A Cabinet of Mathematical Curiosities at Teachers College:
David Eugene Smith’s Collection

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ABSTRACT

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This dissertation is a history of David Eugene Smith’s collection of historical books, manuscripts, portraits, and instruments related to mathematics. The study analyzes surviving documents, images, objects, college announcements and catalogs, and secondary sources related to Smith’s collection. David Eugene Smith (1860 – 1944) travelled the world in search of rare and interesting pieces of mathematics history. He enjoyed sharing these experiences and objects with his family, friends, colleagues, and students. Smith’s collection had a remarkable journey itself. It was once part of the Educational Museum of Teachers College. This museum existed from 1899 – 1914 and was quite popular among educators and students. Smith was director of the museum beginning in 1909, although, he had a major influence on the museum from the moment he began his professorship at Teachers College in 1901.

After the Educational Museum of Teachers College disbanded, the collection was exhibited in numerous venues. George A. Plimpton (1855 – 1936) created the Permanent Educational Exhibit that housed both modern educational items, as well as, historical pieces for display. Since Smith and Plimpton were great friends and fellow collectors, Smith’s collection was included in the historical section of Plimpton’s establishment. Unfortunately, due to the hard times of the world at this moment, the Permanent Educational Exhibit closed in 1917. Smith continued to exhibit his collection of mathematical artifacts through the Museums of the Peaceful Arts, founded by George F.

Smith’s research, teaching, and publications were directly influenced by his collection. Throughout most of his published works are images and photographs of items in his collection. He also believed in the importance of having primary sources included in mathematics education. This view he followed in his own teaching, which included research in his collection.

David Eugene Smith’s collection could never be replicated and thus is quite unique and valuable. Smith donated his collection to Columbia University’s Libraries in the 1930s. Various exhibits of his collection have occurred since then, the most recent concluded in 2003. The history of Smith’s mathematical collection is important to the history of mathematics education as it displays the importance of preserving mathematical books, manuscripts, portraits, and instruments for future generations to research.
Table of Contents

Chapter I: Introduction .................................................................................................1
  Need for the Study ........................................................................................................1
  Purpose of the Study .....................................................................................................2
  Procedures of the Study ...............................................................................................5

Chapter II: Methodology .............................................................................................8
  Challenges of the Research .........................................................................................8
  Historical Research Methodology ..............................................................................9
  Similar Museum Studies .............................................................................................10
  Material Culture Methodology .................................................................................12
  Summary .....................................................................................................................14

Chapter III: Context for the Study ............................................................................16
  Origins of Teachers College .......................................................................................16
  Genesis of the Educational Museum of Teachers College .......................................22
  Early Life and Career of David Eugene Smith ..........................................................23
  Summary .....................................................................................................................27

Chapter IV: D. E. Smith’s Collection .........................................................................28
  Part I – Smith Travels the World ...............................................................................28
  Part II – Step Inside the Collection ............................................................................47
  Part III – Smith’s Collection Exists Outside Exhibitions .........................................80
  Part IV – Columbia University Receives a Gift .......................................................87

Chapter V: Summary and Conclusion .......................................................................95
Summary ..............................................................................................................................................95
Conclusion ..............................................................................................................................................98
Limitations of the Study.........................................................................................................................102
Recommendations for Further Study....................................................................................................102
Final Remarks........................................................................................................................................104
References .............................................................................................................................................106
Appendix A: David Eugene Smith’s “Illustrations for Lectures on the History of Mathematics,” .................................................................................................................................115
Appendix B: Teachers College’s Set of Lantern Slides from the “Illustrations for Lectures on the History of Mathematics” ........................................................................................................126
Appendix C: List of Portraits in Smith’s Collection .........................................................................285
Appendix D: Catalog of Smith’s Collection of Mathematical Instruments .................................295
Appendix E: The Educational Museum of Teachers College and the Department of Mathematics Pamphlets ........................................................................................................................................311
Appendix F: Countries Visited by David Eugene Smith .................................................................320
List of Figures

Figure 1.1. Photograph of the Department of Mathematics exhibit room, circa 1903. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University .................................................................3

