GEOLOGICAL CURATORS GROUP

GCG

Affiliated to the Geological Society of London
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"I am beginning my research. What do I do with my geological collection?"

Advice from the Geological Curators' Group

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CONTENTS

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For the most up to date version, visit http://www.geocurator.org/researchbooklet

INTRODUCTION

Research projects for PhD, Masters and sometimes undergraduate students, often involve the collection of fossils, rocks and minerals. These may be accompanied by maps and field notebooks, thin sections, acetate peels, SEM stubs, cavity slide preparations and analytical powders, in addition to digital data. However, university departments often do not have the storage capacity or resources to look after geological collections and they sometimes get neglected or discarded after the project has ended or the student has left.

Unfortunately, as many researchers and curators know from bitter experience, this has often resulted in the loss of specimens which should have been preserved for the public good, by depositing them in an accredited museum or other institution with the appropriate facilities. This can easily be avoided with early planning and having the long-term value of the collection in mind.

This booklet is intended to help students, their supervisors, and indeed anyone who collects geological material, to manage their collections and associated data to ensure the best possible outcome for these valuable resources. In fact, if your research is publicly funded, it may be a requirement of your funding that data with long-term value, which includes physical collections and samples, are preserved and made openly available in a timely and responsible way.

What is GCG?

Geological collections are an irreplaceable part of our scientific and cultural heritage. The Geological Curators' Group (GCG) is dedicated to their better care, management and use.

Follow us on Twitter @originalGCG, find us on Facebook, read our blog and find out more online: www.geocurator.org.

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1. Making a data management plan

Good data is fundamental to good science. Good data management, to ensure its integrity, quality and re-usability is fundamental to good scientific practice. A data management plan is simply a table or summary of how you are planning to manage the data you gather. It might sound daunting, but it's actually really useful. It will help you identify the kind of decisions you will need to make about your data as your project progresses. Any physical collections you make can also be thought of as data and should form part of a data management plan. More and more funders are asking researchers to submit one as part of a grant application, and so producing a data management plan is a good part of your scientific training.

> ***Start early and think ahead. The key to good data management is forward planning***

Consider the following:

- What kind of data, format and volume of data will your project create? It might be:
  - Physical collections and samples (e.g. fossils, rocks, minerals and physical derivatives)
  - Hardcopy records (e.g. field notebooks and maps)
  - Digital information (e.g. database or spreadsheet of specimen data, CT scans, mineral chemistry data, images generated by analytical SEM work, etc.).
- How will the data be collected or created?
  - How will you structure and name your folders and files?
  - How will you make sure you keep track of different versions?

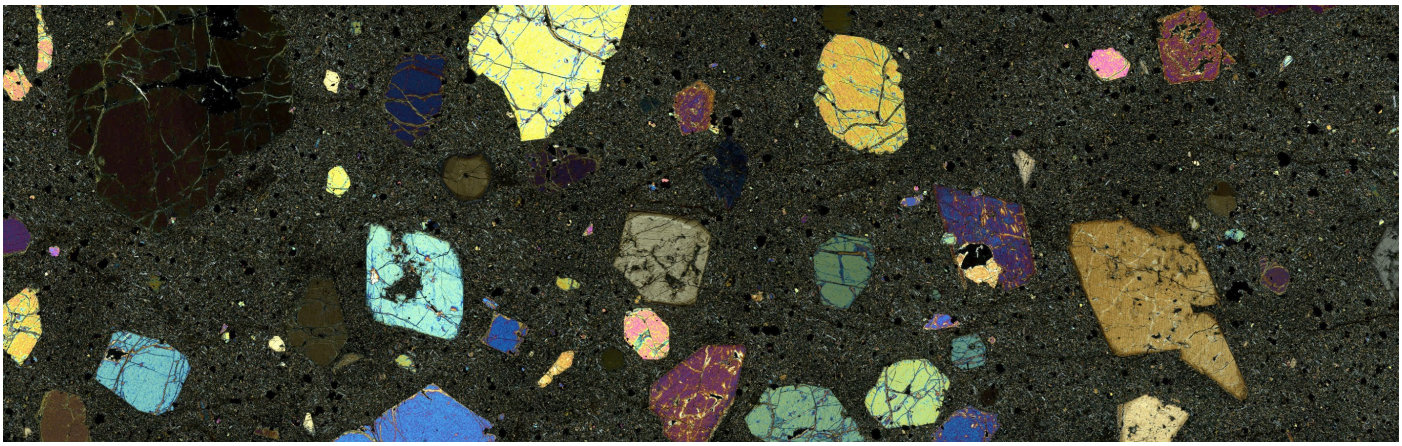
- Where will you store your data and keep it secure? How will your data be backed up?
    - Do you need boxes and packing materials for specimens? Some environmental conditions, such as very high or low temperatures, damp, or bright sunlight might adversely affect some fossils or minerals, so consider this too.
    - All digital storage methods have their pros and cons and aren't all listed here, so you should look into these and discuss them with your supervisor before you decide. Some common storage methods are external hard drives, cloud storage and servers. External hard drives fail more often than you might think so avoid relying on just one of these! Cloud storage is accessible from anywhere with fast enough internet, but may not be secure enough for any sensitive data – check with your department or university on their rules for using cloud storage. If you have access to a server, check if your university or department automatically backs it up. If it doesn't, remember to back up your work yourself!
- What documentation and metadata will accompany the data?
    - What information do you need for the data to be interpreted in the future, both by yourself and others?
    - How will you capture/create this documentation and metadata? (see **2: Documenting your specimens and samples**).
- Do some or all of these data have long-term importance? If so, where will they be stored to ensure that they will be accessible for the public good? When will you deposit them? The sooner you start thinking about it, the easier it will be to put plans in place (see **3: Preserving your collection**)
- Should these data have restrictions on access? After data is deposited, you might be able to ask for an embargo for a limited period, while you publish your research.

