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Highlight Reel:

Arizona Geological Society February 6 2024 Speaker: John Douglass

Title: New discovery of beach sand, beach rock, and tufa from the uppermost portion of the Bidahochi Formation and their implications for the development of Grand Canyon by John Douglass, Ph.D.

ABSTRACT: The formation of the Grand Canyon is a long-standing controversial topic in geology. The literature is littered with hypotheses and conjecture. A river that has cut a canyon through a topographic bedrock highland, as the Colorado River does through the Kaibab Plateau, is termed a transverse drainage. Four mechanisms have been proposed to explain the development of transverse drainages: antecedence, superimposition, piracy, and lake-overflow. In the past 150 years each of these have been proposed for the development of Grand Canyon, but since the mid-1900s only the latter two have been considered viable explanations.
The Bidahochi Formation, which outcrops on the Colorado Plateau in northeastern Arizona, was deposited between roughly 16 and 5 Ma. The lower member of the formation records deposition of mostly silt and clay in a playa lake environment within a broad basin. The character of deposition changes abruptly in the middle member with the eruption of maar volcanoes of the Hopi Buttes, and the upper member records a transition into lacustrine and fluvial-lacustrine conditions ~7 Ma. Deposits of the upper member record the arrival of a substantial fluvial system, almost certainly the proto-Colorado River arriving from the north. Research in the past several decades has constrained the development of the lower Colorado River below Grand Canyon to ~5 Ma. Thus, the Bidahochi Formation is the nexus in time and space between the upper and lower segments of the Colorado River. For a lake to spill over and begin to cut Grand Canyon, the highest lacustrine deposits should be at least close to the elevation needed for spillover.

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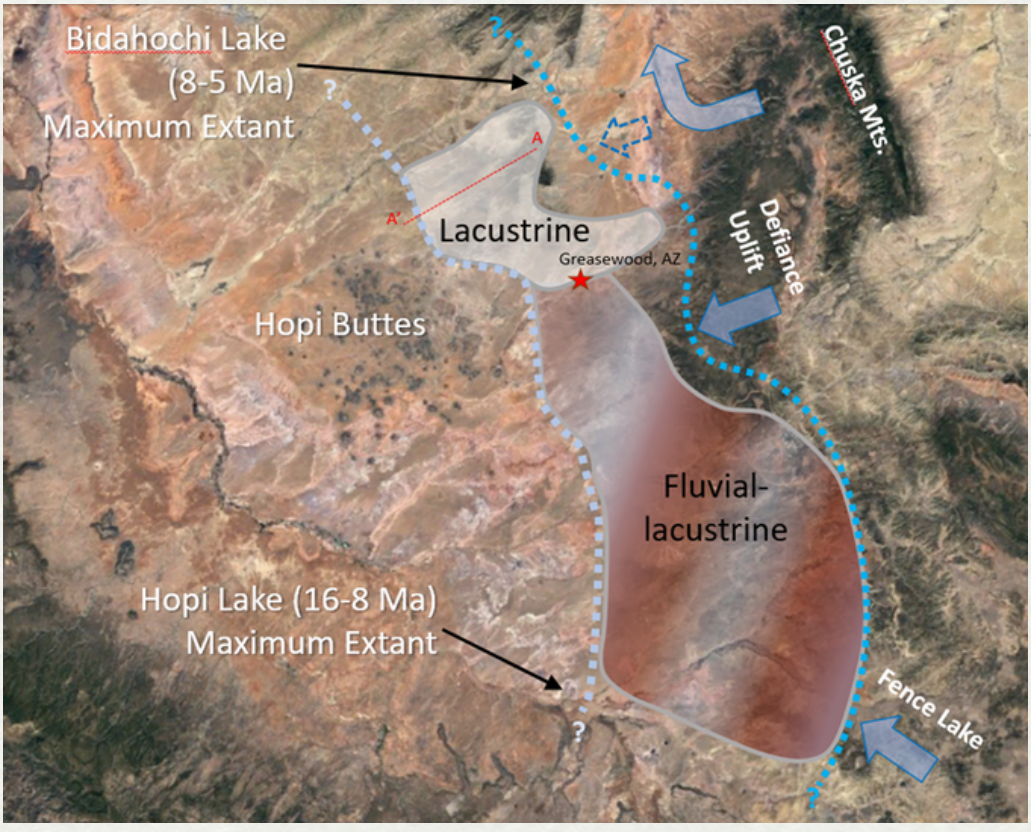
...Prior to the new discoveries presented here, the estimated high stand for this lake was about 2,000 m, about 300 m lower than the estimated spillover elevation. This was used as an argument against the spillover mechanism (Dickinson, 2013), although post-Bidahochi erosion could have removed some of the highest lake deposits.

