

A GOOGLE EARTH—BASED GRAND TOUR OF
THE MOST IMPORTANT GEOSCIENCE
LOCALITIES ON EARTH AND OTHER PLANETS



DECLAN DE PAOR, STEVE WHITMEYER, MLADEN DORDEVIC,
CALLAN BENTLEY, STEPHEN BURGIN, FILIS COBA.
OLD DOMINION UNIVERSITY, JAMES MADISON UNIVERSITY, N VA COMMUNITY COLLEGE

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GOOGLE GEO CURRICULUM AWARDS



Acknowledge NSF DUE and Google support

The Grand Tour Concept:

PLANNING THE GRAND TOUR (BRACK EMIL)



In 19th century England, upper class gentlemen were sent on a 'grand tour' of European cities to round off their education.



At recent national and regional meetings, we've been asking colleagues this question.

Not surprising:

GRAND CANYON



SEMKEN, BRUCE, ANBAR, KARLSTROM, & CROSSEY

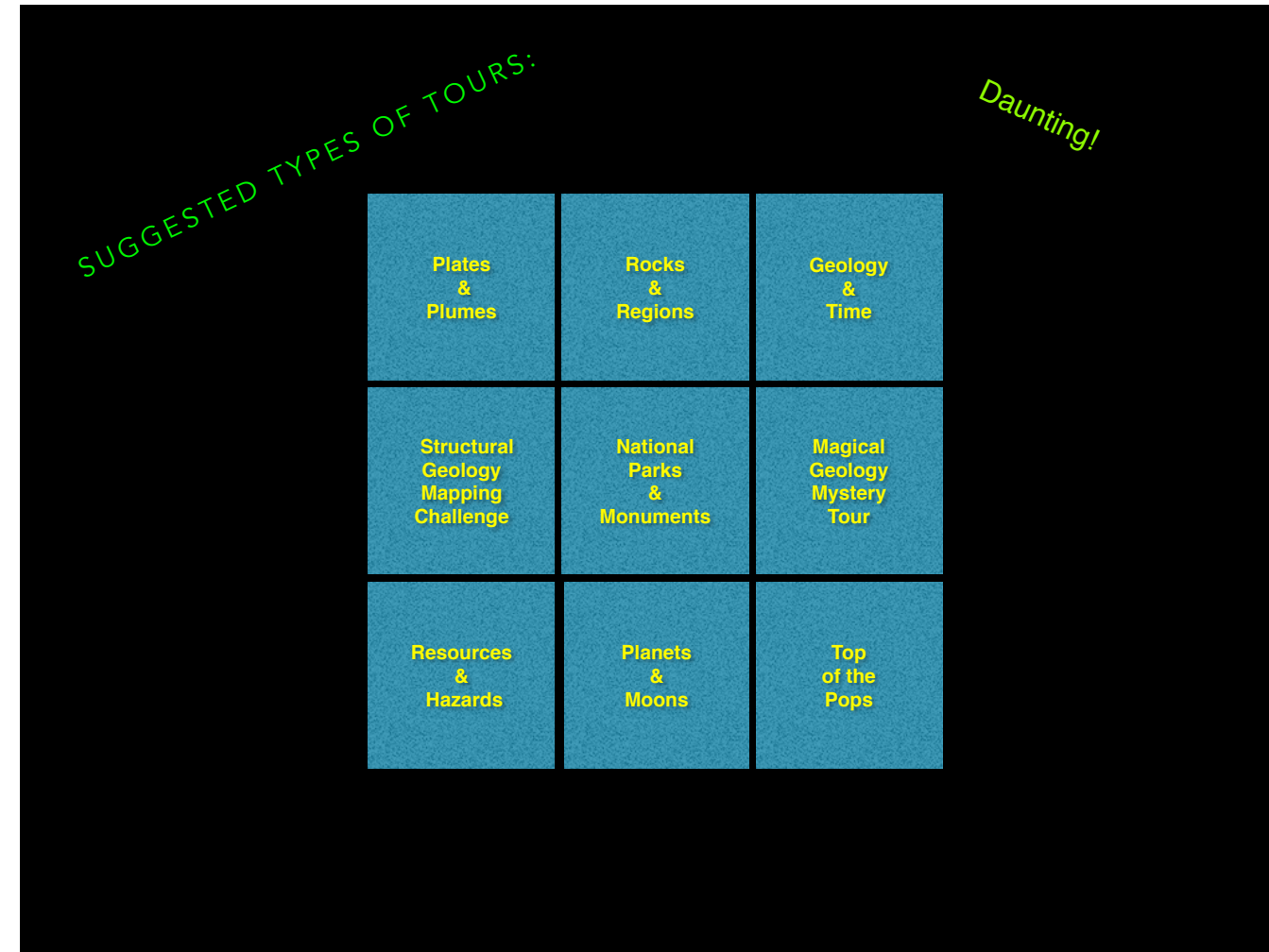
Surprising:

