



**Wickenburg Gem & Mineral Society, Inc.**

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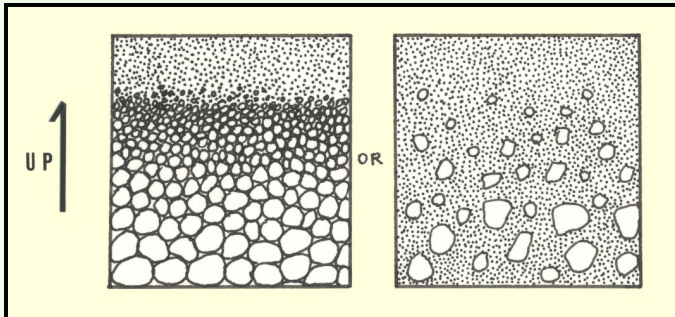
*The purpose of this organization shall be to educate and to provide fellowship for people interested in rocks and minerals; to foster love and appreciation of minerals, rocks, gems, and the Earth.*

*Membership shall be open to all interested people.*

## Sedimentary Structures: Graded Bedding

*By Susan Celestian*

In the normal bedding in coarse clastic sedimentary rocks, such as sandstone, conglomerate, and breccia, the fragments are either pretty uniform in size or are randomly arranged within the beds. In graded bedding, the clasts are very specifically arranged. Almost always, the particles are coarsest on the bottom and grades up through finer and finer particles. See Figures 1-2. There is a variation, called reverse graded bedding, in which the particles are coarsest at the top, and finer at the bottom.



**FIGURE 1 Graded Bedding** In graded bedding, the usual situation is that the coarsest particles are at the bottom of the layer, and they become finer as one moves toward the top. As a result, graded bedding can be used to determine the original UP direction. *Illustration by Susan Celestian*



**FIGURE 2 Graded Bedding** This is a cobble the author found in some glacial till, is part of a rock unit that involved sedimentary layers that had graded bedding. *Photo by Stan Celestian*

As illustrated in Figures 1 and 2, graded bedding can be used to determine the original UP direction. Figure 3 is a drawing based on a real-life situation in Tennessee. Here, a sequence of graded beds has been tilted and overturned. That structural history is indicated by the orientation of the graded bedding.

*Graded Bedding continued on page 3.....*

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### Meeting Minutes — April 13, 2018

The meeting was called to order by Craig Jones at 7:00. The pledge of allegiance was recited. Alyson forgot copy of last months minutes, so please refer to last months newsletter. Debbie read the Treasurer's Report (Accepted by Irma-seconded by Jim). Bill and Jeff were a new member and guest.

Jim talked about the recent trips. The blacklight trip and dinner was a success, as usual. About 51 people attended. Craig entertained us with a very acrobatic fall from his truck. Burro Creek was wonderful, as well. A lot of agate. There were 9 rigs, with about 20 or so people (one flat tire). Dessert was provided by Jill.

Craig would like to go back to Bullard Mine for the slag glass

Bev says lots of people are signing up for the show. Not everyone has paid yet. .

Steve says 6-12 people have applied so far for the scholarship. The board members will decide by internet, as there is no meeting. There was a question about continued help for past recipients. This would happen only if there are no new entrants. May 1 is the deadline for entrants. Checks are made out to the school, not the recipients. They can attend any school.

Jim suggested Slot Canyon as next weeks trip. Its about a mile hike there and back. It was voted to go Tuesday, leaving at 8:00AM from Vista Royale. ATV's can meet at Signal Road, at 9:00.

Craig requested ideas for next year. Suggestions include trips for opal, desert rose, fire agate and turquoise-lessons on use of Stanton equipment, and gold claim, with a burgers at the Quonset hut-another scavenger hunt-back to Al and Irma's-trips to Anderson Mine, Camp Verde, Burro Creek, Skull Valley, Bagdad Mine, Black Pearl Mine, Cave Creek, Robeson Mine Hike, Peridot Mine, Nicole Marie Mine, and Joyce's place.

At present there are about 130 paying members of our club here and in Stanton.

