



DEPARTMENT OF GEOSCIENCES

THE PENNSYLVANIA STATE UNIVERSITY
309 DEIKE BUILDING
UNIVERSITY PARK, PA 16802-2714
(814) 865-6821
PJHEANEY@PSU.EDU

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The Honorable Daryl Metcalfe
Chair, House State Government Committee
Pennsylvania House of Representatives
Room 43, East Wing
PO Box 202012
Harrisburg, PA 17120-2012

Dear Representative Metcalfe,

Thank you for the opportunity to testify on behalf of House Bill 1177, which proposes that Pennsylvania adopt celestine as the official State mineral of the Commonwealth. Let me tell you a little about my background to explain why I am here: After receiving a PhD in geosciences at the Johns Hopkins University in 1989, I served as a mineralogy professor first at Princeton University and – since 1998 – at the Pennsylvania State University in University Park. I am extremely proud to be a member of Penn State's Department of Geosciences, which is consistently ranked among the top ten geology departments nationally. In 2008 I also served as President of the Mineralogical Society of America, which is the largest international society of professional mineralogists. I have a serious interest in minerals and mineralogical research, but the object of my career is to train the next generation of Pennsylvania's Earth scientists. Therefore, it should be no surprise that I strongly support this bill.

My involvement in this effort began last January, when an impressive young man named Royce Black emailed me – and every other geologist in Pennsylvania, I think – to ask for assistance in his campaign to make celestine the State mineral. With Royce's encouragement I decided to join the crusade. I am aware that the representatives and senators of our State have heavy responsibilities, and that the establishment of a State mineral might seem less urgent than other concerns. I also believe, however, that symbols matter. The Founding Fathers agreed. Immediately after the Second Continental Congress met in Philadelphia to ratify the Declaration of Independence, the Congress charged Benjamin Franklin, Thomas Jefferson, and John Adams to create an official seal for the new nation. As is well known, Jefferson proposed the dove as a sign of peace, and Franklin favored the American turkey as a native species that sustained the early settlers. The significance of a national symbol was important enough that these three negotiators – famed for their skills at compromise – never did agree. It was not until 1782 that Adams's selection of the bald eagle succeeded in becoming the official emblem of the United States.

Symbols tell the world who we are. What does the selection of celestine as State mineral tell the world about the Commonwealth of Pennsylvania?

Of the approximately 4500 minerals recognized by the International Mineralogical Association, about 300 have been observed to occur in Pennsylvania localities. Of these 300, only 8 share a special distinction – they were the first discoveries worldwide of a new mineral species. These Pennsylvania archetypes are celestine, sauconite, lansfordite, nesquehonite, downeyite, matulaite, laphamite, and eastonite.

Celestine was the first of the eight Pennsylvania archetype minerals to be discovered, and like Central Pennsylvania itself, its history has Germanic roots. The naturalist who first described celestine, Andreas Gotthelf Schütz, was born in 1771 and died in Freiberg, Germany in 1807. Trained at the famed Mining Academy in Freiberg, Schütz traveled to the United States in the late 1780s and explored the Pennsylvania wilds, collecting rocks and fossils for scientific study. In 1791 he published a 16-page monograph in which he reported finding “a [f]ibrous barite from Baley [now Brush?] Mountain, Frankstown, Huntingdon County, one hundred and seventy-six English miles from Lancaster, [which] is of sky-blue color, undulating finely fibrous fracture, and breaks into thin layers up to one-inch thick.” Today we recognize this site as Bellwood, Pennsylvania.

At this early date, not even the best “natural philosophers” in the young United States offered the expertise to characterize the chemistry of new minerals. As a result, Schütz asked two of the most renowned European scientists of the eighteenth century to analyze the new mineral. Martin Klaproth is regarded as the greatest chemist in Germany of his time, and among his 200 publications he is credited with the discovery of several elements, including titanium, uranium, and zirconium. Klaproth published the first chemical analysis of Pennsylvanian celestine in 1797, and he demonstrated that it was a sulfate mineral containing strontium. Today we express the chemical composition of celestine as SrSO_4 . Abraham Gottlob Werner was the leading professor at the Freiberg Mining Academy, and he is cited today in every introductory geology text for his influential ideas regarding mineral classification and the formation of the Earth. It was Werner who provided celestine with its name and with a formal physical description in 1798.

Thus, celestine boasts a paternity of mineralogical royalty. More significant, it was an actor in a major scientific drama that now is largely lost to history. The scientific revolution in chemistry was taking shape at exactly the time of celestine’s discovery. In the 1790s, a budding natural philosopher could establish an international reputation through the discovery of a new element; such breakthroughs were accorded the public and professional acclaim that today greets advances in fundamental particle research. Unknown minerals were targeted as the most likely repositories of new elements, and naturalists like Schütz traveled to exotic localities across the world in hopes of finding them. Déodat de Dolomieu had in fact reported celestine occurrences in Sicily in 1781, but he misinterpreted the mineral as barium sulfate – today’s barite. Klaproth inferred that Schütz’s material was insufficiently dense to be *barium* sulfate. Fortunately, strontium was discovered as a new element in the early 1790s (from a carbonate in

Strontian, Scotland). It took a only a few years for Klaproth to put it all together and identify celestine as the *strontium*-rich analogue of barite. In this way, the Pennsylvania specimen was the first of its kind to be scientifically recognized.

Beyond historical and scientific arguments, a second rationale for making celestine our State Mineral is its beauty. Named from the Latin *caelestis*, meaning “heavenly,” celestine crystals are colorless to a delicate blue, with the best examples reminiscent of the sky. Moreover, unlike the seven other archetype minerals from Pennsylvania, celestine grows as large, clear crystals that can be faceted into gems. With a refractive index similar to that of topaz, these gems are optically lively. Because the hardness of celestine is relatively low, however, celestine gems are best suited for pendants rather than rings.

Finally, I would argue that no other mineral is more representative of Pennsylvania than celestine. Pennsylvania is deservedly famous for its coal, oil, and natural gas, but these economic resources are not classified as minerals. Celestine is a major ore for strontium, whose compounds are responsible for the bright red flames in fireworks and road flares. Strontium salts also were employed for refining beet sugar, and during the long period when cathode-ray tubes dominated television technology, strontium was added to the glass to absorb X-rays for the protection of the viewer.

State objects fundamentally are symbols of celebration – of a region’s heritage, its natural resources, and its economic foundations. They also provide a powerful means for educating students about the contributions that a state has made to science and industry. Just as Royce Black’s tireless enthusiasm has inspired me to reconsider the role that Pennsylvania’s mineralogy has played in our nation’s history, so will the establishment of celestine as State mineral motivate countless students to investigate Pennsylvania’s rich geological contributions.

Thank you for your consideration of this proposal.

Peter J. Heaney
Professor of Geosciences
Pennsylvania State University