FRENCH FRIGATE SHOALS

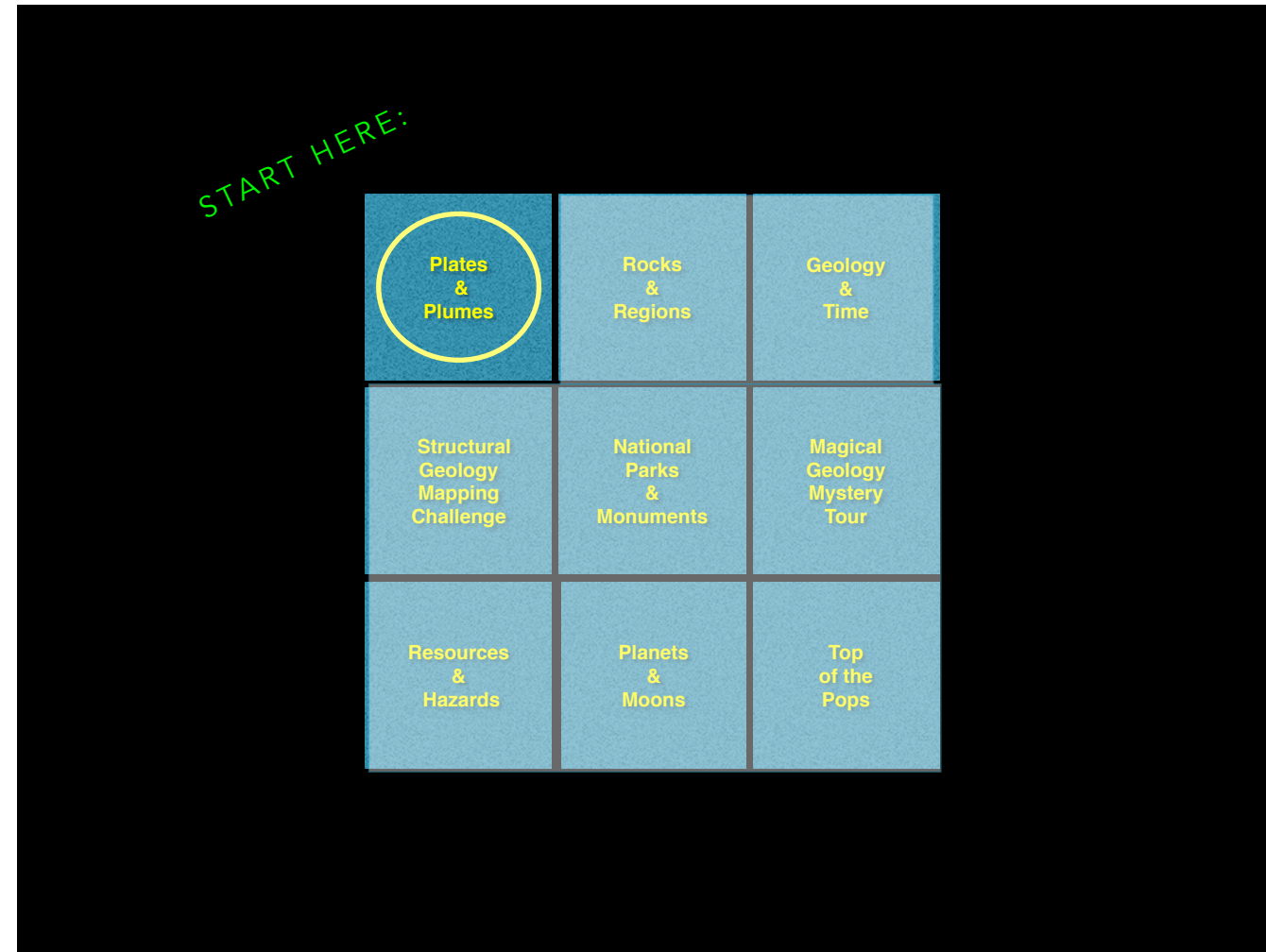


Photo: George H. Balazs (1978-81)

It was no surprise that the first tour stop in many people's view was the Grand Canyon. Other suggestions were a little surprising but that's democracy for you!



