DATA MANAGEMENT PLAN TRACEOLAB

Version 1.0 25/09/2024

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COLOFON

Version 1.0

TraceoLab, University of Liège

Acknowledgments:

We would like to thank the following people that helped to improve this data management plan : Lena Asryan, Sophie Bodart, Roné Oberholzer, Sonja Tomasso (TraceoLab staff members), Judith Biernaux (RISE, ULiège), Lyne Van de Vyvere (RISE, ULiège)

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1 INTRODUCTION TO DATA MANAGEMENT

In the pursuit of our scientific research and archaeological investigations, the proper management and preservation of data are pivotal to ensuring the integrity, accessibility, and longevity of valuable information.

TraceoLab recognises the significance of effective data management practices. This Data Management Plan (DMP) outlines the strategies, guidelines, and infrastructure established to safeguard, organise, and maximise the utility of the lab's data assets. The cornerstone of our approach lies in meticulous data organisation, clear file naming conventions, and the implementation of secure storage solutions. This DMP provides a comprehensive overview of how data are structured, named, stored, and safeguarded. It addresses the types of data generated, storage locations, back-up strategies, and specific guidelines for data handling.

By adhering to this DMP, TraceoLab aims to achieve the following objectives:

1. **Data Integrity:** Ensuring that data remains accurate, complete, and unaltered during collection, analysis, and storage.
2. **Data Accessibility:** Facilitating easy access to data for project members, collaborators, and future researchers while maintaining appropriate access controls.
3. **Data Security:** Implementing measures to protect data from unauthorised access, loss, or damage.
4. **Data Retention:** Defining clear policies for data retention and disposal to manage storage efficiently.
5. **Data Sharing:** Establishing protocols for data sharing with collaborators and the broader scientific community.

This DMP serves as a roadmap that will guide all project stakeholders in their data-related activities. It underlines the commitment of TraceoLab to maintain data transparency, rigour, and sustainability throughout the project's lifespan. As technology and research methodologies evolve, this plan will be periodically reviewed and updated to adapt to emerging best practices and changing needs.

Effective data management is a shared responsibility, and this plan encourages all team members to actively participate in preserving the intellectual heritage of TraceoLab. By following the principles outlined here, we aim to enhance the value of our research and contribute to the broader scientific community's knowledge.

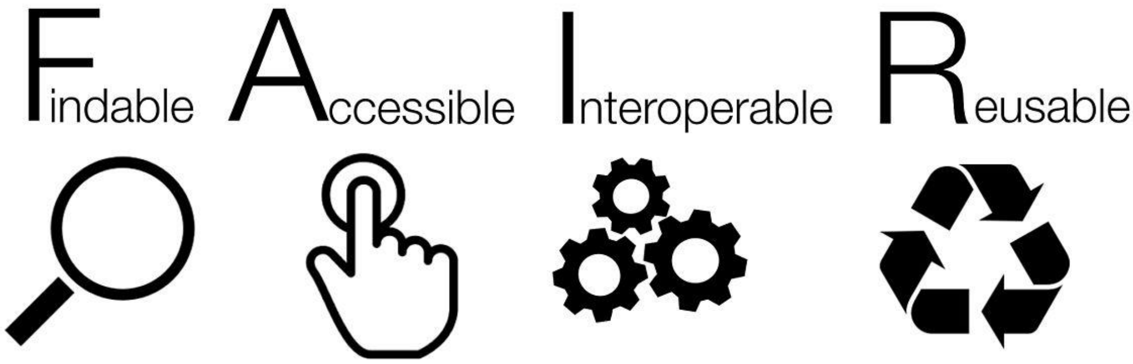
2 GENERAL PRINCIPLES OF DATA MANAGEMENT

2.1 FAIR PRINCIPLES

The University of Liège promotes and facilitates the application of the FAIR guiding principles among its researchers, with the same application used for any general question relating to the responsible management of research data:

https://www.recherche.uliege.be/cms/c_9022717/en/ethics-and-scientific-integrity

The acronym "FAIR" (Wilkinson et al. 2016) encapsulates four fundamental attributes that data should possess to be considered truly valuable in today's data-driven landscape: It operates on the principle of being 'as open as possible, as closed as necessary'. Results and data may be kept closed if making them public in open access is against the researcher's legitimate interests.



To align with the FAIR principles, TraceoLab will implement the following measures:

1. **Enhancing Data Discoverability :**
    - Use clear, detailed metadata and persistent identifiers to make data assets searchable and accessible through various repositories.
2. **Promoting Accessibility :**
    - Adopt appropriate licenses like Creative Commons (CC) to ensure data is open and available while respecting privacy and ethical considerations.
    - Anonymize data, secure consent for data use, and adhere to legal standards such as GDPR.
    - Provide data in user-friendly formats like CSV, JSON, or XML.
    - Ensure comprehensive documentation and metadata to make data understandable and usable.
    - Utilize open data repositories and platforms for easy access and sharing.
3. **Ensuring Interoperability :**
    - Select open, unrestricted, and sustainable data formats to facilitate integration with other data sources and tools.

4. **Fostering Reusability :**
    - Maintain high-quality documentation and metadata to support data sharing and collaborative efforts.
    - Implement effective archiving strategies to ensure data remains usable and well-documented over time.

By adopting these practices, TraceoLab aims to maximize the value and impact of its data, fostering a collaborative and innovative research environment.

2.2 DATA LIFECYLE

The data lifecycle is a fundamental concept in data management and analytics (Figure 1). It represents the journey data undergoes from its initial creation or acquisition to its ultimate disposition or archival. Understanding the data lifecycle is essential for effectively managing, utilizing, and protecting our data assets. At TraceoLab, the data lifecycle typically involves several distinct stages, each with its own set of processes and considerations. This is carefully considered when elaborating the data management plan.

Figure 1 The concept of the data lifecycle

3 DATA MANAGEMENT AT TRACEOLAB

3.1 DATA MANAGEMENT AND TRAIL (TRACES IN LIEGE)

At TraceoLab, a significant portion of the data we generate is intricately associated with the TRAIL *(TRAces In Liège)* experimental reference collection and associated database. The latter comprehensive database serves as a central repository for all experimental stone tool objects along with their corresponding experimental and analytical data. The TRAIL database is not just a storage platform; it is a crucial tool for organising and interlinking various datasets to create a cohesive and accessible body of knowledge.

To ensure consistency and facilitate effective data retrieval and analysis, it is imperative that all data entered in the TRAIL database are recorded in a uniform manner. Data recording therefore includes using data registration sheets, standardised data formats, naming conventions, and metadata descriptions. By maintaining homogeneous data entry practices, we aim to enhance the database's reliability and usability.

The data within the TRAIL database encompasses a wide range of information types and includes detailed descriptions of stone tool objects, their manufacturing processes, experimental setups, and the results of analytical techniques applied to these tools. It also integrates photographic documentation, quantitative measurements, and qualitative observations, making the TRAIL database a multidimensional and comprehensive resource for research.

To achieve this level of standardisation, we employ rigorous protocols and guidelines for data accumulation and entry. These protocols ensure that each dataset is complete, accurate, and in line with the overall structure and format of the database. Regular audits and reviews of the data are also conducted to maintain the integrity and quality of the information within the TRAIL database.

In essence, TRAIL is a cornerstone of our research infrastructure, and its associated database plays a pivotal role in synthesising and preserving the wealth of data we produce. Its structured and homogeneous management of data are essential in facilitating research, enabling comparative studies, and advancing our understanding of stone tool technologies.

3.1.1 DATA ASSOCIATED WITH TRAIL

TRAIL includes both physical objects and associated digital information which are stored in the TRAIL database. Relying on a structure developed by the researchers of TraceoLab, it is the informatics center of the Faculty (Centre d'informatique de Philosophie et Lettres – CIPL) that has developed the professional structure of the database in continuous interaction with members of TraceoLab. The CIPL also takes care of the storage and back-up of the database on the data servers of the University of Liège and supports the team in all efforts of further development and maintenance of this database.

