# A PAPER-FREE LAB

How to work in a modern lab environment

**ELN workshop** 

14.3.2016

Joram Schimmeyer

Max Planck Institute for Molecular Plant Physiology

#### Lab books did not change much



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Marie Curie's lab book

http://factually.gizmodo.com/marie-curies-100-year-oldnotebook-is-still-too-radioac-1615847891





Protocol 6.3.13 According to the protocol a BN-PAGE was set up and loaded with 5 samples. 2 for 2D-BN-SDS-P (18 kDa and Col-0), 2 for GLDH Antibody blotting (18 kDa and Col-0) and 1 for blotin labelling w streptavidin-HRP conjugate. The gel was run for 45 min at 6 mA and 100 V and then for 8 hrs a BN-PAGE Protocol 8.3.13 BN-PAGE mA and 500 V. Transfer on two membranes. Lane Col-O for biotinylated protein detection and Lanes Col-O and 18 kDa for @GLDH AB detection, which will be performed next week. The membranes have been unt of sample was 8 µl for Col-0 mitochondria and 10 µl for 18 kDa KO mitoc The loaded an 73:13 Transfer of DV-PAGE ge lanes on PUDF menos Neubrane I 3N-PAGE of mitochandora GCO for bookinglated protein detection Membrane I 18 hDa (membrane edge out) and Ge for GLDH Antibaly array 73.13 01-0 18 kD 8 The lanes for the 2D get (SDS) were wrapped in disglim and forces at - 20°C. SDS-PAGE the SDS-PAGE of mitochandrial protein was for detection of motinglated protein The samples were marter 1 8 pel of whole witchordon [ 30 pel of pellet 1 20 60 pl prior to bot loading the get the 20 pl of with were used in a mitochandrial fractionation and (see 28.2. 3 for defails) 1 00

Photos by Caleb Roenigk Fairfax Library Foundation







Photos by Alan Light Clive Darra

**Robert Jemimus** Kārlis Dambrāns

#### Today, our workflows are digital.

### So should be our lab books.

#### 2D SDS-PAGE.doc

2011-12-09 CaCl2 competent cells.doc

Bleach sterilization of Arabidopsis th.doc

- Blue-Native PAGE (BioRad).doc
- BN-PAGE for Thylakoids-20140519.doc
- BSA-Standard.xls
- Chemo-Competent cells Pau.docx
- Coomassie staining of protein gels.doc
- Dilution Table DNA.xlsx
- FastDigestionMix.xls
- Genotyping.doc
- GFP expression\_outline.doc
- GFP-Expression\_complete.doc
- Import + BN.doc
- lsolation of total nucleic acid from plant material.doc
- Membrane Stripping protocol GnHCI.doc.xls
- Membrane Stripping protocol.doc
- 🖹 Michi Protoplasten für Grobe mit Maxi und Jen.pdf
- Midi Prep with the Kit by Machery Nagel.docx
- MiniPrep\_DNA.xlsx
- inito from plants (mortar).doc
- mito from plants (mortar)\_jorams-edition.doc
- Mitochondrial fractionation.doc
- Nucleic Acid isolation CTAB Pau.doc
- PCR MM Chlamy table.xlsx
- PCR MM table.xlsx
- PCR program.xlsx
- Phusion\_PCR\_Mastermix.xls
- Phusion\_PCR\_Mastermix\_2.xls
- Possible suppliers for strepatavidin agarose.docx
- Protein expression.doc
- Protein extraction from plant tissues.doc
- Protoplast isolation and transient transfection.doc

	1	3.5	22	
FastDigest Buffer 10x	2	7	44	
Spe1	1	3.5	22	
Xba1	1	3.5	22	
Template DNA	5	17.5	110	
water	11	38.5	242	
total	20	70	440	
	1	5	22	
FastDigest Buffer 10x	2	7	44	
Restriction enzyme	1	3.5	22	
Template DNA	5	17.5	110	
water	12	42	264	
total	20	70	440	

#### SCHIMM-050216-6

Entry date	Old location name	New location name
29/02/2016	CGWCab0710	CGWCab07
19/02/2016	CGWCab0710	CGWCab0710
16/02/2016	CGWPhy110301	CGWCab0710
08/02/2016		CGWPhy110301
Back to Overview		



