

Gypsum In Caves

S304

By Kenrick L. Day

1. The following collection of slides is by no means a comprehensive catalogue of all gypsum occurrences in caves. It also cannot take the place of a textbook in mineralogy, or Cave Minerals of the World by Hill and Forti. However, most of the morphologies of cave gypsum, both common and rare, are shown in this series of slides compiled over a fourteen-year time period by Kenrick L. Day.
2. "Gypsum In Caves"
3. "From the collection of K.L. Day"
4. The primary thrust of this slide series is secondary gypsum deposition in caves. However, it must be noted that some caves are actually formed in gypsum, that is, in gypsum bedrock. This photo was taken in Border Cave, Texas, a true gypsum cave. The cave is primarily a heavily scalloped borehole draining a half-mile wide sinkhole. Like most caves formed in gypsum, this cave contains few formations.
5. Secondary cave gypsum is frequently observed in crusts on limestone. In the cave shown here, the crust occurs as a fine white powder on the walls. This material originated in seeping water.
6. The gypsum crusts are much more prominent in this cave, totally obscuring the limestone bedrock for much of the passage. The gypsum crystal axis are oriented perpendicular to the crust.
7. Here is an excellent example of gypsum exfoliation in an Arkansas cave. The gypsum crust is expanding into the passage as new material is added to the base of the crystals from seeping water. This has sufficient force to shatter an older, overlying crust. This phenomenon is very commonly observed.
8. Here is a very interesting example from a Utah cave. In the center of the picture is a large, six-sided nail head calcite crystal. This was formed when the chamber was filled with water. Now, under drier conditions, fibrous gypsum may be seen growing outward from the face of the crystal. The calcite crystal at this point is completely hidden by gypsum and only its shape betrays its presence.
9. A rarer form of gypsum speleothem resembling a crust is called a "rim". Such rims form where warm, moist air emerges from a small hole into a room filled with cooler, drier air. Water condenses around the lip of the hole, and evaporation causes sulfate

material to precipitate. Such rims are usually only a couple of millimeters thick and are extremely delicate.

10. Here are gypsum crusts gone wild, in Lechuguilla Cave, New Mexico. The crusts resemble great snowbanks and are feet thick in places. The powder on top is called “gypsum snow” and originated on the walls and ceiling the room.
11. In another shot from Lechuguilla, large gypsum crystals in the background have been completely covered with crusts and snow in a later phase of development.
12. In the previous examples, the crystals in the gypsum crusts were aligned perpendicular to the cave wall. Under different circumstances, gypsum crusts may form with the crystals parallel to the underlying wall. This example is from Fort Stanton, New Mexico.
13. More parallel-to-the-wall gypsum crusts from Fort Stanton include some gypsum “starbursts”. These occur when water seeps from a single hole rather than a number of evenly spaced pores. The “starbursts” are sprays of gypsum crystals radiating outward from their source. These structures are not terribly obvious in this slide but may be glimpsed along the left margin.
14. Gypsum-bearing solutions have trickled along the outsides of these previously formed stalactites and have deposited clear gypsum near the tips.
15. This close-up shows a calcite soda straw which has been subsequently overcoated by a sulfate material, either gypsum or epsomite. Such dramatic examples are quite rare in caves, even in caves which show many other gypsum features.
16. Leaving crusts for the time being, let us examine another morphology known as “cave cotton”.
17. Cotton is also known as “cave wool” or “beard”. These terms are used more or less synonymously. All contain short gypsum fibers matted together.
18. All cave cotton grows into the air as new material is added from the base. Cotton is one of the fastest-growing speleothems and may grow millimeters per year.
19. This slide shows an unusually large mass of cotton or wool, woven into a virtual blanket.
20. A caver eyes the gypsum blanket but decides it would make poor material for a sleeping bag!
21. A closely related phenomenon is called “angel hair”. This is one of the finest displays in the United States.
22. Angel hair forms exactly the same way as gypsum cotton except that the fibers are far more elongated and better separated. Individual hairs may be feet long. Once again, formed from seeping water penetrating minute pores in fill or rock.