Recent photointerpretation and field reconnaissance has led to the discovery of higher outcrops of the upper member. Subaerial siliciclastic deposits are dominant with minor lacustrine deposits south of Greasewood, AZ; lacustrine deposits predominate north of Balakai Mesa. The lack of subaerial deposits on Balakai Mesa may have resulted from the capture and diversion of a Chuska Mountains fluvial system that would have supplied sediments to the shoreline. The low sediment input to the Balakai Mesa area allowed for the deposition of first beach sand, then beachrock, and eventually capping tufa recording the rising lake margin. The tufa is complex, with possible algae filament sheaths individually and in coarse concentrations. Sand grains, ooids, and peloids were found deposited within massive to structured micrite and laminated cements that built stromatolite and thrombolite microbial structures. The beach, beachrock, and capping tufa deposits outcrop up to 2,250 m, 50 m shy of the 2,300 m needed for a lake to overtop the Kaibab Plateau. The newly discovered tufa and associated subaqueous facies on Balakai Mesa strongly support a lacustrine setting prior or during lake-overflow across the Kaibab Plateau, leading to the formation of the Grand Canyon.



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John Douglass Bio: John Douglass grew up in San Diego, CA and spent most summers backpacking in the Sierra Nevada Mountains. He received his Ph.D. from ASU in 2005. He teaches honors, geology, and geography at Paradise Valley Community College in north Phoenix, AZ. During his MS program at NAU he noted that the confluence of the Colorado and Little Colorado Rivers sits at the apex of the anticlinal Cedar Ridge and most likely formed from a lake that cut Grand Canyon. This observation kicked off a lifelong passion to understand Grand Canyon incision and whether or not the Bidahochi Formation east of the Grand Canyon records evidence of a large lake. He has been a guest on television shows about Grand Canyon for National Geographic and the History Channel. He has also published ten articles, most of which in some way relate to the puzzle of how the Grand Canyon formed.

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AGS Presentation Schedule 2024 – Spring-Fall-Winter Presentations & Summer Social Events

Phil Pearthree, Arizona State Geologist and AGS Vice President of Programs, is lining up speakers for 2024. Our schedule this year follows last year's mix of in-person presentations and summer social events. Months with in-person presentations include Jan., Feb., Mar., Apr, May, Sept., Oct., Nov., and Dec.; the summer months of June, July, and Aug. will involve monthly Thursday evening social events, probably at the Borderlands Pub in downtown Tucson. With Hexagon's support, we'll continue to host in-person presentations at their conference room at 40 E. Congress St.

AGS 2024 Presentation and Summer Social Mixers

9 Jan. - Dr. Jon Spencer (Arizona Geological Survey retired)
6 Feb. – Dr. John Douglass (Paradise Valley Community College)
Mar. - Dr. Jason Ricketts (University of Texas at El Paso)
Apr - Dr. Carson Richardson (Arizona Geological Survey)
May - TBD
Summer hiatus & Social Mixers

Scheduling speakers for Sept., Oct., Nov., and Dec. is underway.

Jon Spencer speaking at Hexagon in Jan. 2024. AGS members in Dec. 2023 at Hexagon.

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AGS Online Publications Archive | Professional Library

The entire collection of AGS publications – geotechnical papers and field trip guides – are available online for AGS members. There is a wealth of geologic knowledge, maps, and observations contained therein. Note: You must login to the AGS Website for access to In-Print materials.