## Collecting digital data

	Mode	750.0 nm	663.6 nm	646.6 nm	Chl. a [µg ml-1]	Chl. b [µ	Chl. a/b	Total chlorophyll 10
1	Blank-1	-0.037	-0.029	-0.028				
2	Sample-1	0.002	1.401	0.563	15.71	4.53	3.47	3056.4
3	Sample-2	0.002	0.793	0.318	8.88	2.54	3.49	1725.5
4	Sample-3	0.008	1.136	0.46	12.67	3.65	3.47	2465.1
5	Sample-5	0.012	0.186	0.082	1.96	0.57	3.44	381.6
6	Sample-6	0.012	0.145	0.065	1.49	0.42	3.51	289
7	Sample-7	0.01	0.135	0.061	1.4	0.42	3.36	273.8
8	Sample-8	0.011	0.129	0.059	1.32	0.39	3.39	258.4
								300.7
								3007 μg/ml
9	Sample-9	0.008	0.771	0.312	8.57	2.44	3.51	1663.5
10	Sample-10	0.007	0.772	0.312	8.58	2.44	3.52	1664.1

#### Measurement readings



#### Gel images

### Recording digital data





- Cloud based
- Built according to the MPG guidelines for secure handling of scientific data
- Only I can access my data
- Encrypted connection to server

#### Labfolder – introduction

🔀 labfolder	₽ Notebook		NOTEBOOK	() MANAGE	DASHBOARD	Q	Â.		,
+ Add	Filter: Projects (1) - Authors (0) - Tags (0) - Dates -								
									1
Joram Schimmever	Entry 1/1: No entry title yet	created: modified:	12.03.2016		No tags associated		~ *	*	
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#### Labfolder – basic features

CO-II	<sup>2</sup> was pe	riormed with th	e kit by Sign	na, with incu	bation times	according to the i	manufacturer.		
	Α	В	С	D	E	F	G	Н	
1	No.	Mode	750.0 nm	663.6 nm	646.6 nm	Chl. a [µg ml-1]	Chl. b [µg ml-1]	Chl. a/b	Total chlorophyll V
2	1	Blank-1	-0.037	-0.029	-0.028				
3	2	Sample-1	0.002	1.401	0.563	15.71	4.53	3.47	3056.4
4	3	Sample-2	0.002	0.793	0.318	8.88	2.54	3.49	1725.5
5	4	Sample-3	800.0	1.136	0.46	12.67	3.65	3.47	2465.1
6	5	Sample-5	0.012	0.186	0.082	1.96	0.57	3.44	381.6
7	6	Sample-6	0.012	0.145	0.065	1.49	0.42	3.51	289
8	7	Sample-7	0.01	0.135	0.061	1.4	0.42	3.36	273.8
9	8	Sample-8	0.011	0.129	0.059	1.32	0.39	3.39	258.4
10									300.7
11									3007 µg/ml
12	9	Sample-9	0.008	0.771	0.312	8.57	2.44	3.51	1663.5
13	10	Sample-10	0.007	0.772	0.312	8.58	2.44	3.52	1664.1
14									

#### Labfolder – basic features

The samples were run on a SDS-PAGE and stained using the Coomassie staining protocol for gels. The gel was stained over night and destained in water. pos. control neg. control Sample 1

### Labfolder – organisation

L Jo Sc	ram himmeyer		Entry name			×
+	·≣ + <b>%</b>	+= +	Co-Immunop	recipitation ex	periment 01	
	Co-im	munonr	located in projec	t		
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		A	В	С	D	E
	1	No.	Mode	750.0 nm	663.6 nm	646.6
	2	1	Blank-1	-0.037	-0.029	-0.028
	3	2	Sample-1	0.002	1.401	0.563
	4	3	Sample-2	0.002	0.793	0.318
	5	4	Sample-3	0.008	1.136	0.46
	6	5	Sample-5	0.012	0.186	0.082

#### Labfolder - organisation

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		created	: 12.03.2016					
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С	D	Experiment	started	:	08.03.20	16	Ť	-
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.002	0.793	0.318	8.88			2.5	54	
.008	1.136	0.46	12.67			3.6	65	
.012	0.186	0.082	1.96			0.5	57	
.012	0.145	0.065	1.49			0.4	12	

## Labfolder – organisation

ry 1/1: Co-Ir Project: Exan	nmunoprecipi nple project	tation experi		created: 12 modified: 12	2.03 2.03	Create new tags by using commas	×	
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ample-1	0.002	1.401	0.563	15.71		Chlamy	-	
ample-2	0.002	0.793	0.318	8.88		Chlorophyll measurement		
ample-3	800.0	1.136	0.46	12.67		chloroplast		
ample-5	0.012	0.186	0.082	1.96		cloning		
ample-6	0.012	0.145	0.065	1.49		Co-IP		
ample <sub>-</sub> 7	0.01	0 135	0.061	14		medium		

# Labfolder – organisation

Co-immunoprecipitation

6 search results found

#### 13.03.2016: Example project

... Co-immunoprecipitation experiment with 1 sample. 90 plants were harvested, thylakoids were extracted and the chlorophyll content per sample was measured. Co-IP was performed with the kit by Sigma ...

