

Mineralogical Collections Extension

A Task Group of the **Earth Sciences and Paleobiology** (ESP) Interest Group

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Overview and Motivation

As an organization with origins in taxonomic classification, TDWG membership has long been dominated by biological research, informatics, and collections professionals. The result is a natural tendency toward areas of growth associated with knowledge domains that overlap with biology (e.g., ichthyology, herpetology, paleontology) and a community deficient in specific subject areas such as mineralogy. Identifying these knowledge gaps and taking direct action to address them is critical to the continued growth of the TDWG community.

To explore specific areas of interest identified by the community, such as subject matter expansion, TDWG created community-led interest groups such as the Earth Sciences and Paleobiology (ESP) interest group. The core function of this group is to facilitate the use of Darwin Core across an array of earth sciences, including geology, chronostratigraphy, mineralogy, paleontology, paleobiology, zooarchaeology, and paleoanthropology.

Following the membership trends of the wider TDWG community, the majority of ESP interest group participants are members of the paleontological community. The result is a set of priorities and subsequent discussions that naturally lean toward topics related to paleontology and paleontological collections. If the ESP interest group is to continue progress toward achieving its comprehensive goal of extending support to all earth sciences, specifically those with minimal biological overlap such as mineralogy and petrology, these deficits in community expertise must be identified and addressed through task groups, targeted and concerted efforts within the scope of a parent interest group.

Motivation

The formation of the Mineralogical Collections Extension task group is motivated by the need to extend support of the Darwin Core Archive and TDWG community to Mineralogy, an earth sciences field conceptually foreign to biological and paleontological collections. The system and techniques used to classify mineralogical specimens are prime examples of this semantic disconnect. Specimens in biological and paleontological collections share a hierarchical classification system with a classic Linnaean origin. The result is a common hierarchical data structure for grouping specimens. In contrast, the classification of specimens in mineralogical collections is based on one of two partially hierarchical independent systems, the Dana^[1] and Nickel-Strunz^[2] classification systems. The traditional mechanisms and vocabularies have limited applicability to the field of mineralogy, which calls for special consideration in the form of a task group.

Given its narrower scope and shared knowledge domain, the Mineralogical Collection Extension effort will reside under the 'parent' ESP interest group. Furthermore, the task group will follow the practices established by the existing inventory of ESP task groups that include the Darwin Core Chronometric Age Extension (<https://www.tdwg.org/community/esp/chrono/>) and Extension for Geosciences (EFG) (<https://www.tdwg.org/community/esp/efg/>).

Phases

The task group will operate in two primary phases. The first involves recruiting new members in disciplines underrepresented in TDWG. The task group is the ideal mechanism to facilitate community expansion by providing collective purpose and structure. Once a recruitment effort is complete, the second phase begins. The newly formed collection of subject matter experts will develop a supplemental extension to the Darwin Core to support the needs of the mineralogical collections community.

Goals, Outputs, and Outcomes

The Mineralogy Collections Extension task group plans to adopt a similar set of goals, outputs, and outcomes with the two existing ESP task groups, the Darwin Core Chronometric Age Extension and Extension for Geosciences (EFG) ^[3]. These are:

1. Establish a formal set of terms and definitions for mineralogical collections at the specimen level following the Darwin Core model and the best practices of previous successful task groups within TDWG.
2. Develop a supplemental specification that extends the existing Darwin Core Archive to provide direct support for mineralogical collections.
3. Author a Quick Reference Guide for the Mineralogical Collections Extension that follows the current Darwin Core Quick Reference information model.
4. Provide a crosswalk between the Mineralogy Extension and the EFG standard (<https://www.tdwg.org/community/esp/efg/>) ^[3] that leverages the Simple Knowledge Organization System (SKOS) schema ^[4] to describe the conceptual similarities between the two standards (e.g., narrowMatch, exactMatch, closeMatch, etc.).

Community

Although not a primary goal, we hope that the effort to expand the participatory body in TDWG can be used as a successful model to assist community expansion in the future.

Strategy

1. Create a GitHub repository for the task group to assure adoption of best practices for the development of TDWG standards and successful submission of final deliverables to the TDWG leadership and community for review. The repository configuration and function will follow existing TDWG practices.
2. Assemble a team of professionals with expertise in mineralogy and experience in projects involving the standardization of collections data, especially those associated

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with earth sciences. This will allow the group to optimize outcomes through expert analysis and consensus across key subject areas.

