The Carpentries Incubator

Metadata Annotation in the Scientific Context

Fundamentals of Scientific Metadata: Why Context Matters

You should start your project with **repeating** your collaborator's results

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The Publication

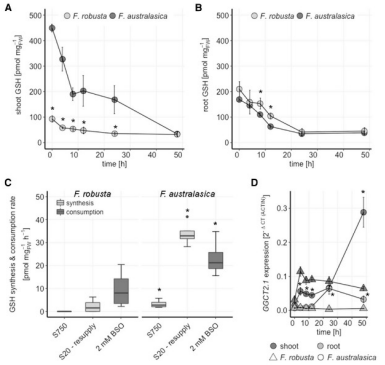

Figure 4. GSH turnover in *F. robusta* and *F. australasica*. GSH concentrations in shoots (A) and roots (B) of 20-d-old seedlings of *F. robusta* (C_3) and *F. australasica* (C_3) in a time course of 48 h after transfer to medium supplemented with 2 mM BSO. Data are presented as means and SE, $n = 4$. C, GSH synthesis was analyzed in 20-d-old seedlings exposed to low sulfate (20 µM sulfate; S20) or adequate sulfate (750 µM sulfate; S750) for 6 d by resupply with 0.2 mM [^{34}S]sulfate solution for 4 h. GSH consumption rate is calculated from A at 4 h after treatment with 2 mM BSO. Data are shown as box plot (25%–75%); the line represents median, and the whiskers represent 1.5 IQR, $n = 4$. D Transcript levels of *GGCT2.1* in shoots and roots of 20-d-old seedlings in a time course of 48 h after transfer to medium supplemented with 2 mM BSO. Data are presented as means and SEM, $n = 4$. Asterisks represent significant differences between *F. robusta* and *F. australasica* at $P < 0.05$ (Student's *t* test).

to higher GSH synthesis are therefore likely to be involved in the adjustment of S supply and GSH homeostasis of C_4 plants.

Partitioning of S in Shoots and Roots of *Flaveria* Species

To test the significance of the root for S metabolism in the context of the evolution of C_4 photosynthesis, the five species were grown under full nutrient and low S conditions. Total S, sulfate and low M_r thiols were determined in shoots and roots (Supplemental Fig. S7). Whereas total S and sulfate did not show any clear patterns relative to photosynthetic type, Cys, and GSH at full nutrition. To better understand the partitioning of S in the different species, the relative portions of total S in sulfate, Cys, and GSH were calculated (Fig. 5). In the shoots of fully nourished *Flaveria* species, the fraction of total S occupied by inorganic sulfate was relatively stable at 50%–70%. However, in the roots, the fraction of inorganic sulfate was higher in the C_4 species. Exposure to S deficiency reduced the sulfate pool in the shoots and roots of *F. robusta*, *F. linearis*, *F. anomala*, and *F. palmeri* to 3.5%–16%. The C_3 species *F. australasica* suffered little loss of relative sulfate pool in shoots, but showed a strong decrease in roots. The increase in GSH fractions of total S in shoots and roots