3.1.1.1 PHYSICAL OBJECTS

3.1.1.1.1 STONE TOOLS

TRAIL consists of a large experimental reference library for wear traces and residues on stone tools. These tools are an important source of information, as TRAIL is used to provide a reliable reference framework for identifying and interpreting functional evidence on archaeological stone tools. Each stone tool is given a unique reference number that consists of two components: a group number that reflects the theme of the experiment and an individual sequence number. Before and after each experiment, each individual stone tool is photographed with this unique reference number displayed to make sure this information is properly logged. All data regarding relevant variables, such as those related to production, hafting, use, or other non-functional processes, are recorded within the TRAIL database. This information is also available in paper format in the folders housed within the microscope lab.

Each stone tool is carefully placed in a suitable individual zip-lock bag. All stone tools are grouped in numbered draws according to the experiment theme number. To not contaminate the stone tools, the reference number of each tool is marked solely on the bag, not on the tool itself. This method requires careful attention to ensure that each tool is correctly placed in its respective bag. Above-mentioned pictures are available as back-up in the case of human error. After use or consultation, a stone tool needs to be carefully placed in its original zip-lock bag and must be returned to their designated locations.

3.1.1.1.2 CLEANING OF STONE TOOLS

If chemical cleaning of stone tools is required, it must follow TraceoLab's cleaning protocols (see supplementary information 1). Details of actions undertaken need to be recorded on the bag and a list with details needs to be provided to Dries Cnuts so it can be recorded within the database. Stone tools with adhering residues that have not been cleaned yet can only be cleaned with permission of Dries Cnuts or Veerle Rots. If stone tools are cleaned with chemical solutions, this must be noted on the bag (including all details about the cleaning method (e.g., ultrasonic bath 3 minutes HCL3%). Caution is advised when using chemical solutions, as they may potentially damage the stone tool's surface.

3.1.1.1.3 OTHER OBJECTS RELATED TO THE EXPERIMENTAL STONE TOOLS

TRAIL also contains various other items such as handles, spears, foreshafts, and lithic cores and various blank products, each of which is assigned a unique identifier number. These unique identifier numbers are used for cataloguing and tracking purposes, ensuring that each item within TRAIL's inventory can be easily identified and managed.

3.1.1.1.4 MICROSCOPIC SLIDES

TRAIL also integrates a library of microscope slides, stored in the slide cabinet in the residue analysis lab. These slides are available for consultation at any time using either the Zeiss transmitted light microscope or the Hirox Digital Microscope. Some slides are completely sealed to prevent drying, while others are only partially sealed to allow for staining.

Slides are fragile and need to be handled with care, but the partially sealed slides are more vulnerable to environmental factors and can be damaged easily if not handled properly. This necessitates an increased level of caution and precision when dealing with these slides to ensure their longevity and the preservation of the valuable data they hold.

All microscopic slides should be labelled with the associated reference tool number and the extraction liquid. An additional unique identifier number needs to be added if there are multiple slides related to the same experimental tool number.

3.1.1.1.5 VIALS OR TUBES

Some of the residues extracted from the stone tools were transferred to vials or tubes to facilitate long-term storage. This method is crucial for preserving the integrity of the residues for future analysis. Most of these vials and tubes are stored in a refrigerator that is maintained at a temperature of 4 degrees Celsius to prevent moulding and degradation. This refrigeration is particularly important for organic residues, which are prone to spoilage and deterioration at room temperature. The controlled environment ensures that the chemical composition of the residues remains stable, allowing for accurate analysis and research over an extended period.

3.1.1.1.6 REFERENCE PLANT MATERIAL

TRAIL also includes a library of metal slides containing anatomical sections of various plant materials. These slides are stored in the slide cabinet located in the residue analysis lab. This reference library is primarily intended for examinations with the scanning electron microscope. Therefore, the anatomical sections are placed onto conductive carbon tape mounted on aluminium slides. Each slide has a unique identifier number, and an inventory list with all the details will be made accessible by integrating the inventory list into the TRAIL database.

3.1.1.2 DIGITAL INFORMATION

3.1.1.2.1 EXPERIMENTAL DATA

Detailed experimental data pertaining to various aspects of the stone tools, including their production, hafting, use, and other processes, are meticulously documented and accessible for research and reference. These valuable data offer insights into the methodologies and outcomes of the experiments conducted on the stone tools, providing a comprehensive understanding of their historical and functional context.

This wealth of experimental data is available in two formats. Firstly, it can be consulted in a physical format, organised in folders located in the microscope lab of TraceoLab. These paper records serve as a tangible reference for researchers who prefer or need to access information offline or in a traditional format. They include detailed notes, diagrams, and possibly drawings and photographs, capturing the essence of the experimental processes and results.

Additionally, for more convenient and widespread access, all relevant experimental data are integrated into the TRAIL database. This digital repository enhances the accessibility of the information, allowing researchers to easily search, retrieve, and cross-reference data from various experiments. The TRAIL database is equipped with user-friendly interfaces and search functionalities, making it easier to navigate through the extensive collection of data.

Access to the TRAIL database requires a login, ensuring the security and integrity of the data. This login can be obtained through Dries Cnuts, who likely oversees the database management and grants access permissions in agreement with Veerle Rots. This procedure ensures that the valuable and sensitive data within the database are accessed responsibly and by authorised individuals. It reflects the importance of balancing accessibility with data security and integrity in academic and research settings.

3.1.1.2.2 MICROSCOPE PICTURES

Microscope images are used to document the observed wear and residues on the stone tools and are saved in non-compressed formats, preferably in .tiff format. These images are captured using Optical, Digital Microscope and Scanning Electron Microscope (SEM), using different magnification levels and the magnification level and microscope used are registered within the filename of which the format follows the following structure:

3.1.1.2.3 SEM-EDS SPECTRA

SEM-EDS spectra data provide essential information about the elemental composition of samples. By exporting them to PowerPoint presentations, we create accessible and organised documentation that not only aids our internal research efforts but also serves as a valuable resource for sharing our findings with collaborators and the wider scientific community. EDX spectra data are stored on our secure NAS SERVER, ensuring their availability and preservation.

3.1.1.2.4 PHOTO MANAGEMENT

Photographs are essential for documenting artifacts and experimental setups, providing a visual reference that complements other data forms. This section provides practical steps for managing these photographs to ensure high-quality data preservation and easy access.

CHOOSING THE RIGHT FORMAT

For the best results, use TIFF or RAW formats for your photographs. Here's why:

- **Image Quality**: These formats maintain high image quality, crucial for detailed analysis.
- **Flexibility**: TIFF and RAW files allow more editing options without losing quality.
- **Data Preservation**: These formats are uncompressed or minimally processed, keeping all the image data intact.

HOW TO STORE AND BACKUP PHOTOS

Follow these steps to store and back up your photos properly:

1. **Save in Preferred Formats**: Always save your photographs in TIFF or RAW formats to ensure the best quality and data retention.
2. **Store on NAS**:
    - Transfer your photos to the Network-Attached Storage (NAS) device.
    - Organize your files into clearly labeled folders for easy access. For example, create folders named "Lithic Tools" and "Experimental Setups."
    - Regularly check the NAS to ensure all photos are successfully saved and backed up.
3. **Backup on CIPL Server**:
    - Upload your photographs to the CIPL Server.
    - Maintain the same folder structure as on the NAS for consistency and easy retrieval.
    - Verify the upload to ensure all files are correctly backed up.

PRACTICAL TIPS

- **File Naming**: see section 3.3.2.1.
- **Regular Backups**: Schedule regular backups to both the NAS and CIPL Server to avoid data loss.
- **Quality Checks**: Periodically review your saved photos to ensure they meet the quality standards and are correctly stored.

By following these steps, you can efficiently manage your photographic documentation, ensuring it is well-preserved and accessible for future use.