If you are starting a new research project, then it is good to make a data management plan, whether or not the research is funded by an external funding body. The earlier you start to think about it, the easier it will be to ensure the long-term usefulness and preservation of your specimens and data.

1.2. Finding out more

Many universities have their own guidance on managing research data and can offer advice, which can easily be found on-line. The DCC (Digital Curation Centre) has created a comprehensive checklist for a data management plan: http://www.dcc.ac.uk/resources/data-management-plans/checklist.
You can also find out more about data management policy and planning for the Research Councils on the UK Research and Innovation website: https://www.ukri.org/funding/information-for-award-holders/data-policy/common-principles-on-data-policy/.

Good version control will serve you well as a scientist but is also a good transferrable skill, for use in all jobs that generate electronic documents of some kind. It's the means by which different versions and drafts of documents are managed so that you know you are always working on the most up-to-date version. If you keep multiple versions, you also won't accidentally delete something important – you can always go back to the previous version. Your university might have its own suggested system, but if not, there is a good explanation on the University of Leicester website: https://www2.le.ac.uk/services/research-data/organise-data/version-control



2. Documenting your specimens and samples

When you are making your collection of fossils, rocks and/or minerals, making thin sections, acetate peels, SEM stubs, cavity slide preparations and analytical powders etc. it is important that you document them well. You will need to:

- Make sure you have the correct data associated with each specimen, sample or preparation so and that you can easily find the data and use it when you need it.
- Make sure that the data is recorded in such a way that it will still make sense to you or anyone else who wants to use it again in the future.

At the most basic level your documentation system needs to:

- Record all the data associated with a specimen in a useable format, in your field notebook(s) but ideally also in an easily searchable spreadsheet or database.
- Ensure that the data in your field notebook, spreadsheet or database can **always** be associated with the correct specimen.

Common pitfalls

⇒ **Relying on memory**. When you have collected one fossil/mineral/rock sample, you can probably remember everything about it. You might even remember it all in a year's time. But as you collect more and more, you will forget, and as data is lost, the collection will begin to lose its usefulness for scientific research. This can be avoided by documenting everything as you go along.

⇒ **Using your own personalised codes, abbreviations or acronyms.** Using your own personalised codes to record data like location and stratigraphy is not advisable. The codes will probably not make sense to anyone except you (and you might also forget what they mean!). Writing down all the information about a specimen clearly and in full is the best way to preserve the information so that it will always make sense.

The following system is one that museum curators have been using for decades, and is a tried and tested method for ensuring no (or minimal) data loss through time and use:

A. Create a numbering system that gives each specimen a unique number. Clearly mark the specimen with its unique number. Some really helpful guides on how to do this and the best materials to use can be found here (general): https://collectionstrust.org.uk/resource/labelling-and-marking-museum-objects-booklet/ and here (palaeontological): http://vertpaleo.org/For-Members/Preparators-Resources/Preparators-Resources-PDF-files/Davidson_et_al_2006.aspx. You will need to make the mark so that it is not likely to come off, but also reversible, so it can be removed if necessary in the future. It should also be discreet, but visible and safe for the specimen.