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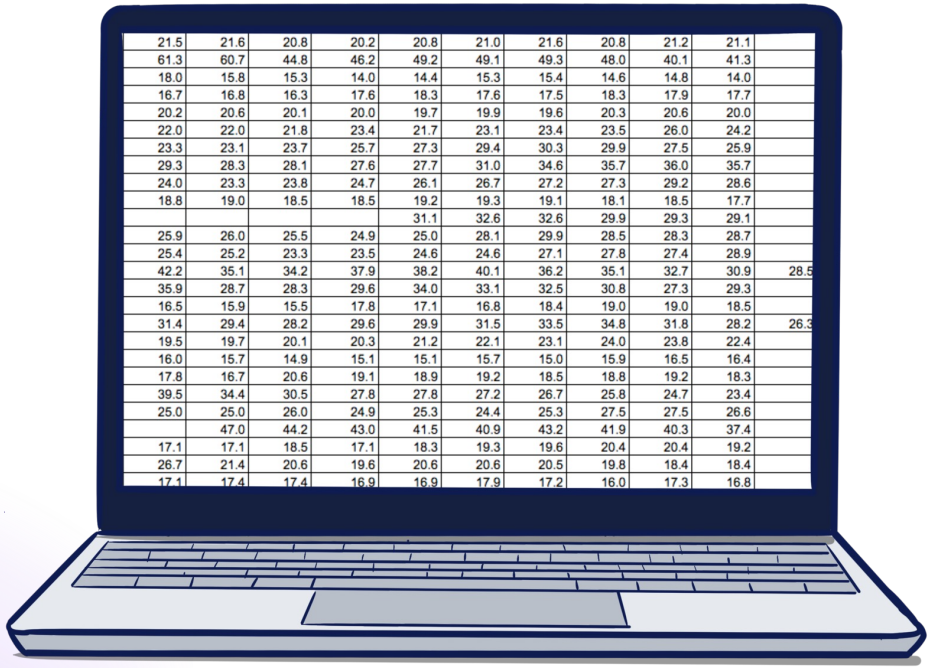
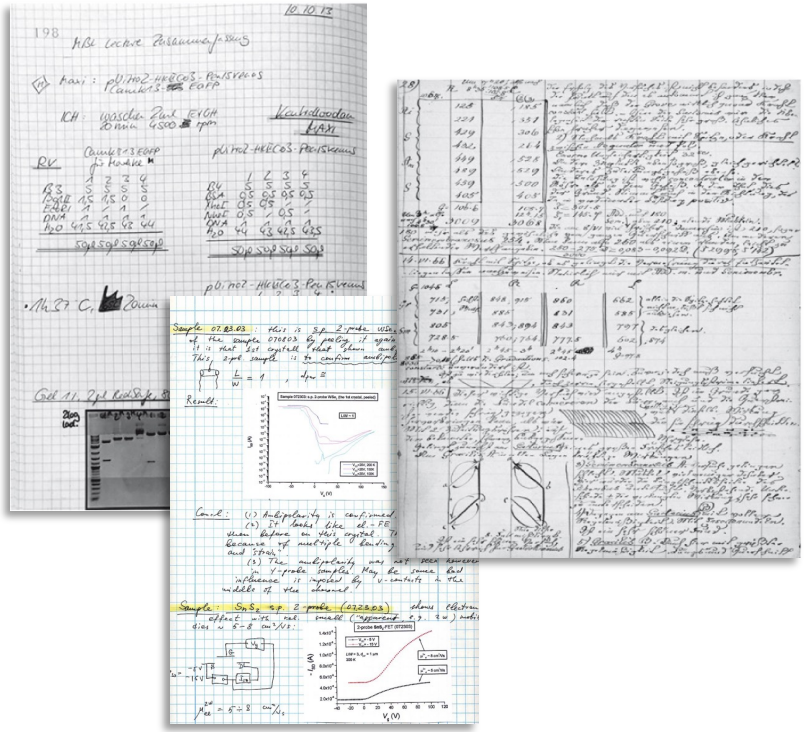
The Data



21.5	21.6	20.8	20.2	20.8	21.0	21.6	20.8	21.2	21.1	
61.3	60.7	44.8	46.2	49.2	49.1	49.3	48.0	40.1	41.3	
18.0	15.8	15.3	14.0	14.4	15.3	15.4	14.6	14.8	14.0	
16.7	16.8	16.3	17.6	18.3	17.6	17.5	18.3	17.9	17.7	
20.2	20.6	20.1	20.0	19.7	19.9	19.6	20.3	20.6	20.0	
22.0	22.0	21.8	23.4	21.7	23.1	23.4	23.5	26.0	24.2	
23.3	23.1	23.7	25.7	27.3	29.4	30.3	29.9	27.5	25.9	
29.3	28.3	28.1	27.6	27.7	31.0	34.6	35.7	36.0	35.7	
24.0	23.3	23.8	24.7	26.1	26.7	27.2	27.3	29.2	28.6	
18.8	19.0	18.5	18.5	19.2	19.3	19.1	18.1	18.5	17.7	
				31.1	32.6	32.6	29.9	29.3	29.1	
25.9	26.0	25.5	24.9	25.0	28.1	29.9	28.5	28.3	28.7	
25.4	25.2	23.3	23.5	24.6	24.6	27.1	27.8	27.4	28.9	
42.2	35.1	34.2	37.9	38.2	40.1	36.2	35.1	32.7	30.9	28.5
35.9	28.7	28.3	29.6	34.0	33.1	32.5	30.8	27.3	29.3	
16.5	15.9	15.5	17.8	17.1	16.8	18.4	19.0	19.0	18.5	
31.4	29.4	28.2	29.6	29.9	31.5	33.5	34.8	31.8	28.2	26.3
19.5	19.7	20.1	20.3	21.2	22.1	23.1	24.0	23.8	22.4	
16.0	15.7	14.9	15.1	15.1	15.7	15.0	15.9	16.5	16.4	
17.8	16.7	20.6	19.1	18.9	19.2	18.5	18.8	19.2	18.3	
39.5	34.4	30.5	27.8	27.8	27.2	26.7	25.8	24.7	23.4	
25.0	25.0	26.0	24.9	25.3	24.4	25.3	27.5	27.5	26.6	
	47.0	44.2	43.0	41.5	40.9	43.2	41.9	40.3	37.4	
17.1	17.1	18.5	17.1	18.3	19.3	19.6	20.4	20.4	19.2	
26.7	21.4	20.6	19.6	20.6	20.6	20.5	19.8	18.4	18.4	
17.1	17.4	17.4	16.9	16.9	17.9	17.2	16.0	17.3	16.8	

The Documentation



Monya Baker

„More than 70 % of researchers have tried and failed to reproduce another scientist's experiments.