3.1.1.2.5 VIDEO MANAGEMENT

Videos provide dynamic data type that complements static data related to both experiments and analysis. These videos capture rapid processes, providing insights into the dynamic behaviour of stone tools during experiments. Standard videos can be recorded with the Sony DSC-RX100M4 or the GOPRO10.

In addition, also high-speed recordings are made for certain experiments, for instance in the case of projectiles. This video footage is captured with a high-speed PHOTRON camera and stored in formats such as .CIHX, .AVI, and .MP4. The high-speed camera footage allows us to observe actions such as knapping, tool use and hafting with exceptional detail, enhancing our understanding of the underlying mechanics and forces involved in these processes.

Importance of Video Documentation

Videos complement static data by capturing dynamic processes during experiments. They are essential for documenting our experimental activitiess, offering valuable insights that static images cannot provide.

Recording Standard Videos

For standard video recordings, follow these guidelines:

1. **Resolution**: Record videos at a minimum of Full HD 1080p (1920 x 1080 pixels). Preferably, use 4K resolution (3840 x 2160 pixels) for higher quality and detail.

2. **Setup**: Ensure proper lighting and focus to capture clear and detailed footage. Use a tripod or stable mounting to avoid shaky videos.

RECORDING HIGH-SPEED VIDEOS

Certain experiments, such as those involving projectiles, require high-speed recordings to capture rapid actions (for example, impact of projectiles) in detail. Follow these steps:

1. **Equipment**: Use a high-speed PHOTRON camera for these recordings.

2. **Formats**: Save the footage in formats like .CIHX, .AVI, and .MP4 for compatibility and ease of use.

3. **Detail**: High-speed videos allow detailed observation of actions such as knapping, tool use, and hafting, providing exceptional insight into the mechanics and forces involved.

How to Store and Backup Videos

Proper storage and backup are crucial for preserving video data. Follow these steps:

1. **Save in Preferred Formats**: Ensure all videos, both standard and high-speed, are saved in suitable formats (.CIHX, .AVI, .MP4).

2. **Store on NAS**:

- Transfer your videos to the Network-Attached Storage (NAS) device.

- Organize videos into clearly labeled folders, e.g., "Standard Videos" and "High-Speed Videos."

- Regularly verify that all videos are correctly saved and backed up on the NAS.

3. **Backup on CIPL Server**:

- Upload your videos to the Centralized Image Processing and Library (CIPL) Server.

- Maintain the same folder structure as on the NAS for consistency and easy retrieval.

- Confirm the upload to ensure all files are accurately backed up.

Practical Tips

- **File Naming**: see section 3.3.2.1.

- **Regular Backups**: Schedule consistent backups to both the NAS and CIPL Server to prevent data loss.

- **Quality Checks**: Periodically review your videos to ensure they meet quality standards and are properly stored.

By following these guidelines, you can effectively manage your video documentation, ensuring it is well-preserved and accessible for future analysis and research.

3.1.1.2.6 EXPERIMENTAL LOGS AND NOTES

In addition to images and spectra, our research generates a substantial amount of experiential knowledge. This knowledge is systematically documented through experimental logs and notes, serving as comprehensive records of the procedural aspects of our work. These documents provide important context to the data, including detailed descriptions of experimental setups, observations, and any deviations from expected outcomes. The recommended format for data storage is UTF-8 encoding, such as the .txt format (this follows the university policy regarding data management). Maintaining these records is essential for ensuring the reproducibility and quality control of our research efforts.

3.1.2 WORKFLOW FOR DATA MANAGEMENT RELATED TO TRAIL

3.1.2.1 CREATION OF A NEW EXPERIMENT

The development of new experiments requires consultation with Veerle Rots. Her role involves assessing each new experimental proposal and determining its categorisation. She either assigns a new unique number to experiments introducing novel themes, or incorporates them into an existing series, marked by existing experiment numbers. A new experiment cannot be started without the approval of Veerle Rots. This procedure also guarantees that no errors can be made in the numbering system of the experiments.

3.1.2.2 PRODUCTION OF STONE TOOLS

Once a general number for an experiment assigned, a scientific team member is charged with the responsibility of the data management for the experiment. For the first phase of the experiment, this management is done in direct collaboration with Christian Lepers. Christian Lepers typically produces and uses the experimental stone tools. He is responsible for assigning a sequence number to each individual tool that is incorporated within an experimental theme. He enters all production details, including hafting, into the database. The responsible scientific team member verifies that all entered data are complete and correct to assure that no errors persist in the database. When experiments involve stone tools made by other knappers, it is mandatory that all details are handed over to Christian so he can assign each tool an experimental sequence number upon receipt. He will also verify if all essential data regarding production (or other processes) has been recorded on appropriate data sheets and he will enter the data in the database.

3.1.2.3 THE USE OF STONE TOOLS

The responsibility for recording data related to the usage of the stone tools falls upon the individual who designed the experiment, typically a scientific team member. This person bears full responsibility for (1) collecting all relevant experimental data and for entering these data in the database, (2) for documenting both experimental tools and settings appropriately, and (3) for storing all data and visual materials (pictures, videos) according to the outlined procedures, including ensuring proper back-ups. It is the scientific team member’s duty to ensure that these records are accurately added to the TRAIL database. This meticulous data entry is crucial to maintain the integrity and comprehensiveness of the database for future reference and analysis.

3.2 DATA STORAGE INFRASTRUCTURE

3.2.1 PHYSICAL INFORMATION

The physical objects described in section 3.1.1.1 are stored within dedicated facilities at TraceoLab. In the future, the specific locations of each object will be recorded in the TRAIL database. Currently, the location of each physical object in TRAIL is mainly determined by its category:

- Most of the TRAIL reference collection consists of experimental stone tools that are stored in numbered drawers of the reference material cabinet in the microscope room. Each experiment has its dedicated drawer(s). Stone tools are stored in an individual zip-lock bag and then grouped with 5 tools in a larger zip-lock bag. Stone tools should always be returned to their designated drawer and bag. If items from the existing reference collection are used in blind tests, the list of selected tools together with the time frame should be sent to both Dries Cnuts and Veerle Rots. After finalisation of the blind test, the tools are replaced in their original setting and both Dries Cnuts and Veerle Rots are informed.
- A minority of experimental stone tools are stored in numbered plastic boxes in the microscope room and in Christian's office. These tools should be bagged in groups of 5 zip bags within one larger zip bag, with each group including consecutive experimental numbers (e.g., 1-5, 6-10, 11-15).
- The TRAIL reference collection also includes items such as handles, spears, foreshafts, cores and blanks. All of these are also individually numbered. These items are currently stored in Christian's office.
- All microscope slides and the reference plant material slides are stored in the slide cabinet located within the residue lab.
- Vials and tubes are stored in the fridge, which is currently located in the washing room ('salle de lavage').

3.2.2 DIGITAL INFORMATION

As a research lab of the University of Liège, TraceoLab boasts a well-structured and multifaceted data storage infrastructure, adeptly designed to meet the diverse requirements of present-day research. This infrastructure is strategically divided into four key categories (Figure 2), each holding specific data types and serving distinct storage purposes, to optimise both the efficiency of data management and the security of all research data.

Four key categories of digital storage facilities at TraceoLab:

1. **Personal Storage**: This category focuses on individual storage needs, making it ideal for storing preliminary data related to your experiments or archaeological analysis. It ensures privacy and security, allowing you to organize and access your data independently. This

independence is crucial for maintaining the integrity and confidentiality of your ongoing research.

2. **Shared Storage**: This category acknowledges the collaborative nature of research at TraceoLab by offering storage solutions designed for data sharing within our team. Shared storage spaces enable multiple users to access and contribute to common data sets, fostering teamwork and enhancing our collaborative research process. These solutions are essential for our projects, where several researchers need to access and update data regularly.

