Relief depiction

Depiction of relief/terrain/topography is more complex than other elements

Relief / terrain / topography

- a third dimension (height) that varies continuously over space
- has several components: e.g. height, slope, shape, aspect
- can be depicted using: points, lines, or areas (~ 10 options)
- they vary in how effective they are visually / quantitatively
- Often the major visual map component and affects the other elements

1. Sugar loafs

Idealized depictions from a side or oblique view; the only form of topography on maps pre-1800

Sugar Loaf, Rio de Janeiro

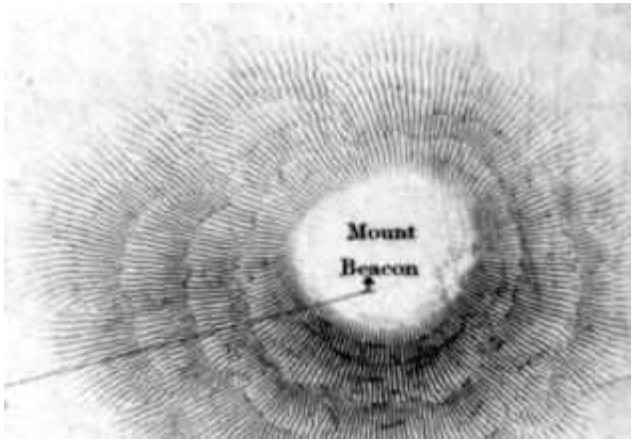
A sugarloaf was the traditional shape of sugar in the eighteenth century: a semi-hard sugar cone that required a sugar axe or hammer to break up

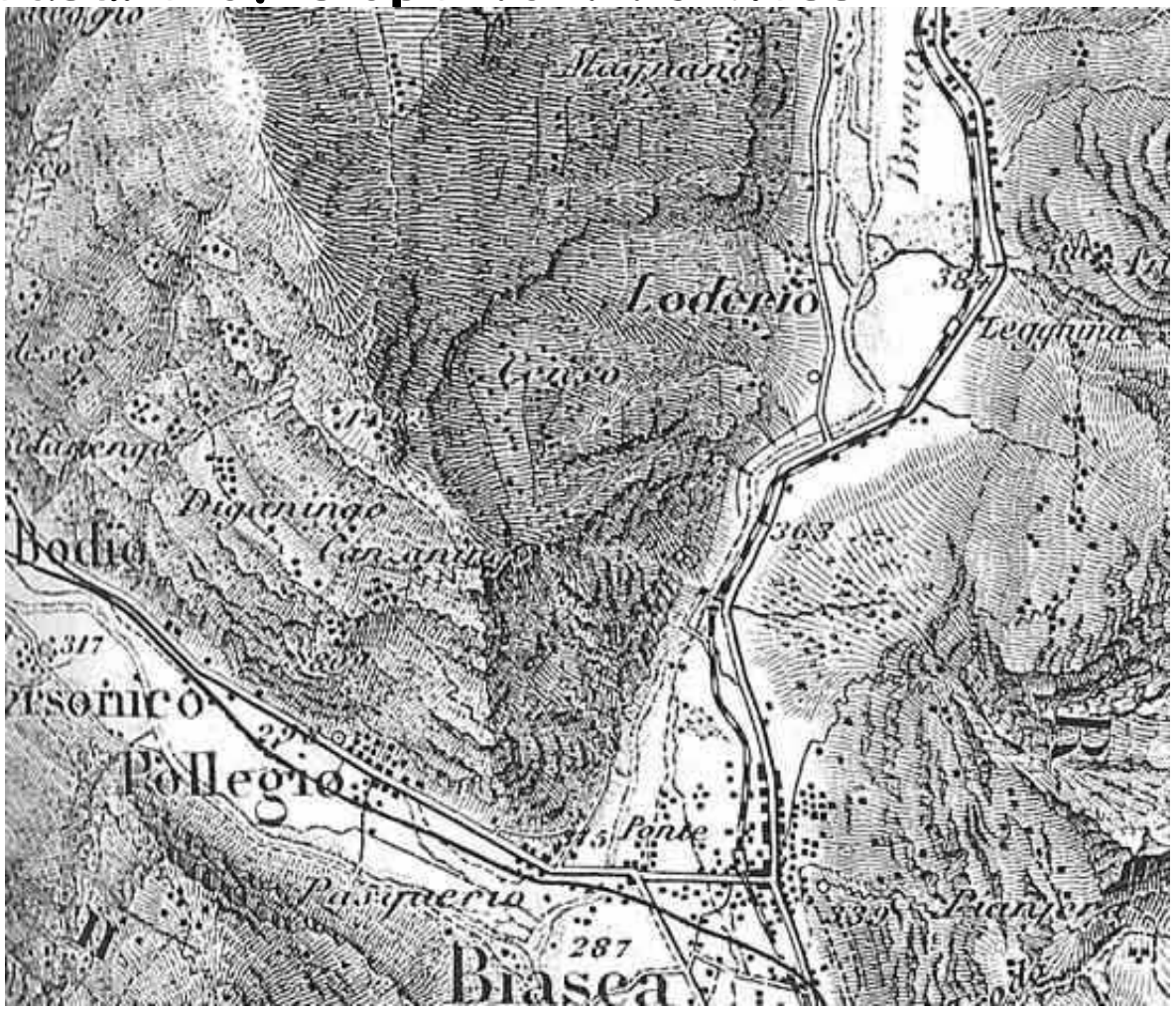
Modern use of sugar loafs: when only a rough idea of hills/mountains is needed

2. Hachures

- **lines of varying width and length**, drawn along steepest slope.
- main type of relief depiction through the 19th century, no exact heights
….. In 1800 only 50 mountain heights were plotted worldwide

Oblique illumination could be added for more visual effect – but losing a direct measure of slope to thickness





Disadvantages of hachures

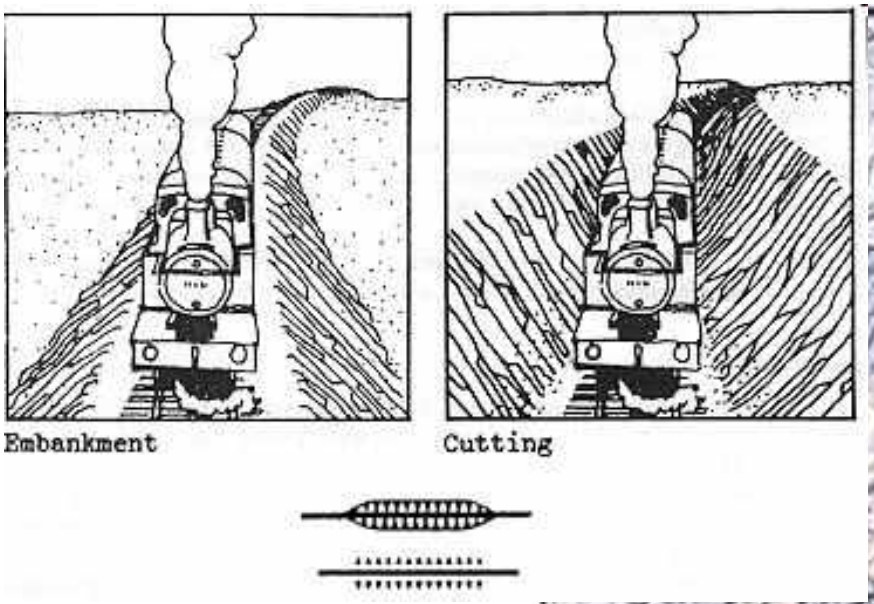
- time-consuming to produce, obscures other information
-not very effective except in mountainous terrain
- 'figure' more than 'ground'