The most daunting aspect of designing a grand tour is the number of possible types of sites. We' narrowed these down to nine categories.



Many folks suggested that we start with global tectonics, including a tour of plate boundaries and hot spots.

NEW MOVABLE POLYGONS

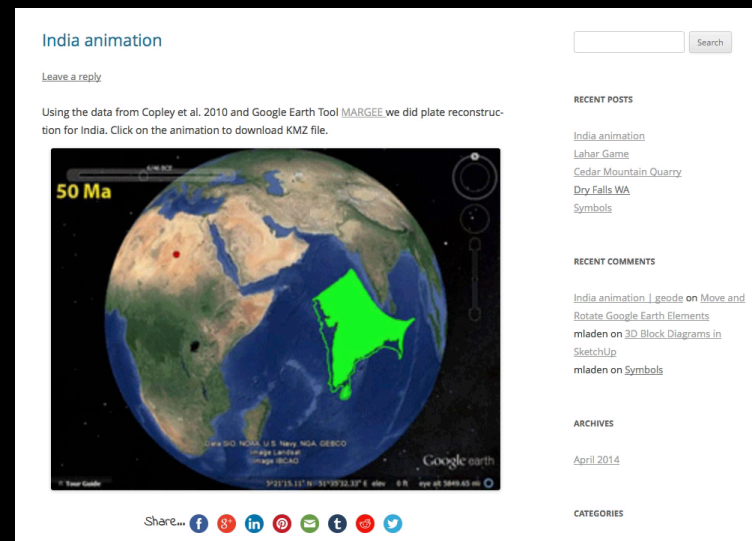
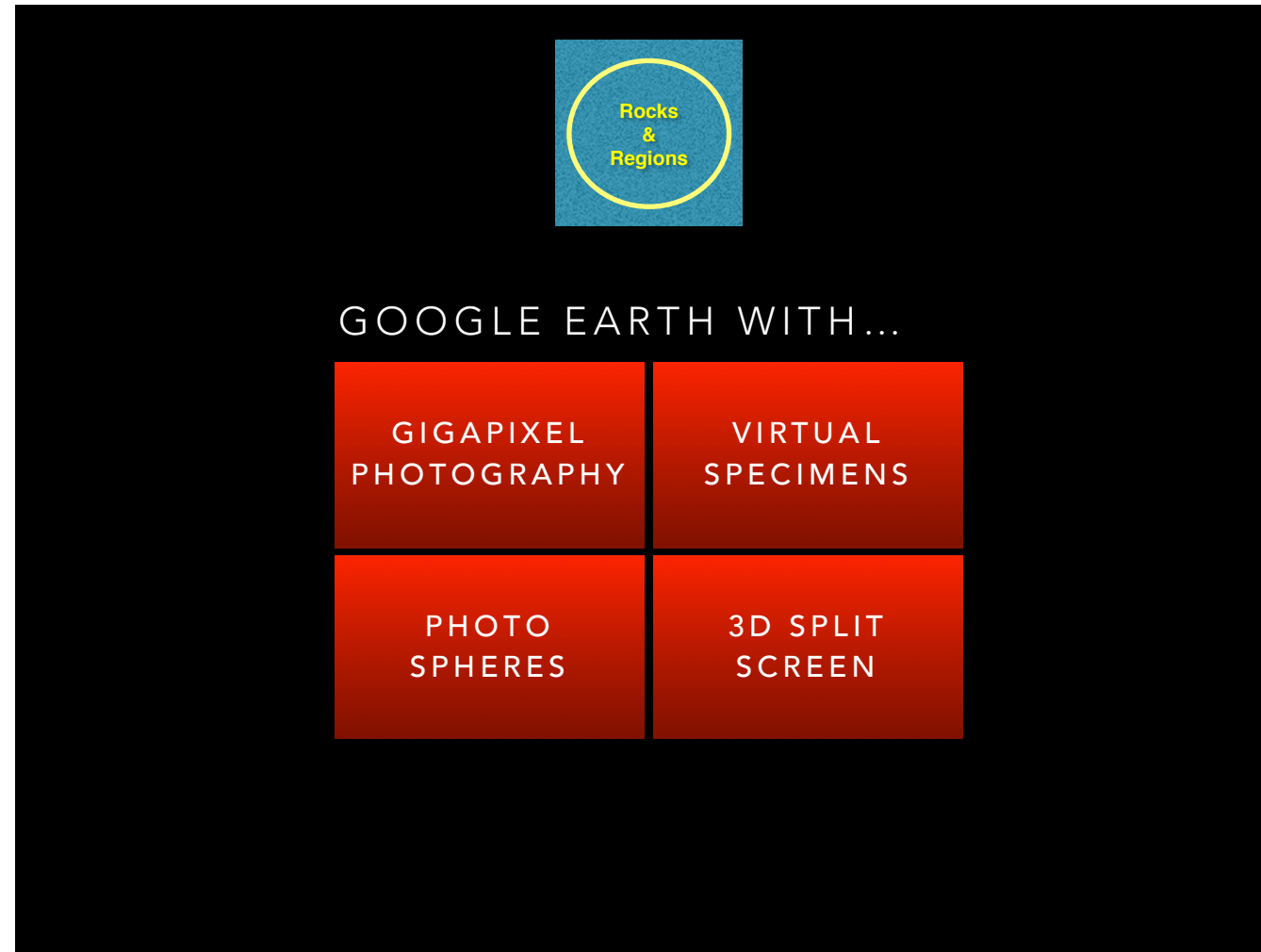
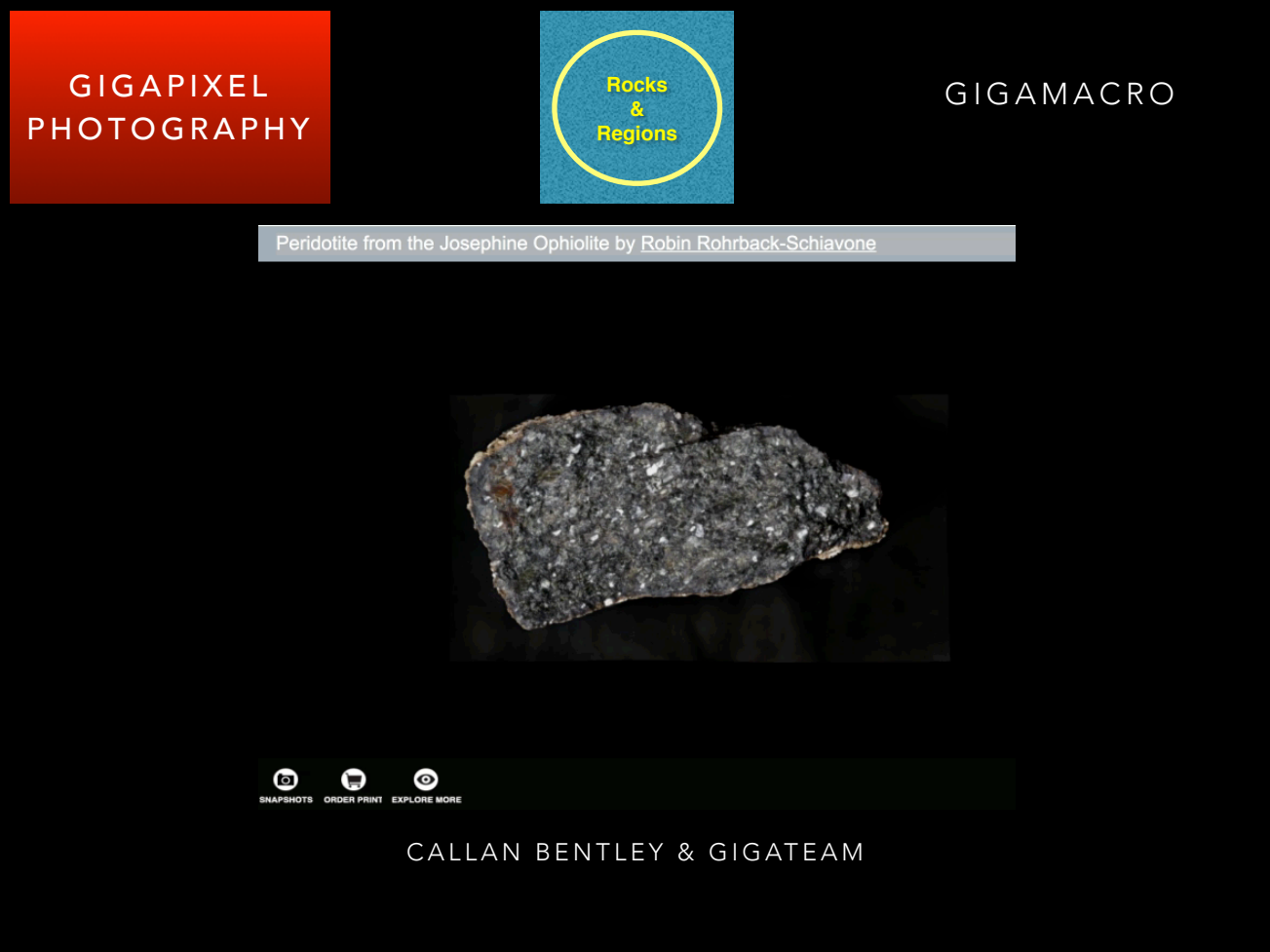