Q

#### Creating even more data

	prot_acc	prot_desc	prot_score	prot_mass	prot_matche	prot_matches_si	prot_sequence	prot_sequences_si	prot_cover	pep_query	pep_rank	pep_isbol	pep_isuniqu	(pep_e)
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	105180	1	1	0	352
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	105184	1	1	0	352
1	CON_Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	127981	1	1	1	. 416
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	127985	1	1	1	. 416
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	127991	1	1	1	. 416
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	128004	1	1	1	416
1	CON_Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	128034	1	1	1	. 4
1	CON_Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	134905	1	1	1	437
1	CON_Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	134907	1	1	1	437
1	CON_Q6GSJ0	CON _ _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	134909	1	1	1	437
1	CON_Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	141166	1	1	0	455
1	CON Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148565	1	1	0	487
1	CON Q6GSJ0	CON _ _ Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148567	1	1	0	487
1	CON Q6GSJ0	CON        Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148568	1	1	0	487
1	CON Q6GSJ0	CON       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148569	1	1	0	487
1	CON Q6GSJ0	CON      Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148573	1	1	0	48
1	CON Q6GSJ0	CON        Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148576	1	1	0	487
1	CON Q6GSJ0	CON       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148578	1	1	0	487
1	CON Q6GSJ0	CON       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148579	1	1	0	487
1	CON Q6GSJ0	CONI       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148580	1	1	0	487
1	CON Q6GSJ0	CONI       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148581	1	1	0	487
1	CON O6GSJ0	CONI     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148582	1	1	0	48
1	CON O6GSJ0	CONI       Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148583	1	1	0	487
1	CON O6GSI0	CONI     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	148584	1	1	0	487
1	CON O6GSI0	CONI     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154089	1	1	1	517
1	CON DEGSIO	CONL     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154091	1	1	1	517
1	CON OFFICIA	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154094	1	1	1	517
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154103	1	1	1	517
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154116	1	1	1	517
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154117	1	1	1	517
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154124	1	1	1	51
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	154126	1	1	1	517
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	157188	1	1	1	533
1	CON DEGSIO	CONL     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	157205	1	1	1	533
1		CONL     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	163866	1	1	1	563
1	CON DEGSIO	CONL_L_L_Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	163867	1	1	1	563
1		CONUL   Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	31	45.3	168064	1	1	1	500
1		CONUL   Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	31	21	45.3	168068	1	1	1	500
1		CONUL     Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	21	21	45.5	168060	1	1	1	500
1		CONUL L Keratin 1- Homo sapiens (Human)	2002	66027	274	274	21	21	45.5	169070	1	1	1	500
1		CONUL L L Keratin 1 - Homo sapiens (Human)	2002	66027	274	274	21	21	45.5	160070	1	1	1	500
1		CONUL 1 Keratin 1 Homo sapiens (Human)	2002	66027	274	274	21	21	45.5	160073	1	1	1	590
1		CONTRelatin 1 - Homo sapiens (Human)	2002	66027	2/4	2/4	21	21	40.0	160075	1	1	1	59
1		CONULT L Keratin 1 - Homo sapiens (Human)	2002	66027	2/4	2/4	51	31	40.0	160075	1	1	1	590
1		CONUL 1.   Keratin 1 - Homo sapiens (Human)	2002	66027	2/4	2/4	21	21	40.0	160070	1	1	1	590
1		CONULT L Keratin 1 - Homo sapiens (Human)	2002	66027	2/4	2/4	51	31	40.0	160070	1	1	1	590
1		CONULUL (Kerstin 1 - Homo sapiens (Human)	2002	66027	2/4	2/4	31	31	45.3	1680/8	1	1	1	590

#### Labfolder – Record data in files

- The gel pieces were digested with trypsin and purified using the ziptip protocol.
- purified peptides were dried and analyzed by mass spectroscopy.
- The acquired data was analyzed by removing hits from keratin and trypsin. Then, a database search against the emerging candidates has been performed.





