3D Documentation of a Basketmaker Petroglyph Panel in Southeastern Utah

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SITE & SETTING

- Inaccessible Rock Art Panel (petroglyphs = marks made by removing rock)
- Basketmaker Period (400 BC- 400 AD)
- Location: Moqui Canyon tributary, San Juan County, Utah (Bureau of Land Management property)
- Context: U-shaped Alcove known as archaeological site 42SA749
- Panel occurs 10-30 m above modern ground surface
- Height precludes traditional documentation methods or even ascertaining what images are present
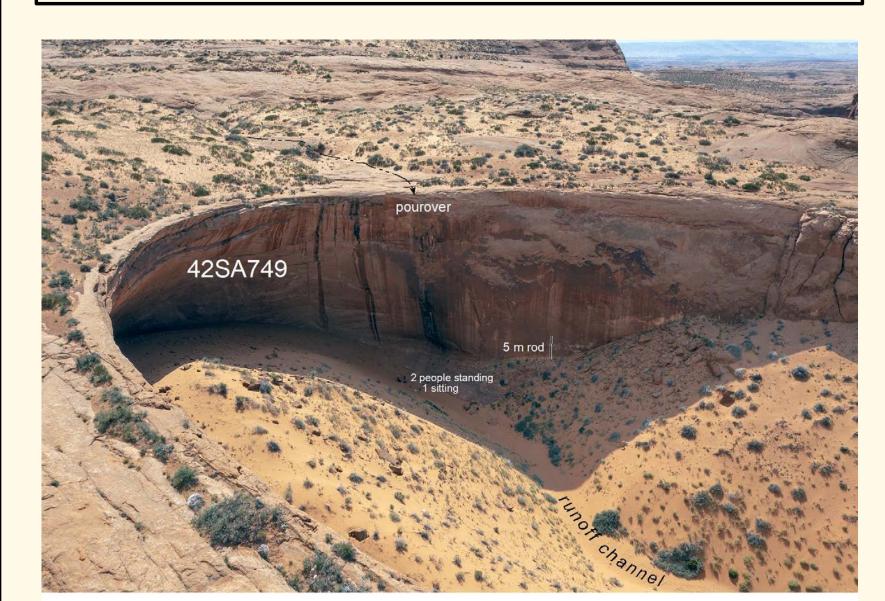- Drone used to generate a 3D model ("Preservation" by digital documentation)

Image 1: The Alcove, from above looking down, by the drone
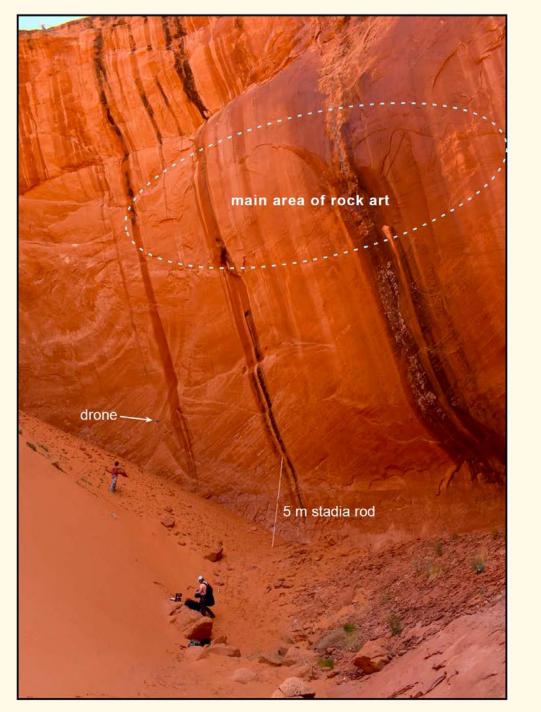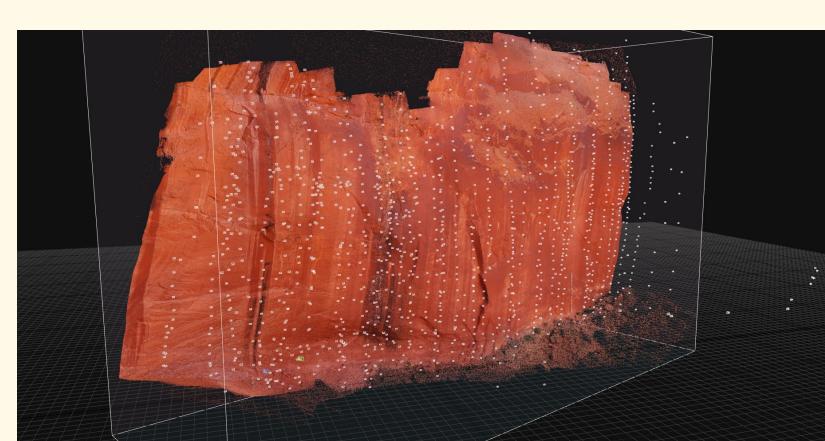

Image 2: Alcove wall, captured by Dr. Phil R. Geib

METHODS

- 3D Model Technique: Structure from Motion (SfM)
- Approximates a three-dimensional structure using overlapping two-dimensional images
- Photo capture using a drone with image resolution of 5472 x 3648 pixels
- 1,333 images taken of the cliff face with the petroglyphs