PLATE RECONSTRUCTIONS ON GOOGLE EARTH
BY STEVE WHITMEYER AND MLADEN DORDEVIC

To facilitate plate reconstructions on Google Earth, Steve and Mladen have developed the ability to move KML polygons across the terrain. (movie)



Our second category borrow the title of Steve Reynolds's book. The GE terrain imagery is not sufficiently resolved to be useful at outcrop level and needs to be augmented by other digital technologies, as follows:



First, gigapixel photography can enable deep zoom to outcrop level and GigaMacro hardware brings zoom down to microscopic scale (movie).



VIRTUAL
SPECIMENS &
GIGAMACROS

123D CATCH SPECIMEN BY ERNESTINE
BROWN AND NATHAN ROGERS



THANKS TO SAM BOWRING
FOR ACATA GNEISS SPECIMEN

We've been making virtual specimens using 123D Catch from Autodesk. Sam Bowring lent us a specimen of Acasta Gneiss, the oldest whole rock ever dated (4.03 Ga). It can be viewed in its collection location on GE.



CREATE A PHOTO SPHERE WITH
ANDROID PHONE OR ANY CAMERA

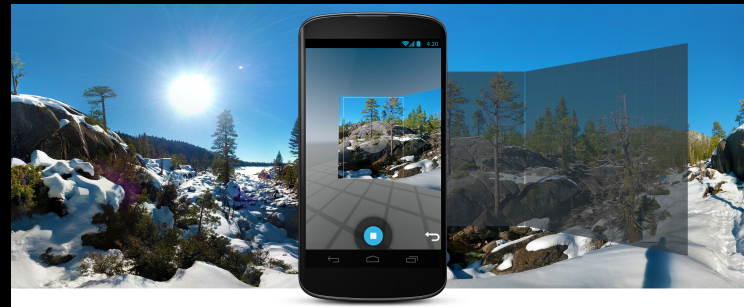


PHOTO
SPHERES

The new Photo Sphere app for Android enables one to create immersive 360° panoramas (also works with camera images).

