

Introduction to the exercises

1. Please divide yourselves into **6 groups**
2. We will **explain** you the exercises
3. We will then give you 5 minutes to **attempt** the exercise. If you need any clarifications during the working time, please feel free to ask the Teaching Assistants (Aastha, Beatriz)

<https://bit.ly/FAIR-bioimage-data-worksheets>

4. Each group will then have the chance to **present** the results for one of the exercises and we can all discuss the answers together
5. That's how we **learn** about all things FAIR

Instructions:

Look at the dataset and identify the following aspects for the different “Letters” of FAIR.

<https://zenodo.org/records/10937403>

FAIR in the real world



FINDABLE



F

1: What is the persistent identifier of the dataset?

ACCESSIBLE



A

2: What is the access protocol? Is access restricted?

INTEROPERABLE



I

3: In which formats are the data? Are they standard and open?

4: Which links to other data are present?

5: How extensive is the metadata?

REUSABLE



R

6: What is the license and does it allow for reuse?

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5 min

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Images .czi (proprietary) and .tiff (open), additional info: .txt (open)

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or 561 nm (DPSS 561-10) laser excitation line

The original CZI files are provided, which could be opened by the ZEISS ZEN software.

Files

Loricera_BA202301_confocal_data.zip

Image0620-3#175_zStack.tif	100.5 MB
Image0620-3.czi	377.5 MB
Image0620-4.czi	264.3 MB
Image0620-4_zStack.tif	38.1 MB
Image0620-5#190_zStack.tif	166.4 MB
Image0620-5.czi	387.0 MB
Image0620-6#215_zStack.tif	43.4 MB
Image0620-6.czi	283.1 MB
Image0620-7.czi	311.5 MB
Image0620-7_zStack.tif	67.7 MB
Notes - Loricera BA202301.txt	262 Bytes

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Supplement to article DOI:10.11646/palaeoentomology.7.2.10

5: How extensive is the metadata?

Additional details

Related works

Is supplement to

Journal article: [10.11646/palaeoentomology.7.2.10](https://doi.org/10.11646/palaeoentomology.7.2.10) (DOI)



Citations ?



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Supplement to article DOI:10.11646/palaeoentomology.7.2.10

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Identification of organism and basic description of imaging instrument, missing experiment description.

Image metadata within image files. Example of more extensive metadata: <https://zenodo.org/records/10479096>

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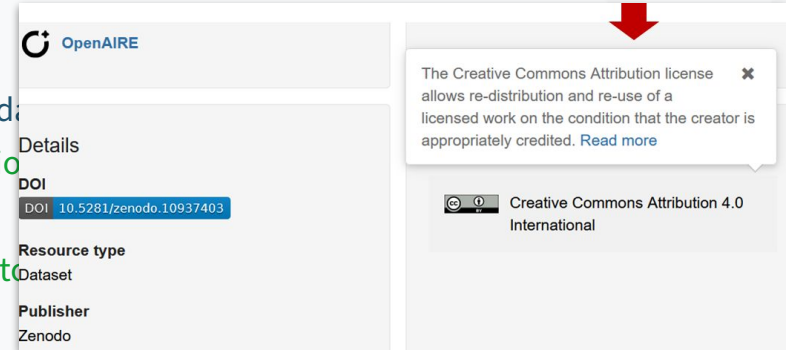
Image metadata within image files. Example of more extensive metadata: <https://zenodo.org/records/10479096>



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6: What is the license and does it allow for reuse?

Creative commons Attribution 4.0 International (allows re-distribution and re-use)



Browsing BioImage Repositories



Instructions:

Search for 'SARS-CoV-2' in each repository.
How many datasets do you find in each one?
Is this result surprising?

Tip: Divide and conquer

Choose one dataset from one of the repositories and report on:

Title:

Author(s):

Licence:

Size of dataset:

Imaging method:

Organism that was imaged:

Links to other data:



<https://www.ebi.ac.uk/bioimage-archive/>

datasets



<https://www.ebi.ac.uk/empiar/>



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Instructions:

Place the label of each dataset to the archive(s) it could be deposited

Where to find bioimage datasets?



