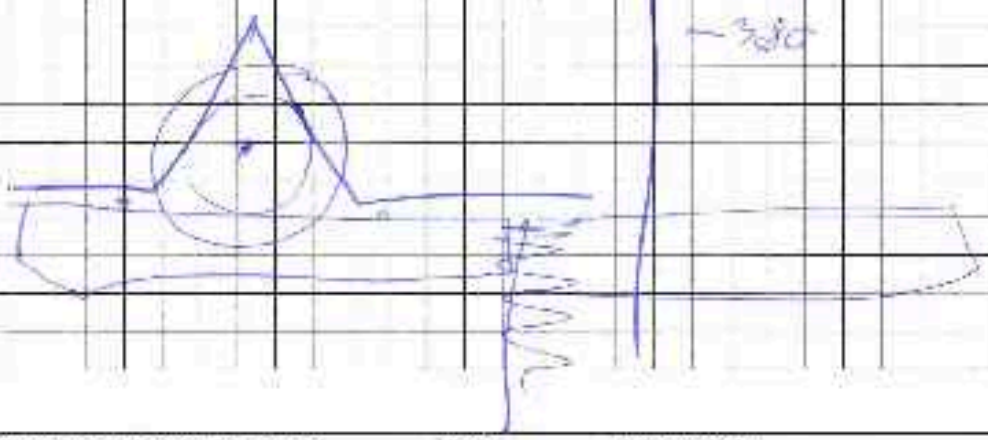
+200 −330 mV

20mV / 3

26 mV / pH

Buffers used kindly provided by Katerina.

pH	E/mV	E/mV
4	+200	
7	−330	−365
7	−377	
4	−260	117 / 3
		39 mV / pH
4	−262	
	−330	



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HEKA

Project No.

TITLE Writing a script to fix the meander algorithm

Book No.

From Page No.

Problem:

x	y	z
0	0	
1	0	
2	0	1st line
3	0	
4	0	
0	1	
1	1	
2	1	2nd line
3	1	
4	1	

The direction should be reversed for the even numbered lines, like this:

x	y	z
0	0	
1	0	
2	0	
3	0	
4	0	
4	1	
3	1	
2	1	
1	1	
0	1	

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Witnessed and understood by me

Date

Invented by

Recorded by

Date 180705

HEKA

fc2m.sh „Fast code to meander"

inputs : 1/ # of ~~points~~ points in a line (x)

example from the left: x=5

2/ # of lines (y)

example from the left: y=2

usage: fc2m -x 5 -y 2 -f test.txt
-o test_o.txt

both arguments : getopts

```
while getopts u:d:p:f: option
do
case "${option}"
in
u) USER=${OPTARG};;
d) DATE=${OPTARG};;
:
esac
done
```

finished script on next page!

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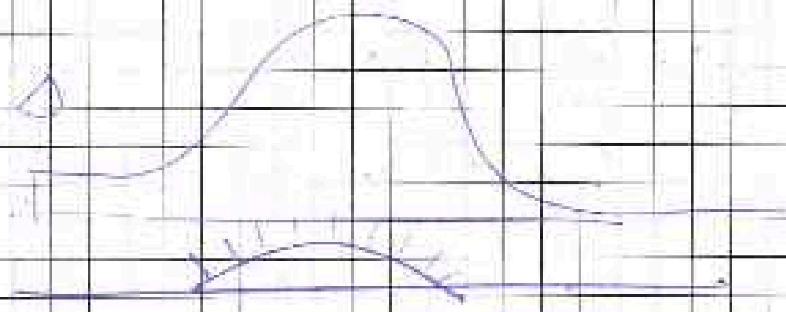

```
#!/bin/bash

POSITIONAL=()
while [[ $# -gt 0 ]]
do
key="$1"

case $key in
      -x|--x)
     x="$2"
     shift # past argument
     shift # past value
     ;;
      -y|--y)
     y="$2"
     shift # past argument
     shift # past value
     ;;
      -if|--inputfile)
     inputfile="$2"
     shift # past argument
     shift # past value
     ;;
      -of|--outputfile)
     outputfile="$2"
     shift # past argument
     shift # past value
     ;;
     *)     # unknown option
     POSITIONAL+=("$1") # save it in an array for later
     shift # past argument
     ;;
esac
done
set -- "${POSITIONAL[@]}" # restore positional parameters

#old version done with sed, not complete
#cp /dev/null $outputfile
#for i in $(seq 0 2 $y)); do
# sed -n "$((i*x+1)),$((i*x+x)) p" "$inputfile" >> "$outputfile"
# sed -n "$(((i+1)*x+1)),$(((i+1)*x+x)) p" "$inputfile" | tac >> "$outputfile"
#done

#with awk
cp /dev/null $outputfile
for i in $(seq 0 2 $y); do
 awk -v line="$1" 'NR>=$((i*x+1)) && NR<=$((i*x+x)) {print $3*1000000, line, $4*1000000000000}' $inputfile >> $outputfile
 awk -v line="$1" 'NR>=$(((i+1)*x+1)) && NR<=$(((i+1)*x+x)) {print $3*1000000, line+1, $4*1000000000000}' "$inputfile" | tac >> "$outputfile"
done
```

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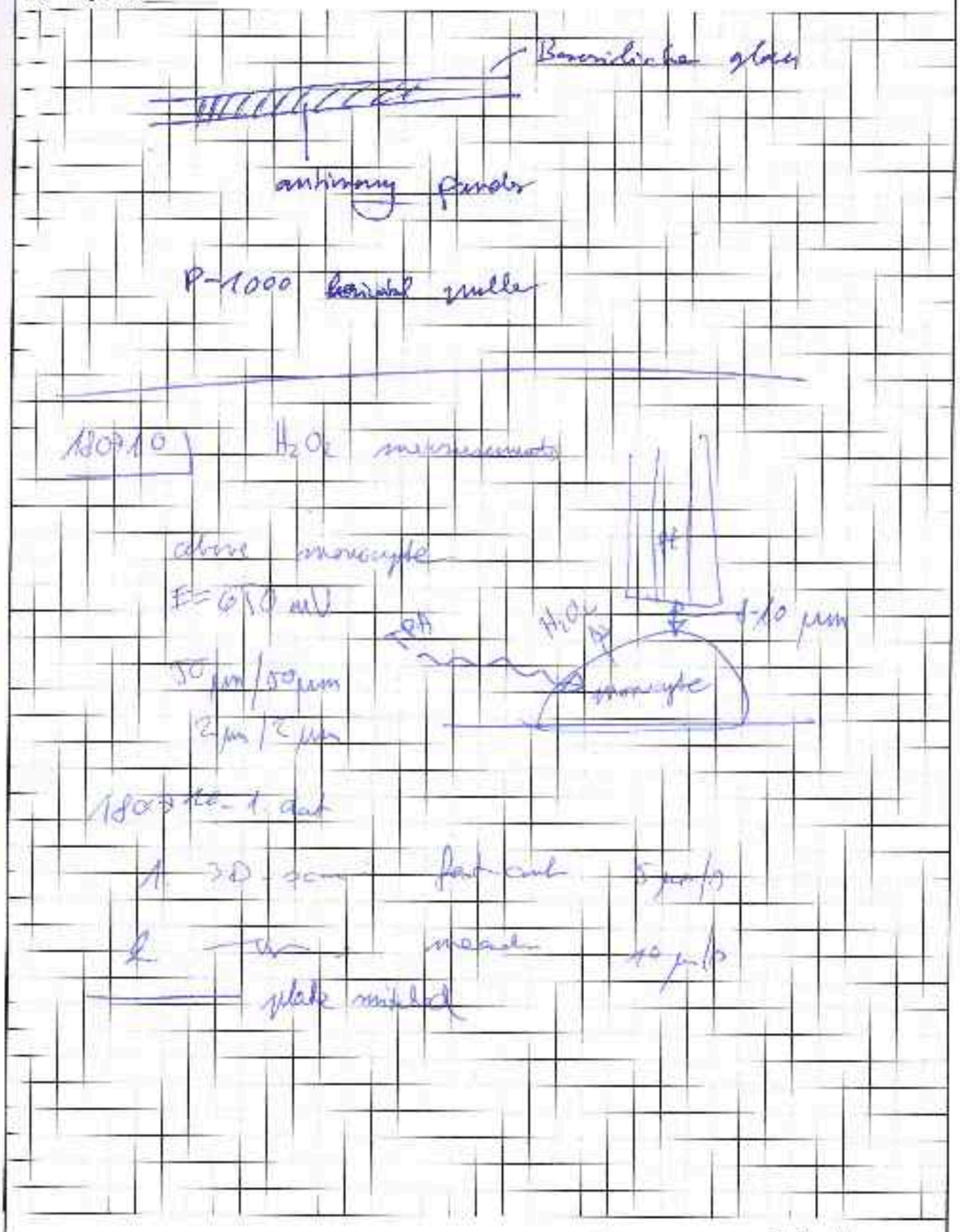
Recorded by

