

Mineral Classification – What's in a Name?¹

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You will do the first two parts of this project in one class. Then write up the results and return the next class prepared to share your answers with other groups and to apply what you have developed to new samples.

Part I. Your job is to develop a systematic way of classifying minerals that will differentiate and organize members of the "mineral kingdom." Use any properties you wish to develop a key (a series of questions) that can be used to separate and identify minerals and give them a name. Simple questions such as "Is the mineral black?" or "Does the mineral have a metallic luster?" should form the basis of your classification scheme. But, you can get creative and use any questions that seem logical and appropriate.

Your system must:

- be easily used in both the lab and in the field
- be consistent, so that other people obtain the same results as you do
- be expandable, so you can use it to classify new minerals that may be discovered

As the basis for this project, we have provided you with about 30 different minerals. Some mineral species are represented by more than 1 sample. These sample display many different properties and you should have no problems finding some that help you tell them apart. That does not mean, however, that all properties are of equal significance.

Each group will have to come to a consensus about which properties to use and in what order. Your final product should be a taxonomic tree with a written description of how to systematically use it to classify and name minerals. There is no correct answer but you should be able to justify your reasons for using the criteria the way you use them.

Part 2. After you come up with your initial classification system, read Robert Hazen's article "Mineralogy: A Historical Review." (Robert M. Hazen 1984 Journal of Geological Education v 32, p288-298). Then, answer the following questions:

1. How can you use the observations, interpretations, and arguments of the "formalists" vs. the "naturalists" to revise your classification scheme?
2. What problems were encountered by early scientists who believed that "form and only form should be used for classifying minerals"?
3. What problems were encountered by early scientists who developed classification systems based on "empirical" or natural properties of minerals?

¹This exercise is slightly modified from one presented at the Teaching Mineralogy Workshop in 1996: Mogk, D. (1997) Mineral Classification – What's in a Name? (*in* Brady, J.B., Mogk, D.W., and Perkins, D., eds., Teaching Mineralogy, The Mineralogical Society of America, p37-42)

4. What was the contribution of James Dwight Dana to the problem of mineral classification?
5. What physical properties used in your classification scheme are qualitative and which are quantitative? What are the benefits and limitations of each type of observation?
6. What can the physical properties of minerals tell you about fundamental principles in nature? (e.g., structure and composition of minerals, etc.)? Based on your observations, what other information would have helped you develop your classification system? How could you have obtained this information?
7. Historically, what technologies became available that brought new evidence to this controversy? What new evidence and technologies became available to address and understand the physical and chemical properties of minerals?
8. What technologies are currently relied upon and most useful to aid identification and characterization of the chemical and physical properties of minerals?

Part 3. After you have completed Part 1 and Part 2, trade your classification scheme with one from another group and classify the minerals using their scheme.

9. Contrast and compare your classification scheme with the other group's?
10. Do the two systems give the same answers?
11. Are they equally easy to use?

Part 4. We will give you a set of unknown minerals to classify. Use your classification scheme, and the one from the other group, and see if you get the "correct" answers. No cheating.

12. What problems and ambiguities did you encounter?
13. What improvements could you make to your scheme, and to the other group's scheme, so that they work better and more consistently?