3. **Archive Storage**: Dedicated to the long-term preservation of TraceoLab's research data, archive storage provides a secure and stable environment for storing completed projects and historical data. This applies to data related to both the trail reference collection and the analysis of archaeological material. Designed for data that is not frequently accessed but must be retained for future reference, compliance, or historical value, archive storage ensures that critical research data is preserved over extended periods, safeguarding the lab's academic legacy.

4. **External Data Storage**: This category encompasses storage solutions for data sourced from external entities or needing to be shared beyond TraceoLab. It includes systems that facilitate the secure exchange of data with external collaborators, partners, and public repositories. External data storage is crucial for projects involving multi-institutional collaboration, ensuring seamless and secure data transfer between different entities.

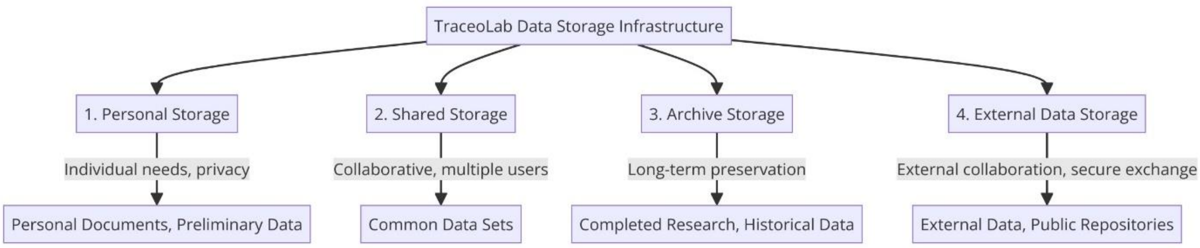


Figure 2 Four categories of data storage infrastructure

Each of these categories plays a vital role in TraceoLab's data management strategy, ensuring a comprehensive approach that covers all aspects of data storage from personal use to collaboration and long-term preservation. This diversified storage infrastructure not only protects the lab's valuable research data but also supports a wide range of research activities, fostering an efficient and dynamic research environment at the University of Liège.

3.2.3 PERSONAL STORAGE

3.2.3.1 COMPUTER

Each team member receives an office computer (desktop or laptop) upon arrival. Each team member can therefore store files onto the local space of their computer and to dedicated locations on the lab computers. This local space concerns the internal hard drive or storage system of the device. It is suitable for saving small numbers of work-related documents, images, software, and other data files. However, the capacity of local storage is limited by the size of the computer's hard drive. Each team member is responsible for the regular back-up of all files that are stored on this local space, both on their computer and their designated folder on the lab computer, to prevent data loss due to hardware failure or other issues. In addition, Dries Cnuts is responsible for the regular back-up of all data on the hard drives of the lab computers.

3.2.3.2 DOX

This service, powered by the "ownCloud" platform, offers features like Dropbox or Google Drive. However, it uniquely ensures that all data is securely stored within the University's ISO27001 certified data centres. Each user receives a substantial 100GB of storage space, which can be increased upon request. This space allows for effortless synchronisation of folders between the user's computer and the dox.uliege.be server. Once synchronised, the data can be accessed from any device associated with the same account, including computers, tablets, and smartphones. This ensures that professional data is not only secure but also backed up daily on ULiège's servers, maintaining both its security and confidentiality.

The service not only facilitates file sharing and collaboration within the ULiège Community but also extends its capabilities beyond, making it suitable for a wide range of projects and groups. With any internet-connected device, you can easily access your data through a web browser interface. This feature offers the flexibility to work and retrieve information from any location at any time. A key benefit of utilising this in-house solution like this is the availability of prompt and efficient support.

https://dox.uliege.be/

More information :

https://www.campus.uliege.be/cms/c_11230582/fr/dox

Given the existence of this service and the one described under 3.2.3.3, TraceoLab team members are requested to refrain from using other services such as Dropbox or Google drive.

3.2.3.3 ONE DRIVE

OneDrive, the cloud storage solution adopted by ULiège and CHU, provides each user with 1 TB (1000 GB) of dedicated online storage. As a part of the Office suite, OneDrive excels in its integration with the Office ecosystem, promoting collaboration through features like real-time co-editing of files. This makes it more conducive to collaborative efforts within the TraceoLab team and other University members compared to DoX.

However, there are considerations to be made regarding OneDrive. While it facilitates the use of Office apps, its servers are not managed by SEGI but are instead hosted by Microsoft. Despite meeting the necessary security and confidentiality standards on paper, and being located in Microsoft-certified data centres in Europe that are GDPR compliant, the outsourcing of these servers implies certain drawbacks. These include potentially slower support and weaker confidentiality measures, distinguishing OneDrive's operational framework from in-house solutions like DoX.

https://my.segi.uliege.be/cms/c_18012686/fr/mysegi-onedrive

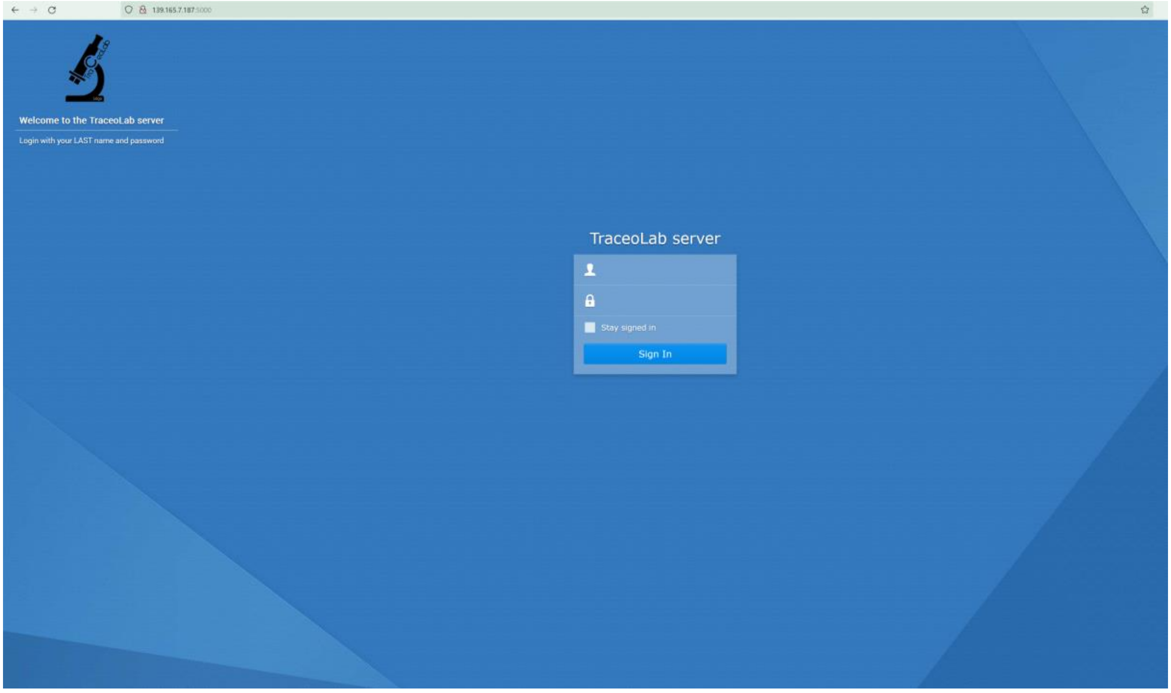
Given the existence of this service and the one described under 3.2.3.2, TraceoLab team members are requested to refrain from using other services such as Dropbox or Google drive.

3.2.3.4 NAS SERVER (SYNOLOGY DISKSTATION DS213+):

The NAS server is owned and managed by the TraceoLab team itself. It therefore serves as the primary storage location for work-related files, including microscope images, experimental data, and pictures. It is mandatory to back up all work-related data on this server, ensuring data integrity, accessibility, and security. Additionally, this server functions as the exclusive transfer station for SEM files.