More than half have failed to reproduce their own experiments. “

Quote: Baker, M. 1,500 scientists lift the lid on reproducibility. *Nature* **533,** 452 – 454 (2016). https://doi.org/10.1038/533452a

Image: https://www.booksmith.com/event/bindery-launch-katie-burke-urban-playground-what-kids-say-about-living-san-francisco

Slightly better – lab notes

	A	B	C	D	E
1	t	ax	ay	az	scr
2	0	0.3931848	-0.1593144	-0.4178079	0
3	0.01	0.3957354	-0.15696	-0.4242825	0
4	0.04	0.4138839	-0.1547037	-0.429678	0
5	0.05	0.4415481	-0.1512702	-0.4325229	0
6	0.06	0.4741173	-0.1488177	-0.434583	0
7	0.08	0.5021739	-0.1521531	-0.4285008	0
8	0.1	0.5247369	-0.1669662	-0.420849	0
9	0.11	0.5421987	-0.1813869	-0.4160421	0
10	0.14	0.5506353	-0.1947285	-0.4094694	0
11	0.15	0.5538726	-0.203067	-0.4057416	0
12	0.16	0.5534802	-0.2035575	-0.4056435	0
13	0.17	0.5527935	-0.1961019	-0.4098618	0
14	0.2	0.558189	-0.1908045	-0.4121181	0
15	0.21	0.5764356	-0.1865862	-0.4162383	0
16	0.22	0.589581	-0.18639	-0.4258521	0
17	0.25	0.6049827	-0.1941399	-0.4243806	0
18	0.26	0.619992	-0.206991	-0.4192794	0
19	0.27	0.6320583	-0.2191554	-0.4092732	0
20	0.3	0.6392196	-0.2279844	-0.3975993	0
21	0.31	0.6465771	-0.2317122	-0.3908304	0
22	0.32	0.6583491	-0.2291616	-0.3950487	0
23	0.34	0.6725736	-0.2220984	-0.4050549	0