AGS Digests – Geotechnical Papers

§ Digests In-Print 10 to 21; (https://www.arizonageologicalsoc.org/page-1855744)

§ Digests Out-of-Print 1-9, 11, 12 & 22 (https://www.arizonageologicalsoc.org/page-1665440)

AGS Field Trip Guides

§ Out-of-Print 1952 – 2005 https://www.arizonageologicalsoc.org/page-1665439

In-Print (AGS Members) 2006 – 2023 https://www.arizonageologicalsoc.org/page-1667480

AGS Spring 2024 Field Trip Primer

Basin evolution, deformation, and mineralization in Big Sandy Valley, northwestern Arizona

Leaders: Brian F. Gootee, Lisa A. Thompson, Bradford J. Johnson, and Carson A. Richardson (geologists with the Arizona Geological Survey, University of Arizona)

When: Saturday, 27 April 2024 to Sunday, 28 April 2024 (We recommend arriving the afternoon/evening of Friday, 26 April 2024 and either camp in Big Sandy Valley or find accommodation in Kingman)

Registration: In Feb-April at the AGS website https://www.arizonageologicalsoc.org

Description: This field trip, encompassing basin deposits, river integration, structural geology/tectonics, economic geology, and regional geology, will examine two generations of well-exposed basin deposits and associated faults and deformation in Big Sandy Valley, northwestern Arizona. Big Sandy Valley is situated along the margin between the Basin and Range Province and Transition Zone in Arizona within a ~90 km gap along the northwestern segment of the Laramide arc where no porphyry copper deposits have yet been defined. Two sedimentary lithium deposits were discovered in 2019 and continue to be advanced, while two subsurface porphyry copper prospects are being explored by junior mining companies...

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AGS Spring 2024 Field Trip Primer

By examining the spatial distribution and geometric configuration of Big Sandy basin deposits, trip participants will evaluate and make connections between basin structural evolution, depositional systems and basin sedimentation, and modern resource exploration, highlighting the role geologic mapping plays in the intersection of science, policy, and land use. Field trip stops examine four aspects of basin evolution and mineral resources: 1) evaluate the character, form, and depositional environments of two generations of basin deposits (the Miocene Tule Wash beds and late Miocene-early Pliocene Big Sandy Formation) through type exposures; 2) examine the character, provenance, and depositional mechanisms of spectacular rock-avalanche breccia deposits in the Tule Wash beds; 3) evaluate the structural setting of basin deposits, cross-cutting relationships between faults and folds, and implications for the style and timing of deformation; and 4) summarize regional geology and implications for porphyry copper and sedimentary lithium mineralization.

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Request for Volunteer to maintain and enhance AGS website

https://www.arizonageologicalsoc.org

Over the past 10 years, AGS' David Briggs has singlehandedly managed the AGS website (https://www.arizonageologicalsoc.org). Dave is looking forward to a break and we need to identify a new webmaster. If you are interested in volunteering as AGS webmaster, please contact Mike Conway at fmichael.conway@gmail.com.
The AGS website is hosted and supported by Wild Apricot. The website is menu-driven and easy to use; knowledge of html language is not required. Wild Apricot provides web modules and the framework for updating content. Our current website includes a vendor module for collecting and managing fees and registering people for events, e.g., in-person presentations. The availability of online fee payment and management has been a great help for the AGS Treasurer (currently Benedek Gal).

While the web site administrator has been responsible for maintaining the AGS web site, all AGS officers have administrator privileges, allowing them full access to the AGS website. AGS needs more than one individual who knows how to maintain the site, in the event the primary web site administrator can no longer perform his/her duties.

Note from current Web Master David Briggs: "I currently spend about two to four hours per month updating the AGS web site. I can train a new AGS web site administrator, assist him/her as they becomes familiar with the Wild Apricot web site software, and continue helping out from time to time if needed.

Monthly/Bimonthly Duties

- Update Events Page (i.e. monthly meetings, spring and fall field trips)
- Post AGS Newsletter – Publish AGS newsletters provided by the Secretary (monthly/quarterly) on website with links to access newsletters.
- Update Video Presentations Page – Post links to videos of presentations at AGS Monthly meetings
- E-mail Blasts – Send e-mail blasts to membership (newsletter and other announcements)
- Home Page – Update links to AGS newsletter and Meeting Sponsors.

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·**Quarterly/Annual Duties**
·Post Field Trip Page – Add photos (submitted by participants) from AGS Field Trips
·Annual Update to Executive Committee Page
·Annual Update to Officers and Councilors Page – Adding names of new officers and councilors to list of former officers and councilors from previous years.
·Annual Update to Scholarship Info and alert student member via e-mail listserve.
oAnnual Update to J. Harold Courtright Scholarship Page – Posting Photo and Bio provided by recipient.
oAnnual Update to M. Lee Allison Scholarship Page – Posting Photo and Bio provided by recipient.
oAnnual Update to Scholarship Recipients Page – Adding new recipients to the list of AGS scholarship awardees.