It can be accessed in your browser through the following URL: http://139.165.7.187:5000/. However, access requires a username and password, which can be created by Dries Cnuts (dries.cnuts@uliege.be). Your username is always your last name. The NAS Server can also be accessed from home using the VPN program 'Big IP edge' (https://lib.uliege.be/fr/ressources-et-services/outils/acces-hors-campus-vpn)."

The NAS server, located in the microscope lab, boasts a total capacity of 2x1.8 TB. It is identified by the following serial numbers: Drive 1 is WD-WMC301569256 and Drive 2 is WD-WMC301569256. Drive 2 serves as an automatic back-up of all data on Drive 1.



3.2.4 SHARED STORAGE

3.2.4.1 TEAMS

TraceoLab uses Teams, a component of Office 365, as an integrated platform for communication and collaboration. Teams enables advanced chatting, video conferencing, note-taking, and the storage and sharing of files, among other functionalities. It offers extensive collaboration features, such as setting access at the folder level and assigning specific user rights (like read, upload, admin), including file sharing through shared links.

Teams is intricately linked with OneDrive; it acts as an user interface facilitating the sharing and management of access within user groups (the 'teams'), and operates on OneDrive servers. This integration signifies a unified drive for all Office tools, as suggested by the name 'OneDrive.' While OneDrive can function as shared storage independently of Teams, Teams provides a more streamlined approach for managing sharing settings.

3.2.4.2 NAS SERVER (SYNOLOGY DISKSTATION DS213+):

The NAS server is owned and managed by the TraceoLab team itself. This server is serving dual purposes: it provides personal storage for team members (see above) and houses extensive data associated with the reference collection. The server securely stores and organizes detailed records, images, and analytical data related to the various artifacts in the TRAIL (Traces in Liège) collection.

It can be accessed in your browser through the following URL: http://139.165.7.187:5000/. However, access requires a username and password, which can be created by Dries Cnuts (dries.cnuts@uliege.be). Your username is always your last name. The NAS Server can also be accessed from home using the VPN program ‘Big IP edge’ (https://lib.uliege.be/fr/ressources-et-services/outils/acces-hors-campus-vpn).”

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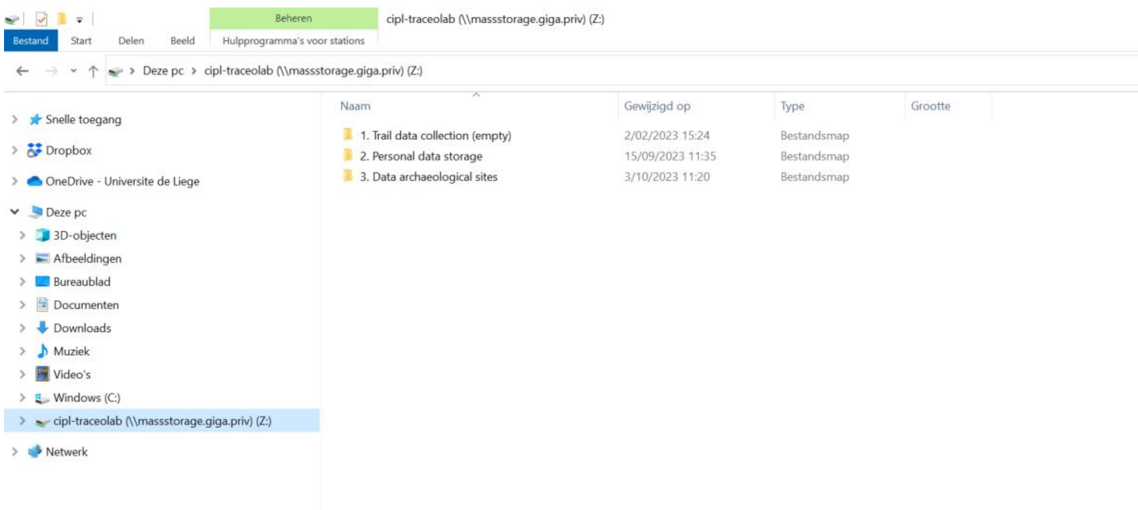
3.2.4.3 CIPL SERVER (MASS.STORAGE)

The CIPL server serves a threefold function: housing data associated with the reference collection, acting as the main server for archiving data (including data from past TraceoLab members), and data storage for microscopic pictures during analysis.

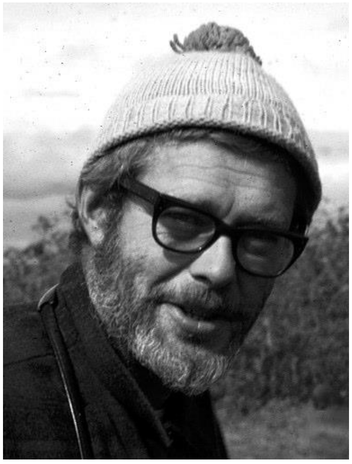
Access requires installation by Emanuel Dupuy (edupuy@uliege.be), following approval from Veerle Rots (veerle.rots@uliege.be). Once installed, the server can be accessed through Windows Explorer. Users have access to all data stored on this server, so it is recommended not to save pictures that are under embargo or that may become subject to embargo through publication. The CIPL is ISO 27001 certified, with a capacity of 3 petabyte (PB) and situated at the ULiège Data Centre.



3.2.5 ARCHIVING STORAGE

TraceoLab currently uses three external disks for archiving data, each named after a famous prehistorian. Each disk serves a specific purpose.

3.2.5.1 EXTERNAL DISK DRIVE 1 (LEWIS):



Purpose: External Disk Drive 1 (LEWIS) primarily serves as storage space for videos captured by the high-speed camera.

Technical specifics:

Capacity: 8 TB
Location : Office Dries
Serial Number: VGJR3PSK

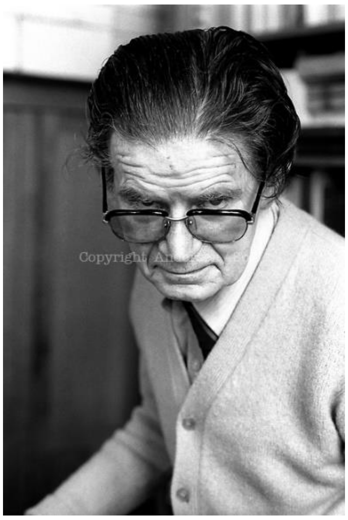
3.2.5.2 EXTERNAL DISK DRIVE 2 (DOROTHY):

Purpose: This external drive serves as an offline back-up location for TRAIL data.

Technical specifics:

Capacity: 8 TB
Location: Office Dries
Serial Numbers: CA2ZMM1K

3.2.5.3 EXTERNAL DISK DRIVE 3 (ANDRE):



Purpose: This external drive serves as an offline back-up location for the 3d data related to the 3d scanner.

Technical specifics:

Capacity: 8 TB
Location: Office Dries
Serial Number:CA3128D

3.2.6 DATA SHARING

3.2.6.1 BELNET FILESENDER

ULiège provides the filesharing tool Filesender through Belnet (Belnet = BE Federal computing service), allowing the sharing of (large) files of up to **2GB** with others (http://filesender.belnet.be). The files are stored temporarily and are only accessible to users you designate. This filesharing tool is recommended for sharing files when it is necessary to use a file hosting service.

More information: https://my.segi.uliege.be/cms/c_11242089/fr/mysegi-belnet-filesender

3.2.6.2 DATAVERSE ULIEGE (OPEN REPOSITORY)

The **Dataverse** is an open-source web application to share, preserve, cite, explore and analyse research data. Researchers, data authors, publishers, data distributors, and affiliated institutions all receive appropriate credit via a data citation with a persistent identifier (e.g., DOI, or handle). More information mail to dataverse.admin@uliege.be.