B. Cross-reference this number to an entry in a spreadsheet or database that records all the information you have about that particular specimen. This will usually include, but is not limited to:

- A brief description or identification of the specimen as far as possible, and name of the person who identified it.
- The geological horizon, giving complete stratigraphic details as accurately and completely as possible.
- Geographical locality as precisely as possible, ideally with Grid references or GPS coordinates. If the material's provenance is not known exactly, this should be stated.
- Name of collector and date of collection.
- Details of any publication and if it is a type, figured or cited specimen.

C. Finally, as an extra step to protect against electronic data loss, put a hard copy of your data in the same container as the specimen (i.e. a printed specimen label) that includes the unique specimen number and all the data, written out in full.

It is crucial that specimens and samples are well documented if they are to have lasting value to the scientific community.

The documentation can be as important as the material itself.

Almost all museums now use electronic databases to manage their collections. If your data is in a suitable electronic format, it might be possible for a curator to import it directly into their database, streamlining the process. Although you might want to develop your own numbering system, which is directly related to your research or collecting procedure, some museums might be able to provide you with a spreadsheet or database with fields for the information that they need, which you could then add to or adapt for your own work. The earlier you think about how to structure your data, the easier it will be.

2.2 Publishing specimens

If you want to cite and figure specimens, or designate new type specimens, most academic journals will demand that your specimens are deposited in a publically accessible, permanent repository (i.e. a museum or similar institution), and you will need to cite their specimen numbers in the publication **(See 3: Preserving your collection)**. This is so that researchers can access the specimens in the future and have the opportunity to confirm or refute your findings themselves.

Some geology journals are now beginning to ask for International Geo Sample Numbers (IGSN). This is a relatively new numbering system that is being applied to all samples collected in the natural environment, including ocean, earth and polar sciences, (e.g. rocks, cores, soils, water, gas) and related sampling features (sections, wells and drill holes etc). It allows you to track the analytical history of a sample and link data collected at different times by different researchers. The British Geological Survey is now a member of IGSN and is on the way to becoming the UK issuing agent for these numbers.

2.3. Finding out more

Documenting your specimens in spreadsheets or databases is easier if you use the right tools. Your university might offer training in the use of specific software packages and relational databases.

Some types of geological material have different conventions for collection, documentation and storage due to their size, number of parts, preparation, preservation type, etc. It is beyond the scope of this booklet to describe all of these in detail. Instead, please see the Guidelines for the Curation of Geological Materials (Brunton, 1985), which can be downloaded from the GCG website (www.geocurator.org). This is still a useful resource, although dated by the myriad of technological and social changes during the recent decades. GCG is actively developing and making available new guidelines and resource materials. You are encouraged to visit the website regularly for these additions and new resource links.

Your project supervisor will probably be familiar with the conventions for your particular collection, and should be able to advise you. However, if you or your supervisor are in any doubt, please don't hesitate to contact the GCG committee, or a museum curator for further advice.

3. Preserving your collection

As with all aspects of data management, the key principle to ensuring the long-term care of your research collection in a museum or public institution is forward planning. The earlier you contact a curator or collections manager regarding the future of your collection, the better. It is vital that you do not leave this until the last minute, when you are focusing on writing up your project, applying for jobs, or moving house!

If you had collected all this material for your thesis, planning a secure home well in advance is essential.

The collection in these boxes took a curator 6 months to incorporate it into their museum's collection. It now occupies 156 drawers in 7 cabinets; a considerable investment of museum resources.

If your university has a museum that collects geological material, a good starting point would be to discuss your project and collections with the curator there. If not, then what museum should you approach? Firstly, ask your supervisor, as they may already have contacts at a museum. If not, you could contact GCG, or do a bit of research yourself.

GCG will provide advice and is especially well equipped to recommend and help establish contact with appropriate local museums (GCG officers are listed on the GCG website, www.geocurator.org). Like any other type of institution, museums are not all the same, with slightly different curatorial systems and collecting policies. Some museums are still growing and acquiring collections, but some might not have enough space and may have to decline an offer of a large collection. See Appendix for a list of museums with larger geological collections.

It is important to choose an accredited museum as a home for your collection, particularly if it includes type or figured specimens (below). Accreditation means that a museum meets a nationally-agreed standard in how it is run, how it manages its collection and it engages with its users (for more information see here: https://www.artscouncil.org.uk/accreditation-scheme/about-accreditation).