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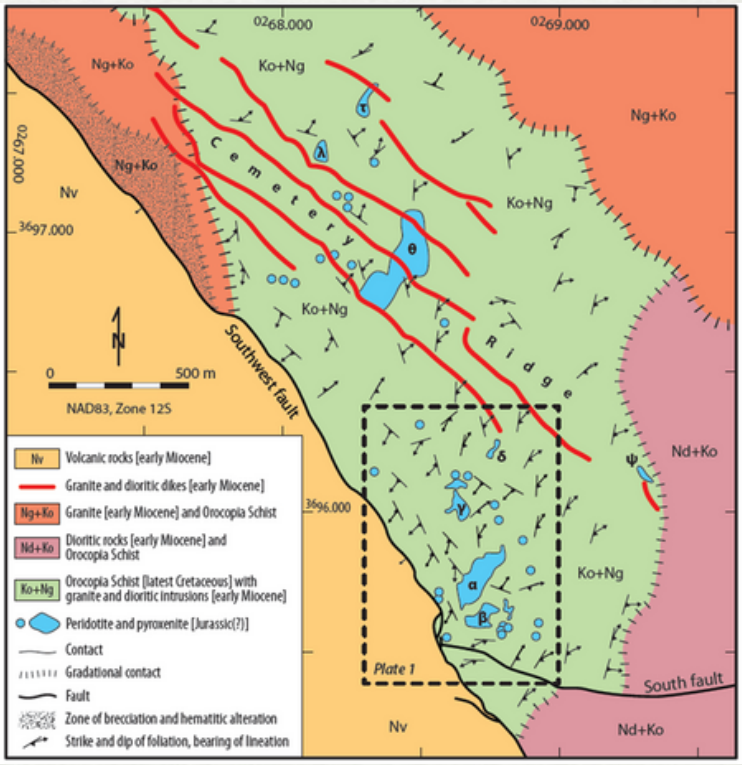
Arizona Geological Survey 2023 Publications

https://library.azgs.arizona.edu/

- Arizona Geology Newsletter v. 44, #1, Winter 2023, ed. J.P. Cook
- Criteria for Recognition of Subducted (Orocopia) Schist in Western Arizona v1.1 by Haxel & others (Contributed Report)
- Geologic Map of the Central Dragoon Mountains, Cochise County, Arizona by Trzinski and Chapman (Contributed Map)
- Geologic Map of the Gunsight Canyon 7.5′ Quadrangle, Mohave County, Arizona
- Geologic Map of the Kaiser Spring Volcanic Field and Lower Burro Creek Area, Mohave and Yavapai Counties, Arizona by Thompson and others.
- Geologic Map of the Salome 30′ x 60′ Quadrangle, West-Central Arizona by Richard and others
- Geologic Map of the Wikieup and northern half of the Greenwood Peak 7.5′ Quadrangle, Mohave County, Arizona by Ferguson and others.
- Geologic Map of the Tule Wash 7.5′ Quadrangle, Mohave County, Arizona
- Mantle Periodotite and associated metasomatic rocks in the Orocopia Schist Subduction Channel (latest Cretaceous) at Cemetery Ridge, SW Arizona v. 2.0 by Haxel and others (Contributed Report & map).



"Geologic map of part of Orocopia Schist at northern Cemetery Ridge (Figs. 1-1, 1-2), emphasizing distribution of peridotite". By Haxel & 5 others, AZGS Contributed Report CR-22-A. Online at https://library.azgs.arizona.edu/item/AGCR-1673973207118-970

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AGS MEMBERSHIP RENEWAL

If you have not already renewed your membership in the Arizona Geological Society, please take a minute to do so. The cost for renewing remains $35 for the year. Current professional and student members by the number.

Acknowledging AGS Members Approaching 50 years as Members

Note: AGS records from the 1970s are sketchy, so if we overlooked someone we apologize. If you let us know, we'll include you in the next newsletter. (fmichael.conway@gmail.com)

- Fred Graybeal – 1974-1975
- Gordon Haxel – December 1975
- Stan Keith - December 1977
- Fleetwood Koutz – August 1978
- Harold Linder – December 1978
- Jan Rasmussen – 1975-1976
- Steve Reynolds – November 1978
- Steve Van Nort – November 1978
- David Briggs - December 1979