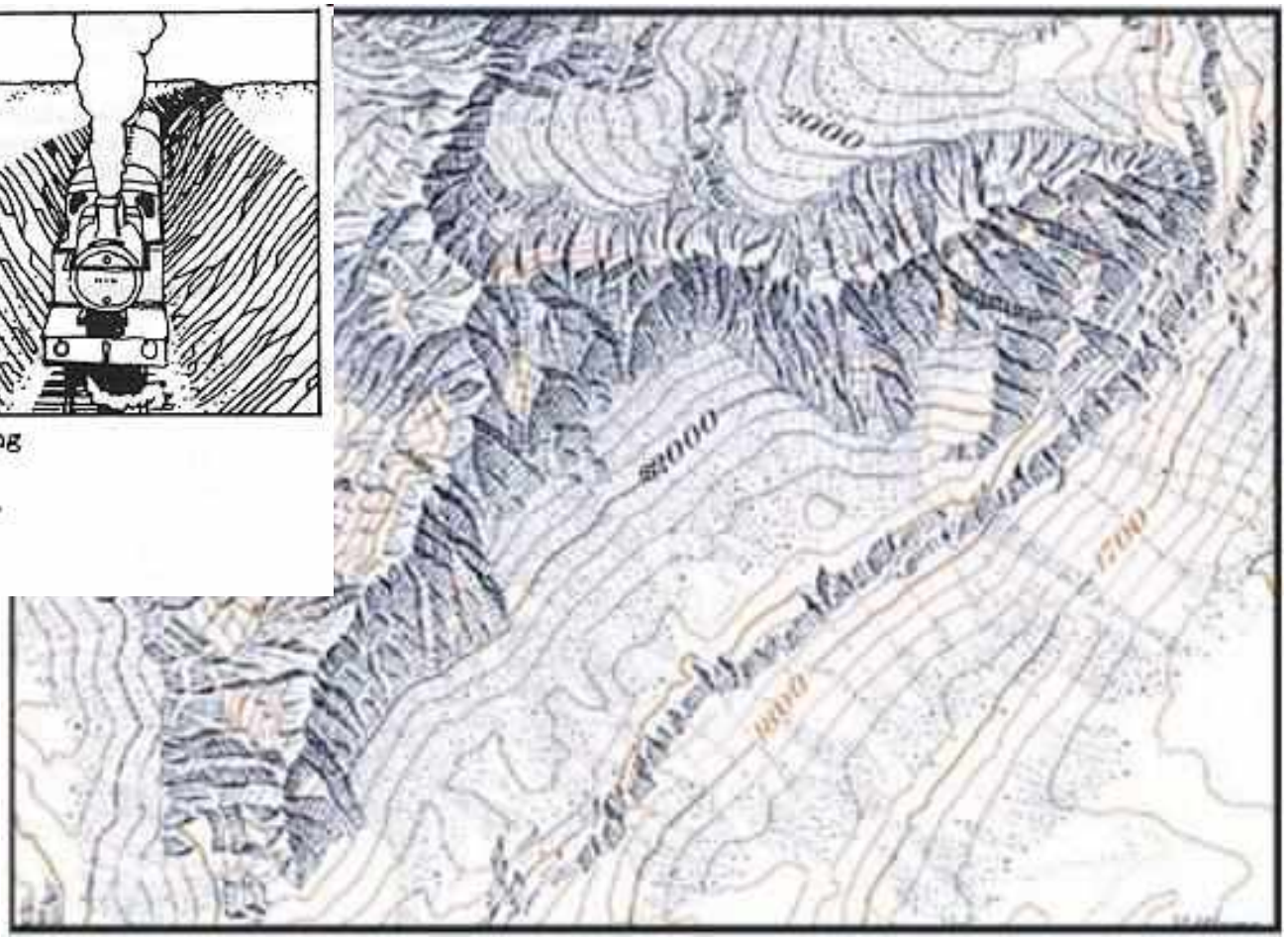
Continuing use of hachures

Steep enbankments

Mountain cliffs

http://www.richardphillips.org.uk/maps/symbols.html





http://www.gitta.info/TopoCart/en/html/ContTopo_learningObject2.html

3. Spot heights ……after 1800

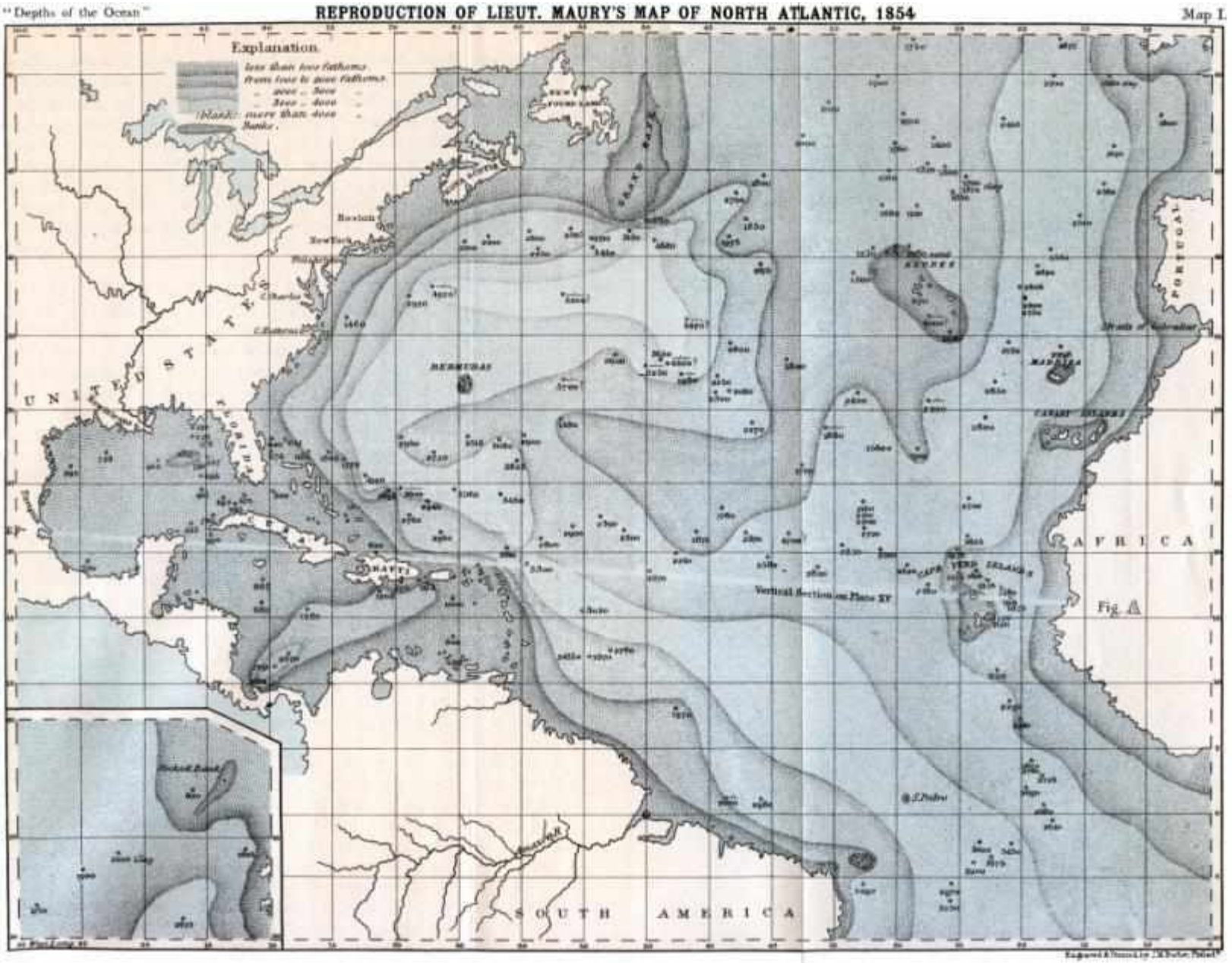
exact elevations enabled by surveying

A base for mapping - next slide

not an effective display method

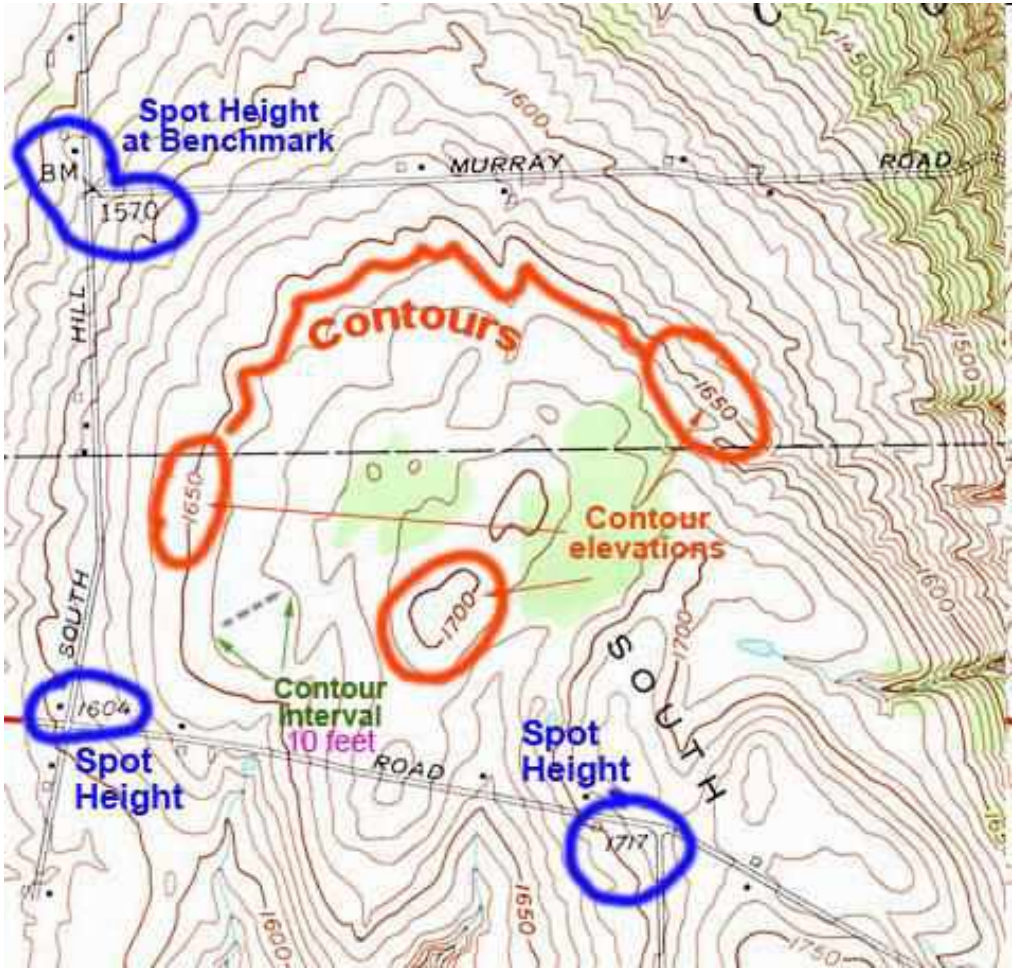
.205 .203 .255 .235 .217 .220 .309 .208 .243 .311 .339 .344 .306 .270 .274 .330 .290 .308 .270 .290 .244 .202 .212

