Planimeters in the Classroom

Amy Ackerberg-Hastings
Smithsonian’s National Museum of American History (NMAH)
University of Maryland University College
aackerbe@verizon.net

Wichmann Model 1192 Compensating Polar Planimeter, about 1930
NMAH cat. no. 1986.0316.06
Neg. no. DOR2011-5269.jpg
Operating a Planimeter

Amsler Type 2 Polar Planimeter, Sold by Crosby Steam Gage & Valve, 1880s
NMAH cat. no. 318485, Neg. no. 73-1252.jpg
Evolving Uses of Planimeters

- 19th century: Mapping/Surveying, Engineering Drawing/Architecture, Maintenance of Steam Engines and Other Machines

- Around 1900: Mathematics Teaching
  - Daily Life Applications
  - Checking Work

- 20th century: Mapping (Geology, Architecture, Transportation, Real Estate, Agriculture/Forestry, etc.), Engineering, Biology, Medicine
  - Electronic Devices (and now, Apps) Replaced Mechanical Planimeters

- 1950-present: Mathematics Teaching
  - Illustration of Green’s Theorem
Multiple Inventors

- Wheel and Cone
  - 1818: Johann Martin Hermann
  - 1825: Tito Gonnella
  - 1826: Johannes Oppikofer
  - 1849: Caspar Wetli & Charles Starke (Wheel and Disc)
  - 1851: John Sang (Rolling Wheel and Cone)
    - Inspired Mechanical Integrator

Sang Platometer, 1850s
NMAH cat. no. 1983.0474.02
Neg. no. 85-6194.jpg
Wetli & Starke Wheel and Disc Planimeter, Serial No. 44, 1850-1854
NMAH cat. no. 1986.0633.01
Neg. no. 87-4849.jpg
Amsler Polar Planimeters

- Invented 1854 by Swiss teacher & mathematician Jacob Amsler (1823-1912)
- Became most popular form
- Workshop sold 50,000 of 6 types worldwide by 1912
- Firm in business until at least 1960
- Type 3 cost $20.00 in 1856

Instructions for Amsler’s Polar Planimeter, 1856
NMAH cat. no. 1987.0107.10
Neg. no. AHB2013q009207.tif
Scope of the NMAH Collection

- 43 planimeters
  - Switzerland: 9 Amsler, 7 Coradi
  - USA: 4 Coffin, 4 Willis (plus 1 attachment), 3 LASICO, at least 1 “other”
  - Germany: at least 5 of various designs and makers

- 10 instruction manuals or advertising flyers

- About 1850-1990

- 6”-19” long

- Brass, German silver, steel, metal
  - Metal or plastic measuring wheels

- Usually in cases
Coradi Compensating Polar Planimeters

- 1880: Gottlieb Coradi (1847-1929) established workshop in Zurich
- 1894: Compensating Polar Planimeter
  - Pole arm raised over tracer arm; ball joint, not hinge
- About 1910
  - Fixed arm $36.00
  - Adjustable arm $47.00

Coradi Adjustable Polar Compensating Planimeter Sold by Eugene Dietzgen (Model 6612), 1913
NMAH cat. no. 1987.0929.01
Neg. no. DOR2011-5311.jpg
Detail of Measuring Wheel
Neg. no. DOR2011-5313.jpg
Detail of Label with Manufacturing Date
Neg. no. DOR2011-5312.jpg
Keuffel & Esser 4236 Polar Compensating Planimeter, 1949-1955
Owned by Anne P. Merrill

NMAH cat. no. 1991.0882.01
Neg. no. DOR2011-5287.jpg
Significant American Contributions Arose from Need to Read Steam Engine Indicator Diagrams

James Watt’s Indicator, from Terrell Croft, *Steam Engine Principles and Practices*, 1922

http://www.youtube.com/watch?v=N9spNkAV7jg
Bushnell-Coffin Planimeter, Sold by American Schaeffer & Budenberg Corporation, 1923-about 1937
Patented by John Coffin in 1881
NMAH cat. no. 323706
Neg. no. DOR2013-001059.jpg
Edward Jones Willis (1866-1941)

- Steam and Electrical Engineer, Richmond, VA
- Planimeter Patents in 1894, 1895, 1901, 1922
- Manufactured by James L. Robertson & Sons of New York

Improved Willis Planimeter
NMAH cat. no. 324247
Neg. nos. 79-10597.jpg and DOR2013-001050.jpg
Planimeter Resources
Search over 7.89 million catalog records with 779,100 images, video and sound files, electronic journals and other resources from the Smithsonian’s museums, archives & libraries.

Search Highlights

- Twinkle Twinkle Little Stars
- All About Animals
- Jazz and Jazz Musicians
- 33c Special Olympics single

Want to help the Smithsonian build its catalog? Get started by jumping into one of these topics:

- Where am I? Identify gardens in Lowcountry.
- Life of Latino Migrant Workers.
- Something for the art lovers.
- Let’s Play Baseball!
- Postal Mail, what was it like?
- What is in your lunchbox? Check out ours.
- Duke Ellington

Any time you see click to contribute your tags. Please read our help.

