Evolution or Devolution of Cartographic Education?

Transformations in Teaching Cartographic Concepts and Techniques

Aileen Buckley
Cartographic Researcher, ESRI, Inc.
abuckley@esri.com
Terminology

**de-volve**  
[di-volv]  
Pronunciation Key - Show IPA Pronunciation  
verb, -volved, -volv-ing.

-verb (used with object)
1. to transfer or delegate (a duty, responsibility, etc.) to or upon another; pass on.
2. *Obsolete* to cause to roll downward.
-verb (used without object)
3. to be transferred or passed on from one to another: *The responsibility devolved on me.*
4. *Archaic* to roll or flow downward.

[Origin: 1375-1425; late ME devolven < L dévolvere to roll down, equiv. to dé- **DE-** + volvere to roll]

—Related forms

deva-lve-ment, noun

Dictionary.com Unabridged (v 1.1)  
This Knowledge Area addresses the complex issues involved in effective visual thinking and communication of geospatial data and of the results of geospatial analysis. This Knowledge Area reflects much of the domain of cartography and visualization, although some components can be found in others.

* University Consortium for Geographic Information Science
UCGIS* Body of Knowledge

CV Cartography and visualization

This Knowledge Area addresses the complex issues involved in effective visual thinking and communication of geospatial data and of the results of geospatial analysis. This Knowledge Area reflects much of the domain of cartography and visualization, although some components can be found in others.

* University Consortium for Geographic Information Science
CV1 History and trends
- CV1-1 History of cartography
- CV1-2 Technological transformations

CV2 Data considerations
- CV2-1 Source materials for mapping
- CV2-1 Data abstraction: classification, selection and generalization
- CV2-3 Projections as a map design issue

CV3 Principals of map design
- CV3-1 Map design fundamentals
- CV3-2 Basic concepts of symbolization
- CV3-3 Color
- CV3-3 Typography

CV4 Graphic representation techniques
- CV4-1 Basic thematic mapping methods
- CV4-2 Multivariate maps
- CV4-3 Dynamic and interactive mapping
- CV4-4 Representing terrain
- CV4-5 Web mapping and visualizations
- CV4-6 Virtual and immersive environments
- CV4-7 Spatialization
- CV4-8 Visualization of temporal geographic data
- CV4-9 Visualization of uncertainty

CV5 Map production
- CV5-1 Computational issues in cartography and visualization
- CV 5-2 Map production
- CV 5-2 Map reproduction

CV6 Map use and evaluation
- CV6-1 The power of maps
- CV6-2 Map reading
- CV6-3 Map interpretation
- CV6-4 Map analysis
- CV6-5 Evaluation and testing
- CV6-6 Impact of uncertainty
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Key
- Making maps
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- Making special types of map
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Key

Making maps
Making special types of map
Using maps
Evolution of cartography education

☐ Does it reflect this current content?
☐ What was the earlier content?
☐ How can we examine the evolution?
☐ My approach...
Course Evolution

- **Waldo Tobler** – Professor Emeritus of Geography at University of California, Santa Barbara
  - BA – 1956, U British Columbia & U Washington, Seattle
  - MA – 1958, U Washington, Seattle, Cartography
  - PhD – 1961, U Washington, Seattle

- **Phillip Muehrcke** – Professor Emeritus of Geography at University of Wisconsin, Madison
  - BA – 1964, Northern Michigan University, Geography
  - MA - 1966, University of Michigan, Geography
  - PhD - 1969, University of Michigan, Geography

- **Jon Kimerling** – Professor of Geography at Oregon State University, Corvallis
  - BA – 1972, University of Washington, Geography
  - MA – 1973, University of Wisconsin, Geography & Cartography
  - PhD – 1976, University of Wisconsin, Geography & Cartography

- **Aileen Buckley** – former Assistant Professor at University of Oregon in Eugene; adjunct Associate Professor at University of Redlands
  - BA – 1982, Valparaiso University, Geography
  - MA – 1992, Indiana University & Michigan State University, Geography & Cartography/GIS
  - PhD – 1997, Oregon State University, Geography & Geographic Techniques (GIS/Cart/RS)
Cartography classes over the years
Cartography classes over the years