4. **Contours:** e.g. bathymetric contours (1854) - isobaths



Accurate surveying of elevations in Canada was developed in the late 19th century, and contouring became common through the 20th century.

A contour is a type of **isoline (isohype)** : line of equal elevation values



- Index contours – every 5th contour
- Supplemented with spot heights

Contours mapped from Surveying and stereo-aerial photography

http://ublib.buffalo.edu/libraries/asl/maps/cat/images/contours-spot.jpg

NTS Contour Intervals: - Normal, Hilly, Steep

1:50,000 = 10, or 20, or 40m ; 1:250,000: 50, or 100, or 200m

Kechika 94L 1:250,000 -> Contour interval = 500 feet (pre-metric version)

Advantages of contours

- the most quantitative manual method
- Effectively stores elevation heights
- Needed for engineering, planning etc.
- the origin for other techniques
- now familiar to many users

1:50,000 Horseshoe Bay, BC

Disadvantages

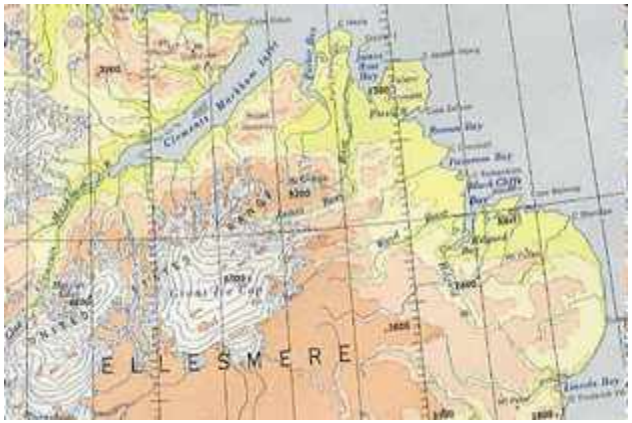
- abstract - no lines on the ground
- less visual, depends on: contour interval, landscape, user experience.

These disadvantages were recognized early on and led to other methods

…

5. Hypsometric Tints

- The addition of colour to elevation ranges
- first tried as early as 1830
- a logical sequence, realistic colours
- the darkest enables readable text

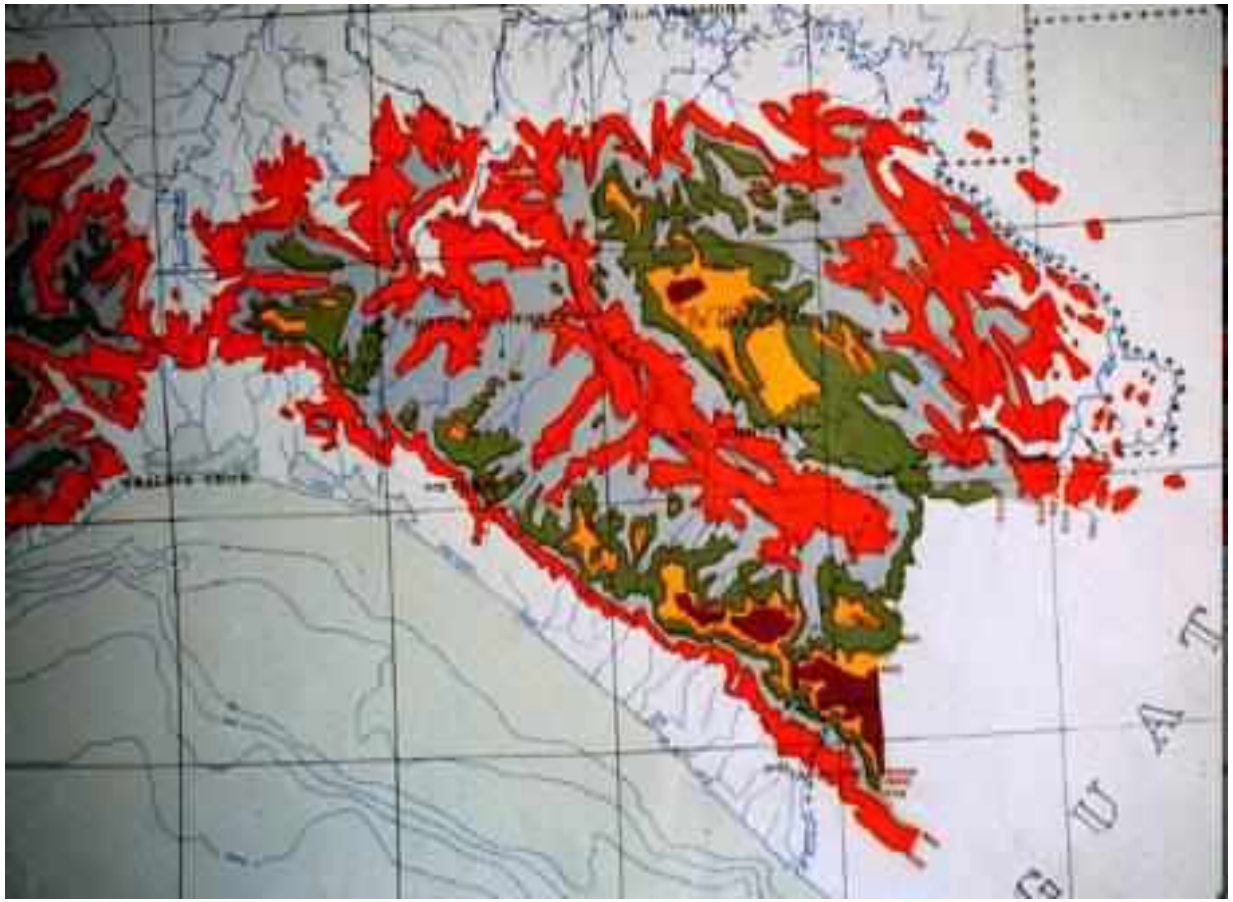


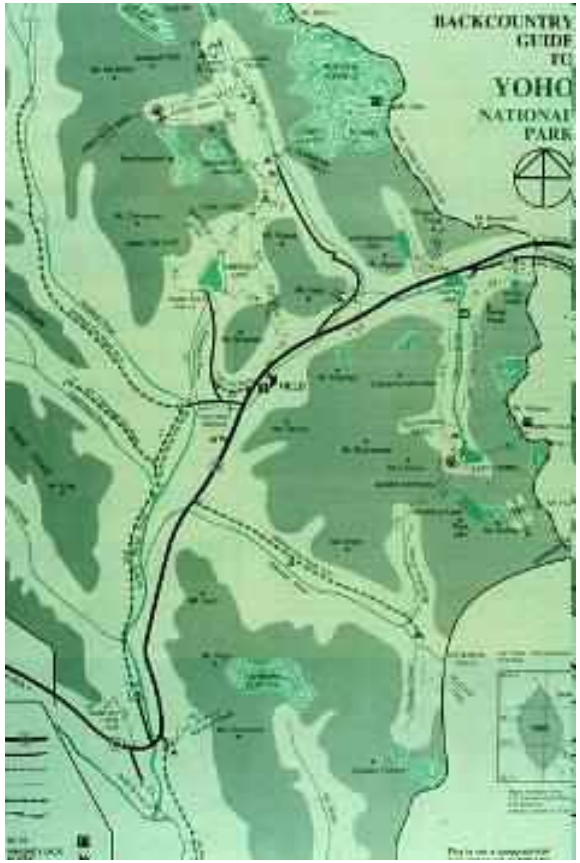
Advantage: adds visual impact at small scale; easily understood

Disadvantages

- exaggerated terrace effect, no new 'information' is added,
- differential contrast with other elements
- mixed color associations, (green= forest, etc.) - can't show forest !