Project No

TITLE Trying out a new technique to fabricate Sb microelectrodes

Book No

From Page No.



To Page No.

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	18/2/09	Recorded by	

HEKA

Project No.

TITLE Testing antimony microelectrodes prepared yesterday

Book No.

From Page No.

E@ pH 7 pH 2.5 (mV)

1	—
2	-409.16
3	-394
4	-378
5	-364
6	-350
7	-350
8	-350
9	-354
10	-357

9/10

02 med = 10 µm (40X)

all	bulk
-415	-413
-416	-413

17th bulk
24 cell
25 bulk

+4 coli.

31 bulk
35 cell (manages)
41 4:30
12 6:30

-430 mV → -696 mV

300 µl 1N NaOH

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30

HEKA

Project No.

TITLE Attempting to image yeast cell O_2 output

Book No.

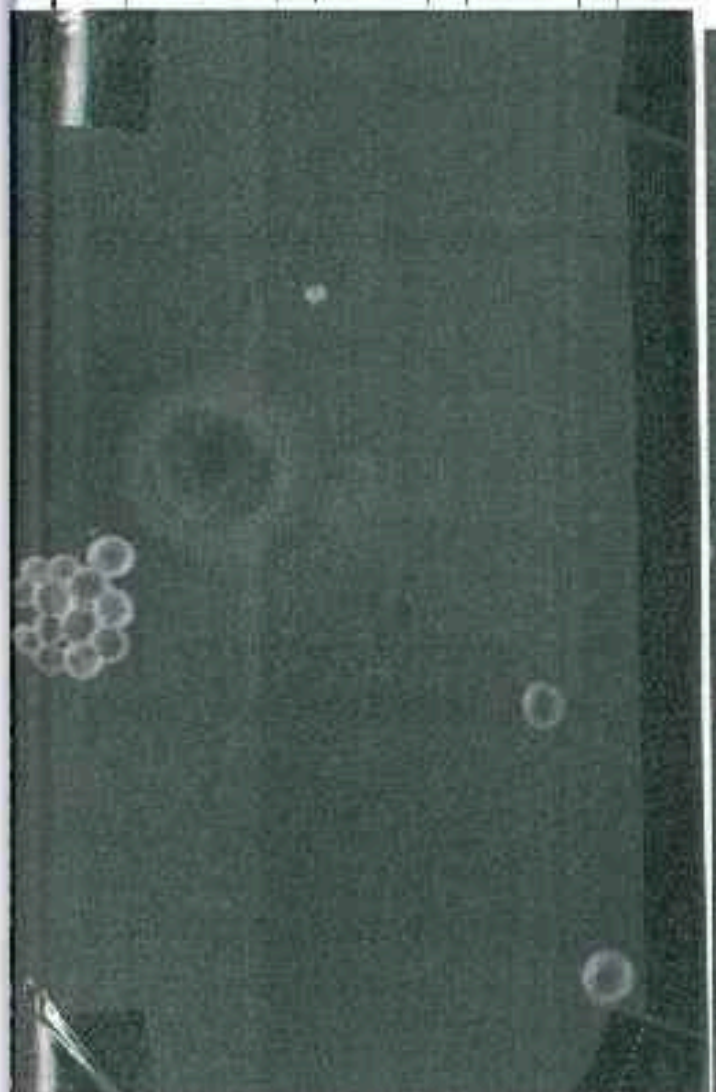
From Page No.

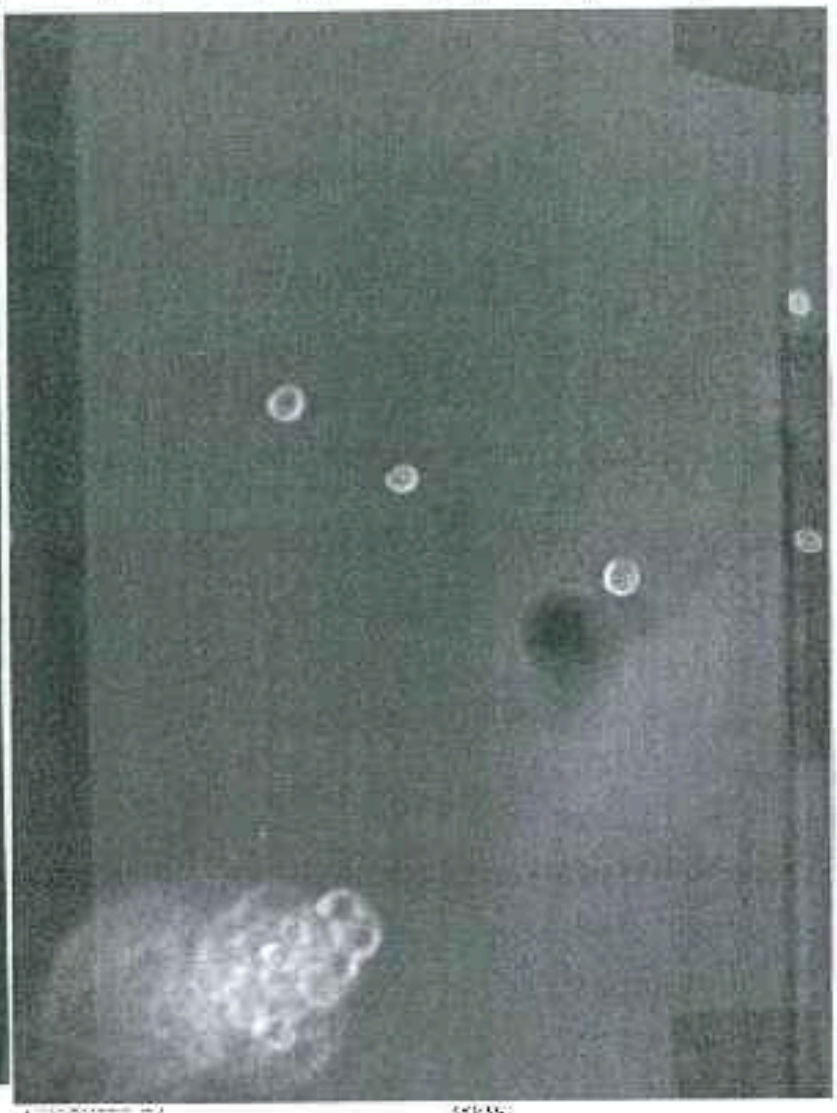
Broth : 2g glucose in 100 ml dw.