3. Survey the current inventory of data standardization efforts/projects in the mineralogical and related collections communities.
4. Solicit the mineralogical collections community for current collections data management policies and practices. Heterogeneity is prioritized over homogeneity in community responses to maximize use case variability and negate the risk of gaps in procedures.
5. Finalize a vocabulary at the specimen-level (in contrast to the collection or institutional level) through community deliberation and consensus within the task group, the parent ESP Interest Group, and the wider TDWG community.
6. In adherence to guidelines in the TDWG Standards Documentation Standard (SDS), submit final deliverables (see *Deliverables* section below) for review in accordance with TDWG by-laws (<https://www.tdwg.org/about/process/>) for the ratification of standards.

** All results from surveys/assessments/solicitations listed above will be published to the task force GitHub Repository with any required supplemental/supporting documentation.*

Deliverables

The final deliverables of the task group include:

1. A formal set of terms and definitions for mineralogy collections within the Darwin Core architecture in multiple forms, including a standard TDWG documentation deliverable (TDWG SDS) and a quick reference guide
2. A supplemental extension schema to the existing Darwin Core Archive for mineralogical collections
3. A schema crosswalk between the Mineralogy Collections Extension and EFG standard using the SKOS schema to describe conceptual differences between individual terms.

Becoming Involved

This task group welcomes anyone interested in mineralogical, geological, or petrological collections and/or data standardization efforts. We encourage parties interested in participating to contribute to the task group GitHub repository. They may also contact the task group convener, Ben Norton, using the above contact information.

Future Extension

Minerals are naturally occurring, inorganic chemical compounds that form the building blocks of rocks. This compositional relationship between rocks and minerals can be extrapolated to formulate a strategy for tackling complex problems by breaking them into smaller, more manageable components. We view this task group as the first step toward a larger goal of tackling geology comprehensively. Furthermore, we fully anticipate the deliverables created in this task group to be used as a model for future efforts to tackle other areas within the earth sciences, such as petrology and meteoritics.

The full scope of our digitized scientific collections, including geology, ichthyology, herpetology, malacology, mineralogy, and paleontology is required to achieve a higher-level understanding of the interconnections and patterns that define our natural world. A critical component to reaching this long-term goal is establishing a common digital language. As the flagship organization for the standardization of collections data standards, we hope this task force furthers this global effort by extending the work of TDWG into currently unoccupied scientific collections spaces.

Summary

To extend the scope of the TDWG community beyond biology and biological-related knowledge domains, targeted efforts in the form of specialized task groups within the existing TDWG architecture are needed. Within the scope of the ESP interest group, the field of mineralogy is an outlier relative to its paleontological counterpart in terms of overlap with biology. As a result, mineralogical collections lack support from the TDWG community and the Darwin Core archive. By expanding TDWG membership to the

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mineralogical collections community and developing a supplemental extension to the existing Darwin Core Archive for mineralogical collections, the Mineralogical Collections Extension task group will bring mineralogy under the TDWG "umbrella" thereby resolving an identified gap in support to the scientific collections community. This effort will strengthen the TDWG community with a new pool of knowledge and provide the foundation for future efforts by the ESP interest group to extend the Darwin Core standard across all geoscientific fields.

Resources

- [1] Gaines, R.V., Skinner, H.C.W., Foord, E.E., Mason, B., Rosenzweig, A. (1997) Dana's New Mineralogy: The System of Mineralogy of James Dwight Dana and Edward Salisbury Dana. 8th Edition. John Wiley & Sons, Inc.
- [2] Strunz, H. Nickel, E.H. (2001) Strunz mineralogical tables: Chemical structural mineral classification system. 9th Edition. Stuttgart: Schweizerbart.
- [3] Petersen, M., Glöckler, F., Kiessling, W., Döring, M., Fichtmüller, D., Laphakorn, L., Baltruschat, B. & Hoffmann, J. (2018). History and development of ABCDEFG: a data standard for geosciences. Fossil Record, 21(1), 47-53. <https://doi.org/10.5194/fr-21-47-2018>
- [4] SKOS Simple Knowledge Organization System Reference. <https://www.w3.org/TR/skos-reference/>. W3C Recommendation 18 August 2009.