- which colour scheme?.. NOT the one below

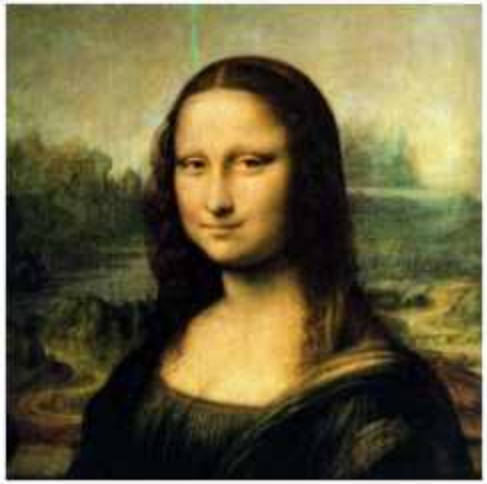


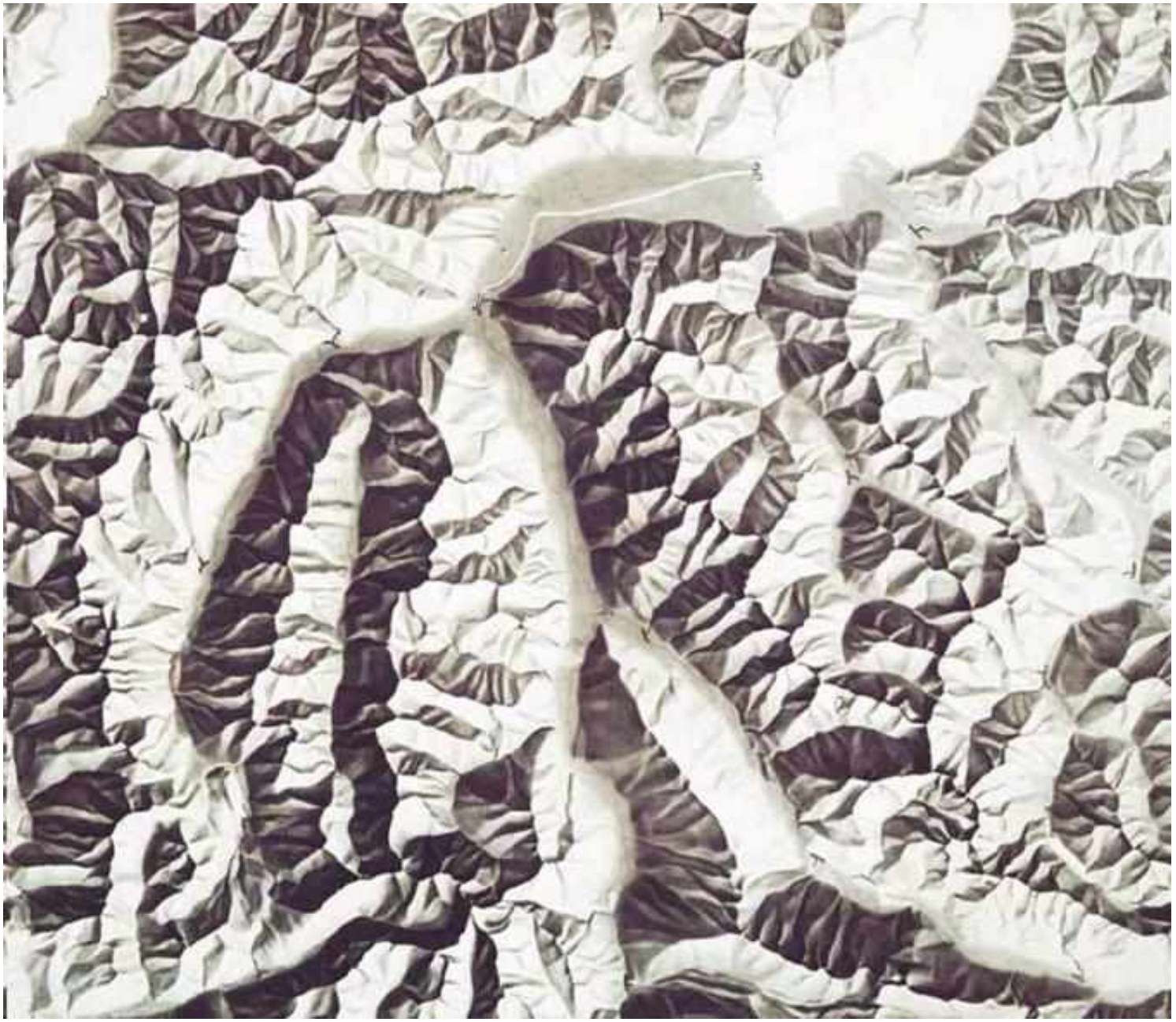


Gray here = > 2000m

6. Shaded relief (hillshading)

The addition of shadows to give the illusion of depth, with a NorthWest light source (at ~45 degrees elevation). - introduced in the late 1800s





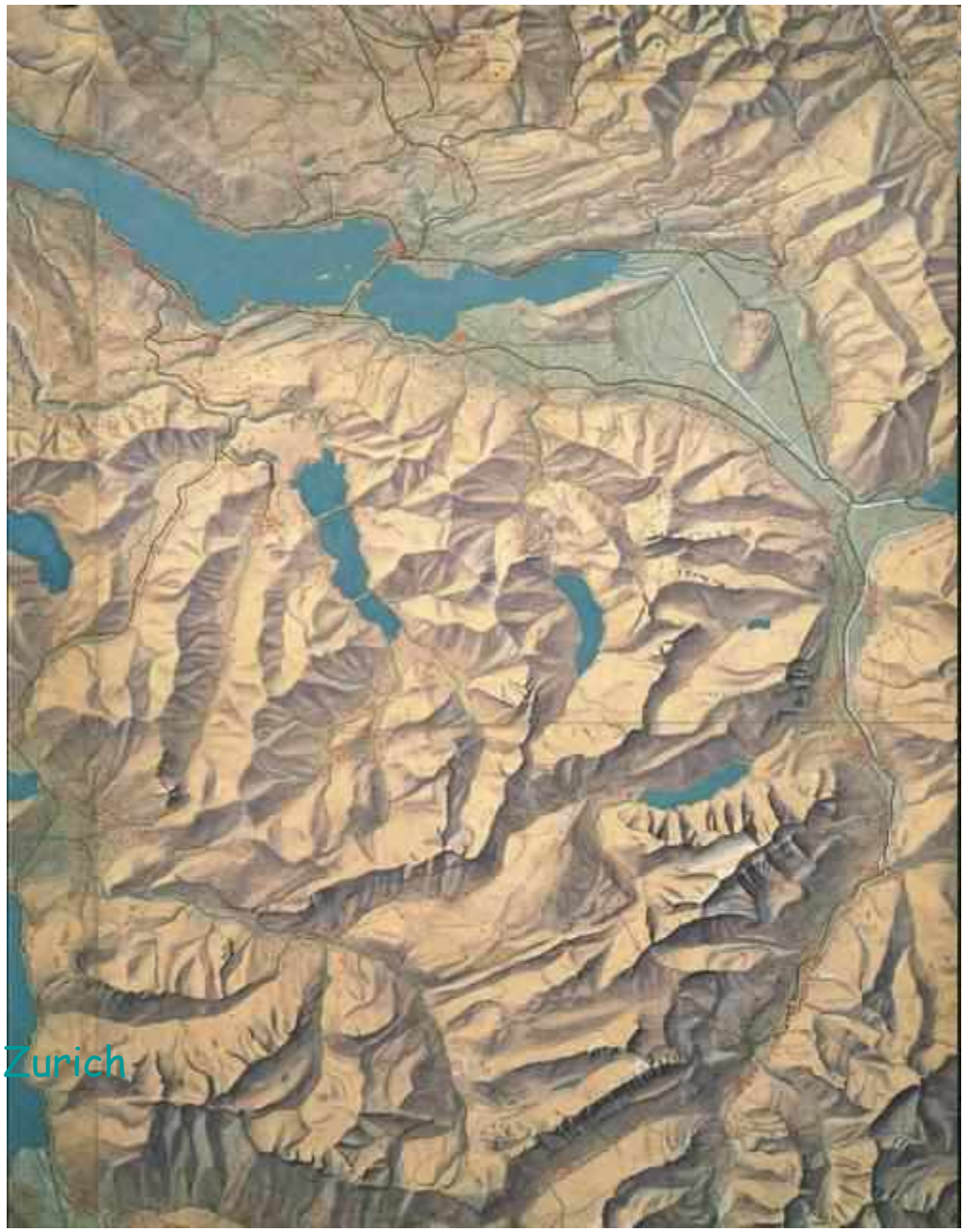
'pseudoscopic inversion'- with light from SE / bottom right