Yeast : „Oma's Un-Hefe Universal" from Edeka

I could not observe any pH change above the yeast cells.

(Pt electrode #7 broke.)





Recorded by

HEKA

180713

Project No

TITLE: Measuring oxygen above the human monocytes

Book No

From Page No.

180716_01

Monocyte 6 days old

E1 = ?

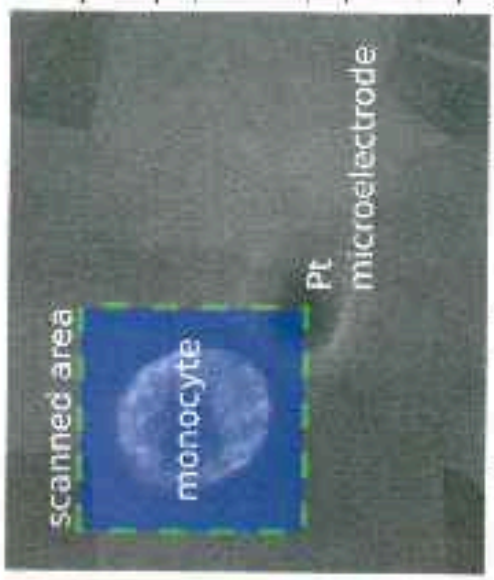
incomplete

100 µm × 100 µm area

101 × 101 points

↓

1 µm × 1 µm step size



10 µm/s scanning speed

meander algorithm

electrode #8

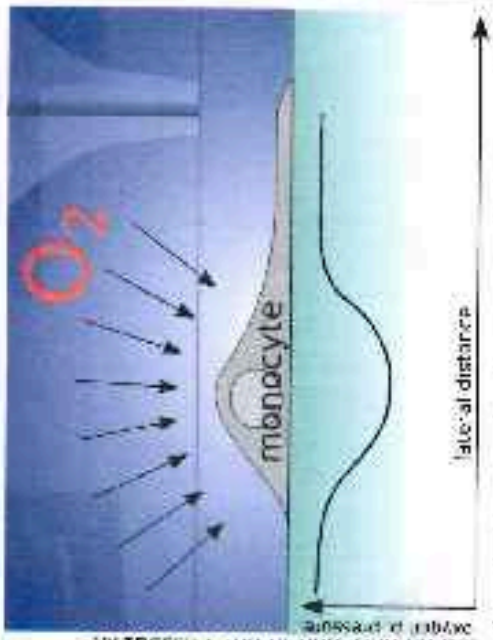
Pt glass

E = −700 mV vs. quasi-reference

(chlorinated silver wire)

medium + electrolyte: PBS

10 mM glucose



10 µm = h

glass

monocyte

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180716	Recorded by	

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TITLE _____ Book No. _____

From Page No. _____

E1 – 3 40 µm / 40 µm
41 × 41
5 µm/s meander incomplete
start: 3 (Cell150716_003.TIF)
finish: 4

E1 + 4 40 µm × 40 µm
41 × 41 incomplete
1 µm/s fast cont

E1 – 5 40 µm × 40 µm
41 × 41 h = 3.15 µm
10 µm/s meander

E2 – 1 60 µm × 60 µm
61 × 61
0.5 µm/s fast cont

new cell
z = +26.71 µm

E2 – 8 × 40 × 40
401 × 41
fast cont
5 µm/s

E2 – 8
40 × 40
401 × 41
meander
10 µm/s

E2 – 10 – 11
20 µm/s meander

Only 401, because it's 10 times faster

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Witnessed and understood by me Date Invented by Date

Recorded by

E2 – 11
50 µm/s
meander

E2 – 0.5 µm/s fast cont

HEKA

33

Project No.

TITLE continued from previous page

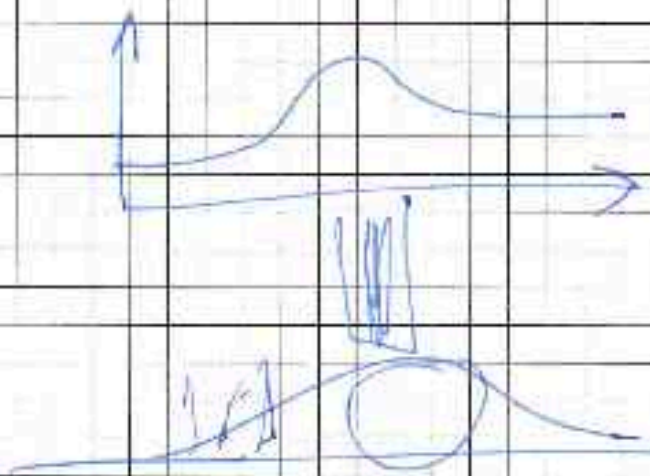
Book No.

From Page No.

