4. MAPS

I Main Topics

A Why make geologic maps?

B Construction of maps

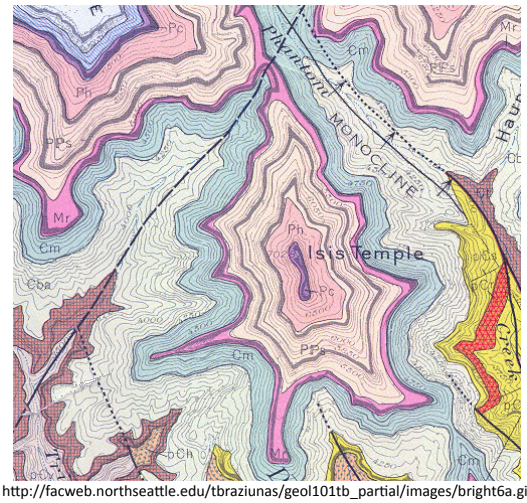
C Contour maps

D Introduction to geologic map patterns

The First Geologic Map of Britain by William Smith, 1815

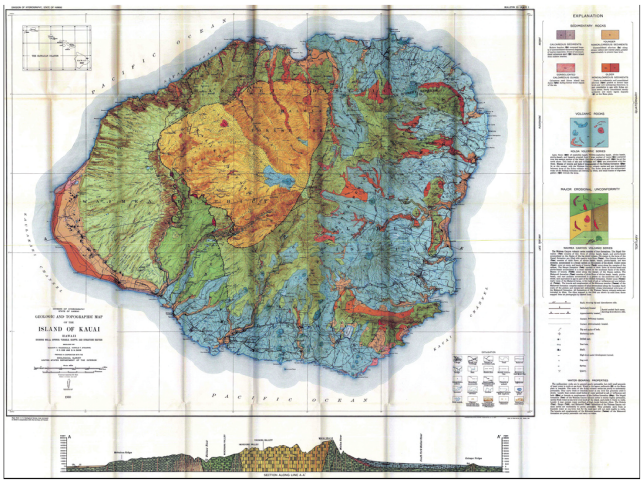
http://upload.wikimedia.org/wikipedia/commons/9/98/Geological_map_Britain_William_Smith_1815.jpg

Portion of the Geologic Map of the Bright Angel Quadrangle



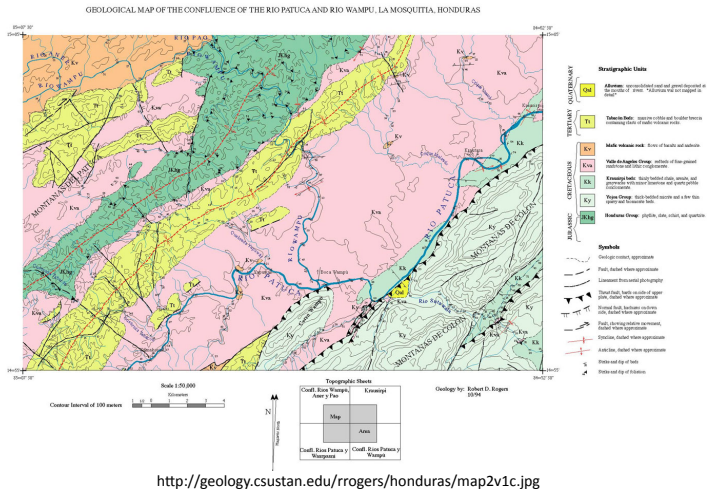
http://facweb.northseattle.edu/tbraziunas/geol101tb_partial/images/bright6a.gif

Geologic Map of Kauai



http://www.flickr.com/photos/59798762@N00/5384685047/in/set-72157626858828635/lightbox/

Geological Map of the Confluence of the Rio Patuca and Rio Wampu, La Mosquitia, Honduras



http://geology.csustan.edu/rrogers/honduras/map2v1c.jpg

Map of small faults and joints at the Bear Creek Camp Outcrop From Martel et al., 1988

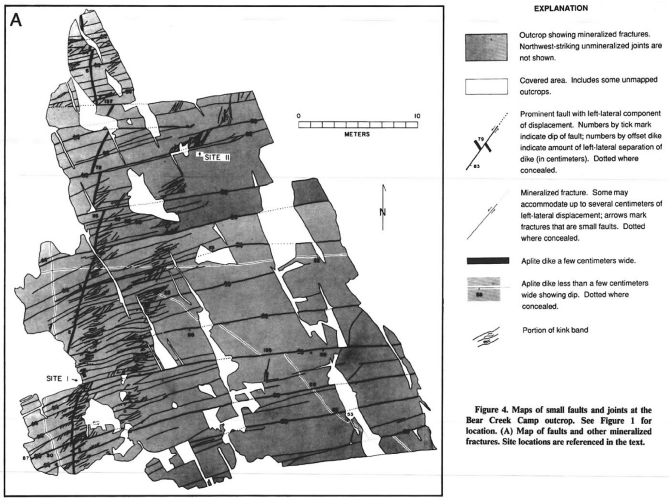


Figure 4. Maps of small faults and joints at the Bear Creek Camp outcrop. See Figure 1 for location. (A) Map of faults and other mineralized fractures. Site locations are referenced in the text.