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1: FIB SEM of mouse brain tissue
(*Focussed ion-beam scanning electron microscopy*)

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2: Drug screening with high-content
fluorescence microscopy

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3: Digital histopathology for lung cancer

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4: Correlative Light and Electron
Microscopy of marine microorganisms

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5: MRI of breast cancer patients
(*Magnetic resonance imaging*)

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6: Segmentation masks for human cells
expressing sphingolipid marker



BioImage Archive



EMPIAR

Electron Microscopy Public Image Archive



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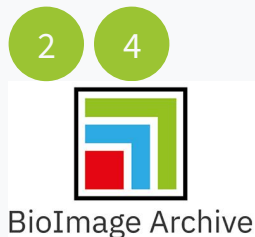
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Instructions:

Place the labels of the metadata elements in the correct categories within REMBI

(<https://www.ebi.ac.uk/bioimage-archive/rembi-help-overview/>)

- | | | | |
|---|------------------------------------|----|-----------------------------------|
| 1 | 1: Analysis software | 6 | 6: sample preparation protocol |
| 2 | 2: Drug treatment | 7 | 7: Pixel size |
| 3 | 3: Organism name according to NCBI | 8 | 8: Funding statement with GrantID |
| 4 | 4: Multiple imaging methods | 9 | 9: Spatial alignment procedure |
| 5 | 5: Microscope manufacturer | 10 | 10: Emission wavelength |

Categories of REMBI



Sarkans, Ugis et al. "REMBI: Recommended Metadata for Biological Images-enabling reuse of microscopy data in biology." *Nature methods* vol. 18,12 (2021): 1418-1422. doi:10.1038/s41592-021-01166-8

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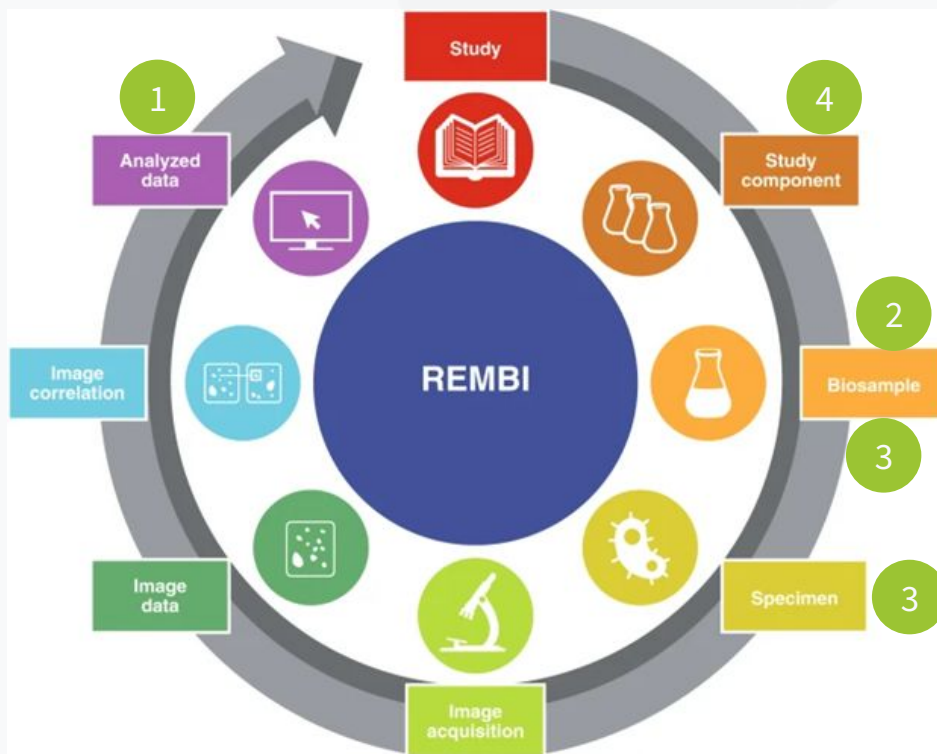
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Instructions:

Search for the ontology term of each image experiment related item and paste them with their corresponding ontology ID to the table.

<https://www.ebi.ac.uk/ols4/ontologies/fbbi>

Item #	Imaging Method Term	Ontology ID
1		
2		
3		
4		
5		
6		

Ontologies



5 min

1: fluorescence labeling with Alexa-Fluor 488

2: Imaging of cells in vitro

3: super-resolution imaging using STED
(*stimulated emission depletion*)

4: detection of fluorescence signal using a
CCD (*charge coupled device*)

5: confocal microscopy with spinning-disk

Bonus: 6: Image segmentation



5 min

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Bonus: 6: Image segmentation

Item #	Imaging Method Term	Ontology ID
1	Alexa Fluor 488	FBbi:00000440
2	dispersed cells in vitro	FBbi:00000611
3	stimulated emission depletion (STED)	FBbi:00000334
4	charge coupled device (CCD)	FBbi:00000294
5	spinning disk confocal microscopy	FBbi:00000253
6	Image analysis, segmentation (procedure)	SNOMED:74529 008



Instructions:

Place the labels of each action during a bioimaging project to the sections of the DMP in which you describe them.