Suggestions for the show included-No more gold nugget and a better sound system. Members have asked to set up tables as vendors. This is not a good idea, because it conflicts with paid vendors and we need people to run the show. It is also suggested we do more advertising. Possibly buying time on Facebook to target more and younger people. Also, getting into Park Newsletters. We are in the Federation Directory . We might try TV and radio stations local interest shows. Also, possibly put Tent cards at local restaurants. The banner has caused problems in the past because of conflicts with the city putting up Xmas decorations. Beth needs help with advertising, and getting info to motels and trailer parks. The PTA will do the food again. Another suggestion is to buy 40-50 hats or tee shirts with our logo to be used at the Silent Auction. Members could also wear these items, or vests.

Show and Tell-David, Alyson, Alice, Steve. Bill, Al, Dale, and Craig. The winner of the drawing was Craig.

Door prizes were won by Nadine, Rick, and Chris.

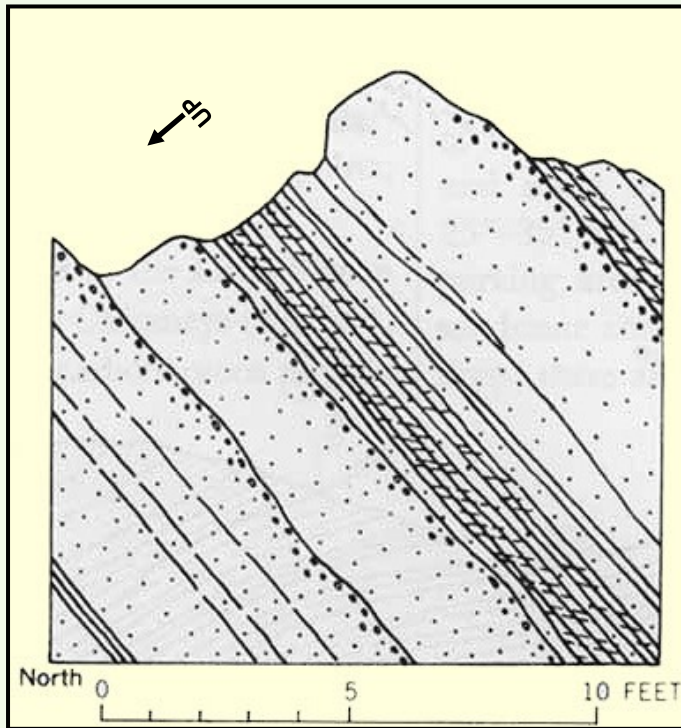
There will be a meeting the second Friday in May, for whoever is still here.

Respectfully Submitted,  
Alyson A.



These guys greeted Stan and Sue Celestian, on a recent personal trip to Burro Creek area. *Photo by Susan Celestian*

...Graded Bedding continued from page 1



**FIGURE 3 Overturned Graded Beds** This is a diagram of a series of graded beds at The Sinks on Tennessee Highway 73 at Blount-Sevier County line. The sequence has been overturned, and original UP was determined, as illustrated by the arrow. *Illustration courtesy of the USGS, from USGS Bulletin 587 (2006)\_Drawing H.W. Ferguson & Phillip B. King.*

Graded beds generally occur in sets, indicative of multiple or periodic depositional events. And the thickness of the individual graded beds ranges from millimeters to many meters.

**Environmental significance of graded bedding:**

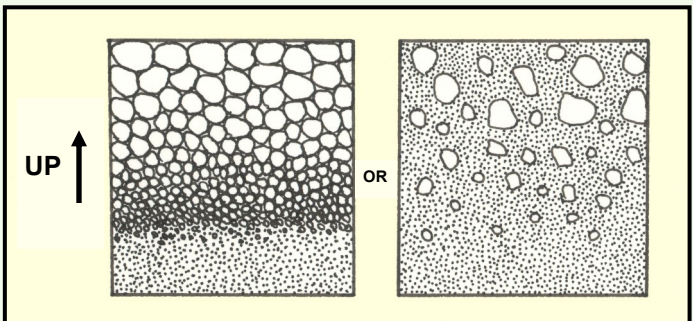
Graded bedding is usually reflective of a relatively dense transporting medium, and one that is relatively slow-moving. The less dense the transporting medium, the more likely the settling time of different-sized particles is the same. Large and small particles settle out together, and the particle size is random throughout the bed (or layer). In a very dense medium, the coarsest (and heaviest) particles will settle out faster than the smallest. And, in fact, the smallest particles tend to be clay, which is lightweight and platy, so is kept in suspension by weak currents, and far longer than the larger particles. As a result, the

transported particles are sorted vertically, within the bed (or layer). Graded bedding is most typical of fluvial seasonal and flood deposits (Figure 4), debris flows (Figure 5), and turbidity current deposits.