Arthur Robinson
*The Look of Maps*
Cartography classes over the years

Waldo Tobler
- BA: 1956
- PhD: 1961

Arthur Robinson
- MA: 1958

The Look of Maps
Cartography classes over the years

Waldo Tobler  Phil Muehrcke


Arthur Robinson

The Look of Maps

Waldo Tobler
1952

BA 1956

PhD 1961 1966

MA

Phil Muehrcke
1966

MA

1964

BA

1969 1970

PhD
Cartography classes over the years

Waldo Tobler  Phil Muehrcke  Jon Kimerling


BA  PhD  MA  BA  PhD

1958  1972  1976

Arthur Robinson

*The Look of Maps*
Cartography classes over the years

Waldo Tobler  Phil Muehrcke  Jon Kimerling  Aileen Buckley

BA  MA  MA  BA  PhD  BA  MA

Arthur Robinson
The Look of Maps

BA  PhD  BA  MA  MA  PhD  MA  PhD  PhD
Waldo’s cartography classes

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Phil’s cartography classes

1964  □  Undergraduate degree (NMU)
   ■  Basic Cartography (Pat Farrell)

1966  □  Master’s degree (U MI)
   ■  Introduction to Photo Processing and Dark Room Methods (Waldo Tobler)
   ■  Photo Interpretation (can’t remember)
   ■  introduction to Map Projections (Waldo Tobler)

1969  □  Doctoral degree (U MI/U Sydney)
   ■  Seminars
Jon’s cartography classes

1972  Undergraduate degree (U WA)
      Map Interpretation
      Cartography
      Map Intelligence
      Map Production
      Computer Cartography (through Urban Studies)
      Map Projections (through Civil Engineering)

1973  Master’s degree (U WI)
      History of Cartography
      Map Design
      Seminars

1976  Doctoral degree (U WI)
      Seminars
      Remote sensing classes
# Aileen’s cartography classes

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<td>Seminars</td>
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<td>Seminars</td>
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<tr>
<td></td>
<td></td>
<td>GIS/remote sensing classes</td>
</tr>
</tbody>
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Current cartography classes

- U WA
  - Maps and GIS
  - Principles of Cartography
  - Map Sources and Errors
  - Analytical Cartography
Current cartography classes

- Map Reading and Interpretation
- Introduction to Cartography
- Problems in Cartography
- Graphic Design in Cartography
- Cartographic Methods in Research
- Introduction to Computer Cartography
- Map Transformations and Coordinate Systems
- Animated and Web-based Mapping
Current cartography classes

- OSU
  - Map and Image Interpretation
  - Cartography
  - Computer-assisted Cartography
  - Multimedia Cartography
Evolution of cartography education

☐ New content
Evolution of cartography education

- New content
- New ways to teach cartographic concepts and techniques
Evolution of cartography education

- New content
  - Web sites – tools for map makers
  - FAQs – users asking questions; experts providing answers

- New ways to teach cartographic concepts and techniques
  - Blog – “Web log”; blog owners posting content
  - Forum – user community exchange
  - Webcast – live, one hour, digitally recorded
  - Instructor-led course – presented by an instructor, face to face, 2-5 days
  - Virtual classroom – live, conference call, 3 days, ½ day classes
  - Online Web course – Web delivery of standard course content, “on your own”
  - Podcast – 10 minutes, focused, audio
Evolution of cartography education

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- New ways to teach cartographic concepts and techniques

- Examples
Welcome to Mapping Center

Mapping Center is about the use of ArcGIS in the graphic delivery of geographic information. Its goal is to help you make great looking maps by using the same cartographic concepts and techniques that professional cartographers use.

Current News Feeds

Set legend colors to match feature layer transparency

This question comes in fairly regularly at Ask a Cartographer future queries. This issue is a common one, and is the best level for the largest portion of our audience. The survey is only twelve...

FAQs – users asking questions; experts providing answers

Blog – “Web log”; blog owners posting content

Mapping Center Web Site

- About Mapping Center
- About the Mission Center

Mapping Center Blog

Announcements

Check out the presentations we made at the North American Cartographic Information Society (NACIS) conference this year. They are now on the Mapping Center Other Resources page.