The following points are useful things to consider, although don't worry if you don't know all the answers at the beginning:

- Will the collection contain type specimens? If so, the museum must be capable of ensuring that the specimens are permanently accessible to researchers.
- What will be the geographical extent of the collection? Some museums have collecting policies that might restrict what they can acquire to specific areas at the local, national or international level.
- Will the collection be biased geographically, stratigraphically, palaeoecologically, or taxonomically? Some institutions may be better suited than others because of their own research programmes or storage methods.
- Will the collection involve a fossil or mineral group in which a particular institution specialises?
- Will there be many or a few specimens? Will the individual specimens be small or large? Some museums may have difficulty in dealing with very large collections or specimens, due to lack of resources and/or storage space.

3.3. Important paperwork

There are now many laws regarding the collection, export and import of some types of fossils, rocks and minerals. When offered a new collection, museums in the UK will carry out due diligence to ensure that any material has been acquired legally and check who owns the collection and therefore who has the right to sign ownership over to the museum. This involves some paperwork, and the curator will ask if you have any of the following documentation, if applicable to your collection (ask if you are not sure):

- Collecting permit or written permission from the landowner
- Import or export licence or other customs documentation
- Receipts/invoices if any specimens were purchased

It is important that you keep copies of these if you obtained them yourself, or find out where to get copies from your supervisor if they have them. Again, the earlier you know what you will need the better, so plan ahead.

In most circumstances, the curator will arrange for you to sign a transfer of title form to confirm that ownership of the collection has passed from you to the museum. If your institution or other party (e.g. a quarry owner) still owns the collection, the curator will organise the transfer of title to be signed by the appropriate person, with your help.

You should also provide the museum with an electronic copy (or hard copy if unavailable) of any journal articles that you publish that cite or figure your specimens. This may include a copy of a Masters or PhD thesis.

SUMMARY

University departments usually do not have the storage capacity or resources to look after student research collections and they often get neglected or discarded after the research project has ended or the student has left.

This can lead to the loss of valuable collections that could have been deposited in a museum or other public institution for future use in research, science education and/or public engagement. This can be avoided with good forward planning.

The earlier you start thinking about how to manage your data, how to document your specimens, where your specimens will end up, and what paperwork you will need, the easier it will be for you and the museum, and the better the outcome will be.

Whilst the beginning of the project is the ideal time to think about this, we realise projects change and the unexpected sometimes happens. The GCG committee is always happy to provide advice. A list of officers and their contact details can be found on the website: www.geocurator.org

ACKNOWLEDGEMENTS

Much of the text here is adapted from a 1983 version of this guidance written by Steven Tunnicliff, then Curator of the British Geological Survey fossil collections, and published by NERC. We thank both for permission to reuse the title and adapt the original for today's needs.

Image credits:

Front cover (top to bottom): *Quenstedtoceras flexicostatum*, Callovian, Weymouth; courtesy of Cindy Howells, National Museum Cardiff. Agate; courtesy of Bill Crighton, National Museums Scotland. Calcite; courtesy of Bill Crighton, National Museums Scotland.

Page 2: *Didymograptus* from the Middle Ordovician of Abereiddi bay, Pembrokeshire, UK. Courtesy of Cindy Howells, National Museum Cardiff.

Page 4: Fossil wood, Triassic, Arizona, USA. Courtesy of Cindy Howells, National Museum Cardiff.

Page 6: Olivine basalt under crossed polarised light. Courtesy of Robert Knight, Oxford University Museum of Natural History.

Page 7: Petrographic thin section. Courtesy of Robert Knight, Oxford University Museum of Natural History.

Page 9 (top): Sign, Lyme Regis Museum.

Page 9 (bottom): A large PhD research collection. Courtesy of Matthew Parkes, Natural History Museum, Dublin.

Appendix: Wulfenite. Courtesy of Oxford University Museum of Natural History.

APPENDIX

Museums and public institutions with geological collections

An interactive map of museums and other institutions with geological collections can be found on the GCG website: https://geocurator.org/collections.

Some of the larger collections are listed here, in alphabetical order. Please note that this is not a comprehensive list, nor does it mean that the institutions listed would all be suitable for, or able to accept, your particular collection.

British Geological Survey, Keyworth

Bristol Museum and Art Gallery

Dinosaur Isle

The Etches Collection

Geological Museum, Trinity College Dublin

The Hunterian Museum, University of Glasgow

The Lapworth Museum of Geology, University of Birmingham

Manchester Museum, University of Manchester

National Museum Cardiff

National Museum of Scotland

Natural History Museum, Dublin

Natural History Museum, London

New Walk Museum and Art Gallery, Leicester

Oxford University Museum of Natural History

Rotunda Museum, Scarborough

Sedgwick Museum of Earth Sciences

Ulster Museum

World Museum, Liverpool

Yorkshire Museum