someRandomFileName.csv

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20220228_recordingData.csv

2022-02-28

Gotham City, New Jersey, USA

Flight of the bat

weather: more clouds than sun, 11°C, 74% humidity, 1023 mbar, SSW, 17 km/h

recording device strapped to upper arm

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LAB NOTES IV
LAB NOTES III
LAB NOTES II
LAB NOTES I

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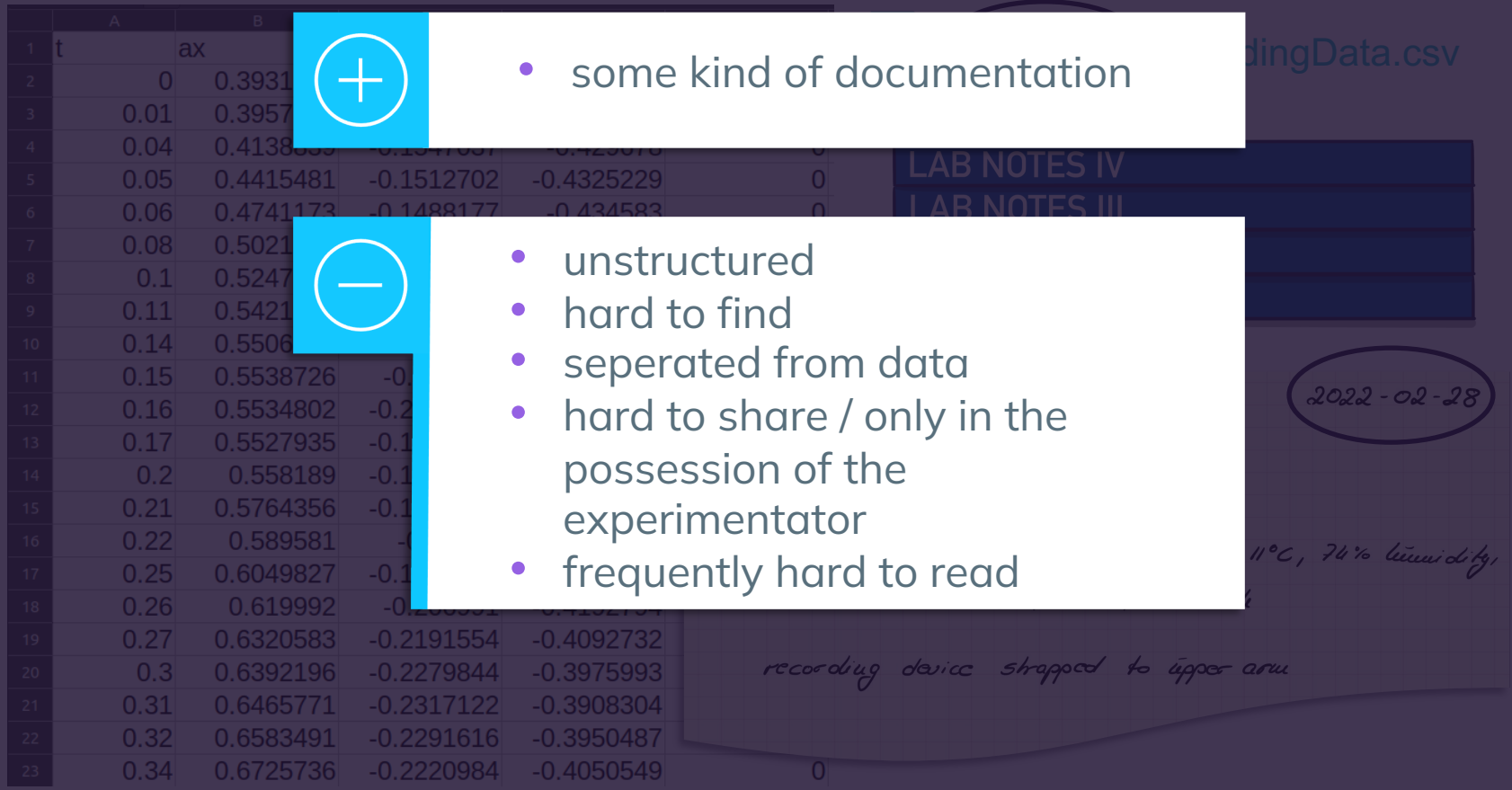

- some kind of documentation

- unstructured
- hard to find
- seperated from data
- hard to share / only in the possession of the experimentator
- frequently hard to read

Even better – Readme style metadata

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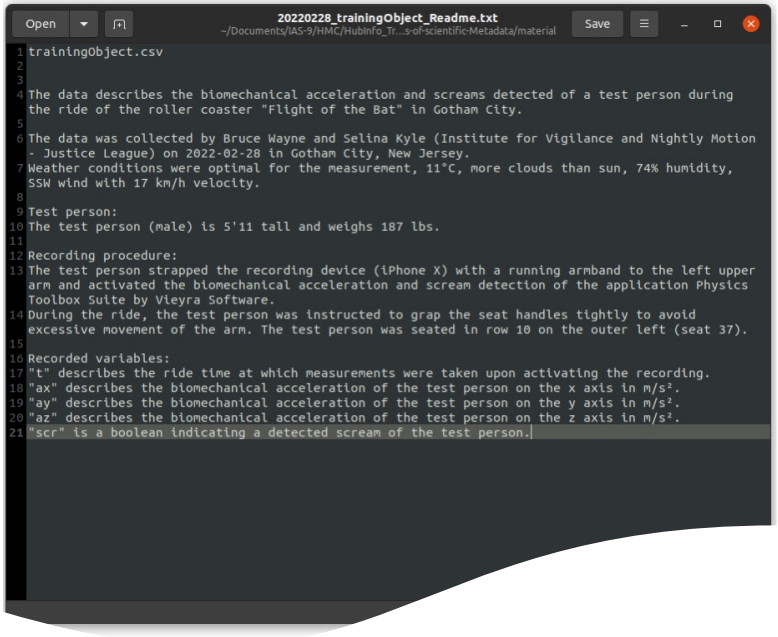
csv 20220228_recordingData.csv