Eduard Imhof

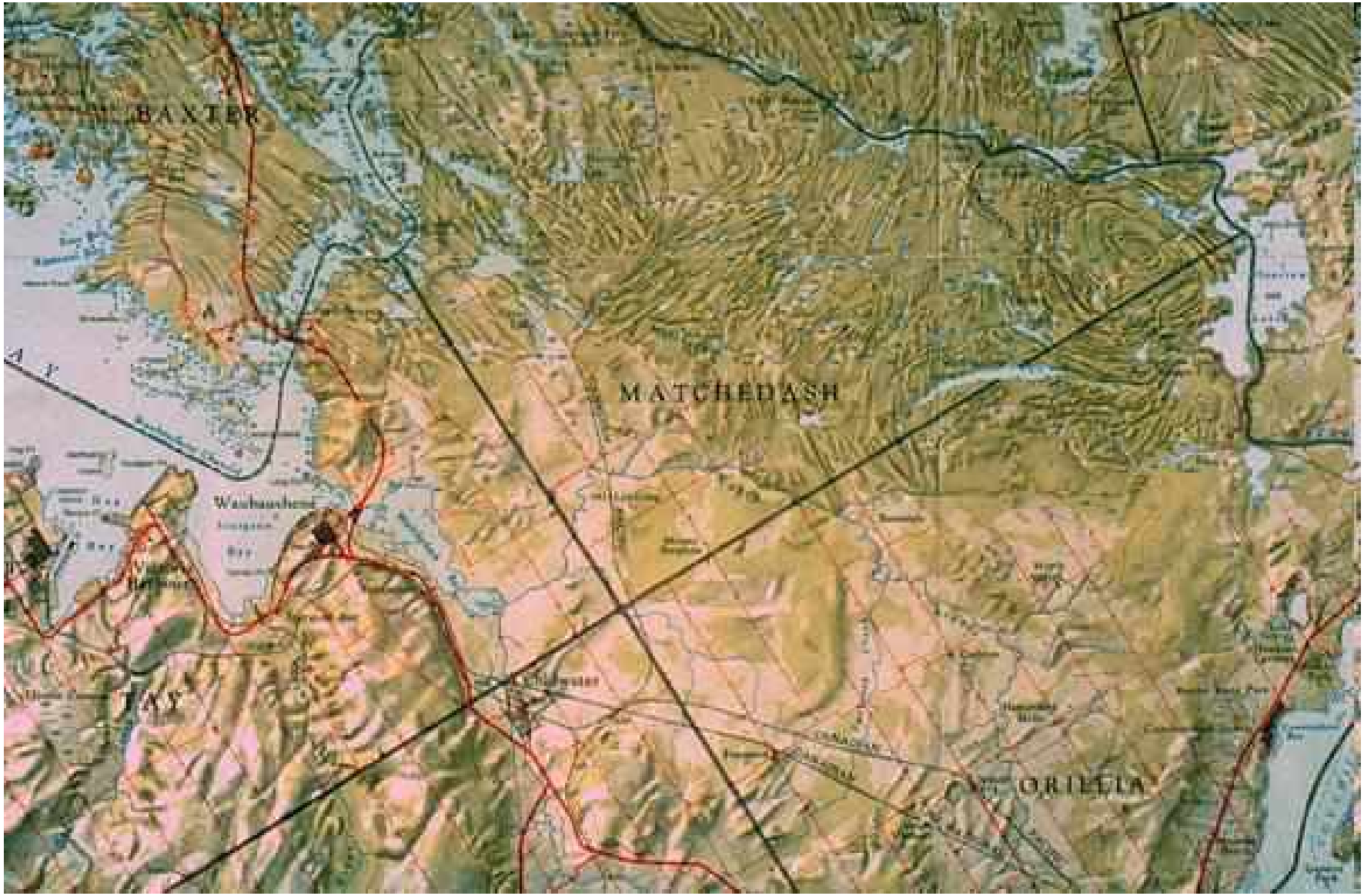
Manual hillshading

Eduard Imhof (1895-1986) was a professor of cartography at the Swiss Federal Institute of Technology Zurich 1925 - 1965.