v [µm/s]	fast comb	meander
1	~~(E2-13)~~	
5	E2-8	
10		E2-9
20		E2-10
50		E2-11

+ step response? →

cell dead: E2-12



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TITLE

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+ 20 µl of 100 mM H_2O_2

V_{total} = 2 ml

$20 \cdot 10^{-6}\ dm^3 \cdot 0.1 \frac{mol}{dm^3}$

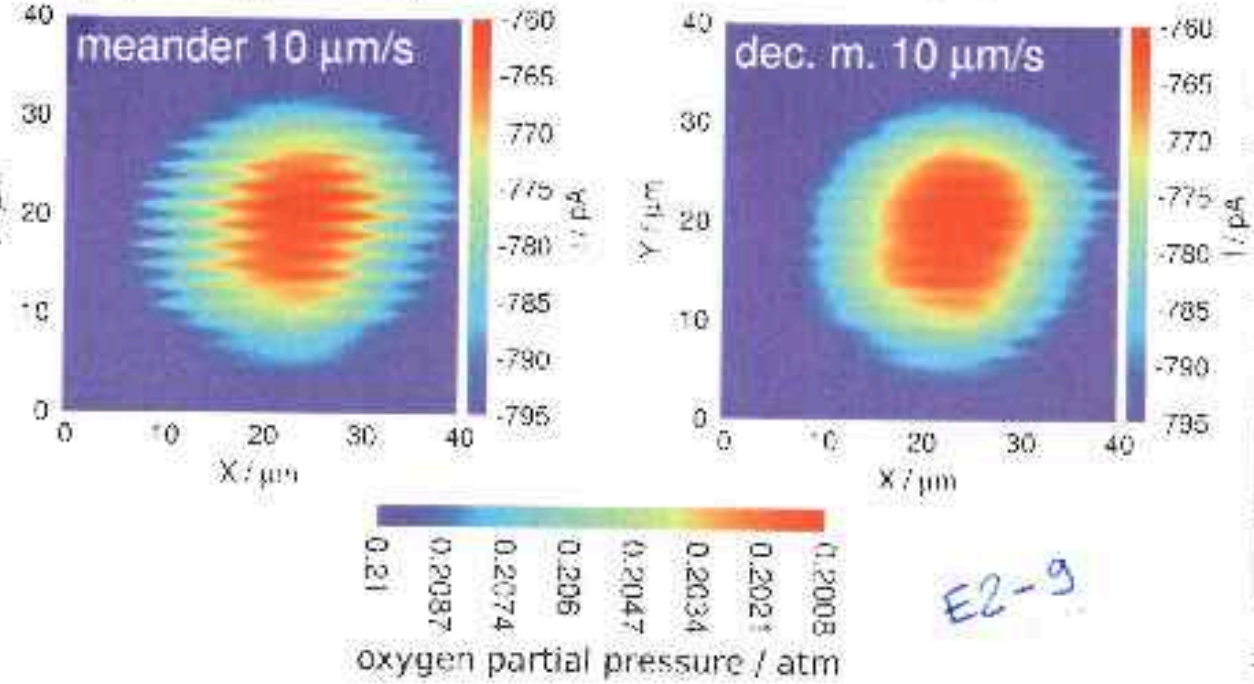
$2 \cdot 10^{-6}\ dm^3$

$2 \cdot 10^{-6}$ mol

2 µmol in 0.002 dm^3

$c = \frac{0.000002\ mol}{0.002\ dm^3}$

$c = 1\ mM\ H_2O_2$



E2-9

Recorded by

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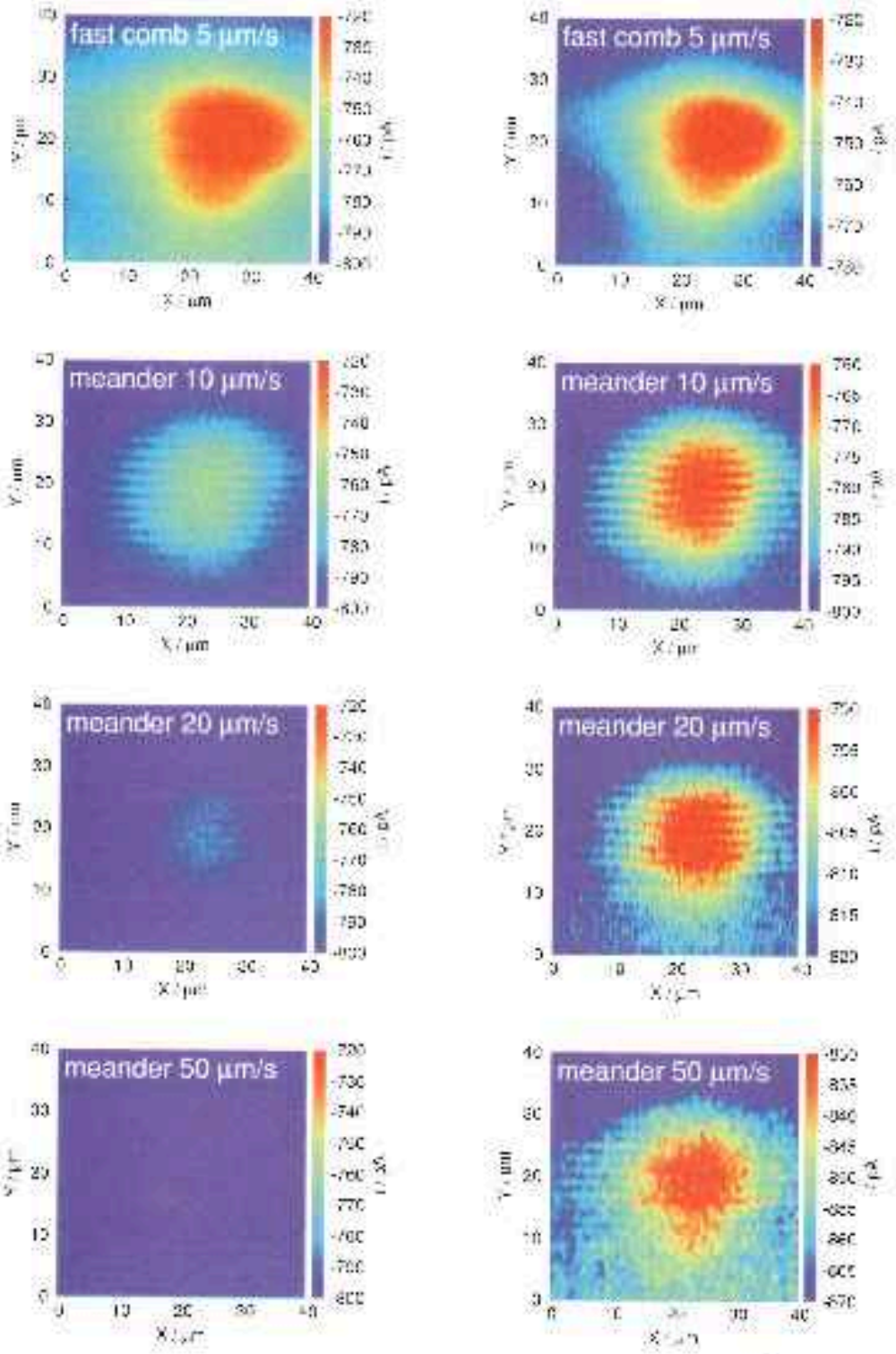

Figure 1: Oxygen reduction current scanned from monocyte at h = 10 µm relative to the glass bottom of the Petri dish. Working electrode d = 5 µm Pt UME, RG as 2.5, E = -700 mV vs. Ag/AgCl quasi-reference electrode. Medium/electrolyte PBS + 10 mM glucose. Date: 2018.07.16. Left column: fixed scale -800 pA to -720 pA. Right column: autoscale.

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Project No.