4. MAPS

II Why make geologic maps?
- A Documentation of structural geometry (and sequence of events)
- B To force us to look closely; maps act like a tool for observation
- C Pattern recognition at a useful and appropriate scale. Many structures are too large or outcrop is too poor to see otherwise.
- D To develop conceptual models for kinematic and mechanical reconstructions of how structures form
- E To help define boundary conditions for mechanical models (e.g., at the boundaries of igneous intrusions)

4. MAPS

III Construction of maps
- A Establish control points on ground and map
- B Transfer geologic information at or near control points to map
- C Link information between control points

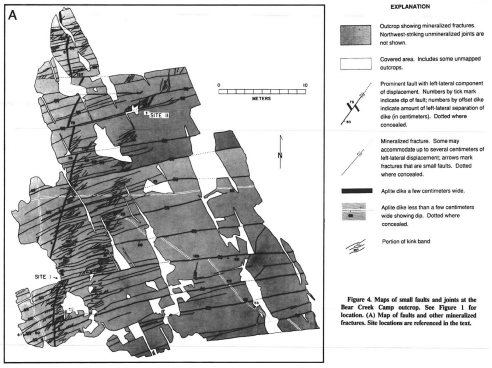


Figure 4. Maps of small faults and joints at the Bear Creek Camp outcrop. See Figure 1 for location. (A) Map of faults and other mineralized fractures. Site locations are referenced in the text.

4. MAPS

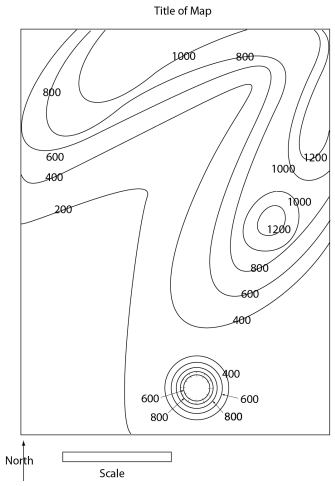
IV Contour maps: Maps that represent surfaces in terms of a series of curves

A An individual contour represents a part of the surface along which the surface "value" is constant.

B Topographic contour map: contour lines represent points of equal elevation of the ground surface.

1 **Streams flow downhill** (contours vee upstream)

2 Contours for a ridge "point" down the ridge



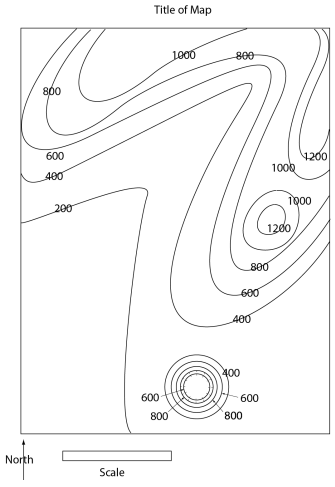
4. MAPS

C Structure contour map: contour lines represent points of equal elevation along a geologic surface (e.g., the top of a geologic unit) that commonly is buried. If the values of a structure contour map are subtracted from the values on a corresponding topographic map, the difference gives the depth from the ground surface to the top of the geologic unit.

D Isopach contour map: contour lines represent points of equal thickness of the geologic unit

E Given a data set (x, y, z), one can prepare a contour map of z (e.g., concentration of contamination in ground water) vs. (x, y)

- See last page in notes of Lec. 4 -

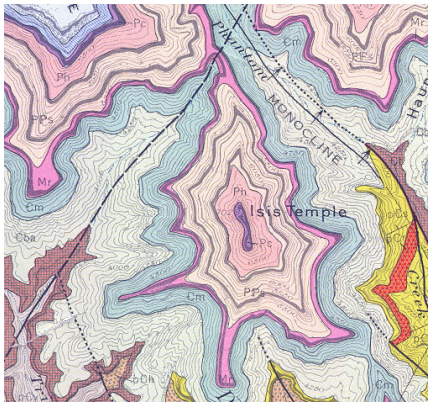


4. MAPS

V Introduction to geologic map patterns

A Geologic maps show the intersection (**trace**) of geologic features with the ground surface, a surface that is generally subhorizontal but irregular (i.e., with 3-D relief).

B Geologic maps are <u>not</u> top views of subsurface features as projected into a horizontal plane.