**FIGURE 4 Graded Beds Formed in a Fluvial Environment** These graded beds formed in a slot canyon, near Alamo Lake. During periods of high discharge, gravel and sand are deposited; and during subsequent periods of low discharge, clay and silt are deposited. *Photo by Craig Jones*

In the case of debris flows, avalanching dry sediments along slopes (such as dune slip faces or sloping blankets of air-fall particles), or special circumstances of differential settling, the style of graded bedding, may be *reverse graded bedding*. See Figure 5-6.



**FIGURE 5 Reverse Grading Bedding** In specific circumstances, graded bedding may exhibit as fine to coarse, from the bottom toward the top of a bed. *Illustration by Susan Celestian*

Graded Bedding continued on page 4.....

...Graded Bedding continued from page 3

For an example of the latter, there is a pumice deposit in a lake, within Death Valley. A volcanic eruption resulted in the air-fall deposition of pumice, which initially floated at the surface. Over time, the pumice became fully saturated with water, and sank to the lake's bottom. Naturally, the smaller particles became saturated first, followed by larger and larger particles. The result? A deposit with the smaller particles on the bottom, grading up into the coarsest particles at the top. <http://www.pitt.edu/~cejones/Geolimages/5SedimentaryRocks/SedStructures/GradedBedding.html>

Debris flows are very dense, viscous, wet mixtures of fine-very coarse particles. This situation allows very large boulders to "float" at the upper surface of the flow. When the flow slows or stops, much of the fine material, between the boulders, may flow out (wholly or partially). This leaves a layer of rock in which the particles are finer at the bottom, and coarser toward the top. See Figure 6.



**FIGURE 6 Probable Reverse Graded Bedding in Mosaic Canyon, Death Valley National Park**  
The Mosaic Canyon Breccia bedding is graded, and most likely is reverse graded bedding, as the thick slurries of repeated debris flows, through the slot canyon, allowed the larger particles to float cork-like at the tops of the flows. Photo by Stan Celestian

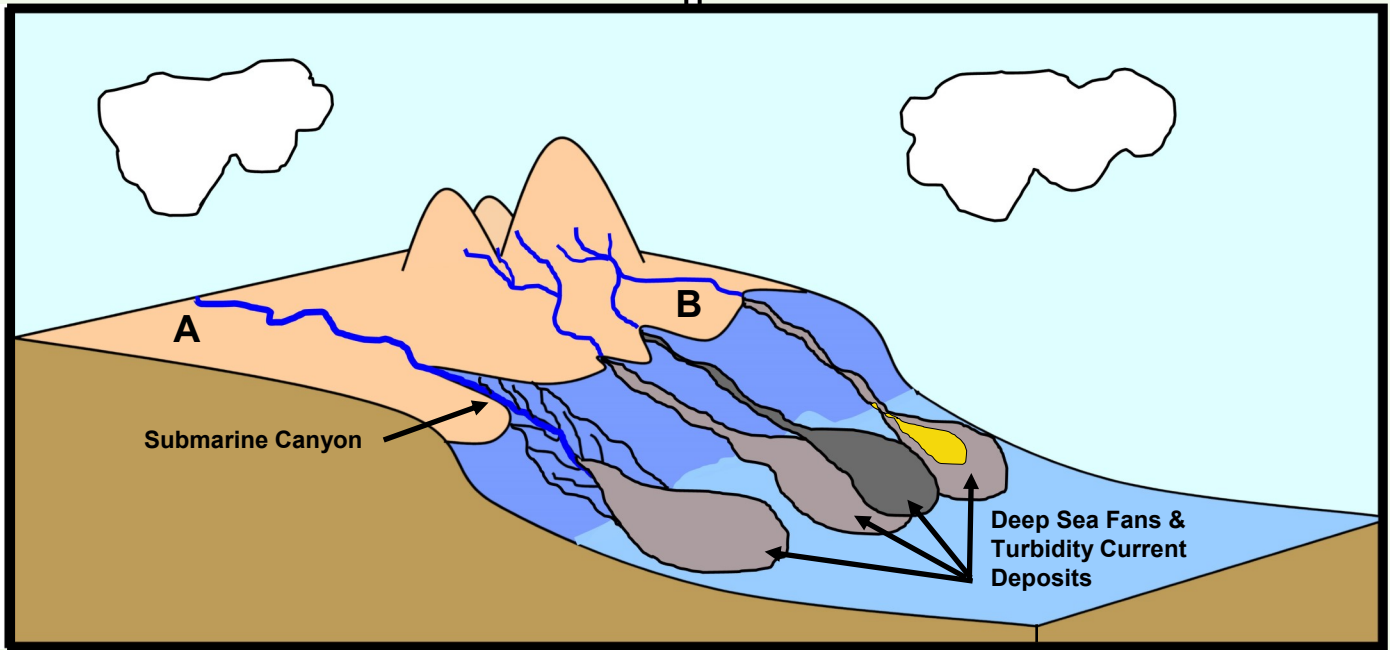
Turbidity currents are very dense, turbid (lots of sediment suspended in the water column) underwater debris flows. They commonly occur