TITLE

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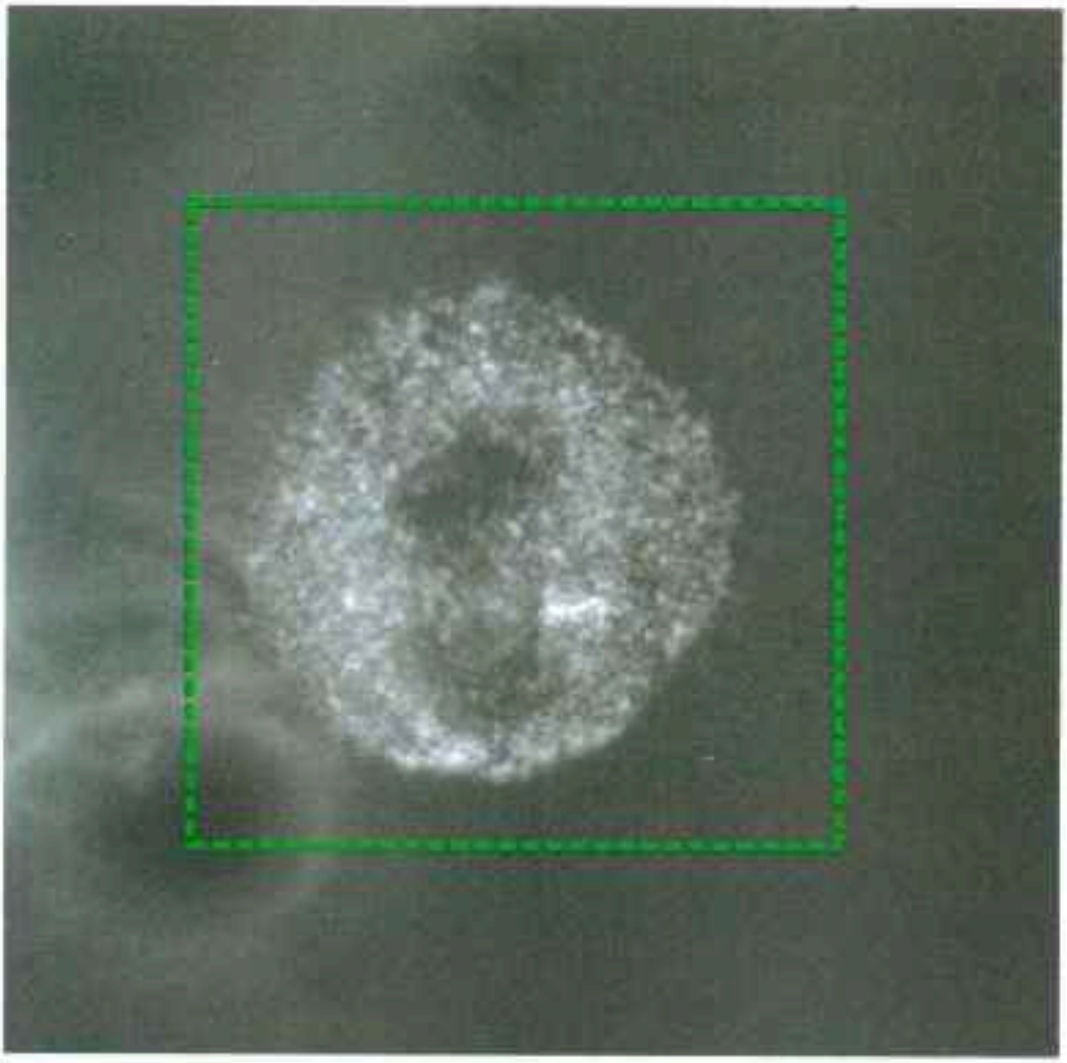

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Project No.

111 Sb microelectrode calibration

Book No.

From Page No.

1, Make pH = 6 6.5 7 7.5 & Solution

(PBS)

adjusted with 1N HCl and 1N NaOH

real pH 6.06 6.57 7.06 7.5 8.03 ~~8.42~~ 8.42

measured with Hanna pH 211

pH	E/mV
6.06	-293.1
6.57	-318
7.06	-344
7.5	-364
8.03	-388
8.42	-403

Sb #5

ref. solution

Ag/AgCl/3M KCl ref. electrode

with HEKA patch-clamp EPC 10 USB

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Project No.

Book No.

Title

From Page No.

Equation	y = a + b*x		
Weight:	No Weighting		
Residual Sum of Squares	18.27252		
Pearson's r	-0.99895		
Adj. R-Square	0.99738		
		Value	Standard Erro
B	Intercept	-10.16421	7.86916
B	Slope	-48.95497	1.07525

Sb #3

E vs. Ag/AgCl/3M KCl (mV)

pH (PBS)

-280 -300 -320 -340 -360 -380 -400 -420

6.0 6.5 7.0 7.5 8.0 8.5

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pH	E (mV) vs Ag/AgCl quasi-ref (chlorinated silver wire)
6.06	-315
6.17	-336
2.06	-378
2.5	-377
8.03	-397
8.42	-415

The slope is similar to that of the V measured against an Ag/AgCl chloride ref electrode.
The potentials are shifted by about -20 mV, as a consequence of the shift in the potential of the reference half-cell.
The minor difference in acc at the buffers doesn't seem to effect the response noticably.

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E vs. SHE (mV)
0,22
0,20
0,18
0,16
0,14
0,12
20
40
60
80
100
120
140
T (Celsius degrees)
25 0,222
60 0,196
125 0,133
Equation y = a + b*x
Weight No Weighting
Residual Sum of Squares 2,12919E-5
Pearson's r -0,99748
Adj. R-Square 0,98994
Value Standard Error
B Intercept 0,24735 0,00523
Slope -3,04437E-4 6,42989E-5

Project No.:

TITLE

Book No.:

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HEKA

Project No.

TITLE Investigating the noise problem

Book No.

From Page No.

The noise in chronoamperometric measurements increases as temperature increases

2ml PBS
E = 650 mV
Pt WE - # 8

t = 36.8 °C

noise ≈ 2.42 pA – 2.53 pA ≈ 305 fA

1:42:30 thermostat off

t / °C	≈ noise
~~36.8~~	~~305 fA~~
32.8	270 fA
31.3	240 fA
30.0	~~50 fA~~) ≈ 110 fA
28.0	130 fA
27.0	110 fA
26.0	90 fA
23.0	50

Arrhenius - equation
$k = A e^{\frac{-E_a}{RT}}$

(1:51:00 + ice ≈ 10 °C
1:54:00 + ice)

16 °C | 58 fA

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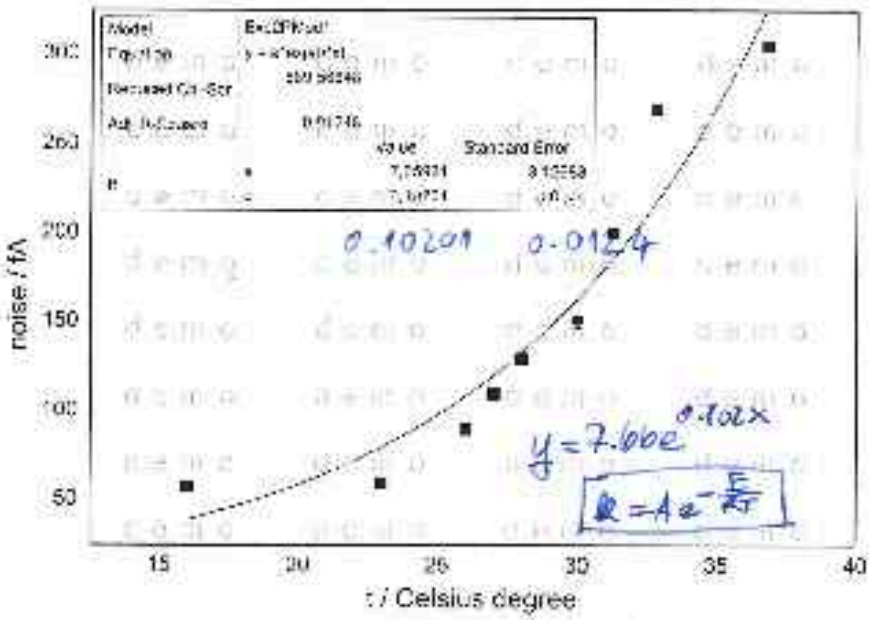
	180719	Recorded by	

HEC



The observed noise might be caused by the increased reaction rate. It appears that the magnitude of the noise follows the Arrhenius law.

$k = A e^{-\frac{\Delta E}{RT}}$

Note on 2018.08.04:
The signal is not increasing with temp. as much, because the rate limiting step is not the electrode reaction (it's transport limited.