txt 20220228_recordingData_Readme.txt



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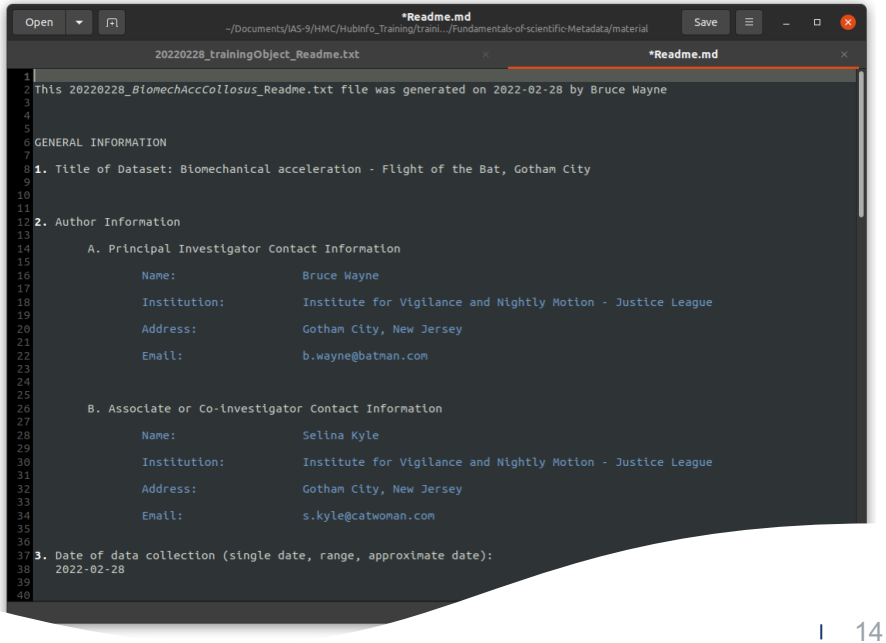

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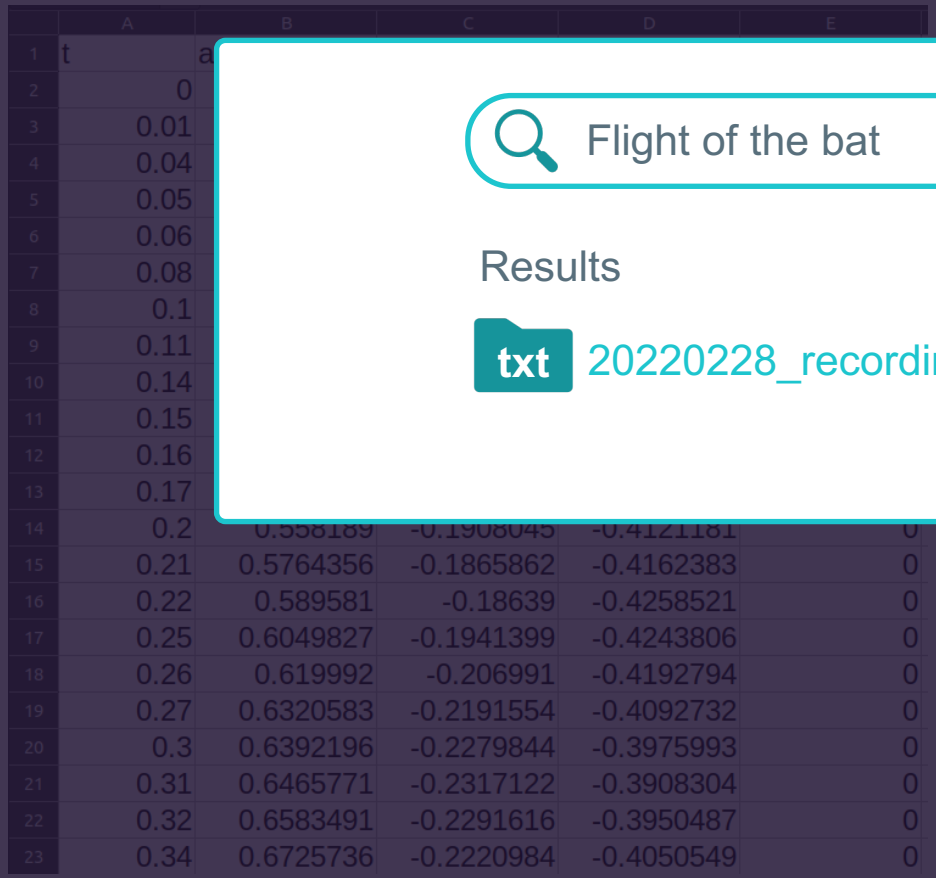

	A	B	C	D	E
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2	0				
3	0.01				
4	0.04				
5	0.05				
6	0.06				
7	0.08				
8	0.1				
9	0.11				
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21	0.31	0.6465771	-0.2317122	-0.3908304	0
22	0.32	0.6583491	-0.2291616	-0.3950487	0
23	0.34	0.6725736	-0.2220984	-0.4050549	0