Figure 3.1. From left to right: Grace Hoadley Dodge, Nicholas Murray Butler, and James Earl Russell. Images are provided courtesy of the Gottesman Libraries at Teachers College, Columbia University .................................................................21

Figure 3.2. Educational Museum of Teachers College. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University ..........................23

Figure 3.3. Photograph of Smith as a young child. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University .................................................................24

Figure 3.4. Smith, age 21. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University .................................................................25

Figure 3.5. Smith, age 35, teaching at Michigan State Normal College in Ypsilanti. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University .................................................................26

Figure 4.1. Smith (center), Helen McAleer (front left), and Clara Jewett (far right) in 1937. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University .................................................................28

Figure 4.2. (Left) Flyer sent to loyal customers of Helen Jewett McAleer, Smith’s niece, in 1930. (Right) Smith in her shop in 1934. It was common for Smith to visit the family home to get away from New York City. He also gave presentations on the items in McAleer’s gallery from time to time. David Eugene Smith Professional Papers, 1860-1945 (Box 32, Box 121). Rare Book and Manuscript Library, Columbia University .................................................................29

Figure 4.3. Third letter in a collection of 124 letters from Prince Boncompagni to Ferdinando Jacoli. David Eugene Smith Collection of Historical Papers [ca. 1400-1899]. (Box 3). Rare Book and Manuscript Library, Columbia University .................................................................32

Figure 4.4. Libri’s History of Mathematics in Italy (1835). Title page (top left), page showing Libri’s handwritten corrections (top right), note written by Jacoli, in Italian, explaining the rarity of the text (bottom left), and translated note from Jacoli (bottom right). These notes, among a few other pieces, are placed in the front of the text. Smith Ref R510.9 L611. Rare Book and Manuscript Library, Columbia University .................................................................34

Figure 4.5. Smith sent this photograph to Miss Bertha M. Frick during his travels through Persia in 1933. The left image is the reverse side of the photograph. Smith demonstrates his humorous side with witty notes, such as describing himself as “an unknown wanderer on the road of life.” David Eugene Smith
Figure 4.6. Photographs of the Department of Mathematics exhibit room (top – facing towards the door, bottom – facing opposite direction). David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University .................................................................54

Figure 4.7. Paolo Casati’s *Fabrica et uso del compasso di proportione* (1685). Smith 510.78 1685 C26. Rare Book and Manuscript Library, Columbia University ....58

Figure 4.8. Tonstall’s *De Arte Supputandi* (1529) with the autograph of Thomas Digges. On the left hand page, George A. Plimpton, who presented this text to Smith, signed it. Smith 510 1529 T83. Rare Book and Manuscript Library, Columbia University ........................................................................59

Figure 4.9. Gemma Fresius’ *Arithmeticae practicae methodus facilis* (1540) title page. Smith 910 1540 Ap34. Rare Book and Manuscript Library, Columbia University .................................................................60

Figure 4.10. Smith’s bookplate (1907), modeled after Fresius’ bookplate where Smith used his own image instead. Image courtesy of the Rare Book and Manuscript Library, Columbia University .................................................................61

Figure 4.11. Unpublished Manuscript of Galileo. MS 520.1800. Description: “Manuscript written in the late 18th century. Apparently the author was a contemporary of Galileo. Numerous errors corrected in red, perhaps by Ferdinando Jacoli, to whom this ms. probably belonged.” Rare Book and Manuscript Library, Columbia University .................................................................63

Figure 4.12. Portrait of Guillaume de l'Hôpital. Smith Portraits (Box 6). Rare Book and Manuscript Library, Columbia University .................................................................64

Figure 4.13. Letter from Charles Lutwidge Dodgson (Lewis Carroll) to the Mathematical Editor of “The Educational Times.” David Eugene Smith Collection of Historical Papers [ca. 1400-1899]. (Box 9). Rare Book and Manuscript Library, Columbia University .................................................................66


Figure 4.15. Ancient Roman compass, about the beginning of the Christian era. Smith 27-286. Rare Book and Manuscript Library, Columbia University...........68

