Fourth Report from the IMA Mineral Informatics Working Group—July 2026

The IMA Mineral Informatics Working Group has been tasked with exploring needs and opportunities in the exciting direction of data science applied to mineralogy. We have identified three principal scientific tasks:

1) Create and expand robust open-access mineral data resources, including complete lists of IMA-approved mineral species and their attributes; comprehensive lists of mineral crystal structures and compositions for numerous samples; systematic tabulations of mineral physical and chemical properties; and information on mineral localities, the associated minerals, their modes of formation, age, geological context, and other attributes; similar lists for other planets and moons.
2) Development and application of powerful open-access data analytical and visualization methods related to fundamental problems in mineralogy, for example cluster analysis and community detection to identify distinct kinds or groups of minerals; network analysis, chord analysis, and other methods to explore and illustrate relationships among populations of minerals; and association analysis to predict the occurrences of as yet undiscovered mineral resources and new mineral species.
3) Development of machine learning and artificial intelligent algorithms, including mineralogical foundation models to identify large-scale, multi-dimensional patterns in mineralogical data.

Layered on these scientific ambitions are organizational tasks related to community building; the dissemination of informatics methods and other resources; fostering mineral informatics publications and conference sessions; and the engagement, training, and promotion of early-career scholars. The past year has continued to see a significant increase in the numbers of mineral informatics publications, not only in mineralogical (*e.g.*, *American Mineralogist*; *Mineralogical Magazine*) and data science (*e.g.*, *Geoscience Data Journal*) periodicals, but also in prominent general science journals, including *Nature*, *Science*, *PNAS*/*PNAS Nexus*, and *National Science Review*. Also of note is the increase in size and frequency of special mineral/geoscience materials informatics sessions at major conferences, most notably including the forthcoming International Geoscience Congress (Nanjing, China; August 2026).

Another important development has been the instigation of graduate programs that emphasize mineral informatics at Rutgers University (led by Prof. Shaunna Morrison), the University of Idaho (Prof. Xiaogang Ma), and Peking University (Prof. Li Yan).

At the same time as these advances, a major challenge to mineral informatics continues to be the development and sustenance of comprehensive, open-access data resources. The community is especially grateful to the leaders of such efforts, including Jolyon Ralph (https://mindat.org), Robert Downs (https://rruff.net), and Kerstin Lehnert (https://Earthchem.org). Unfortunately, the latter two essential repositories have no secure source of long-term funding. Either data resource could quickly disappear if sufficient financial and leadership support is lost. It is an open question whether IMA or some other organization should take on such challenges, but it is difficult to imagine mineral informatics thriving as a research domain without these indispensable platforms.

In the next two years it will be appropriate to change and expand the leadership of the IMA Working Group on Mineral Informatics, including one or two early-career scientists, who will become the next generation of leaders in this organizational effort. At some point, with forward-looking looking leaders installed, IMA may even choose to elevate this Working Group to the status of an IMA Commission.

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