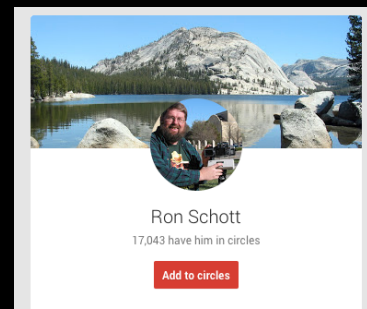
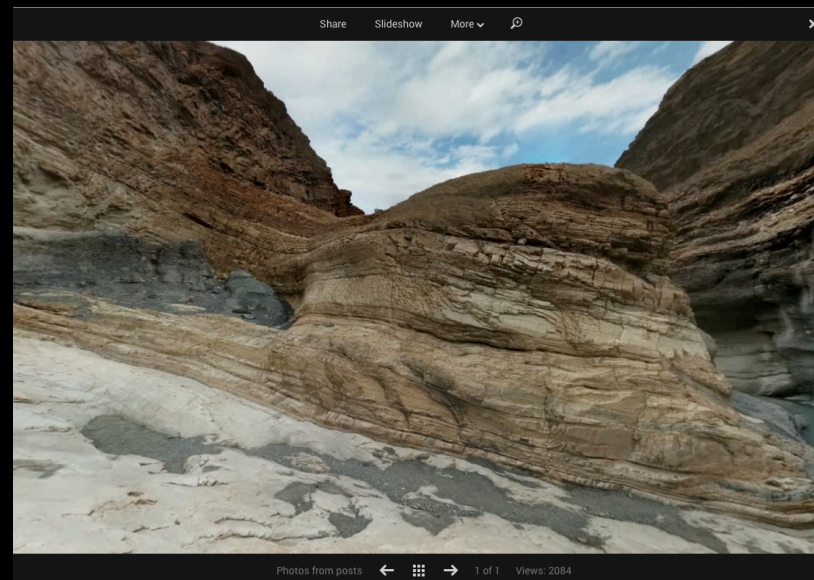


PHOTO SPHERE BY RON SCHOTT



Here is a a geo- photo sphere by Ron Schott (movie).



REMEMBER VIEWMASTER?



EVOLVED INTO HASBRO MY3D



3D SPLIT
SCREEN

How many of you owned a Viewmaster as a child? You may have thought these went extinct but now there is My3D—a digital viewmaster into which you can pop your phone.

YOU CAN MAKE YOUR OWN 3D/4D SPLIT SCREEN
IMAGES/VIDEO WITH POPPY3D.COM



Better still, you can make your own split screen images and video with Poppy3d for iPhone.

VIEW WITH MY3D, POPPY3D,
OCULUS RIFT, OR GOOGLE CARDBOARD



DEMO AT DIGITAL GEOLOGY
SANDPIT II THIS AFTERNOON

Split-screen images can be viewed with a number of devices, including Google Cardbord.

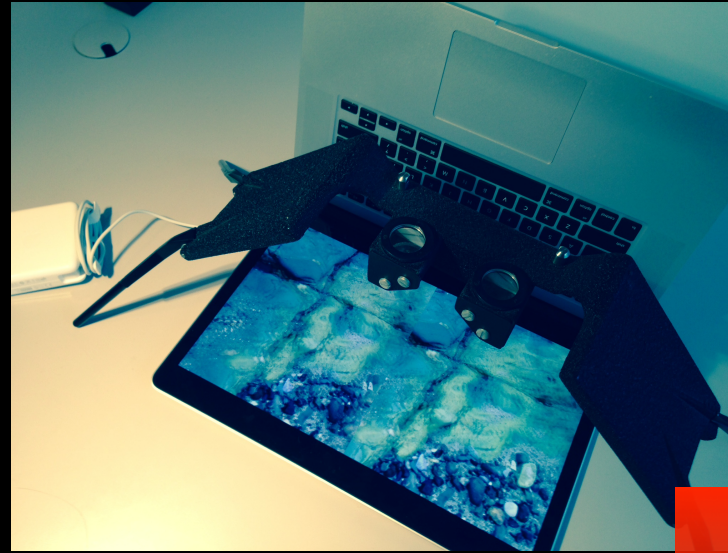
3D SPLIT SCREEN VIDEO



3D SPLIT
SCREEN

Here's an example of a splitscreen video I shot at Atlantic Hill, Hull, MA. (movie)

REPURPOSING OLD STEREOSCOPES



DEMO AT DIGITAL GEOLOGY
SANDPIT II THIS AFTERNOON

3D SPLIT
SCREEN

Split-screen images can be saved as inverted Quicktime Movies and viewed on laptops using traditional stereoscopes.