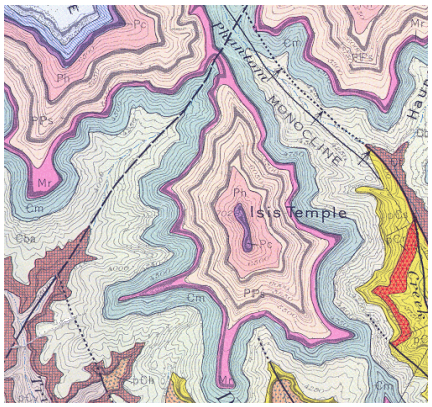


http://facweb.northseattle.edu/tbraziunas/geol101tb_partial/images/bright6a.gif

4. MAPS

V Introduction to geologic map patterns

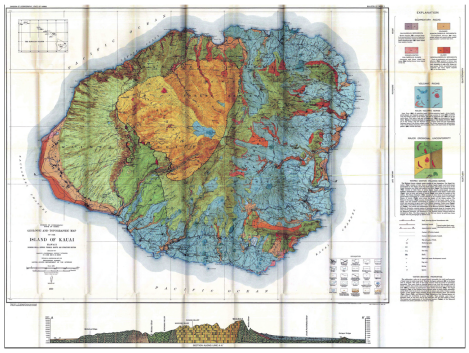
C The strike of a geologic surface is obtained by determining the azimuth between two points on the geologic surface that have the same elevation (i.e., that lie along the intersection of the geologic surface and a horizontal plane).



4. MAPS

V Introduction to geologic map patterns

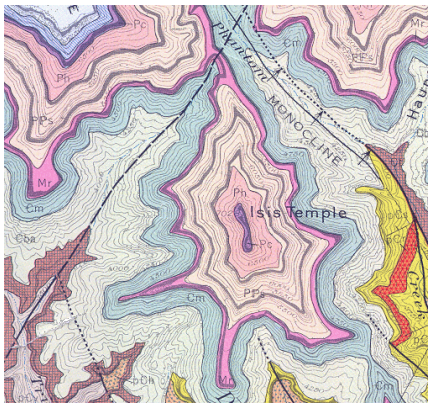
D A strike view cross section is taken perpendicular to the strike of a geologic body. It shows the true dip and true thickness of the body.



4. MAPS

V Introduction to geologic map patterns

E The contacts of horizontal layers parallel elevations contours.

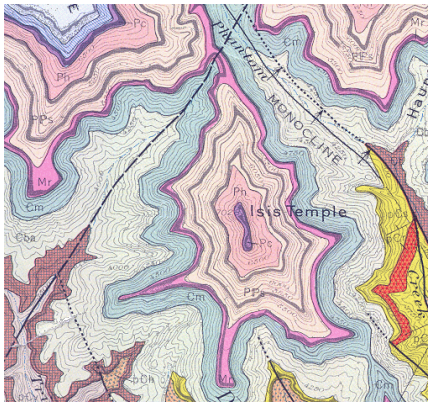


http://facweb.northseattle.edu/tbraziunas/geol101tb_partial/images/bright6a.gif

4. MAPS

V Introduction to geologic map patterns

F The contacts of vertical geologic surfaces appear as straight lines on geologic maps with a topographic base.



http://facweb.northseattle.edu/tbraziunas/geol101tb_partial/images/bright6a.gif

4. MAPS

```
% Matlab script for producing contour map examples
x=-2:0.2:2;                     % Values of x range from –2 to +2;
y=-2:0.2:2;                     % Values of y range from –2 to +2;
[X,Y]=meshgrid(x,y);            % Makes grid of x and y at each point;
Z=(peaks(X,Y));                 % Matlab's "peaks" function;
clf                             % Clears any prior plots;
subplot(2,2,1)                  % First plot of 2 rows and 2 columns
Surf(X,Y,Z);                    % 3-D perspective plot;
xlabel('x')                     % Labels the x-axis as 'x';
ylabel('y')                     % Labels the y-axis as 'y';
title('Surface Plot of the Peaks Function')
subplot(2,2,2)                  % Second plot of 2 rows and 2 columns;
c= contour(X,Y,Z);              % Calculates the contour line positions;
clabel(c)                       % This plots and labels the contour map;
xlabel('x')
ylabel('y')
title('Contour Plot of the Peaks Function')
[DX,DY] = gradient(Z, 2, 2);
subplot(2,2,3)                  % Third plot of 2 rows and 2 columns;
contour(X,Y,Z)
hold on                         % Allows arrows to plot on contour plot;
quiver(X,Y,-DX,-DY);            % This plots the arrows;
colormap hsv                    % Assigns the hsv color scheme to plot;
grid off                        % Turns off plotting of grid;
hold off
xlabel('x')
ylabel('y')
title('Contour Plot and Negative Gradient of Peaks Function')
subplot(2,2,4)                  % Fourth plot of 2 rows and 2 columns;
contour(X,Y,Z,[0 0])            % Plots one contour line (here it's 0);
xlabel('x')
ylabel('y')
title('Zero Contour of Peaks Function')
```