Figure 4.16. Examples of dice. (A) Roman. Gypsum, rudely made. Opposite sides marked 1-6, 3-5, 2-4, perhaps indicating that the piece is rather old. Not exactly Etruscan marking. Found near Civita Castellana, 43 miles from Rome. Smith 27-155. (B) Roman. Bone, discolored by lying next to a piece of bronze. Correctly marked. Found at Francati. Smith 27-156. (C) and (D) A hexagonal prism, bone,
with an ivory handle for twirling. Nuremberg, c. 1800. Smith (250) 242. Rare Book and Manuscript Library, Columbia University

Figure 4.17. Examples of tesserae with descriptions. David Eugene Smith Collection of Mathematical Instruments (Box D6). Rare Book and Manuscript Library, Columbia University

Figure 4.18. Japanese sangi sticks used in solving equations in the Old Japanese algebraic system. Purchased in Kyoto, Japan, 1907. Smith 27-292. Rare Book and Manuscript Library, Columbia University

Figure 4.19. English tally sticks of 1296. (Top) Leather covered, silk lined decorative box. (Middle) Four wooden tally sticks. (Bottom) Descriptive label used when exhibited. Smith 27-312. Rare Book and Manuscript Library, Columbia University

Figure 4.20. (A) Nuremberg, signed by Hans Tröschel, 1603. Ivory, with string gnomon horizontal dial and pin gnomon for vertical dial. Smith 27-225. (B) Cubical sundial. Bavarian, 18th century. Horizontal and vertical. North, south, east, and west. Smith 27-222. Images courtesy of the Rare Book and Manuscript Library, Columbia University

Figure 4.21. Ramsden Telescope. Description: Telescope said to have been made by Ramsden of London, the great maker of mathematical instruments about 1775. Smith 27-267. Rare Book and Manuscript Library, Columbia University

Figure 4.22. Representations of the Magic Square. (A) Magic square on reverse of medal showing Venus (contains errors). Smith 254a. (B) Arabic (?) Amulet, found at Karnak. Illustrates the degeneration of the Magic Square. Smith (253) 27-311. (C) Amulet. Christian-Kabbalistic. On the rim are Greek and Hebrew words separated by a cross. Magic square that adds to 175. Smith 27-318. Rare Book and Manuscript Library, Columbia University

Figure 4.23. Part of Case X at the 2002 Exhibit. Includes nests of weights and money changer’s balances. Image courtesy of the Rare Book and Manuscript Library, Columbia University

Figure 5.1. Department of Mathematics Office, with prints of celebrated mathematicians on the back wall. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University
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Dedication

This study is dedicated to my mother, Linda, father, Gordon, sister, Trisha, and fiancé, Adam for their constant support and understanding during this dissertation process and all of my previous educational endeavors. It is also dedicated to Dr. Bruce R. Vogeli, who handed me a box full of lantern slides during my second semester at Teachers College which led directly to this dissertation. I am not alone to say that I am entranced when listening to Dr. Vogeli’s travels and life experiences – David Eugene Smith must have had the same effect on his audience when describing his wonderful adventures.
Chapter I: Introduction

Need for the Study

David Eugene Smith (1860-1944), a distinguished professor at Teachers College and a noted mathematics historian, had a profound love and interest in historical books, manuscripts, portraits, and instruments related to mathematics. During Smith’s forty years of travel that included eighty crossings of the Atlantic by ship (Lawler, 1938), he curated an impressive collection of memorability of mathematics and mathematics education pieces. This collection was displayed in the Department of Mathematics offices, as well as in the Educational Museum of Teachers College. The collection of historical items was readily available to students and the interested public through the Educational Museum of Teachers College, the Department of Mathematics, the Museums of the Peaceful Arts, and eventually in 1931 at Columbia University.

An early dissertation, completed at Teachers College by Benjamin R. Andrews in 1909, entitled *Museums of Education: Their History and Their Use* discusses educational museums throughout the country and internationally. The Educational Museum of Teachers College is a substantial portion of the study along with brief mentions of the Department of Mathematics and David Eugene Smith’s personal collection. Since Andrews was a former supervisor of the Educational Museum of Teachers College, his research about the museum is essential to the current study. Andrews’ study was completed during the middle years of the Educational Museum and thus has no perspective on how the items of the museum were eventually dispersed.