VR VERSUS AR

DOWNLOAD FRESHAIR
APP—SEARCH FOR GSA



WORK WITH HELEN CROMPTON
AND MATT DUNLEAVY

Split-screen is virtual reality (VR). There are also Augmented Reality (AR) apps of use in geology. One called FreshAiR delivers content (text, images, video, questionnaires) to students based on proximity to placemarks, thus enabling asynchronous field classes.

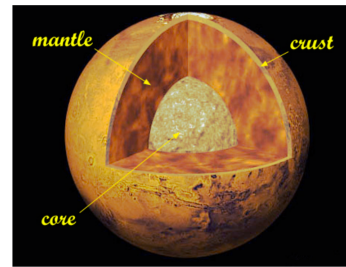
TYPES OF TOURS

Plates & Plumes	Rocks & Regions	Geology & Time
Structural Geology Mapping Challenge	National Parks & Monuments	Magical Geology Mystery Tour
Resources & Hazards	Planets & Moons	Top of the Pops

Moving quickly to other categories...

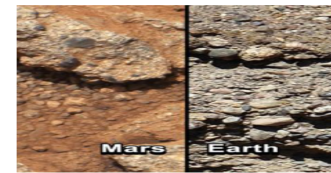
PLANETS & MOONS

FILIS COBA: IRB-COMPLIANT CLASSROOM TESTING: KML VERSUS PDF



Interior of Mars

Although no human has ever set foot on Mars, planetary scientists can transport themselves on the Martian surface using rovers (robots) to roam around, dig and collect data. Since 1964, there have been sixteen successful US missions to Mars and one recent 2013 mission from India called the Mars Orbiter Mission (MOM), which just started taking data on the surface features and atmosphere.



VALLES MARINERIS

Named after the Mariner 9 Mission that discovered this large slash in the Martian landscape. At 4,000 km long and 200 km wide, on Earth this would stretch from Los Angeles to the Atlantic Coast! You would also see giant landslides, which have caused the walls to slump off and pile up to the valley floor. The hypothesis is that Valles Marineris is a large tectonic "crack" in the Martian crust, forming as the planet cooled, affected by the rising crust in the Tharsis region to the west and widened by erosional forces. However, near the eastern flanks of the rift there appear to be some channels that may have been formed by water. Evidence is everywhere such as collapse pits created by rushing water eating away at the land, massive floods all point to water just at or beneath the surface at some point in the Martian history.



Filis Coba has created a KML Grand Tour of Mars and has tested this in an IRB-compliant study comparing interactive KML to passive PDF files with the exact same content. Students learned nothing from the latter.

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next...

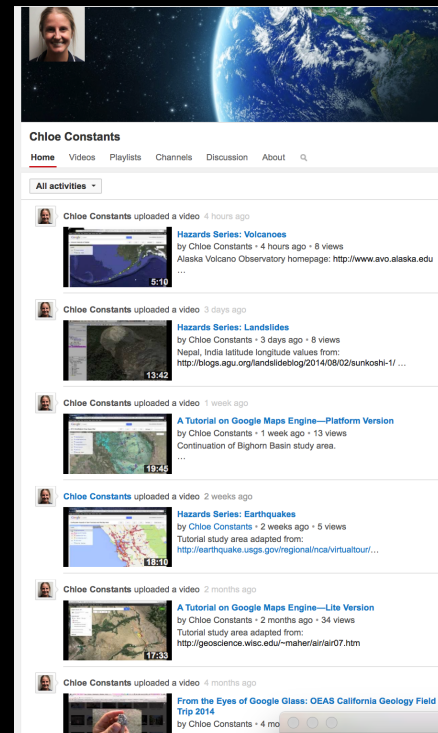
RESOURCES & HAZARDS

BIGHORN BASIN, WY

ODU Geospatial Analysis Lab
Advisor Declan G. De Paor and Chloe Constants, ODU Oceanography,
Earth & Atmospheric Science senior

2014 Google GEO Curriculum Grant and NSF DUE 1323419

Resources
&
Hazards



CHLOE CONSTANTS

Chloe Constants is assembling a set of video tutorial demonstrating how to use GE for resource and hazard lessons.