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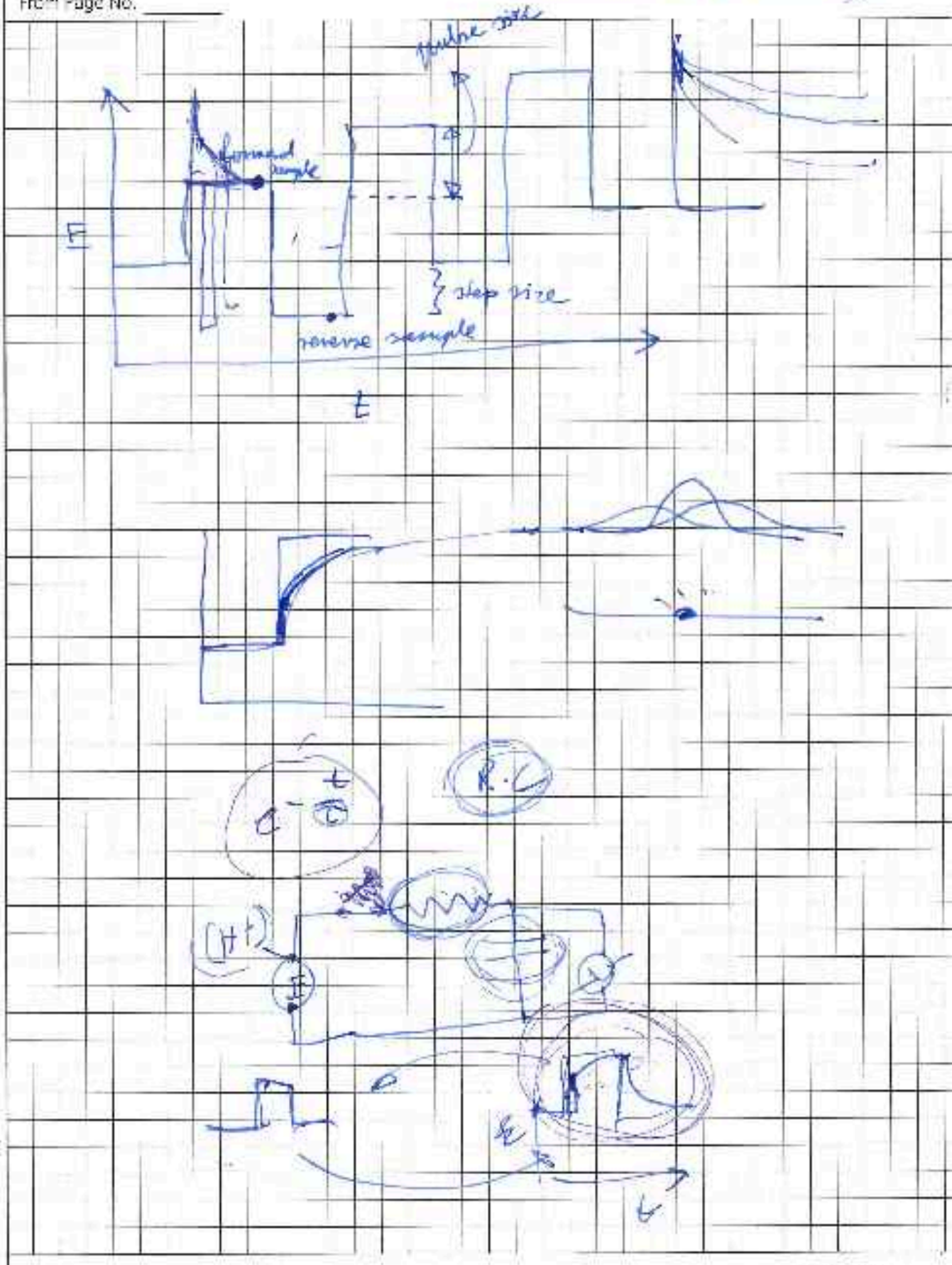
Book No.

TTL Square wave voltammetry (Discussion with Valentin)

From Page No.



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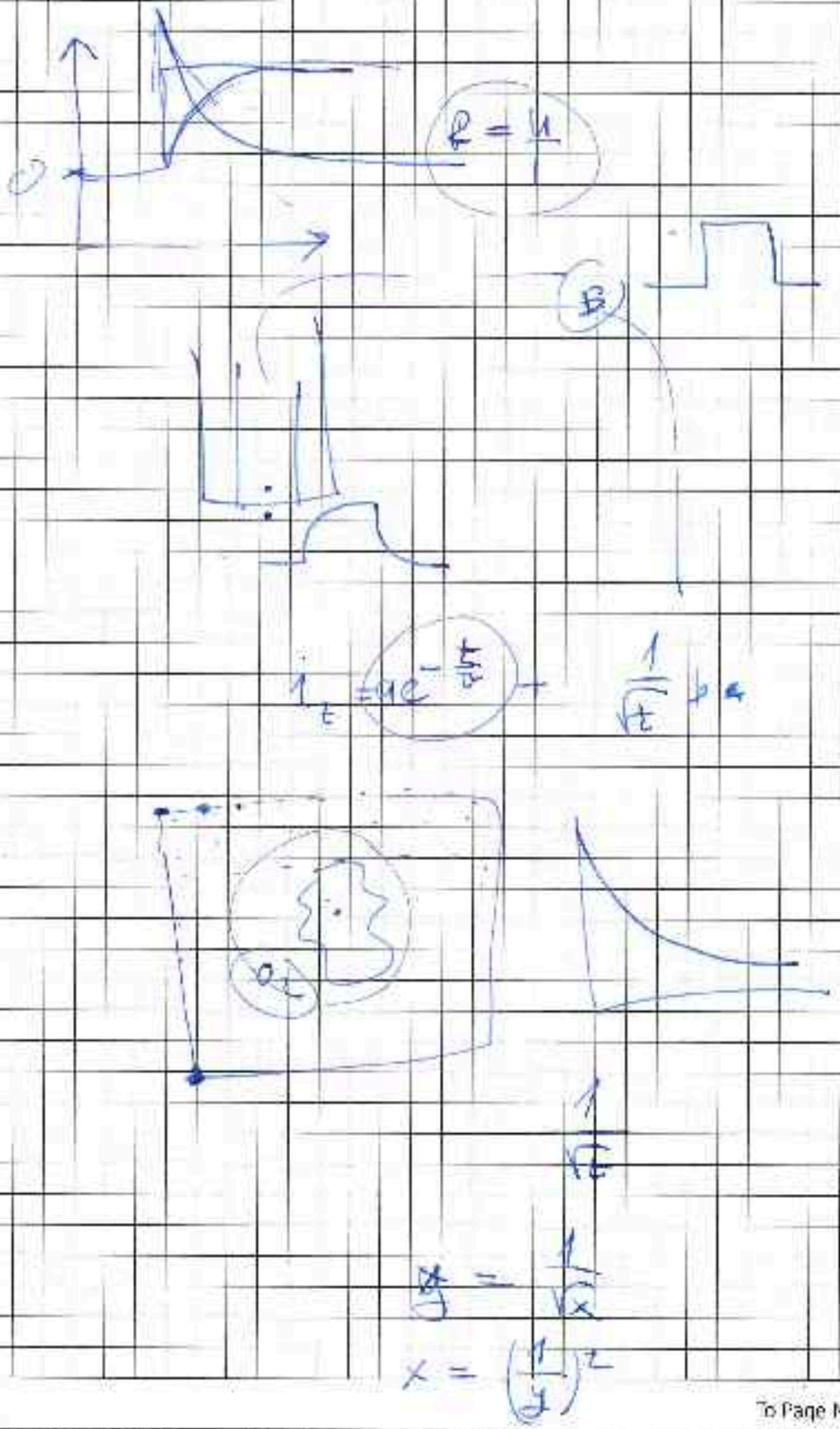
Discussion with Valentin



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Project No.:

TITLE: Platinum etching in aqua regia

Book No.:

From Page No.:

mole ratio

Aqua regia: 1:3 mixture of HNO_3 and HCl
cc. cc.