Flight of the bat

Results

txt 20220228_recordingData_Readme.txt

me.txt

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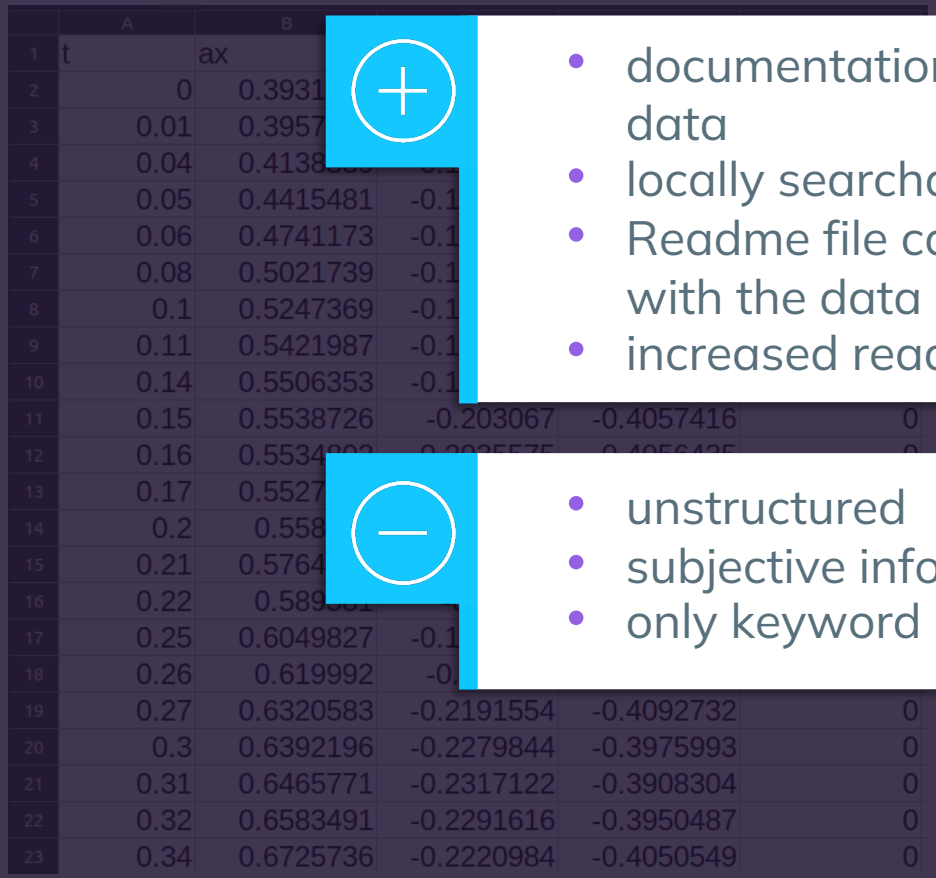
Address: Gotham City, New Jersey
Email: b.wayne@batman.com

B. Associate or Co-investigator Contact Information
Name: Selina Kyle
Institution: Institute for Vigilance and Nightly Motion - Justice League
Address: Gotham City, New Jersey
Email: s.kyle@catwoman.com