3.3 DATA CONVENTION TRACEOLAB

3.3.1 TRACEOLAB'S WORKFLOW FOR THE STORAGE OF DIGITAL INFORMATION

Within research, a well-structured data workflow is paramount for ensuring the integrity, accessibility, and security of valuable information. At TraceoLab, we recognise the critical importance of a robust data management system. This document outlines our guidelines for data storage, a fundamental component of our data workflow, to provide clarity and coherence in the way we handle and safeguard data. Data storage at TraceoLab encompasses the strategic placement of information within our secure infrastructure, categorisation for efficient access, stringent access control, back-up and recovery procedures, data retention and archiving policies, and unwavering compliance with data protection regulations. It is through these data storage guidelines that we uphold our commitment to precision, transparency, and compliance, ensuring the success of our data-driven initiatives.

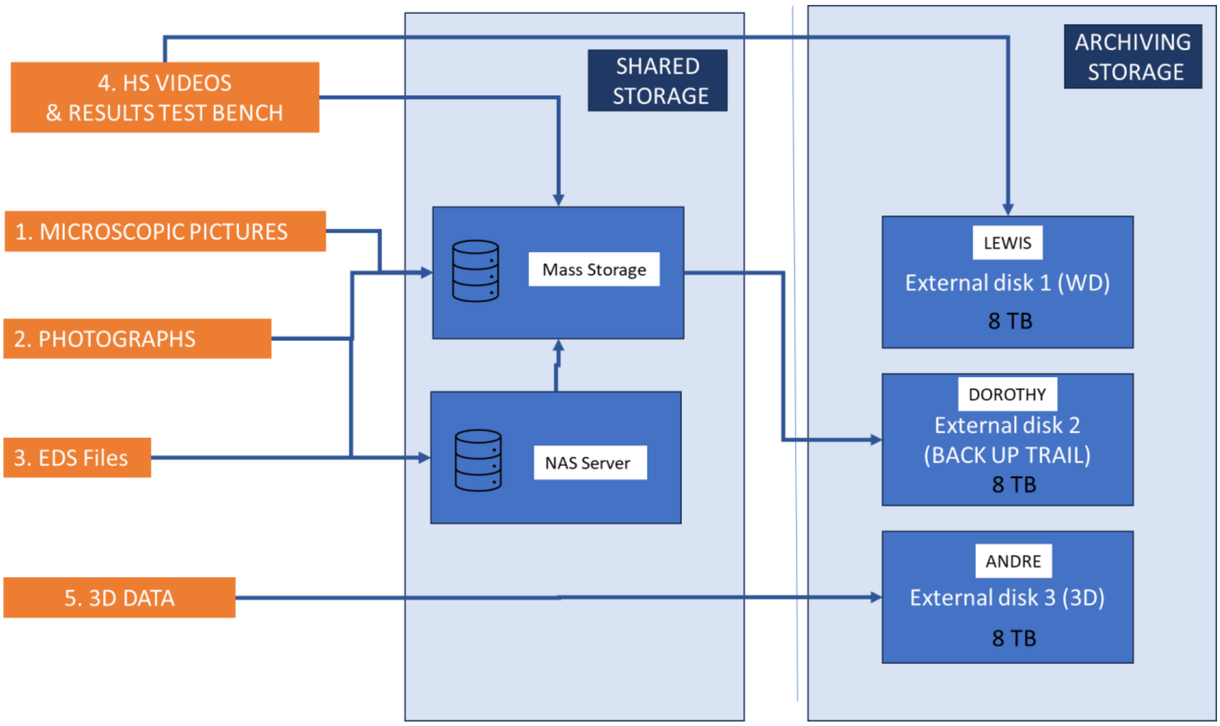


Figure 3 Workflow of TraceoLab for data storage

3.3.2 POLICY REGARDING THE REGISTRATION METADATA

In the ever-evolving landscape of data management, the significance of well-structured and comprehensible metadata cannot be overstated. Metadata serves as the foundation upon which the usability, discoverability, and longevity of data are built. As we delve into this crucial aspect of data stewardship, it is imperative to transition from general recommendations to the adoption of more concrete conventions and, in certain cases, obligatory practices.

This chapter aims to outline and establish clear guidelines and standards for managing metadata, with a specific focus on files and folders within data projects. We recognise that effective data management is not just about storing data efficiently; it's also about making it accessible and understandable for a wide range of users, both now and in the future. To this end, we will introduce standardised practices, including the obligation to create 'readme' files following a specific template, which will serve as a comprehensive guide for documenting various aspects of data, such as variables, measurement units, dates, versioning, and more.

Our objective is to ensure that the data managed within our systems is not only preserved in a structured and standardised manner but also enriched with detailed metadata that facilitates efficient retrieval, interpretation, and reuse. By adhering to these standards and practices, we commit to fostering an environment where data is not just a collection of files and numbers, but a well-documented repository of knowledge, ready to be explored and utilised effectively.

3.3.2.1 DATA TYPES RELATED TO EXPERIMENTAL TOOLS

Photographs

File names for all data related to photographs of experimental tools should follow a specific convention for consistency and ease of identification. The file name should include the following elements:

- *Experiment Number*: e.g., EXP01
- *Sequence Number*: e.g., 01
- *Face of the tool*: Dorsal = D; Ventral = V
- *Experimental sequence*: Before use = BU; After Use AU
- *Additional number*: 01

For example: EXP01_01_D_BU_01 = photograph of the dorsal surface of tool EXP01_01 before use

Microscopic pictures

File names for all data related to experimental tools should follow a specific convention for consistency and ease of identification. The file name should include the following elements:

- *Experiment Number*: e.g., EXP01
- *Sequence Number*: e.g., 01
- *Lifecycle Stage Code*: KNAP, HAFT, USE, TAPH

Lifecyle Stage	Code
Knapping	KNAP
Retouch	RET
Hafting	HAFT
Use	USE
Taphonomy (post-depositional processes)	TAPH

- *Subject Type*: RES (residue), WEA (wear)
- *Description*: A brief description of what can be seen on the picture
- *Wear code*: P (polish), ER (ed
- *Microscope code:* code of the microscope that has been, used

Microscope	Code
Stereoscope Zeiss V16	V16
Axioscope Imager A1	AI
Axioscope A1	AS
JEOL Scanning electron Microscope	SEM
Olympus BX51M	OL
Hirox	HI
FTIR microscope Lumos Bruker	FTI
Axio Imager Transmitted	TRA

- *Magnification*: Magnification used for the microscope image (x50, x100, x200, x500, x1000)
- *Initials of Author*: e.g., DC (Dries Cnuts), VR (Veerle Rots)

3.3.2.2 DATA TYPES RELATED TO ARCHAEOLOGICAL TOOLS

File names for all data related to archaeological tools should follow a specific convention for consistency and ease of identification. The file name should include the following elements:

a. *Sitename*: e.g, Fumane, Sibhudu
b. *Subject Type*: RES (residue), WEA (wear)
c. *Description*: A brief description of what can be seen on the picture
d. *Magnification*: Magnification used for the microscope image
e. *Initials of Author*: e.g., DC, VR

3.3.3 POLICY REGARING THE BACK-UP OF YOUR RESEARCH DATA

Backing up your research data is a crucial responsibility for every TraceoLab member. The importance of data back-up cannot be overstated, as it serves as a safety net in the event of unforeseen disasters, technical failures, or human errors. It is an obligation to protect valuable assets, preserve critical information, and ensure research continuity. Regular, secure back-ups not only guard against data loss but also contribute to compliance with data protection regulations. Make it a **weekly** practice to back up your data, store it in a secure location, and periodically test your recovery procedures. This obligation extends to safeguarding sensitive and personal information, safeguarding intellectual property, and maintaining the trust of colleagues. Remember, when it comes to data, it is not the question whether a back-up is needed, but when it is needed.

At TraceoLab several storage solutions are available to back up your data, in particular the NAS server (Synology DiskStation ds213+), which serves as the primary storage space for the back-up of personal research data.