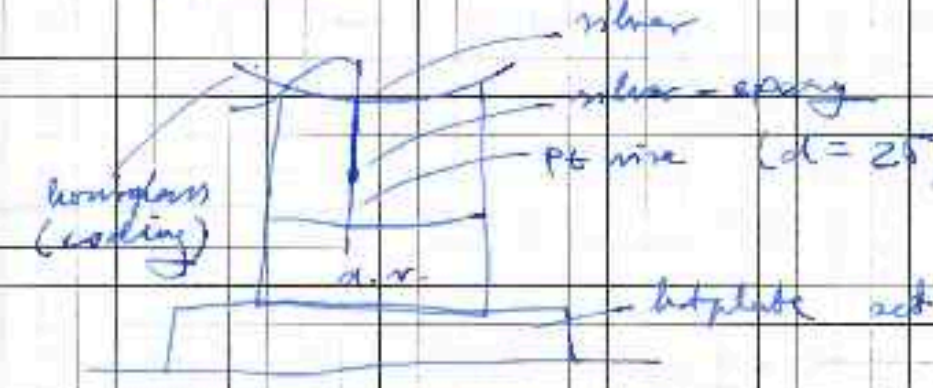
HCl
HCl
HCl

$N^+=O$
HO

(Remark) $[HNO_3] = 6.66 \frac{mol}{dm^3}$ (not ex.) this was a very old solution
$[HCl] = 11.65 \frac{mol}{dm^3}$ 3 ml. (1 cc.)

2 ml HNO_3 conc.
3.3 ml HCl conc.

$t \approx 100°C$



etch start: 13:00
finish: 13:40

10 µm Pt wire was etched down to ~2.5 µm

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Date: 13.07.24

Invented by:

Recorded by:

Date:

IHEG

Project No.

TITLE

Book No.

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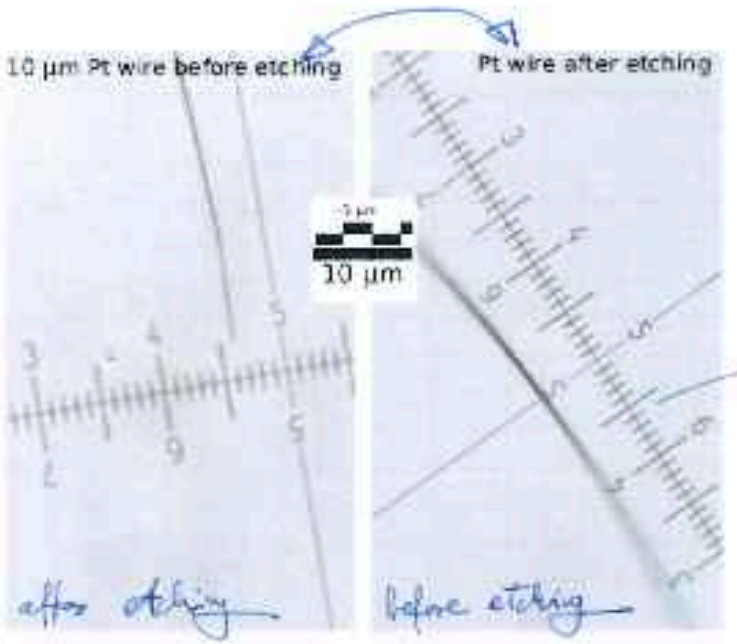

One notch here is 10 µm

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HEKA

Project No.:

TITLE Planning the presentation

Book No.:

From Page No.:

1, introduction → what is SECM
2, previous work → potentiometry
3, SECM Conference Warsaw
4, question: „ Can it be done for amperometric SECM? "
5, YES: page 3 → amperometric cell, feedback ...
6, I've started a rigorous study
7, glass sheet
8, Pt wire

deconvolution worked surprisingly well!

9, cells: H_2O_2 sink
~~H_2O_2 source~~
O_2 sink ✓
2 cells

10, spatial deconvolution
DSF
:
:
11, thank you → plots from this

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	180726	Recorded by	

HEKA

180731

Project No. O_2 mapping

TITLE Additional measurements

Book No.

From Page No.

1, O_2 reduction above glass sheet / bulk
2, O_2 change response
3, very slow scan (O_2 reduction) for spatial deconvolution (slowest possible) 0.1 µm/s ?

- with circular Pt electrode 10µm
- electrolyte : PBS + 10mM glucose (same as for monocytes)

— o —

optical and electrochemical images are horizontally mirrored of each other

algorithm / speed µm/s	meander	fast comb	
1		12	
2			
5			
10	E2-4	E2-3	0.1 µm/sample
20	E2-5	E2-6	1 µm/sample
50	E2-~~8~~ 8 7	E2-9	1 µm/sample
100	E2-11	E2-10	

data not shown correctly by software

To Page No.

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TIF:3

E2-13 is for spatial deconvolution!