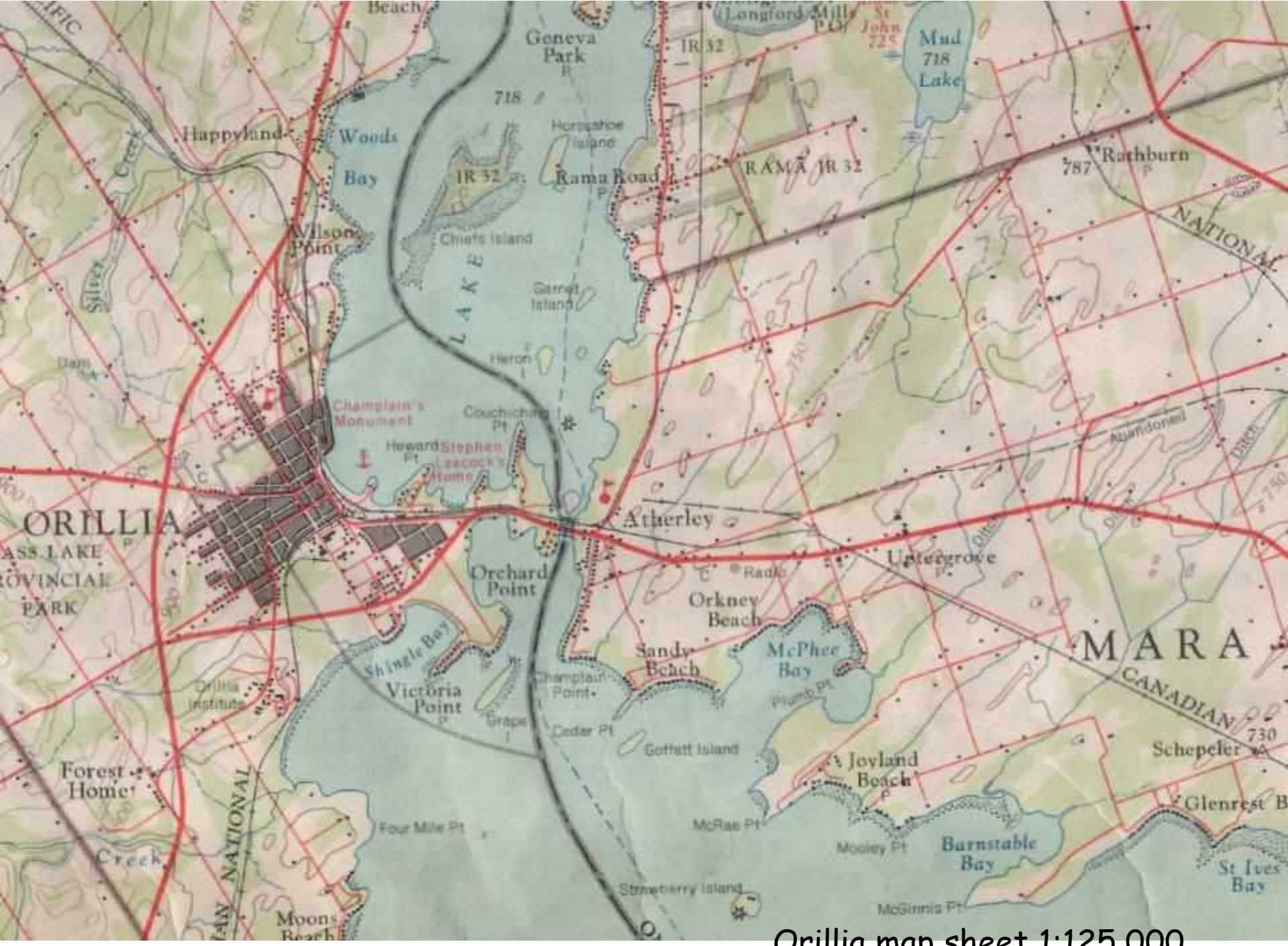
Produced with pencil or airbrush



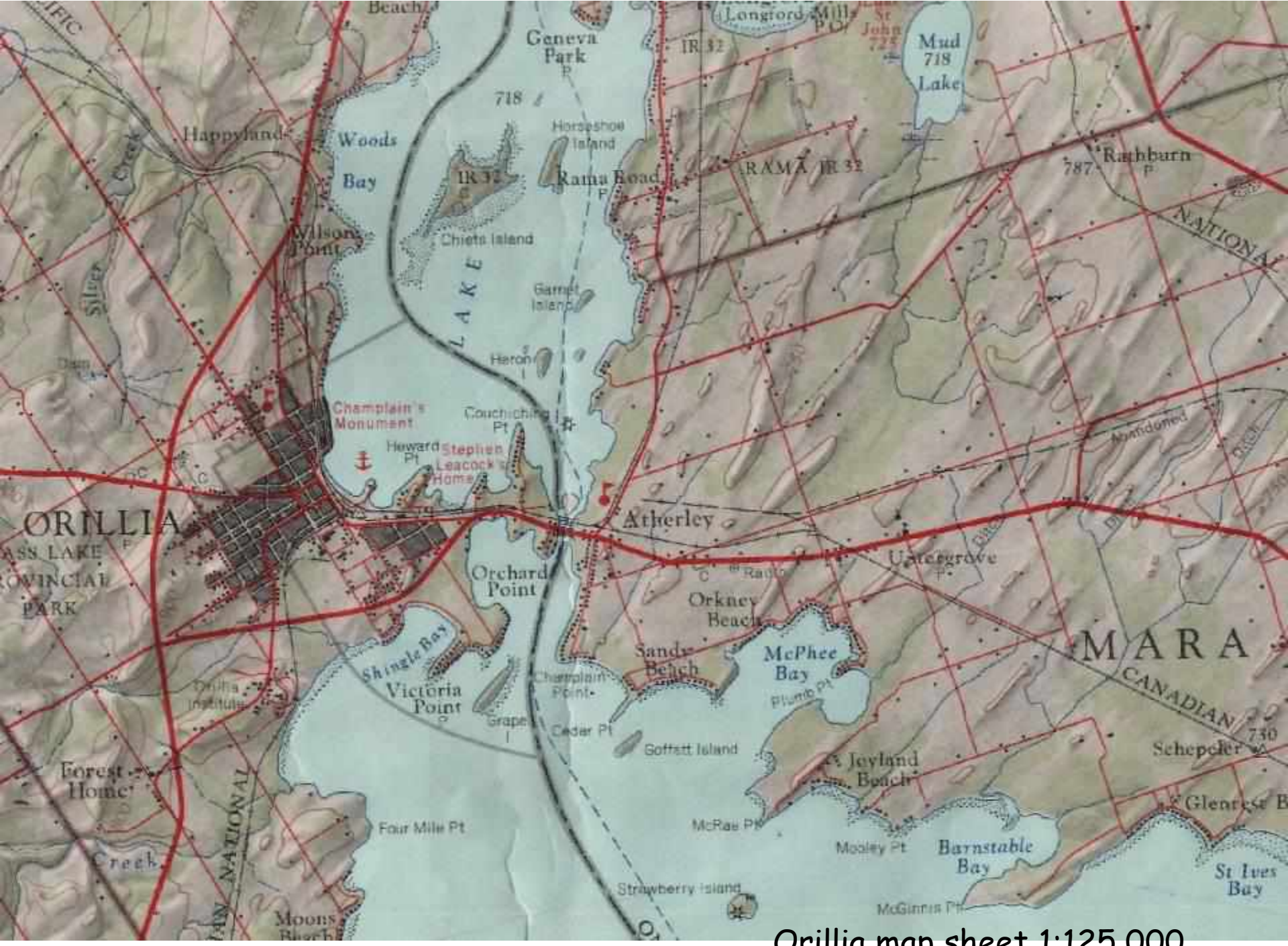
Ontario, 1:125,000 ~1970 Manual shading (airbrush)



Swiss shading experts imported to teach Canadian cartographers



Orillia map sheet 1:125,000



Orillia map sheet 1:125,000

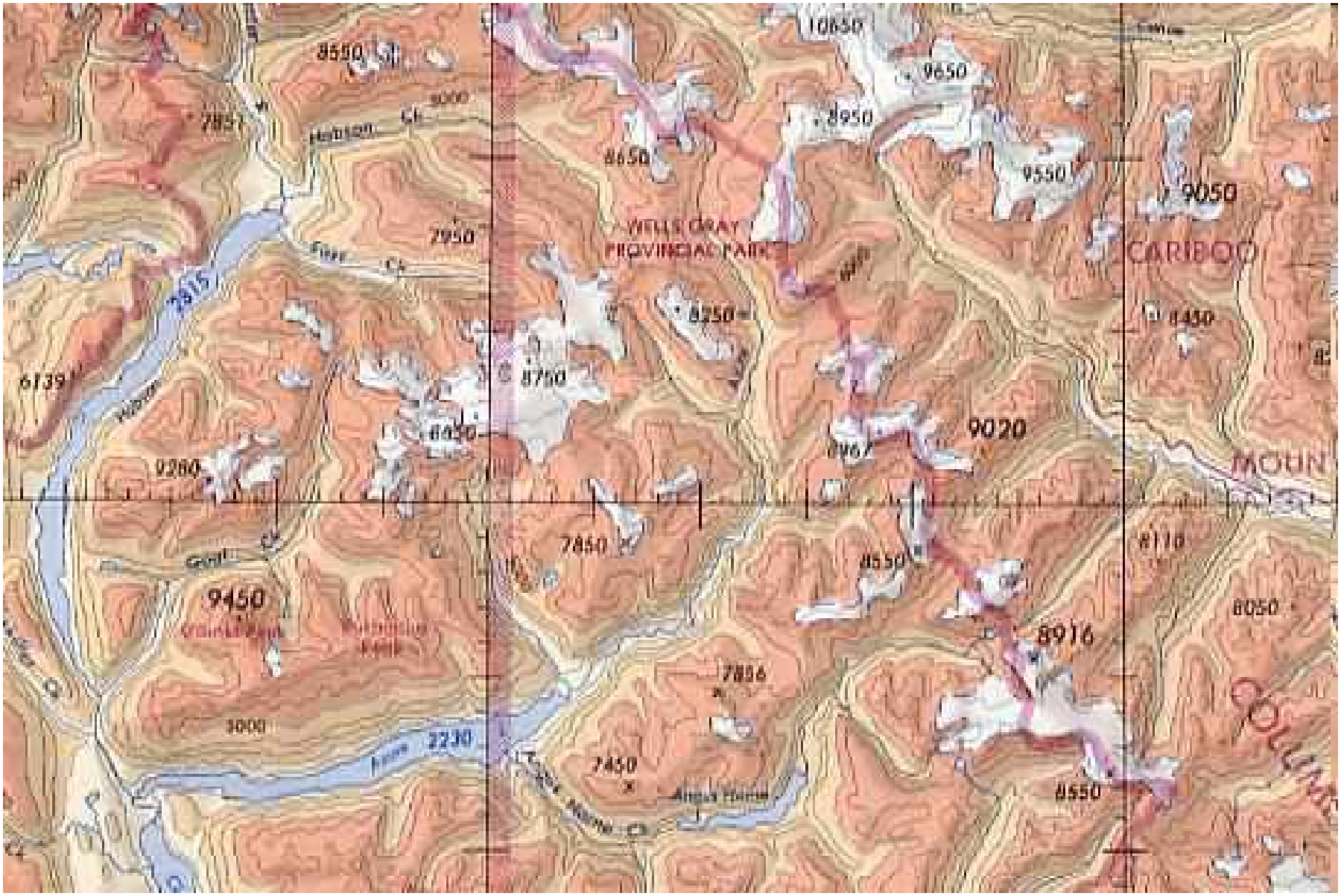
Advantages

- show detail / character of landscape
- Highly visual, continuous in appearance
- 'Ground' quality for other map layers

Disadvantages

- required artistic creation with pencil or air brush
- Costly: 100 hours / square foot .. often poorly rendered
- some slopes can be dark (SE slopes), and hide other details
- no actual quantitative information e.g. elevations