- \* when sediment buildup causes slumping and rapid flow from the continental slope onto the abyssal plain, or into a submarine trench, as where a river enters the ocean, and dumps a load of sediment on the continental shelf, at the edge of the continental slope (Figure 7-8);
- \* where sediment-laden river water has a density greater than the seawater into which it is flowing, and feeds a rapidly moving plume, flowing down the continental slope. This is most usual after exceptional events, such as a strong storm, flood, dam break, or lahar -- all of which introduce large volumes of sediment into a fluvial system;
- \* where coastal sediments are funneled into a submarine canyon (called canyon flushing) -- not dissimilar to the aforementioned process (Figure 7-8);
- \* where an influx of sediment creates underwater slope instability in a large lake or reservoir;
- \* where fluvial debris flows move large quantities (and very large particles) rapidly down a mountain valley (may result in reverse graded bedding).

Triggers for the currents can be an earthquake, overloading of a slope, and storms.

Graded Bedding continued on page 5.....

...Graded Bedding continued from page 4



**FIGURE 7 Turbidity Current Deposits Along a Continental Shelf-Slope-Abysal Plain Environment** In this diagram, two scenarios are presented that may result in turbidity current deposits in the deep ocean off a continental shelf/slope. In (A) there is a submarine canyon extending out from the mouth of a stream, down the continental slope. Sediment may enter this canyon from the stream, and/or via introduction from a sediment-laden longshore current. In (B) sediment that has piled up on the upper edge of the continental slope becomes unstable, and cascades down into the deep ocean. *Illustration (primitive as it is) by Susan Celestian*

**FIGURE 8 Turbidite with Graded Bedding**

This meta-graywacke, from Great Falls Park, Virginia, exhibits the graded bedding of a turbidity current. Rocks and sediments formed by turbidity current, are called turbidites. Photo courtesy of the USGS



<https://pubs.usgs.gov/circ/2004/1264/html/trip5/fig11.html>

**FIELD TRIP  
TUESDAY, APRIL 16, 2018**



On probably the last club trip of the season, the Schneiders let a group to a very picturesque slot canyon north of Phoenix.

In this photo, Alice S stands in the narrow canyon.

*Photo by Craig Jones*

**UPCOMING AZ MINERAL SHOWS**

**April 28 - Cornville, AZ** Verde River Rockhounds; Windmill Park, Cornville Rd; Sat 9-5; Admission: free.

**May 5-6 - Kingman, AZ** Mohave County Gemstoners; Kingman Academy of Learning (H.S. Gym), 3420 N Burbank; Sat 9-5, Sun 9-4; Admission: free.