Project No. ______________

TITLE ______________ Book No. ______________

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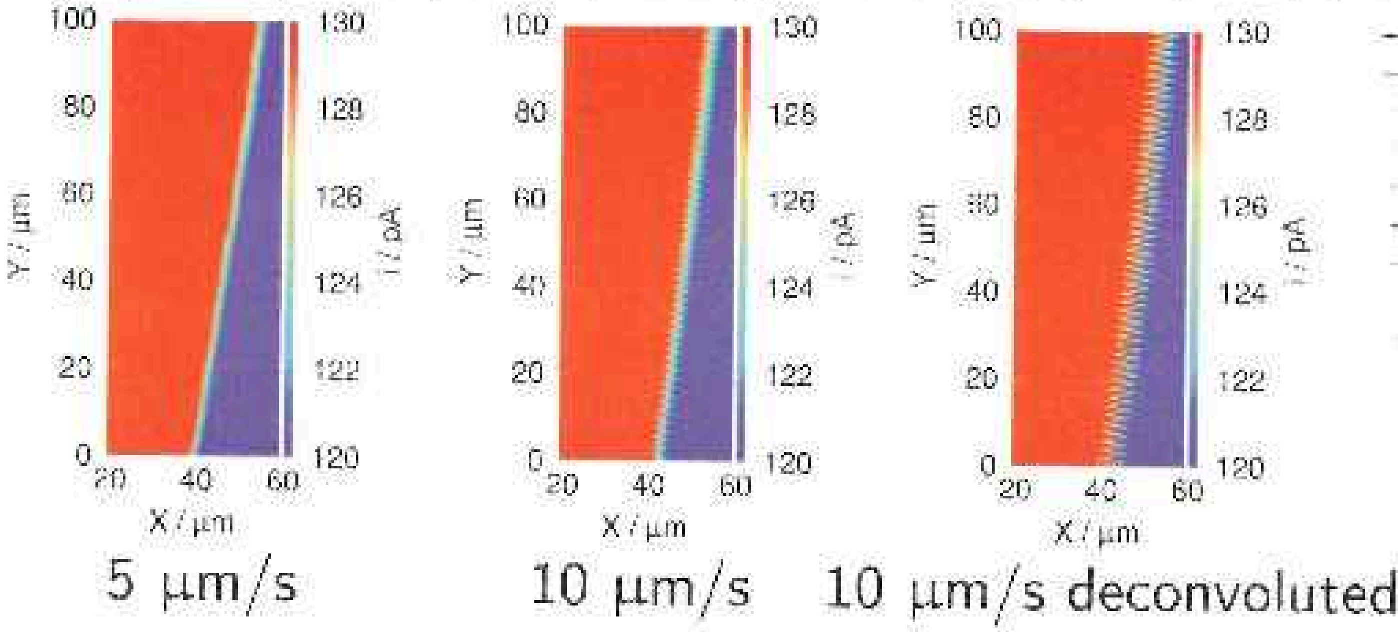
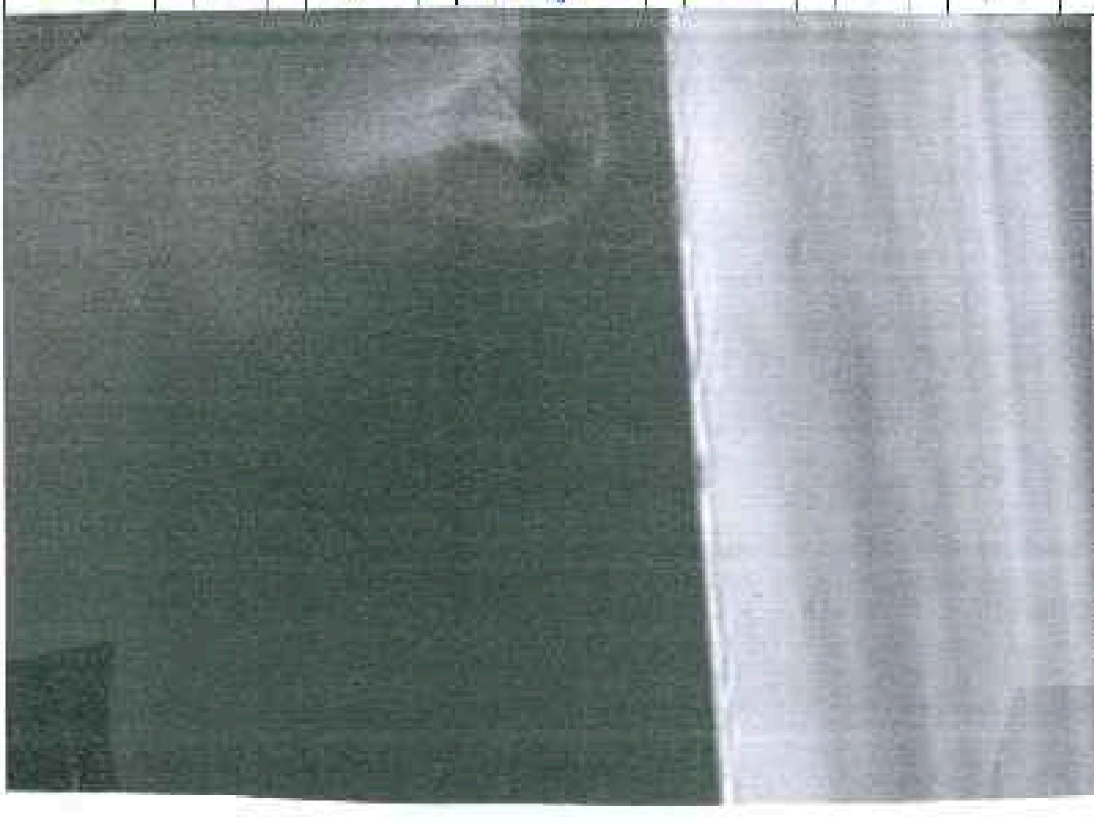


Refered to from page 24.



Optical image is mirrored horizontally, because it's taken with the ...

With ______________

e No. ______________

HEKA

Project No.

TITLE

Book No.

From Page No.

Refined in image J.

To Page No.

Witnessed and understood by me

Date

Invented by

Recorded by

Date

HECA

Project No.

TITLE Deconvolution of already slow image

Book No.

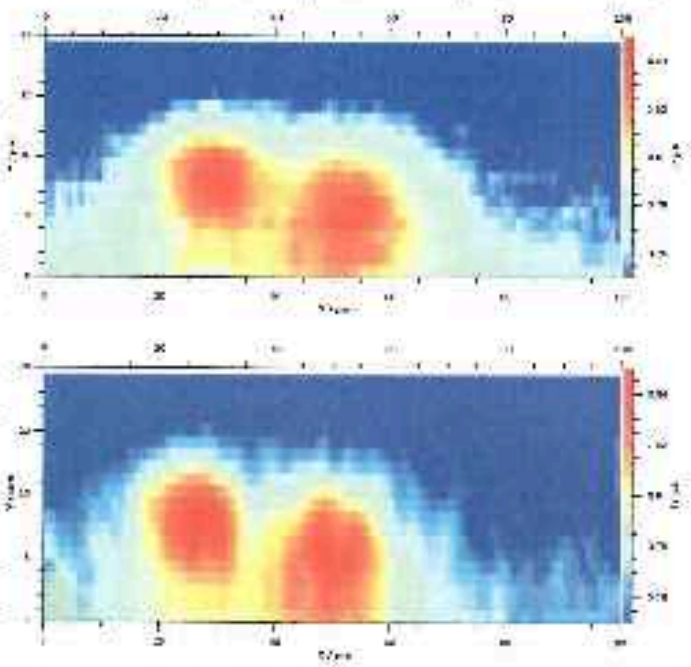
From Page No.

Targets: 2 monocytes stimulated with TPA.

↓

Extracellular H_2O_2 conc. increases.

scan rate: 2 µm/s



From: 2014 april 1.

There isn't much improvement. The image was already pretty good.

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Notes written on 2015.08.02.

HEKA

```
#!/usr/bin/env python

'''
Deconvolution of distorted ZEISS images.
Copyright (C) 2018 Andrew Rice

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modify it under the terms of the GNU General Public License
as published by the Free Software Foundation, either version 2
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Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston,
MA 02110-1301  USA.


  Here is a first attempt at porting the deconvolution algorithm
  from MATLAB to python. The gaussian filter is not yet implemented
  in the program. Right now I do it with the plotting software (gnuplot),
  but it would be better if the python program did it. Also, I have not
  done the command line argument interpreter yet, so the file name must
  be changed in the code every time. A GUI would be nice, and a live plot
  of the convolved and deconvolved images. For that, the XYZ data needs
  to be converted to a matrix.

'''

import numpy as np
import subprocess

conv_img = np.loadtxt('9_11_rendered.txt')
deconv_img = np.copy(conv_img)
e0 = np.float32(conv_img[0][2])
for n in range(0, conv_img.shape[0]):
        deconv_img[n, 2] = np.float32((conv_img[n][2]-e0*0.98)/(1-0.98))
        c0 = np.float32(conv_img[n][2])

np.savetxt('9_11_rendered_deconvolved.txt', deconv_img, delimiter=' ')

#proc = subprocess.Popen(['gnuplot', '-p'],
#                        shell=True,
#                        stdin=subprocess.PIPE,
#                        )
#proc.stdin.write('set xrange [0:0]; set yrange [-2:2]\n')
#proc.stdin.write('plot sin(x)\n')
#proc.stdin.write('pause 10\n') #Close the gnuplot window
```

The deconvolution algorithm in Python.
I've written it on 2018.07.02.

Witnessed and understood by me | Date | Invented by | Date

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