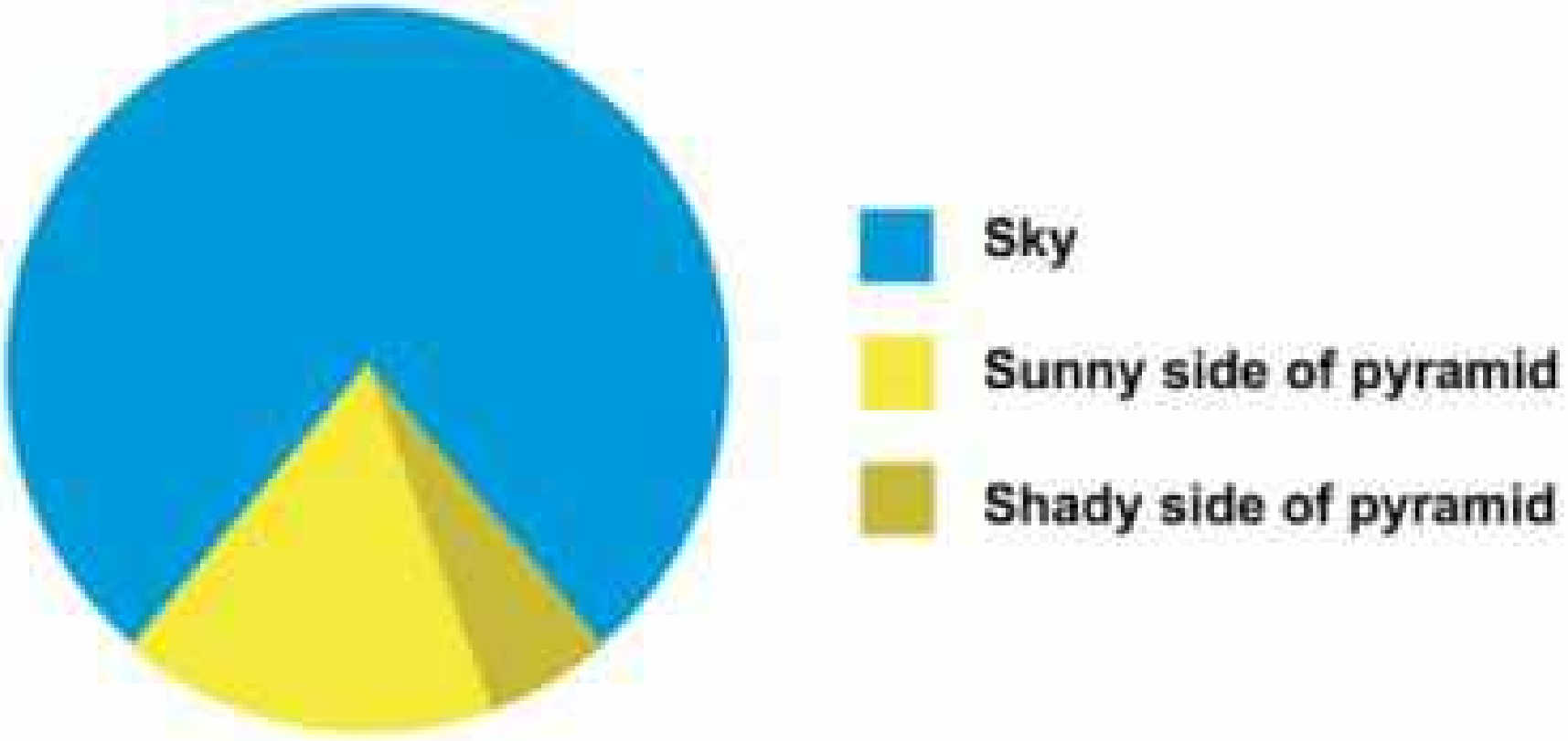
BC aeronautical map, 1:500,000 – contours, tints, shading and spot heights



All 4 methods needed for safe aviation – visual and quantitative

Relief humour: ☺

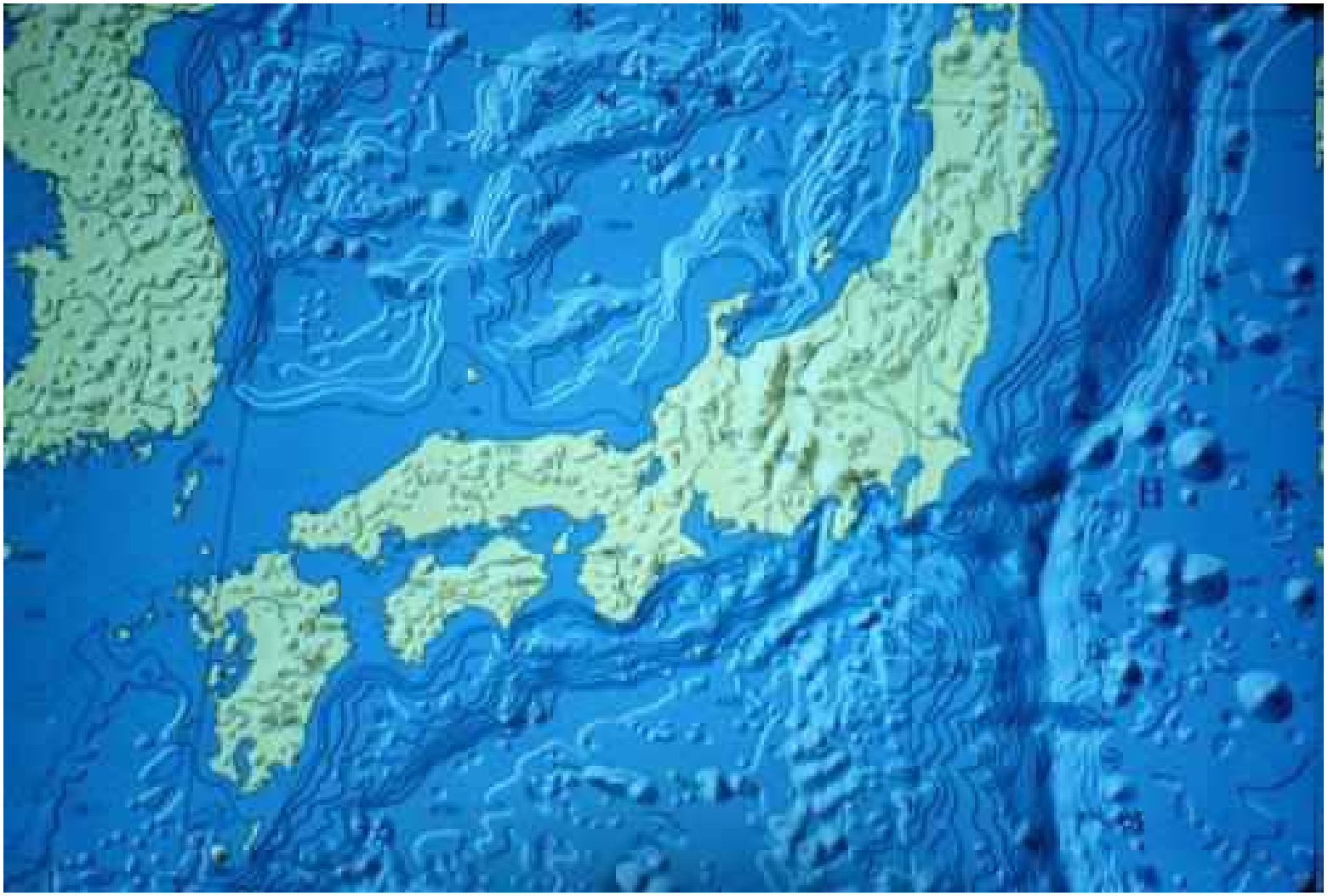
Pie chart for shaded relief / hillshading

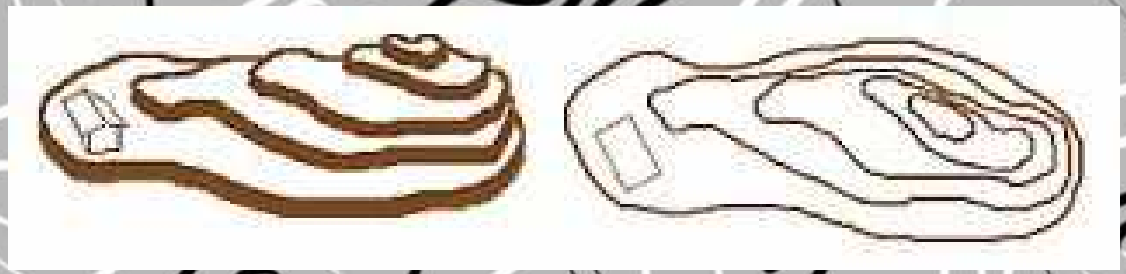


7. Tanaka 'illuminated' contours

-pioneered in the 1950s by Kitiro Tanaka applying shading theory to contours.