23. A still rarer form of fibrous gypsum is called “rope”. This slide depicts what is probably the finest example in the U.S. In a cave rope, parallel strands of gypsum fibers are arranged to closely resemble a cord. This rope has apparently deposited over twenty turns on the underlying ledge!
24. One of the best-known forms of cave gypsum is the “gypsum needle”. They may occur singly, or more commonly in piles like jackstraws, as shown here.
25. This picture shows needles combined with tufts of cave cotton, already discussed. Needles and cotton have a similar origin. One would suppose that the seeps and pores responsible for the needles are larger than those of the cotton.
26. Here are four different forms of cave gypsum morphology within a very small area in a cave in Arkansas. A gypsum crust coats the background wall, sprinkled with a few tiny gypsum flowers, to be discussed later in this program. In the foreground are needles and cotton. All of these speleothems were formed by seepage, with slightly differing conditions producing markedly different forms of the same mineral. Gypsum is truly a fascinating cave mineral!
27. Cave needles may grow up out the floor at any angle. When they grow long enough, they commonly topple over from their own weight. A new needle will begin growing in the same hole. As this process continues indefinitely, the cave floor may almost disappear from view. Needles may be very slender, approaching angel hair, or –
28. They may be relatively short and stubby, almost pencil-like in appearance. It is obvious from this picture that they may also be stained by impurities, though they are most often white to transparent.
29. Closely related to gypsum needles, but strikingly different, is “gypsum grass”. It has been observed in only one cave in the world to date.
30. Gypsum grass occurs as swirls of intertwining selenite needles. The average grass blade length is about fifteen inches though some approach two feet in length. Each tuft of “grass” has about thirty to forty needle swirls. The gypsum-bearing water percolated through the cave soil.
31. In addition to the various needle and hair forms, sub-aerial gypsum may grow in what is called *tabular form*. Tabular gypsum crystals are much blunter than needles but are still due to seepage.
32. Tabular gypsum may grow in crystal bushes. This bush is inverted and is growing on the ceiling in Fitton’s Cave, Arkansas. Its overall length is about nine inches. Note the brown staining, while the background gypsum crust is largely white.
33. It is believed that larger tabs grow under conditions of high humidity. Repeated twinning of the crystals in this tabular bush led to the curved appearance.

34. In contrast to the previous slides, all of which show gypsum forming in air, we will now examine some subaqueous growths of gypsum, which in general are much less commonly observed by cavers. This slide shows some curved, prismatic crystals of gypsum with a flashlight bulb for scale. This slide was taken in a cave in a mine in Mexico. When these crystals formed the chamber was beneath the water table.
35. Note the remarkable resemblance of these subaqueous gypsum crystals to Roman gladiator's swords. They are, in fact, exact miniature replicas of the gigantic swords growing in the same room. These tiny swords are only a few millimeters long.
36. One of the most awe-inspiring sights in the underworld, a chamber filled with huge, transparent *gypsum swords*. While superficially resembling giant gypsum needles, it must be remembered that these swords grew while totally submerged in a supersaturated solution of gypsum, not in the air like the needles.
37. Gypsum crystals may be easily bent without breaking in a direction perpendicular to the long axis. These two great swords grew until they ran into the cave wall, then began to bend as they attempted to grow farther. About two feet of the longer sword is shown.
38. One last look at what is probably the world's finest display of gypsum swords in a cave. The photographer has heard that since these photos were taken, all the swords were quarried out and sold to collectors and museums. This rumor is so depressing he has not cared to investigate it further.
39. *Gypsum flowers* are among the most admired of cave formations. Flowers are composed of branching and curving bundles of gypsum crystals loosely packed together in a polycrystalline matrix. These flowers are at the small end of the scale, all under an inch long.
40. Here is a "mushroom" type flower, about four inches long. The first solutions issuing from the cave wall deposited uniformly over the cave all as a crust. Later, more localized growth associated with a pore began the growth of a flower. This had sufficient force to break through the earlier crust and carry along a fragment of it with it. One cannot help but be reminded of spring flowers pushing up dirt ahead of them as they sprout.
41. Generally, growth on one side of the flower will be stronger than the other, and graceful curves result. Much less commonly, growth will be nearly uniform and long, straight "petals" may result. The three in the center of this picture are almost a foot long.
42. While gypsum flowers seem to grow most often from walls and ceilings of caves, they can appear anywhere and seem to pay little attention to gravity. These are growing on a ledge in Fitton's Cave, Arkansas.