Featured Map

ESRI Lunch Specials

The ESRI Lunch Specials Map was created to help attendees at the 23rd Annual ESRI International Users Conference find a place to eat lunch and get a special discount
EVOLUTION of cartography education

☐ New content

☐ New ways to teach cartographic concepts and techniques
DEVOLUTION of cartography education

- New content
- New ways to teach cartographic concepts and techniques
- New teachers/new audience
Web sites

- Tools for map makers
  - ColorBrewer.org
  - MapShaper.org
  - TypeBrewer.org
- Forum
  - CartoTalk.com
- Hybrid?
  - MappingCenter.esri.com
Web sites

- Tools for map makers
  - ColorBrewer.org (Cindy Brewer)
  - MapShaper.org (Mark Harrower)
  - TypeBrewer.org (Ben Sheesley)

- Forum
  - CartoTalk.com

- Hybrid ?
  - MappingCenter.esri.com
Printed ColorBrewer charts and RGB Excel file are available ... click 'updates' button (upper right)

This material is based upon work supported by the National Science Foundation under Grant No. 9983451, 9983459, 9983461
Printed ColorBrewer charts and RGB Excel file are available … click 'updates' button (upper right)

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Learn More: Legend Type

1. **Sequential schemes** are suited to ordered data that progress from low to high. Lightness steps dominate the look of these schemes, with light colors for low data values to dark colors for high data values.

2. **Diverging schemes** put equal emphasis on mid-range critical values and extremes at both ends of the data range. The critical class or break in the middle of the legend is emphasized with light colors and low and high extremes are emphasized with dark colors that have contrasting hues.

3. **Qualitative schemes** do not imply magnitude differences between legend classes, and hues are used to create the primary visual differences between classes. Qualitative schemes are best suited to representing nominal or categorical data.

These scheme types grow from the teaching of Dr. Judy Olson.

For more information:
(Figures are online).

Other cartography publications by Cynthia Brewer

Printed ColorBrewer charts and RGB Excel file are available... click 'updates' button (upper right)
Designing better MAPS
A Guide for GIS Users

Cynthia A. Brewer
About MapShaper

MapShaper is a free online editor for Polygon and Polyline Shapefiles. It has a Flash interface that runs in an ordinary web browser. MapShaper supports three line simplification algorithms: Douglas-Peucker, Visvalingam-Whyatt, and a custom algorithm designed to smooth convoluted coastlines and spiky features.

The MapShaper project was conceived in 2005 by Matthew Bloch and Mark Harrower at the University of Wisconsin, Madison Geography Department. A paper [pdf] from the 2006 AutoCarto conference describes how MapShaper works “under the hood.”

MapShaper is currently under development. This blog is intended to document the development process and let people test the latest version.

Enhanced Shapefile and EPS Output

September 5th, 2007

The latest online demo has expanded output options for map makers. MapShaper can now convert Polygon Shapefiles to Polyline Shapefiles and EPS files containing either lines or polygons. Converted Polyline Shapefiles contain an attribute field named “SHARED” that identifies those boundaries that are shared by two adjacent polygons. The polyline EPS output now uses a different color for shared and unshared boundaries.
TypeBrewer is a free help tool that gives non-specialist mapmakers a chance to explore typography in a semi-structured environment. It is not mapmaking software. Instead of providing the functionality of a graphic design program or GIS, TypeBrewer offers a quick and easy way to explore typographic alternatives and see the impact that various elements of type have on the overall look and feel of a map. TypeBrewer is designed for mapmakers who want to learn more about map typography and get practical design specifications for starting a map project.

TypeBrewer templates are based on sound typographic and cartographic principles, as well as best professional practices. They can be applied to a wide range of possible projects.

To use TypeBrewer, you'll need the Adobe Flash Player, version 8 or higher.
Formal templates can help contribute to a *formal* or *elegant* map look and feel.
Three ways to explore type: Size, Density, Tracking

These elements of map typography have an impact on legibility, help categorize and classify map features, create visual hierarchy, and change the overall look and feel of a map.

1) Size

Size plays a critical role in determining type legibility. It can also help to communicate the relative importance of features and, in some cases, be used to encode data (e.g., population values). If feature categories are to be distinguished by size, a difference of at least 2 points is necessary.

The size of type is most commonly measured in points (1 inch = 72 pts). Other measures include picas (12 pts = 1 pica), inches, millimeters, and pixels. Size refers to the height of a letter. For a given typeface, it is measured from the top of the capital letter to the bottom of the letter with the lowest descender. This is a holdover from metal type setting, in which all characters in a font had to fit on a slug of the same body size to ensure uniform printing. It is important to note that different typefaces at the same point size can have different heights. Point size alone should never be used to determine legibility.