-NW light source, white and black lines, variable width





Advantages

- visual and quantitative; unlike shading, did not require artistic ability

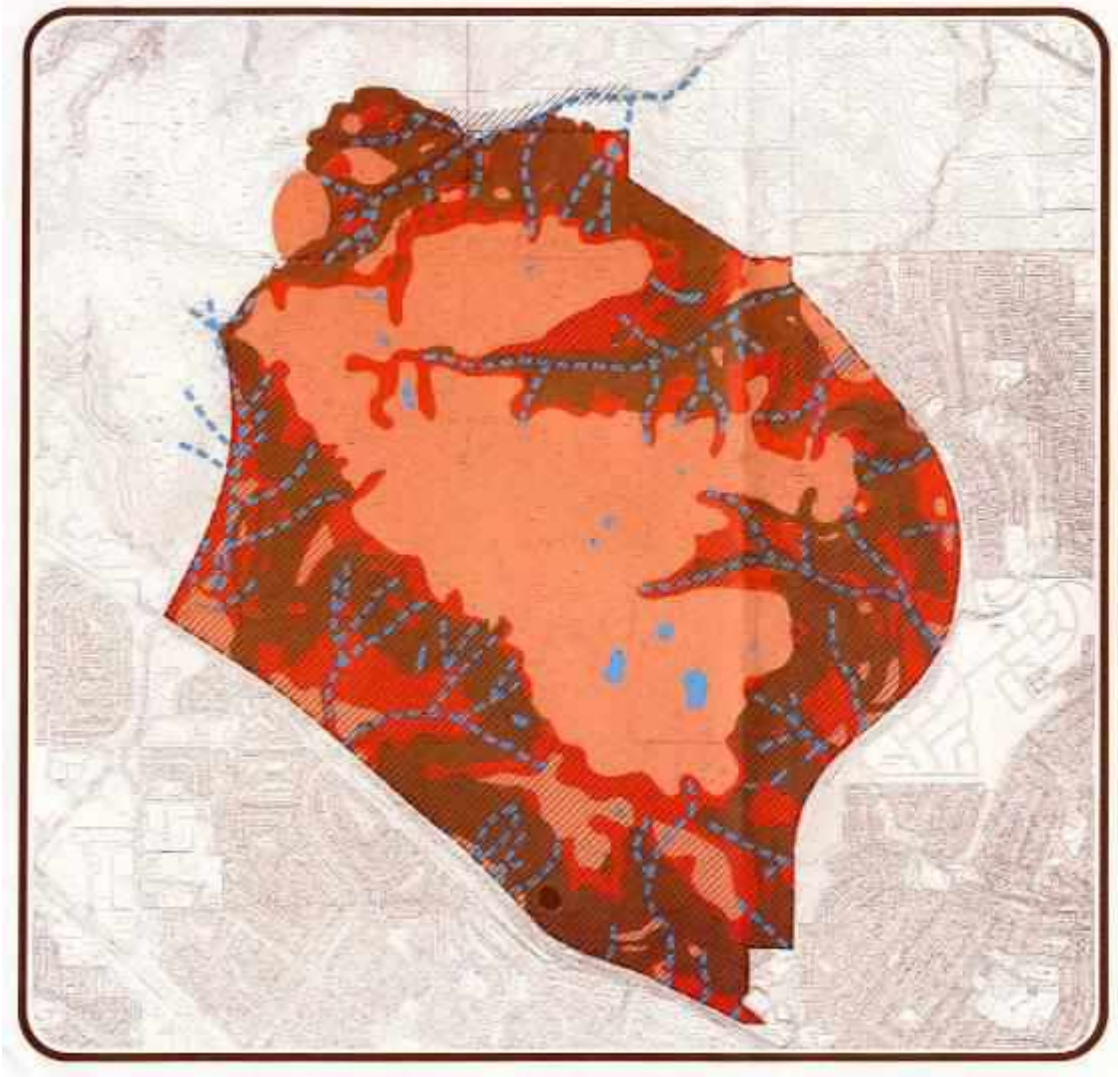
Disadvantages

Requires a non-white background; visually exaggerates terracing

Stronger 'figure', less 'ground' versus shaded relief

8. Slope zones (example: Nose Hill Park, Calgary)

Not common, interpreted from contour maps - show the importance of slope in affecting human land use
(similar to Cranbrook Hill) – not used widely



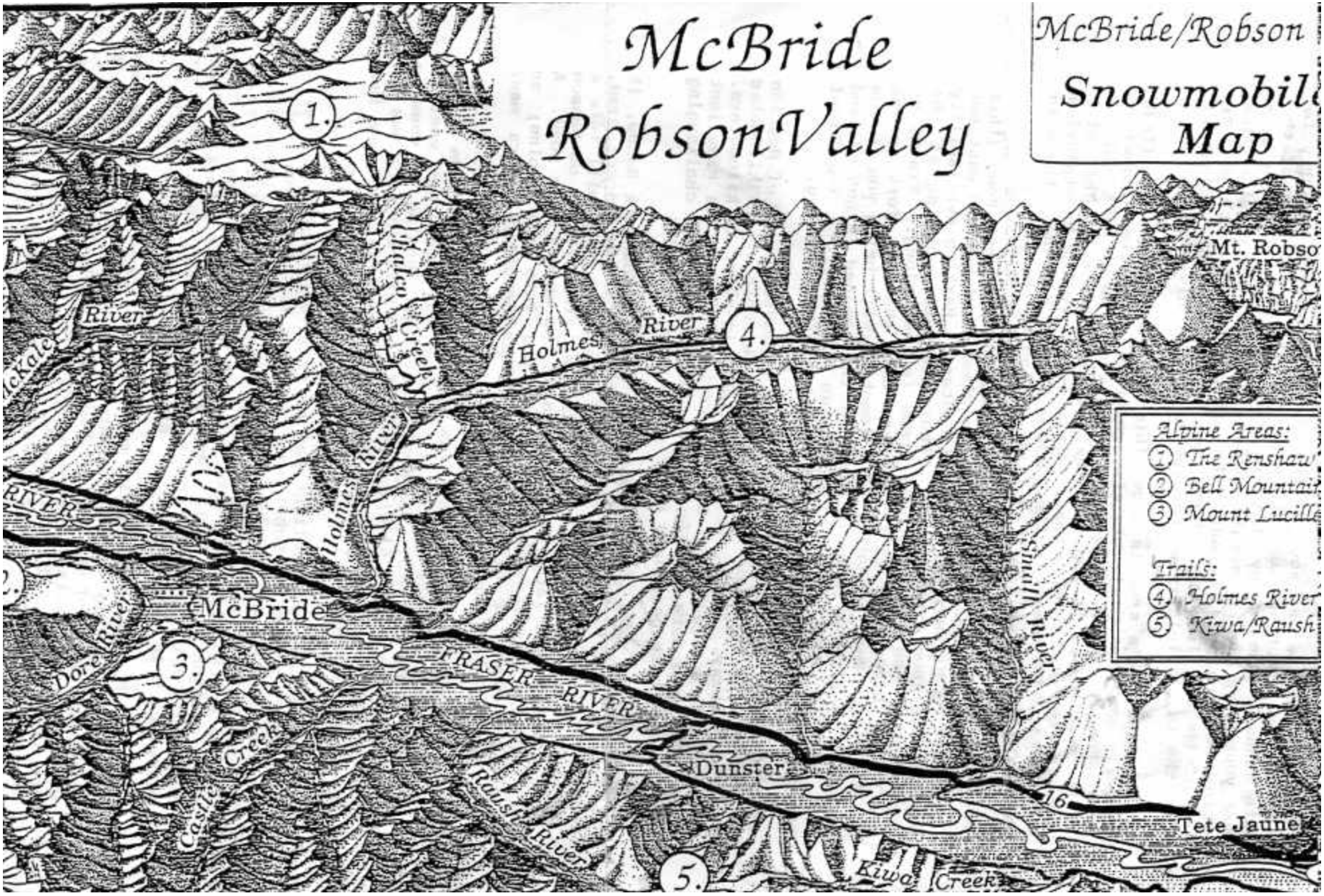
9. '3D' perspectives (2.5D, not true 3D)

Advantage: the most visual portrayal of landscape

Disadvantages: time-consuming; needs artistics, no consistent scale

Perspectives: Ski and tourism 'graphics' (no fixed scale)

'Interesting' local example … sugar-loafs meet skidoos and hobbits



10. 'true' 3D relief map (Plastic raised)

Truly 3D – takes up 3D space …

3D relief models (wood):

The world's largest map: Challenger map (1947-54) 25 x 25 m 1:50,000


Challenger map 'tile' displayed during 2010 Vancouver Winter Olympics for RCMP security operations. Otherwise, the map sits in a warehouse stored in sections

Summary of common relief depiction methods

TECHNIQUE	COMPONENT	FEATURES
Sugar loafs	shape	Simple, stylistic
Hachures	slope	much ink, no heights
Spot Heights	elevation	sporadic info
Contours	elevation	Heights, 'abstract '
Hyps. tints	elevation	Colour layers
Shaded relief	aspect	Visual, artistic
Tanaka	aspect	visual but 'noisy'
Slope maps	slope	uniform slope areas
3D perspectives	shape	visual, no fixed scale
Physical models	all	true 3D – takes up space