43. Here is a classic, curved gypsum flower suggesting a butterfly tongue. This is in a cave in the Grand Canyon of Arizona.
44. Note that while gypsum flowers are usually, white, they may be heavily iron-stained.
45. While some gypsum flowers may be rough and shaggy in appearance, others astound you with their delicacy. The petals of these gypsum flowers are not much thicker than kite string and are the thinnest the photographer has observed.
46. Here is an exceptionally long gypsum flower, over fifteen inches long. Note the mushroom cap still on the tip, a remnant from when it first thrust through the overlying crust. How long ago do you suppose that was? The photographer has seen no data documenting growth rates for such flowers.
47. This caver observed the flower intently for as long as her cramped neck muscles would allow but could detect no growth. Evidently more patience is required than most cavers possess!
48. The largest of these waxy-looking, yellowish flowers is over a foot long and dangles from a cave wall which is inclined at about forty-five degrees. Such thick flowers are sometimes called "ram's horns".
49. Here is Nelson Day observing some outstanding ram's horns in Fitton's Cave, Arkansas.
50. While other caves contain more massive flowers, some of the most beautiful in the United States were discovered in January of 1988 in Lechuguilla Cave, New Mexico. These wonders dangle about eight inches long.
51. And God said, "Let beauty appear amidst the darkness...," and His words were recorded in crystal.
52. We will now visit the weird world of gypsum stalactites and stalagmites. Gypsum stalactites will barely resemble the more familiar calcite ones. They consist of coarse, porous, unoriented grains. They generally look like coated tree roots.
53. This great room in Torgac Cave, New Mexico, is one of the classic localities. Sulfate solutions dripping off the ceiling and gypsum stalactites have formed numerous gypsum stalagmites as well.
54. Gypsum stalactites do not usually maintain a central canal but grow primarily by water flowing down their sides. "Claw" shapes form when end crystals grow large and new growth deviates from the vertical.
55. Here is a famous pair of gypsum claws called, appropriately enough, "The Chicken Feet." The feet are quite large, about three feet long. They hang high overhead, so it is not possible to include scale.

56. Here is a remarkably sharp claw stalactite ensemble. The breakdown blocks in the background are covered with gypsum which appears heavily resolutioned. Apparently, non-saturated ground water invaded this chamber for a time and dissolved away some of the previously deposited gypsum.
57. The final form of gypsum to be shown in this series is the so-called "chandelier." These were discovered in January of 1988 in Lechuguilla Cave, New Mexico. The chandeliers are magnificent clusters of gypsum stalactites, and some stalagmites as well. The tips of each chandelier are characteristically covered with crystal-clear selenite prisms.
58. Here is the largest chandelier growing upward from the floor. Despite their great size, the chandeliers must have grown by seepage through the floor and ceiling of the chamber.
59. The magnitude of the display can best be appreciated by this shot taken farther back. The tops of the chandeliers are covered with the purest white gypsum snow. As mentioned before, the tips are often clear selenite prisms, heavily twinned and striated. This same chamber also contains needles, flowers and angel hair, all at a depth of 800'.
60. The pronounced curves of these claw-like chandeliers may well be due to the crystals following a prevailing air flow. There is however, at present, no detectable air flow in this room, several miles from the entrance.
61. THE END. I hope that you enjoyed your armchair tour through some of the great gypsum caves of North America and that your own interest and awareness of cave gypsum will increase as a result. This slide series was produced and copyrighted in March of 1989 by Kenrick L. Day, the photographer. No slides may be reproduced in any form without written permission from the photographer. Thank you and good evening.
62. (Credit Slide)