Here are some popular tags:

- African masks
- colorful bees
- green and blue bees
Search Results

Modify Your Search
Search Term: slide rules

Search Options
Narrow By:
- online media (361)
  - Images (361)
  - Finding aids (2)
  - Electronic resource (4)
- type
- topic
- name
- culture
- language
- place
- date
- catalog record source

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- **Gilson Binary Circular Slide Rule**
  - Maker: Gilson Slide Rule Company
  - Physical description: aluminum (overall material)
  - Object name: calculating rule
  - Date made: after 1940
  - ID number: 1979.0816.01
  - Data source: National Museum of American History, Kenneth E. Behring Center
  - Visitor Tag(s): No tags yet, be the first! Add Your Tags!

- **Gilson Midget Circular Slide Rule**
  - Maker: Gilson Slide Rule Company
  - Physical description: metal (overall material)
  - Object name: calculating rule
  - Date made: ca 1940
  - ID number: 1986.0119.01
  - Data source: National Museum of American History, Kenneth E. Behring Center
  - Visitor Tag(s): No tags yet, be the first! Add Your Tags!
### Gilson Binary Circular Slide Rule

**Maker:** Gilson Slide Rule Company  
**Physical Description:** aluminum (overall material)  
celluloid (overall material)  
metal (overall material)  
**Measurements:** overall: 21.5 cm x 21.5 cm x 1.5 cm; 8 15/32 in x 8 15/32 in x 19/32 in  
**Object Name:** calculating rule  
slide rule  
**Place Made:** United States: Florida, Stuart  
**Date Made:** after 1940  
**Subject:** Rule, Calculating  
Science & Mathematics  
Mathematics  
Slide Rules  
**Credit Line:** Gift of Lewis H. Strauss  
**ID Number:** 1979.0816.01  
**Catalog Number:** 1979.0816.01  
**Accession Number:** 1979.0816  
**Description:**  
This two-sided aluminum circular slide rule is coated with white celluloid enamel. The front has two interlocking yellow-green plastic arms, pivoted at the center with a metal nut and bolt with metal washers on both front and back. The back has one rotating arm. Thirteen circles of scales are on the front, including C (for multiplication, division, and proportion), CI (C inverted), A (squares), K (cubes), logarithms, a spiral log-log scale (marked from 1.0015 to 1,000,000), two binary scales for adding and subtracting fractions, a scale of drill sizes, a scale of thread sizes, and millimeters. The front is marked near the center: THE BINARY SLIDE RULE (/) MADE IN U.S.A. (/) COPYRIGHTED 1940.  
Three concentric circles forming a scale of degrees, sines, and tangents are on the back. Inside this scale is a chart for decimal equivalents of fractions. The back is marked: COPYRIGHTED (/) 1931 (/) GILSON SLIDE RULE CO. (/) STUART, FLA. The sets of scales are almost the same as those on the front.
Object Groups
http://americanhistory.si.edu/collections/object-groups
Historians have used the term "mathematical practitioners" to refer to the Europeans who worked on mathematics in the 16th and 17th centuries. During the Renaissance and Scientific Revolution, mathematicians often held the equivalent of several modern-day jobs. For example, Thomas Blundeville (c. 1522–c. 1606), who is mentioned in the protractors object group, owned a country estate in England; tutored other gentlemen in mathematics; wrote about horsemanship, history and geography, logic, and astronomy; and may have practiced law. Besides indicating wide interests and employment, the term also tells us that these mathematicians were greatly concerned with the practical uses of mathematics. For instance, Niccolò Tartaglia pioneered a mathematical treatment of artillery shot in 1537 and 1546, inspiring Galileo’s work on projectiles, among others. To carry out their activities, mathematical practitioners used, designed, and made instruments. Surviving early modern examples illustrate their concerns in mathematics as well as the quality of craftsmanship produced in workshops.

The sector was one of these objects that blended theory and practice to visually attractive effect. A sector generally has two arms that are connected by a hinge and covered on both sides with scales useful for problems in practical mathematics. The practitioner used a pair of dividers to measure distances and transfer the distances to the scales, thus opening up the sector to the initial distance and setting up proportions from which the solution distance was read by measuring along with the dividers. A sector may be made of brass.
Concluding Thoughts

• Eye Candy

• Resources for Planimeters

• Motivation for Teaching with Objects
  • Hands-On Mathematics
  • Historical Context

• Complex Historical Relationship between Objects and Teaching
  • *Tools of American Mathematics Teaching* (JHUP, 2008)
  • http://collections.si.edu
  • http://americanhistory.si.edu/collections/object-groups

Thank you for attending the 2013 East Coast Meeting of HPM-Americas!