David Eugene Smith has been the subject of many research publications. Two previous dissertations focused specifically on Smith, *Educational contributions of David*
Eugene Smith written by Weatha Gale McNeil in 1986 and The origins of a professional mathematics education program at Teachers College written by Eileen Donoghue in 1987. McNeil’s dissertation is an historical study of the role that David Eugene Smith played in the evolution of mathematics education; while, Donoghue’s dissertation is an historical account of Smith’s involvement in the development of a proper mathematics education program. Both studies mention that Smith was an avid collector but the museum itself and Smith’s personal collection are not discussed. It is imperative that this part of Teachers College history is not lost. This study comes at an opportune moment; a mathematics museum “MoMath” is opening in New York City in late 2012. That museum claims to be the only contemporary museum dedicated to mathematics in the United States (Mission, n.d.). It is important to discuss and analyze Smith’s collection, and how it influenced mathematics education, to appreciate future mathematics museums’ prospects.

**Purpose of the Study**

During the first quarter of the twentieth century, the Teachers College Department of Mathematics had an extensive collection of artifacts, historical documents, portraits, and mathematical tools housed in rooms 211 and 212 in Main Hall (see Figure 1.1). David Eugene Smith had acquired these items “on numerous visits to various parts of the world, extending over a period of about forty years” (New York Museum of Science and Industry, 1930, p. 59). This collection became very well known in other schools and colleges – in fact the Educational Museum provided excursions to permit students to view and use the instruments on site. The interest of the educational public in the
Museum’s collection was so great that Smith produced sets of lantern slides that could be sent out to requesting institutions and individuals. Due to the size of Smith’s collection, the Educational Museum staff was confident in creating sets in “nearly every branch of the subject” (Smith, 1907, p. 1). Some of these slides still exist in schools and libraries around the nation and the world including more than 150 slides at Teachers College.

Figure 1.1. Photograph of the Department of Mathematics exhibit room, circa 1903. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University.

The purpose of this study is to provide a history of David Eugene Smith’s collection through examination of the surviving images, instruments, and objects in the collection. Knowledge of this collection provides insight into how Smith believed mathematics education could be enhanced through the appreciation of mathematical
The following are the research questions that this study addresses:

1. What was the genesis of David Eugene Smith’s desire to establish a history of mathematics collection?
2. What was the origin of the Department of Mathematics Collection that was housed in the Educational Museum of Teachers College?
3. How did David Eugene Smith incorporate the history of mathematics collection into his research and teaching?
4. How did David Eugene Smith disperse his collection and how is the collection used today?

The first research question provides a history of David Eugene Smith’s travels and acquisitions – the foundation for the study. This question also gives more insight into the important relationship between David Eugene Smith and George A. Plimpton. The second research question focuses on the Educational Museum of Teachers College and the Department of Mathematics Collection to understand how the museum and collection operated to support mathematics education. The third research question discusses how these collected artifacts were used in Smith’s teaching and research. Smith’s publications were studied to find how and where he incorporated these objects into his textbooks and other writings. The fourth research question brings the collection to present day, over a century from when it was first established, to determine how David Eugene Smith’s collection has influenced mathematics teaching today.
Procedures of the Study

The study of a museum to determine the origin, focus, and impact of its collection is unusual in the annals of educational research. Museums in other fields such as art, medicine, and local history have been the subjects of studies that provide some guidance; however, the task posed in this study of examining a special collection is complicated, further due to the fact that the collection is no longer active. In fact, the majority of the collection survives only in the Rare Book and Manuscript Library of Columbia University and in the glass slides prepared by Smith to disseminate his collection beyond two rooms of Teachers College’s main building.

Analysis of Material Objects. The analysis of material objects is a major portion of this study. The term “object” is linked to anything that was collected and placed in the collection. It was through researching the objects that the history of David Eugene Smith’s collection will be told. Columbia University’s Rare Book and Manuscript Library’s special collections of David Eugene Smith were the main source of study for these objects.