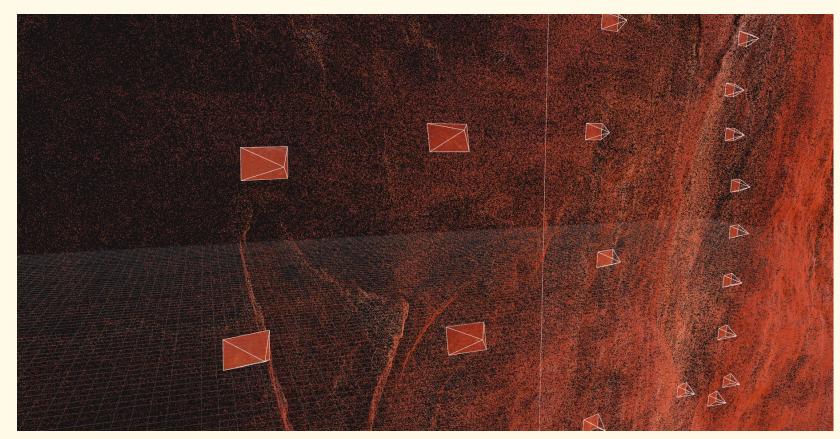**Image 3:** Small white shapes show the position and orientation of a photograph captured by the drone

Image 4: Photogrammetry processing steps involving aligning the images and producing the pointcloud

Image 5: Low resolution 3D model

RESULTS & ANALYSIS

- Archaic (~ 3000 – 400 BC)
  - Stick-like figures
  - Animals
- Basketmaker (~400 BC – AD 400) motifs and elements
  - Anthropomorphs (human-like figures)
    * Twins
    * Flute Players
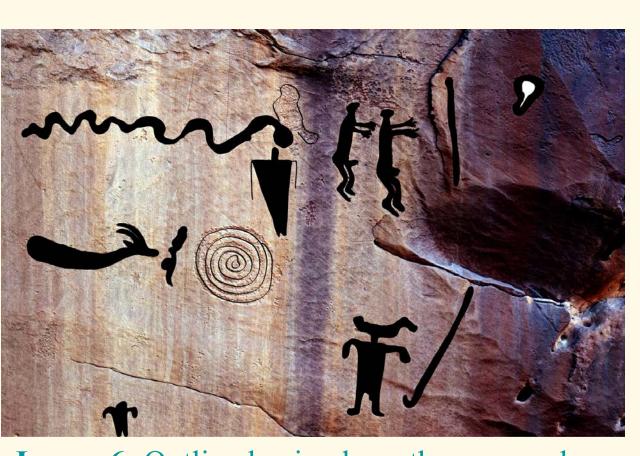 - Concentric circles
  - Dotted Lines
  - Bighorn sheep

Image 6: Outlined animals, anthropomorphs, concentric circles, and twins

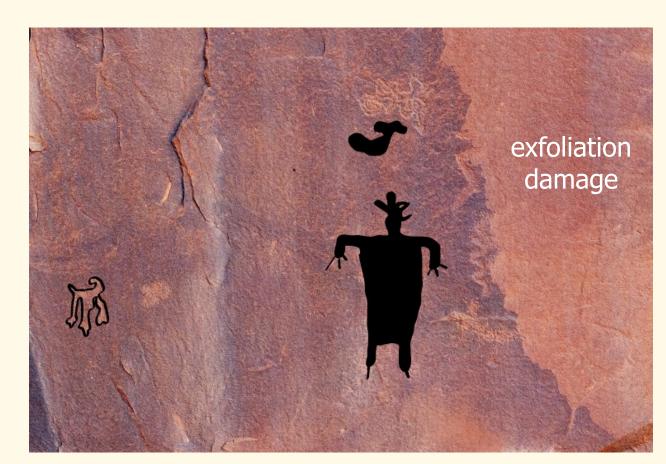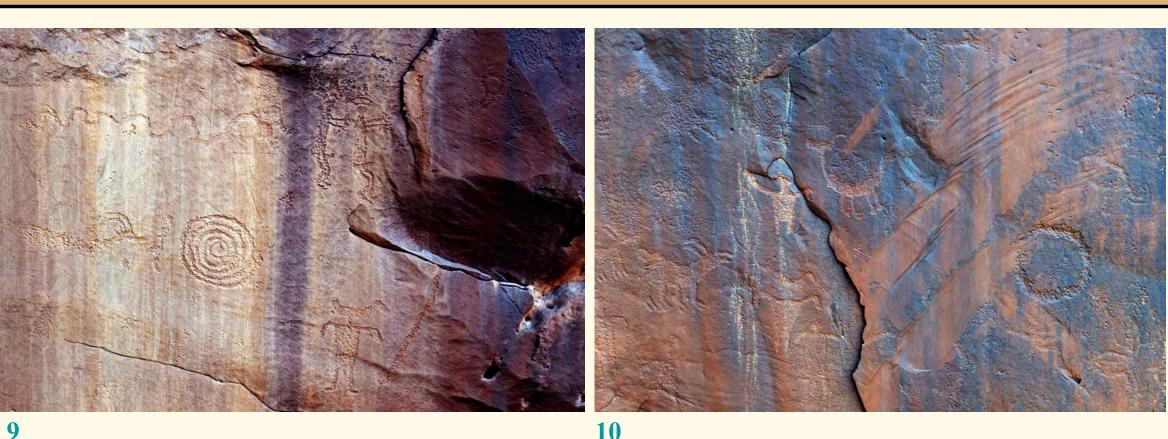**Image 7:** Outlined animal and anthropomorphic figures

Image 8: Outlined Anthropomorph figure

RAW DRONE IMAGES

Images 9-11: Edited with Photoshop to improve the visibility of petroglyphs

Archaic style Glen Canyon Linear bighorn sheep

DISCUSSION

- Overcame inaccessibility
- Tested the ability of the drone and technique.
- Preserve fragile sites without further endangering their integrity.
- Drone method was:
  - Reliable
  - Easy to transport
  - Cost-efficient

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