Proposed Workflow for Data Back-up of Research Data at TraceoLab

1. **Identify Data for Back-up**: determine which datasets need to be backed up, including research data, sensitive information, intellectual property, and personal research information.

2. **Identify the Suitable Storage Solution**: evaluate and select the appropriate storage infrastructure for back-up, such as NAS servers, cloud storage, or other secure storage solutions.

3. **Schedule Back-up**: set a recurring date for the back-up process (e.g., the first Monday of every week).

4. **Perform Data Back-up**

4.1. *Connect to the Suitable Storage Infrastructure*: access the chosen storage solution, ensuring it is secure and ready for data transfer.

4.2. *Transfer the Identified Data to Storage Infrastructure*: securely and encrypted transfer the identified data to the storage solution.

4.3. *Organise Data*: arrange the data in a structured manner on the server to facilitate easy retrieval.

5. **Verify Back-up**: confirm that all necessary data has been successfully backed up and is intact. This may involve checking file sizes, checksums, or sample data retrieval tests.

This workflow ensures a systematic and secure approach for all staff members for backing up research data at TraceoLab. Regular back-ups as per the schedule will help in safeguarding valuable data against loss due to unforeseen events, technical failures, or human errors. Additionally, the process of identifying the right storage solution and organising the data effectively will contribute to efficient data management and recovery when needed.

3.3.4 DATA POLICY REGARDING THE DEPARTURE FROM TRACEOLAB

Before departing, each employee must provide an unprotected copy of all work-related data collected during their time at TraceoLab to Dries Cnuts, as detailed in section 3.2. This includes all types of data specified in that section. The employee is responsible for ensuring that all documents are clearly marked with their initials to identify the original author. Together with Dries Cnuts, the employee will verify that the data complies with the Data Management Plan (DMP) and is fully accessible. To ensure sufficient time for addressing any issues, the employee must start this process at least two weeks prior to their departure.

To ensure smooth transition and future usability, departing members should:

- Organize their data in a logical, clear structure.
- Provide relevant documentation (e.g., data descriptions, protocols, or metadata).
- Confirm that their data complies with TraceoLab's ethical and legal standards for storage.

Additionally, any personal or non-work-related data must be deleted from all computers before they are returned. All university-owned equipment—including computers (desktops and laptops), devices containing work-related data, and any other items provided during the employee's stay—must be returned by or on their final day of work. This is in line with the university's general regulations regarding items purchased with internal or external research funds.

3.3.5 ARCHIVING DATA

Once research data from the TraceoLab is no longer in active use, it must be archived. This responsibility falls on TraceoLab staff members as both an ethical and legal obligation. Proper archiving is essential for preserving the integrity of the scientific process, ensuring that data remains accessible for review, validation, and potential future use. As such, all members of the TraceoLab team should regard data archiving as a fundamental duty.

3.3.5.1 ARCHIVING RESEARCH DATA FROM DEPARTING MEMBERS

When a TraceoLab member departs, it is imperative that their data be properly archived to avoid loss of valuable research material. A specific location on the CIPL server (Z:\2. Personal data storage\Users\Archived users) is designated for storing data from former team members. Before departure, the staff member must ensure that all relevant data is transferred to this archive. This process helps safeguard the continuity of research, allowing future team members to access and build upon the work of their predecessors.

3.3.5.2 ARCHIVING DATA FROM COMPLETED RESEARCH PROJECTS

Upon the completion of a project, the collected data must be systematically archived. This ensures that even if the project is no longer active, the data remains accessible for potential future studies or validation.

The data from completed projects should also be stored in the designated space on the CIPL server (Z:\9. Completed projects).

- For efficient archiving of completed projects, the following steps should be taken:
  - All data should be clearly labeled and organized by project, making it easy to locate and understand.
  - Project documentation, including methodologies, and any other relevant information, should be included to provide context for future researchers.

3.3.5.3 PUBLISHED PAPERS

For every published paper, it is recommended that the raw data underlying the research be archived on the CIPL server (Z:\8. Published papers). This ensures that other researchers can reproduce or expand upon the findings presented in the publication, supporting scientific transparency.

The following guidelines apply to the archiving of data related to publications:

- Raw data must be stored in a clearly defined structure, with accompanying metadata explaining variables, methods, and any analytical procedures.
- A public or restricted-access repository (as appropriate to the field of study and the data type) should be used to store this data.

3.3.6 THE USE OF THE LAB COMPUTERS

3.3.6.1 STORAGE OF TEMPORARY OR PERSONAL FILES ON THE LAB COMPUTERS

The removal of temporary files, such as z-stack images, is a necessary practice after each microscope session to maintain system efficiency and storage space. Additionally, it is imperative to emphasise that saving personal data on the storage space of laboratory computers is strictly forbidden. Adhering to these guidelines is crucial for ensuring the smooth operation of lab equipment and protecting the security and integrity of shared computing resources.

3.3.6.2 INSTALLATION OF EXTERNAL SOFTWARE

The installation of any external software on lab computers is only permitted with prior consultation and approval from Dries Cnuts. This ensures that all software added to the systems is compatible, safe, and necessary for research purposes. Unauthorized installations can jeopardize system security, functionality, and compliance with institutional policies. Therefore, all team members must seek approval before proceeding with any software installation, ensuring that the lab's computing resources remain secure and efficient.

3.3.7 PUBLISHING NEWLY OBTAINED RESEARCH DATA FROM THE TRAIL REFERENCE COLLECTION

Since all artifacts within the TRAIL reference collection are the property of TraceoLab, researchers must obtain permission from the lab's management before publishing any research data derived from these artifacts, such as photographs, microscopic images, or measurements. It is the researcher's responsibility to ensure that TRAIL data are published accurately, including the correct experimental numbers and descriptions as specified in the TRAIL database. This guarantees reproducibility and comparability across published results and helps other researchers accurately identify and locate the relevant research data, including artifacts, when visiting TraceoLab or citing our work.

In cases where researchers wish to give a general description of the TRAIL reference collection in their publications, the following citation should be used to properly acknowledge the work:

ROTS, Veerle. TRAIL-An Experimental Trace and Residue Reference Library for the functional analysis of stone tools in Liège. 2021.

Newly obtained research data can be incorporated directly into the main text of a publication, whether it be a paper or a book chapter. However, due to the word limits often imposed by publishers, these data are typically presented in a synthesized or summarized form. For more detailed information, raw data are usually provided as supplementary material or made available through open- access repositories. We recommend using **Dataverse ULiège** as the preferred repository, as it ensures that the data remain under the ownership of the University of Liège, unlike other repositories. If TraceoLab staff wishes to make raw data from the TRAIL reference collection publicly accessible in the context of a publication, they must first obtain approval from the lab’s director.

3.3.8 REUSE OF EXISTING RESEARCH DATA

Reusing data from TraceoLab members requires proper citation, as it upholds research integrity by acknowledging the contributions of others. It is essential to consistently cite any TraceoLab data you reuse, following the guidelines of the attributed license. A clear distinction must be made between published and unpublished research data.

For previously published data, standard citation practices should be followed. Ensure that you use the correct reference related to the specific topic. If previously published images are being used, adequate permissions must be obtained (e.g., author, publisher).

For unpublished data, or data where certain aspects remain unpublished, strict protocols must be followed. In these cases, permission is required from the TraceoLab director. Also, the researcher who originally produced the data should be informed, but obtaining permission is not a binding condition particularly in cases where the researcher does not respond or cannot be contacted. The director has the final call in such cases. If the data are to be used for publication, the researcher(s) who originally produced the data should be included as co-author(s). Deviations on the latter are only possible when the researcher(s) who originally produced the data decide(s) otherwise, in which case a written agreement should stipulate the details.