Mass\_Spec\_Data.xlsx 204.8 KB Preview Extract Download

## Labfolder – Recording data in files

	A	В
23	1	"Oxidation (M)"
24		
25	"Search Parameters"	""
26		
27	Taxonomy filter	"All entries"
28	Enzyme	"Trypsin"
29	Maximum Missed Cleavages	1
30	Fixed modifications	III
31	Quantitation method	"None"
32	Variable modifications	"Oxidation (M)"
33	Peptide Mass Tolerance	10
34	Peptide Mass Tolerance Units	ppm
35	Fragment Mass Tolerance	0.8
36	Fragment Mass Tolerance Units	Da
37	Mass values	Monoisotopic
38	Instrument type	"ESI-TRAP"
39	Isotope error mode	0
40		
41	"Format parameters"	""
42		
t	4	

Add to project

#### Labfolder – Additional features

#### I. Templates

- My private templates
  - BN-PAGE Thylakoids
  - E Chlamy-Trafo
  - DNA Midiprep for E.coli
  - DNA miniprep for E. coli
  - 🖺 Gel Docu BN Page
  - Quick DNA prep Chlamy Chelex
  - Silver staining of protein gels
  - Transformation of chemocompetent E. coli
- ▶ ☐ Group templates: MPI

#### Labfolder – Additional features

#### 2. Edit history of every entry

			History of	this entry					
13.03.2016 11:31	Layout changed	<u>^</u>							
13.03.2016 11:31	Text changed			Co-in	munop	recipitation exp	eriment with	1 sample.	
13.03.2016 11:29	Element added			00		- homestad fi	u la kaida wa	en autrantad	and the al
13.03.2016 11:27	File uploaded			90 pia	ants wer	e narvested, tr	iyiakoids we	ere extracted	and the ci
13.03.2016 11:27	Element added			meas	ureu.				
13.03.2016 11:27	File uploaded			Co-IP	was pe	rformed with th	e kit by Sigr	na, with incu	bation time
13.03.2016 11:27	Element added								
13.03.2016 10:52	Entry title was set				А	В	С	D	E
13.03.2016 10:50	Text changed			1	No	Mode	750 0 nm	663 6 nm	646 6 nn
13.03.2016 10:49	Layout changed			2	1	Blank-1	-0.037	-0.029	-0.028
13.03.2016 10:49	Layout changed			3	2	Sample-1	0.002	1 401	0.563
13.03.2016 10:47	Table changed			4	3	Sample-2	0.002	0 793	0.318
13.03.2016 10:47	Table changed			5	4	Sample-3	0.008	1 136	0.46
13.03.2016 10:46	Table changed			6	5	Sample-5	0.012	0.186	0.082
13.03.2016 10:46	Table changed			7	6	Sample-6	0.012	0.145	0.065
13.03.2016 10:46	Element removed	E		8	7	Sample-7	0.01	0.135	0.061
13.03.2016 10:46	Element added			9	8	Sample-8	0.011	0.129	0.059
13.03.2016 10:46	Text changed			10	-				
13.03.2016 10:46	Element added			11					
13.03.2016 10:42	Image zoom changed			12	9	Sample-9	0.008	0.771	0.312
13.03.2016 10:42	Image zoom changed			13	10	Sample-10	0.007	0.772	0.312
13.03.2016 10:42	Image zoom changed			14		2000			
13.03.2016 10:42	Text changed							l	
13.03.2016 10:42	Layout changed								

#### Labfolder – Additional features

#### 3. Export everything to pdf

Download as PDF ×							
<ul> <li>Export the whole project Example project.</li> <li>Export just the selected entry Co-Immunoprecipitation experiment 01.</li> </ul>	measured.						
Please select the elements to be included in your document:	I-1]	Chl. a/b	Total chlorophyll V				
Page headers							
		3.47	3056.4				
Page numbering		3.49	1725.5				
Entry headers		3.47	2465.1				
		3.44	381.6				
Entry dates		3.51	289				
Entry footers		3.36	273.8				
Page break after each entry		3.39	258.4				
			300.7				
Preserve entry layout			3007 µg/ml				
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cancel Download							



#### Advantages

- I use an electronic lab book more efficiently than an analog lab book
- Integration of different data types is easy and straightforward
- Access from different places

#### Disadvantages

- Connection to external server is necessary
- Not all browsers work equally well



Protocols Instructions

Recorded data Sample details



#### **Stationary computer**

Plan experiments Analyse experiments Mobile computer Perform experiments Record experiments



microphone.



# Summary

- We create a lot of digital data
- It is now possible to record this data digitally
- A digital lab book holds many advantages
- Labfolder is one solution to document your work
- The integration of modern technology holds many opportunities to improve our workflow

#### Thank you for your attention

Joram Schimmeyer Max-Planck-Institute for Molecular Plant Physiology Potsdam-Golm schimmeyer@mpimp-golm.mpg.de