Data Management Plan



General project
description

Roles &
responsibilities

Data used &
collected

Data &
metadata
documentation

Data storage &
preservation

Data access &
sharing

Ethics & legal
issues

1

1: Develop a strategy for file
naming and organization

2

2: Perform image analysis using a
computational workflow

3

3: Back-up relevant data

4

4: Perform life cell imaging and
convert images to open file format

5

5: Record metadata according to
REMBI scheme

6

6: Publish open access and deposit
images in trusted repository

7

7: Transfer files from instrument PC
to cloud storage

8

8: Deanonimize health data

9

9: Consult with data steward

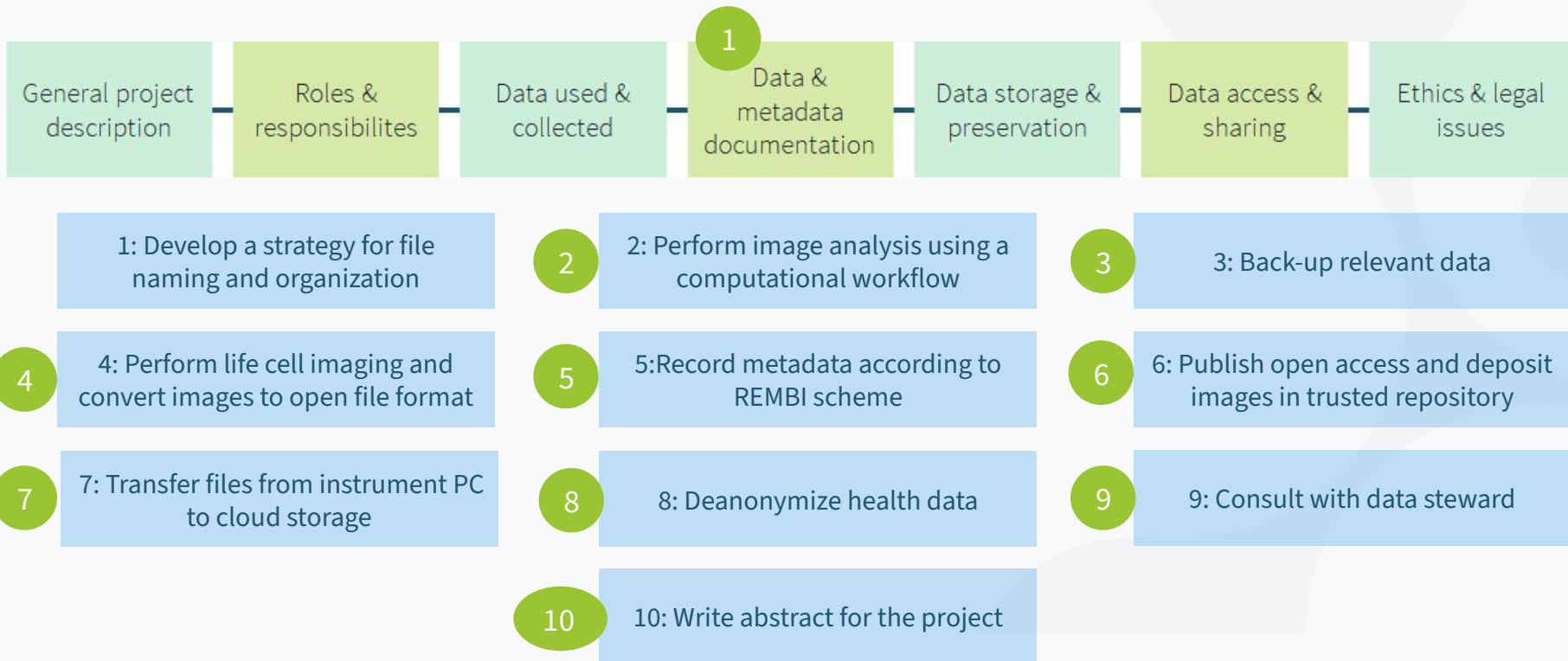
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10: Write abstract for the project

Instructions:

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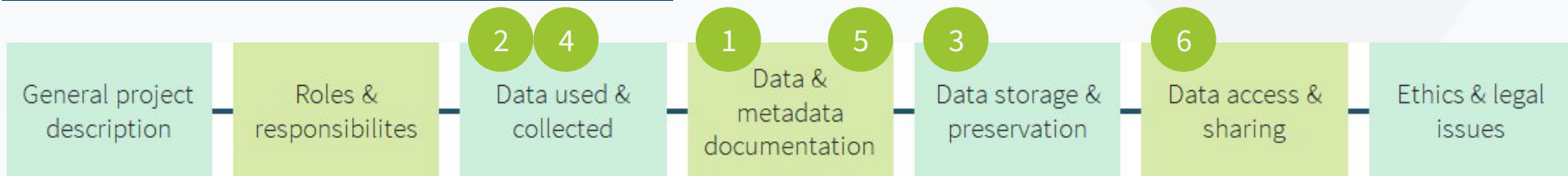
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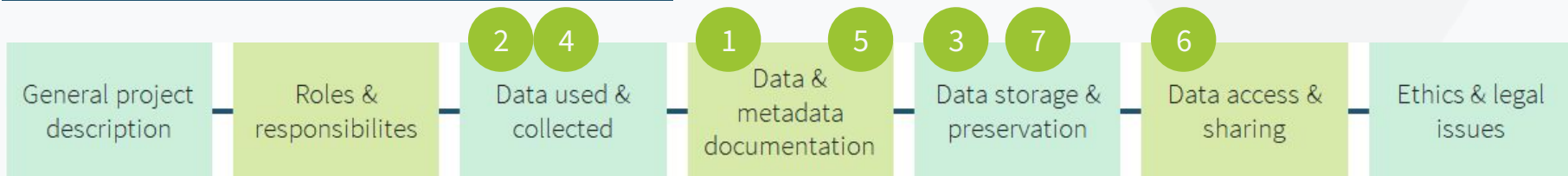
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Instructions:

Place the labels of each action during a bioimaging project to the sections of the DMP in which you describe them.

Data Management Plan



1: Develop a strategy for file naming and organization

2: Perform image analysis using a computational workflow

3: Back-up relevant data

4: Perform life cell imaging and convert images to open file format

5: Record metadata according to REMBI scheme

6: Publish open access and deposit images in trusted repository

7: Transfer files from instrument PC to cloud storage

8

8: Deanonimize health data

9

9: Consult with data steward

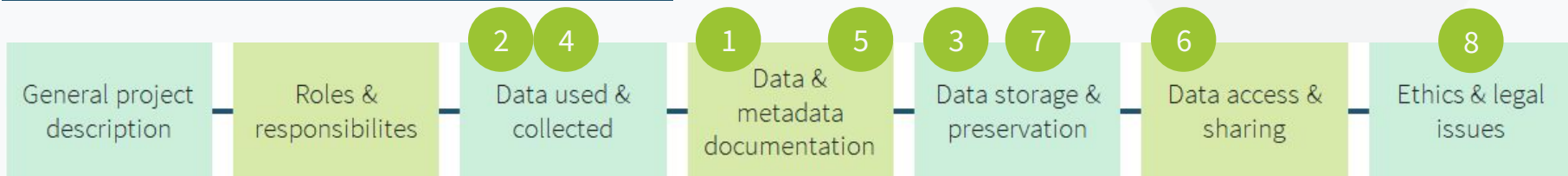
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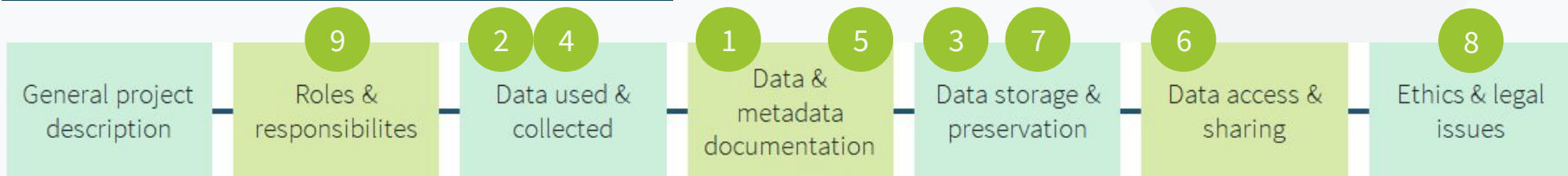
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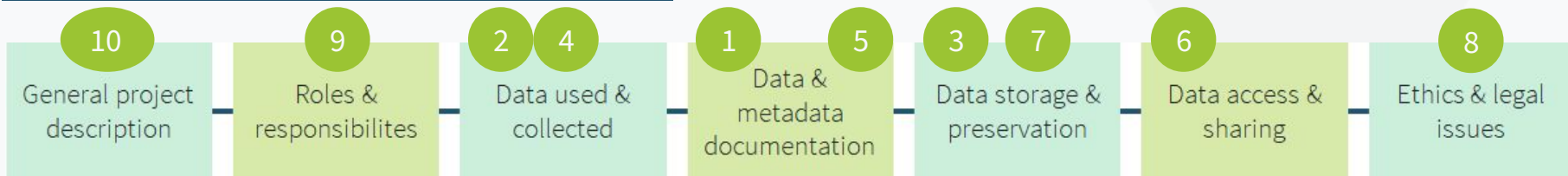
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Take home messages

- Not only publications, but data itself is a research output that should be shared
- There are dedicated repositories to **F**ind and **A**ccess diverse image datasets
- Rich metadata can allow potential **R**euse of datasets
- More than the exact placement of metadata items in a schema, it is important that all of the metadata is present at least somewhere
- As much as possible we should use a common way of describing data through ontologies, making it **I**nteroperable
- Data management plan should be made at the beginning of the project and kept up to date