**June 1-3 - Flagstaff, AZ** Coconino Lapidary Club; Silver Saddle Outdoor Market, 9001 US 89 N (US 89N & Silver Saddle Rd); Fri-Sat 9-5, Sun 9-4; Admission: free.

**July 7-8 - Pinetop, AZ** White Mt. Gem and Mineral Club; Hon-Dah Casino & Resort, 777 Highway 260; Sat 9-6, Sun 9-4; Admission: \$2.

**August 3-5 - Prescott Valley, AZ** Prescott Gem and Mineral Club; Prescott Valley Event Center, 1301 Main St.; Fri-Sat 9-5, Sun 9-4; Admission: Adults \$5, Seniors/Students \$4, children under 12 free with paid adult.

**October 13-14 - Sierra Vista, AZ** Huachuca Mineral and Gem Club; Cochise College, 901 N Colombo Av; Sat 9-5, Sun 10-4; Admission: Free.



If you are travelling, a good source of shows AND clubs is <http://www.the-vug.com/vug/vugshows.html> or <http://www.rockngem.com/ShowDatesFiles/ShowDatesDisplayAll.php?ShowState=AZ> For out-of-the-country shows: <http://www.mindat.org/shows.php?current=1>

A good source for a list of Arizona Mineral Clubs and contact information is [http://whitemountain-azrockclub.org/Public\\_AZ\\_Clubs\\_Links.html](http://whitemountain-azrockclub.org/Public_AZ_Clubs_Links.html)

**Officers and Chairperson**

<b>President:</b> Craig Jones.....	208-523-9355
<b>Vice President:</b> Mel Canter .....	502-641-3118
<b>Secretary:</b> Alyson Arnold .....	517-652-1355
<b>Treasurer:</b> Debra Keiser.....	928-684-1013
<b>Program Director:</b> Dale Keiser.....	928-684-1013
<b>Publicity:</b> currently open position	
<b>Membership:</b> Roma Hagan .....	602-469-7662
<b>Editor:</b> Susan Celestian .....	602-361-0739
<b>Field Trip:</b> Craig J, Alice & Jim S.	
<b>Show Chair:</b> Beth Myerson.....	480-540-2318
<b>Scholarship Chair:</b> Steve Hill.....	928-533-3825
<b>Historian:</b> Jeanine Brown.....	928-684-0489

Meetings are held the **2nd Friday** most months at **Coffinger Park banquet room**. Potluck dessert at 6:30 pm. Business meeting at 7:00 pm. **Exceptions: February and December** meetings are held on the **first Friday of the month**. We do not meet in the summer — **no meetings in June, July or August**.

**Membership Dues: \$15.00 Adults per Person  
\$ 5.00 Juniors and Students**

**Meeting Dates for 2018**

**Wickenburg:** Jan 12, Feb 2, Mar 9, Apr 13, May 11, Sept 14, Oct 12, Nov 9, Dec 7

**Stanton meets** Thursday after the Wickenburg meetings. Jan 18, Feb 8, Mar 15, Apr 19, May 17, Sept 20, Oct 18, Nov 15, Dec 13 (subject to change)

**<http://www.wickenburggms.org/>**

If you ever have photos from a club field trip, send a couple to Dale, for posting on the website.

**UPCOMING WGMS FIELD TRIPS**

No Upcoming Field Trips Planned at this Time

DATES & PLACES SUBJECT TO CHANGE

**CONSIDER VOLUNTEERING TO PLAN OR HELP PLAN TRIPS. YOU WOULD NOT NEED TO LEAD EVERY TRIP, BUT KEEP THINGS ON TRACK**

**If you all have some place that you would like to go, let Schneiders or Craig J. 208-523-9355 or 208-681-4770. This is your club. Let's go out and have some fun.**

**NOTES FROM THE EDITOR**

Have a geological interest? Been somewhere interesting? Have pictures from a club trip? Collected some great material? Write a short story (pictures would be great). I'd like topic suggestions also.

I would love to have some pictures from field trips! Snap a couple and send them -- or a link -- to me.

Deadline for the newsletter is the 27th of the month.

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