3. Date of data collection (single date, range, approximate date):
2022-02-28

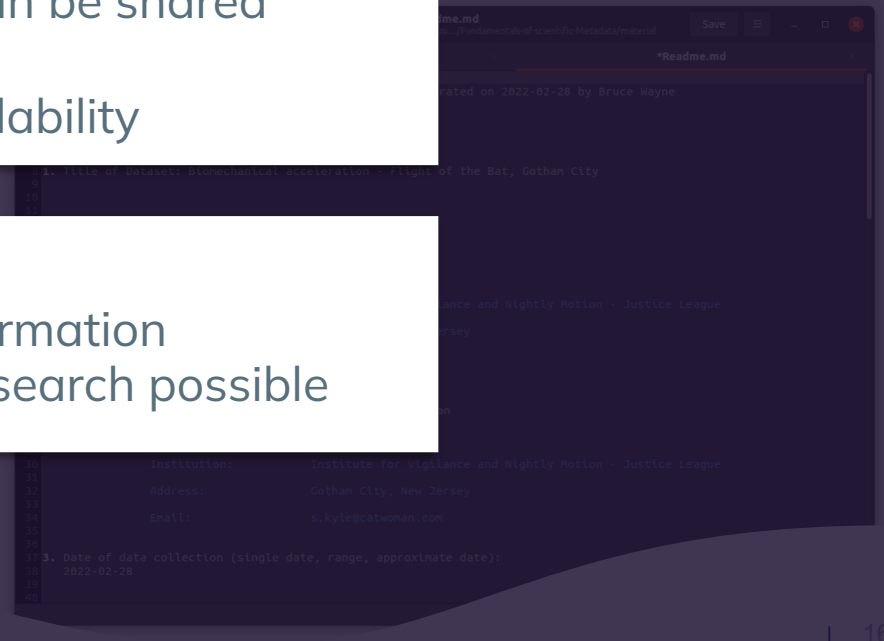
Even better – Readme style metadata



	A	B	C	D	E
1	t	ax			
2	0	0.3931			
3	0.01	0.3957			
4	0.04	0.4138			
5	0.05	0.4415481	-0.1		
6	0.06	0.4741173	-0.1		
7	0.08	0.5021739	-0.1		
8	0.1	0.5247369	-0.1		
9	0.11	0.5421987	-0.1		
10	0.14	0.5506353	-0.1		
11	0.15	0.5538726	-0.203067	-0.4057416	0
12	0.16	0.5534			
13	0.17	0.5527			
14	0.2	0.558			
15	0.21	0.5764			
16	0.22	0.589			
17	0.25	0.6049827	-0.1		
18	0.26	0.619992	-0.		
19	0.27	0.6320583	-0.2191554	-0.4092732	0
20	0.3	0.6392196	-0.2279844	-0.3975993	0
21	0.31	0.6465771	-0.2317122	-0.3908304	0
22	0.32	0.6583491	-0.2291616	-0.3950487	0
23	0.34	0.6725736	-0.2220984	-0.4050549	0

dingData.csv

dingData_Readme.txt



- documentation linked to the data
- locally searchable
- Readme file can be shared with the data
- increased readability

- unstructured
- subjective information
- only keyword search possible

Even better – Readme style metadata

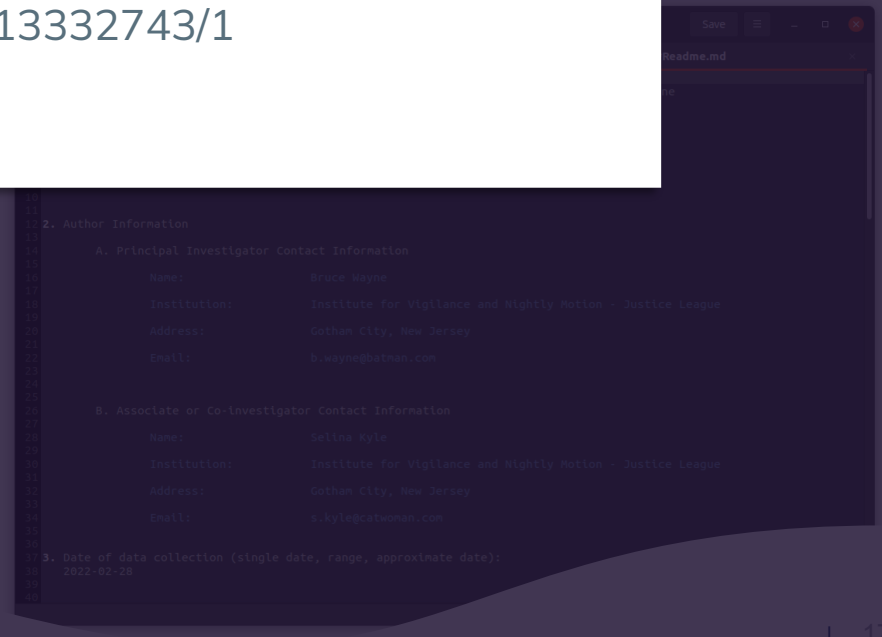
	A	B	C	D	E
1	t	ax	ay	az	scr
2	0	0.3931848	-0.1593144	-0.4178079	0
3	0.01	0.3957354	-0.15696	-0.4242825	0
4	0.0				
5	0.0				
6	0.0				
7	0.0				
8	0.1				
9	0.11	0.542			
10	0.14	0.550			
11	0.15	0.553			
12	0.16	0.5534802	-0.2035575	-0.4056435	0
13	0.17	0.5527935	-0.1961019	-0.4098618	0
14	0.2	0.558189	-0.1908045	-0.4121181	0
15	0.21	0.5764356	-0.1865862	-0.4162383	0
16	0.22	0.589581	-0.18639	-0.4258521	0
17	0.25	0.6049827	-0.1941399	-0.4243806	0
18	0.26	0.619992	-0.206991	-0.4192794	0
19	0.27	0.6320583	-0.2191554	-0.4092732	0
20	0.3	0.6392196	-0.2279844	-0.3975993	0
21	0.31	0.6465771	-0.2317122	-0.3908304	0
22	0.32	0.6583491	-0.2291616	-0.3950487	0
23	0.34	0.6725736	-0.2220984	-0.4050549	0