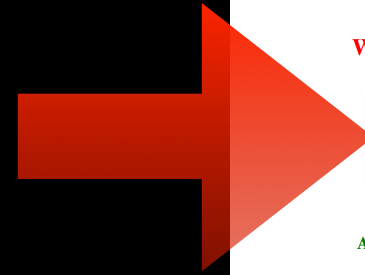
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PROGRAMMING BY MLADEN DORDEVIC

Two other categories are of potentially great interest

GEODE.NET/MGMT



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GEODE.net

Google Earth for Onsite and Distance Education

Welcome Declan to Magical Geology Mystery Tour


[Play](#) [My Page](#) [Browse](#) [Add](#)

A Crowd-Sourced Resource for Teaching and Learning Geoscience

Concept: Declan De Paor (inspired by Geoguessr.com)
Geological Design and Development: Steve Whitmeyer
Geotechnical Design, Programming: Mladen Dordevic

Thanks to our beta-testers, content contributors, and curators.

The GEODE project is funded by NSF DUE 1323419. De Paor and Whitmeyer also acknowledge support by Google Inc. Google Street View and Google Maps are ©2014 Google Inc.



First is what we call the Magical Geology Mystery Tour: www.geode.net/mgmt

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Question 5 of 5 **Score: 216**

Part I

Look at the road cut along this highway. Which of the following best describes the geology and tectonics?

- ☐ Granitic igneous rocks, convergent tectonism
- ☐ Compressional structures, convergent tectonism
- ☐ Extensional structures, divergent tectonism
- ☐ Undisturbed stratigraphy, no obvious tectonism

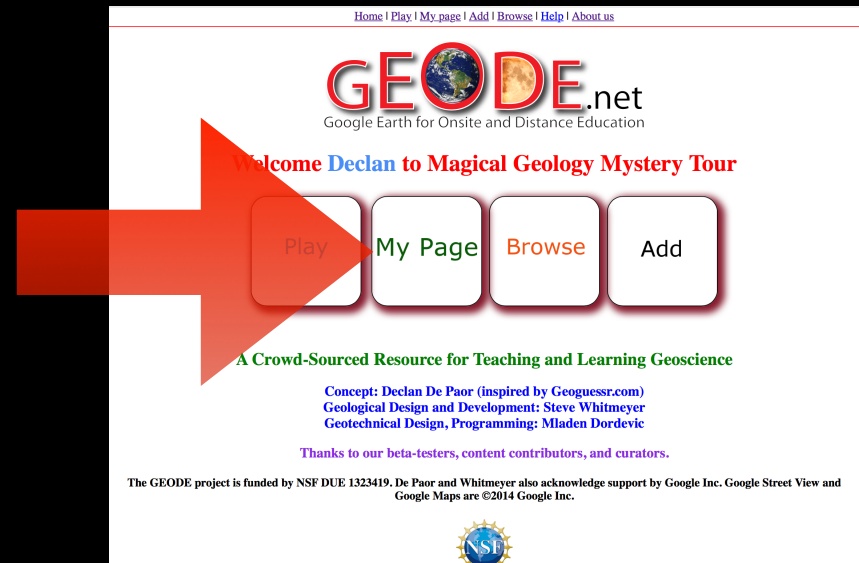
Part II

Now guess the location of the feature by clicking on the map below or dragging the placemark

INSPIRED BY GEOGUESSR

Students are taken to unknown locations in Street View and asked questions about the visible geology and the location.

GEODE.NET/MGMT



A key feature is that instructors can gain access to oversee their own students' work and can create content.

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PROGRAMMING BY MLADEN DORDEVIC

The second is the Structural Geology Mapping Challenge: www.geode.net/sgmc



Students can control the location and orientation of a semi-transparent plane using the sliders and interactive stereographic net and can study how is intersects to terrain in order to map out a fold, for example. They receive medallions based on how close their answer is to their instructor's (the computer autocross this by calculating the cross product of the pole to student and instructor planes).

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EXPECT TO BE OUT OF IT BY NOW!

There are two further categories of tour but I predicted that I would be out of time by now so they must await our next presentations...



COMING SOON...

GSA, Vancouver BC, this afternoon: Digital Geology Sandpit II continues
Fall AGU, Dec 2014: Posters and (Proposed) Google Workshop Event
AAAS, Feb 2015, "Innovations in Imaging Earth" Seminar
NE GSA, Bretton Woods NH, Mar 2015: Workshop

Thanks!