3.3.9 EXTERNAL SHARING OF RESEARCH DATA

The sharing of unpublished research data of either experimental or archaeological materials with external researchers is not authorized unless exception is granted after prior consultation with the director of TraceoLab. All research data remains the property of TraceoLab and may not be used by external researchers without explicit permission of the director of TraceoLab. In cases where a formal data exchange is involved, a written agreement must be established outlining the terms for data use, security, and publication. This agreement must be signed by both parties before any data are shared. This procedure aims to safeguard data integrity, prevent misuse, and protect the rights linked to TraceoLab's research data.

Researchers must utilise institutional services such as **Belnet Filesender** or **Dataverse ULiège** when sharing research data with external partners. These platforms offer secure and reliable mechanisms to ensure data are transferred safely and in compliance with the institution's data governance policies.

SUPPLEMENTARY INFORMATION

SI1: TraceoLab cleaning protocol

(developed in collaboration with Sonja Tomasso and Lena Asryan)

This standard protocol serves as an initial step to remove residues and modern contaminants from the surface of stone tools. It can be adapted at any time, depending on the specific research objectives. It is recommended to begin with the least aggressive methods, gradually progressing to more intensive techniques if necessary. The success of a cleaning method relies on its ability to break the bond between the residue and the stone tool surface, which is influenced by the chemical composition of the residue, the mineral properties of the surface, and the force applied during residue deposition. Therefore, it is crucial to assess the type of residues that need to be removed to effectively clean the mineral surface.

The stone tool cleaning process must be documented with the following details:

- Date of cleaning
- Cleaning agent(s) used and their concentrations
- Duration of exposure
- Method of application (e.g., immersion, ultrasonic bath)
- Observations or notes on the tool's condition before and after cleaning
- Name of the person performing the cleaning

A summary of the cleaning procedure should be written on the storage bag, and all details must be uploaded to the online TRAIL database.

<table>
<tr><td>Residue type</td><td>STEP1: immerse artefact in neutral soap (detergent) in a weighing boat for 15 minutes</td><td colspan="2">STEP 2: cleaning with a diluted chemical solution (3 to 10%)
(depending on the residue type)</td><td rowspan="9">STEP 3: rinse with water to stop the chemical reaction</td><td rowspan="9">STEP 4: apply ethanol or acetone to degrease surface before the optical analysis</td></tr>
<tr><td>Cleaning agent</td><td>Neutral Soap (Detergent)</td><td>NaOH (Sodium Hydroxide)</td><td>HCl (Hydrochloric Acid)*</td></tr>
<tr><td>Bone and Antler (Apatite)</td><td>Mild effect; safe for surface cleaning but may not remove stubborn residues.</td><td>Limited effect on apatite; cleans organic residues without damaging mineral structure.</td><td>Dissolves calcium phosphate; can significantly damage or dissolve bone and antler.</td></tr>
<tr><td>Ochre (Iron Oxide)</td><td>Mild effect; can remove loose particles but not effective for heavy deposits.</td><td>Limited effect: does not dissolve iron oxide, suitable for cleaning organic contaminants mixed with ochre.</td><td>Reacts with iron oxide to form soluble iron chloride; ideal for removing ochre.</td></tr>
<tr><td>Resin</td><td>Effective at removing resin, especially with warm water and scrubbing.</td><td>Breaks down resin through saponification; highly effective for cleaning resin residues.</td><td>Limited effect; not effective for resin removal.</td></tr>
<tr><td>Hide</td><td>Mild effect; gentle cleaning without significant degradation.</td><td>Can degrade hide by breaking down proteins and fats</td><td>Causes significant damage by breaking down collagen fibers</td></tr>
<tr><td>Lipids</td><td>Effective for removing lipids with warm water and scrubbing.</td><td>Saponifies fats and oils, turning them into water-soluble soap and glycerol; highly effective.</td><td>Limited effect; does not saponify fats or oils; not effective for lipid removal.</td></tr>
<tr><td>Plant Tissue</td><td>Mild effect: safe for gentle cleaning but may not remove all residues.</td><td>Breaks down cellulose and lignin, leading to dissolution or degradation</td><td>Can degrade plant tissues by breaking down cellulose; effective but may damage.</td></tr>
<tr><td>Lignin</td><td>Limited effect; not effective for removing lignin.</td><td>Breaks down lignin, making it soluble and easier to remove; highly effective.</td><td>Limited effect; not effective for lignin removal.</td></tr>
</table>

* Cannot be used for cleaning calcium bearing raw materials (e.g., basalt) as it destroys the matrix

SI2: TraceoLab's Agreement on Sharing Research Data

1. Scope of use

This agreement outlines the terms and conditions governing the sharing of unpublished research data from TraceoLab with external researchers. By signing this agreement, both parties agree to comply with the conditions listed below to ensure the integrity, security, and appropriate use of research data.

This agreement must be signed by both the external researcher(s) and the Director of TraceoLab before any data are shared.

2. Location of the external researcher

Laws on data protection in countries outside the EU/EEA will provide levels of data protection that differ from the GDPR. Therefore, if the external researcher is established outside the EU/EEA territory, supplementary contractual safeguards and provisions may be necessary.

3. Consultation and Approval

The sharing of unpublished research data involving either experimental or archaeological materials with external researchers will only proceed after formal consultation and approval from the Director of TraceoLab.

No research data may be shared or used by external researchers without the explicit written permission of the Director of TraceoLab.

4. Ownership and Intellectual Property

All research data remains the property of TraceoLab and the University of Liège (ULiège). External researchers acknowledge that they do not obtain any ownership rights or intellectual property rights over the data, nor rights to publish these data unless explicitly agreed upon.

External researchers may only use the data for the purpose(s) outlined in this agreement and with the specific consent of the Director of TraceoLab.

External researchers do not acquire the right to share TraceoLab data with other parties.

5. Data Use and Security

Research data must be used solely for the agreed-upon research purposes and must not be shared with any third parties without prior written consent from the Director of TraceoLab.

Researchers must employ institutional services such as Belnet Filesender or Dataverse ULiège for the secure transfer of data to external partners. These platforms ensure that the data are transferred safely and in compliance with ULiège's data governance policies.

6. Data Publication

No part of the shared data may be published or included in any academic publication, presentation, or report without prior written authorization from the Director of TraceoLab.

In cases where publication is approved, both parties must establish the conditions and clear terms regarding data citation, acknowledgement, and authorship. Every publication that includes unpublished research data from TraceoLab should be co-authored by at least one team member of TraceoLab)

5. Data Integrity and Protection

External researchers must take all necessary steps to ensure the security and integrity of the data. This includes:

- Adhering to TraceoLab's data governance policies.

- Storing the data in a secure environment.

- Preventing unauthorized access, disclosure, or misuse of the data.

6. Compliance and Consequences

Any breach of this agreement may result in the immediate revocation of data access rights and may also lead to legal action, including claims for damages resulting from unauthorized use or disclosure of the data.

Description of the data that will be shared:

1. Full Name recipient: Click or tap here to enter text.
2. Host institution:Click or tap here to enter text.
3. Data type: ☐ *Microscopic pictures* ☐ *Photos of stone tools/experiments* ☒ *Excel file with raw data* ☐ *Access database* ☐ *Figures, drawings*
4. Description of the data (add a full list of the file names as an attachment): Click or tap here to enter text.
5. Original author of the research data (mention all authors that were responsible for the production of the data): Click or tap here to enter text.
6. Purpose of the transfer:☐*Only consultation* ☐*(Partial) publication*
7. Detailed description of the purposes for which the data can be used
8. Proposed data sharing platform: ☐*Belnet Filesender* ☐*Dataverse ULiège*
9. Describe of data storage infrastructure at recipients institution and the method of encoding: Click or tap here to enter text.

Acknowledgement and Agreement

By signing below, both parties acknowledge that they have read, understood, and agree to the terms and conditions outlined in this agreement.

RECIPIENT:

Name: ________________________________

Institution: ____________________________

Signature: _____________________________

Date: __________________________________

TraceoLab Director (on behalf of ULiège):

Name: ________________________________

Signature: _____________________________

Date: __________________________________