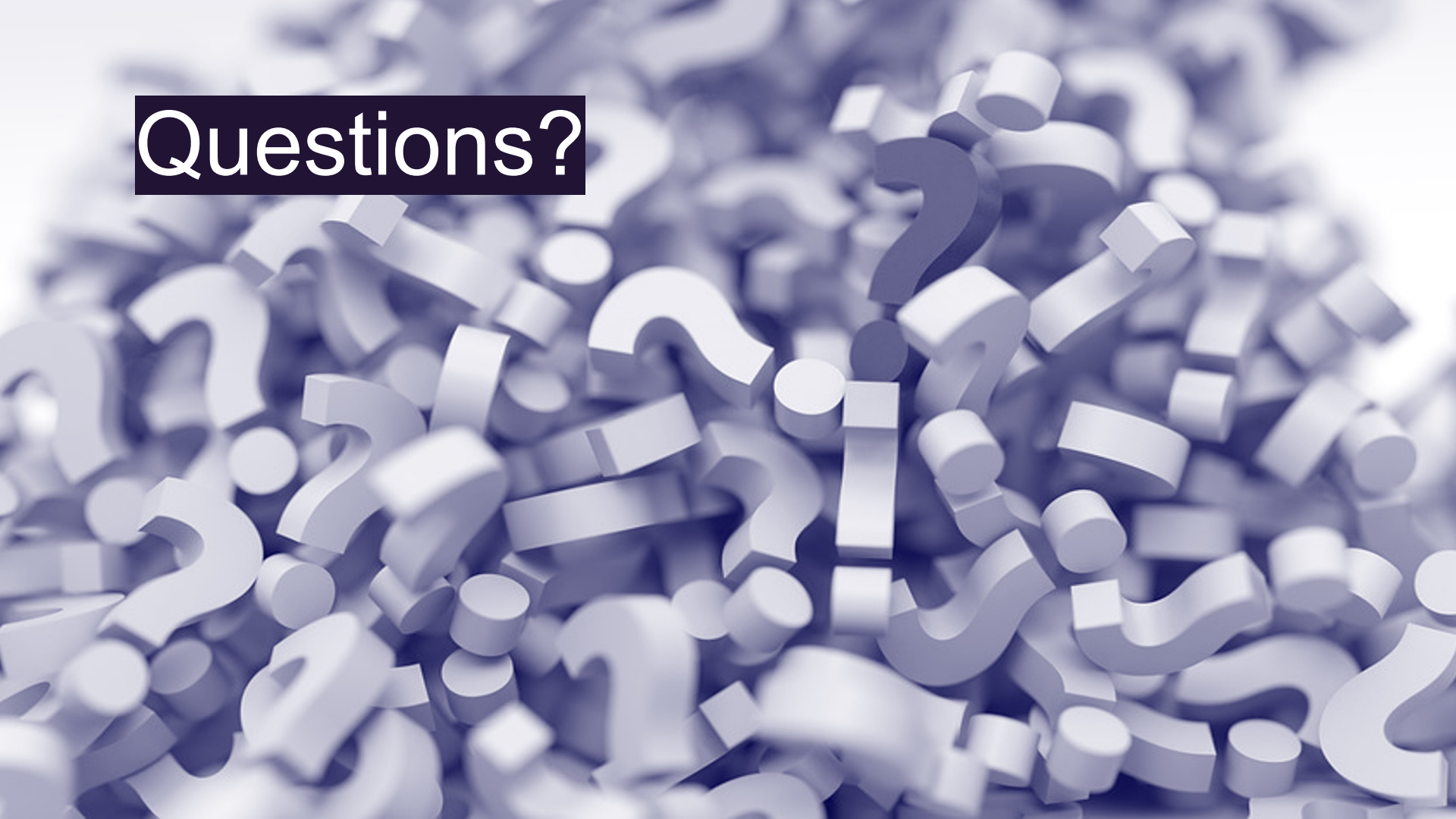
20220228_recordingData.csv

eadme.txt

https://ordo.open.ac.uk/articles/dataset/Template_for_a_README_file_for_data_uploads/13332743/1

Link in Episode!




Questions?

DISCLAIMER

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Fundamentals of Scientific Metadata: Why Context Matters

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You can find more information about this course on **Github**.

image: https://c.pxhere.com/photos/35/f5/coffee_notebook_wooden_background_orange_work_table_office-1222115.jpg!d