24 pt Avant Garde Std  24 pt Adobe Jenson Pro

On the computer, type is rendered by converting points to pixels. Several factors can impact the size of type displayed on screen. The number of pixels per inch that one application (or operating system) uses to calculate height can differ from another. In other words, the same typeface at the same size can have different heights when viewed in different software. Most graphic design software uses 72 pixels per inch (ppi).
Resources in Print

Typography


Typography + Cartography


Resources on the Web

All TypeBrewer material copyright © 2006 by Ben Sheesley
HOW TO USE TYPEBREWER

Follow the 5 steps below:

1. **Select** a template that contains pre-made combinations of typefaces and styles
2. **Explore** ways of altering the template
3. **Get Specs** for all of the labels and other text in the template
4. **Compare** fonts in the template to each other and to the fonts on your computer
5. **Export** the template by downloading an Illustrator file or printing it with its specs
Web sites

- Tools for map makers
  - colorbrewer.org
  - mapshaper.org
  - typebrewer.org

- Forum - user community exchange
  - cartotalk.com

- Hybrid ?
  - MappingCenter.esri.com
Who is the community?

General

<table>
<thead>
<tr>
<th>Forum</th>
<th>Topics</th>
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Who is the audience?
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10,479 people visited this site

- **27,160 Visits**
- **10,479 Absolute Unique Visitors**
- **106,664 Pageviews**
- **3.93 Average Pageviews**
- **00:03:23 Time on Site**
- **48.39% Bounce Rate**
- **35.12% New Visits**

### Technical Profile

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<th>Browser</th>
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Have you received formal cartographic or map production education?
If so, what level of this education have you received?
CV1 History and trends
- CV1-1 History of cartography
- CV1-2 Technological transformations

CV2 Data considerations
- CV2-1 Source materials for mapping
- CV2-1 Data abstraction: classification, selection and generalization
- CV2-3 Projections as a map design issue

CV3 Principals of map design
- CV3-1 Map design fundamentals
- CV3-2 Basic concepts of symbolization
- CV3-3 Color
- CV3-3 Typography

CV4 Graphic representation techniques
- CV4-1 Basic thematic mapping methods
- CV4-2 Multivariate maps
- CV4-3 Dynamic and interactive mapping
- CV4-4 Representing terrain
- CV4-5 Web mapping and visualizations
- CV4-6 Virtual and immersive environments
- CV4-7 Spatialization
- CV4-8 Visualization of temporal geographic data
- CV4-9 Visualization of uncertainty

CV5 Map production
- CV5-1 Computational issues in cartography and visualization
- CV5-2 Map production
- CV5-2 Map reproduction

CV6 Map use and evaluation
- CV6-1 The power of maps
- CV6-2 Map reading
- CV6-3 Map interpretation
- CV6-4 Map analysis
- CV6-5 Evaluation and testing
- CV6-6 Impact of uncertainty

Key
- Making maps
- Making special types of map
- Using maps
Future Additions to Mapping Center

☐ The Cartographer’s Eye
  ■ Map critique

☐ Teaching Materials
  ■ Relief Representation
  ■ Basic Cartographic Design
The Cartographer’s Eye

The Cartographer’s Eye

- “This place looks an island with a lot of rivers.”
- “What do the arrows mean?”
- “What do their colors mean?”
- “I can’t see what’s happening in Florida.”
Teaching Materials

- Useful to teach a one-day workshop (university or anywhere) or to teach yourself
  - Lecture
    - PowerPoints with bottom notes
  - Labs
    - Data sets, styles, expressions, statements, .MXDs, step-by-step instructions, whatever is needed
Terrain Representation

- Morning – The Basics
  - Data
  - DEM Manipulation
  - Hillshading
  - Layer Tinting

- Afternoon - Advanced Topics
  - Advanced DEM Manipulation
  - Advanced Hillshading Techniques
  - Modifications to Layer Tinting
  - Bump Mapping
  - Vegetation
  - Illuminated Contours
  - Printing and Output

- Final Project

- Related readings
  - Imhof – *Relief Presentation*, with attention to selected sections
  - Tom Patterson – selected readings
  - Jeff Nighbert – Bump mapping
  - Kennelly and Kimerling – Tanaka’s illuminated contours
  - David Barnes – Swiss Hillshade
  - David Mark – MDOW hillshade
Basic Cartographic Design

- After Andrew Mundi’s Graphic Design
Evolution or Devolution of Cartographic Education?

Transformations in Teaching Cartographic Concepts and Techniques
Evolution AND Devolution of Cartographic Education

Continuing to Transform How We Teach Cartographic Concepts and Techniques
Evolution AND Devolution of Cartographic Education

Continuing to Transform How We Teach Cartographic Concepts and Techniques

- Evolution of cartography classes
- Devolution of cartography education
  - Methods, teachers, audience
Evolution AND Devolution of Cartographic Education

MappingCenter.esri.com

Aileen Buckley
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abuckley@esri.com