Objects were analyzed in relation to what type of object it is, such as a printed book or pamphlet, manuscript, autograph, portrait, or instrument. The details of the object are discussed, for example: when and by whom was it created? What was its purpose in mathematics? Personal reflections from David Eugene Smith regarding the object are included. The majority of these first-hand descriptions come from an unpublished manuscript of Smith retelling his travels throughout the world and his notes from a speech about his collection to his fellow Hobby Club of New York City members.
**Analysis of Primary Sources Other than Objects.** The majority of the research questions are answered through the study and analysis of primary sources, such as correspondence, records, photographs, course catalogs, and manuscripts. The major source for these items were Teachers College’s Gottesman Library Archives and Columbia University’s Libraries’ special collections. Since a major shift has developed to publish archives online, these materials have been consulted either physically or online. Gottesman Library’s PocketKnowledge is an example of such an online repository. Many images of the Educational Museum of Teachers College exhibitions have been published there, along with documents directly related to David Eugene Smith and his collection.

**Resources for the Study.** The mathematical, historical and pedagogical writings of David Eugene Smith were accessed either through libraries as physical books or through the Internet Archive (www.archive.org) or Google Books (http://books.google.com). Major works of David Eugene Smith were examined to determine where Smith used his collection in his own publications.

Columbia University’s Rare Book and Manuscript Library’s special collections contain a large subsection of the primary resources used in this study. These collections include: David Eugene Smith Collection of Historical Papers [ca. 1400-1899], David Eugene Smith Professional Papers 1860 – 1945, and George A. Plimpton Papers and Miscellaneous Manuscripts Collection 1634-1956.

The material objects – the mathematical artifacts and instruments collected by David Eugene Smith – were studied through Columbia University’s Rare Book and Manuscript Library. In 2002, the Library held an exhibition entitled “The Ground of Arts: Mathematical Instruments and Illustrated Books from the David Eugene Smith
Collection” curated by Jennifer Lee. The author, with permission from the Library, examined these pieces.

A collection of lantern slides of mathematical artifacts and instruments collected by Smith, which were commissioned by the Educational Museum of Teachers College, are in possession of the Mathematics Education Program at Teachers College. The acquisition of these slides by the author was a major development that led to this study. These slides represent major mathematical documents, instruments, and images in history. The researcher has digitized these slides and organized them for publication based on the catalog of slides published by the Educational Museum of Teachers College. These images are included as Appendix B. This subset of objects coordinates with the items in the David Eugene Smith Collection at Columbia University’s Rare Book and Manuscript Library.

For secondary sources online resources were used. These include Columbia University Library and Teachers College Gottesman Library Online Catalogs and Journals, Teachers College Record Archives, The MAA Mathematical Sciences Digital Library – Loci: Convergence, Mathematical Treasures, Columbia University Rare Book and Manuscript Library Online Exhibition: "Our Tools of Learning: George Arthur Plimpton's Gifts to Columbia University”, the Internet Archive: Text Archive, Google Books, Google Scholar, and Gottesman Library’s PocketKnowledge. Secondary sources such as journal articles, monographs, periodicals, and dissertations relevant to the study were analyzed. Many issues and articles are focused on museum studies, history of mathematics, history of special collections, and using primary sources in mathematics education. These documents provide a research-based background for the study.
Chapter II: Methodology

Through extensive analysis of the papers, images, and instruments in David Eugene Smith’s Collection at Columbia University, the mathematical history of the objects in Smith’s collection is revealed, along with the story behind the acquisition of the items, their life in the collection, and how they reached their final resting place at Columbia University’s Rare Book and Manuscript Library’s special collection. The study provides a chronological history of David Eugene Smith’s collection, as well as, offers an insight into the importance of museum and historical studies in mathematics education.

Challenges of the Research

An obvious choice for an historical study on a collection or museum would be to focus on one that is still open and active. This provides more accessibility to people involved, direct contact with objects in the museum, and possible interviews with the benefactors of the collection. Smith’s collection, however, is no longer on public display in a museum. Thus the organization of the collection as it was during the beginning of the twentieth century can only be found through historical research.

The position of this study falls between the extremes of a purely curatorial focus and an educational philosophy analysis. The material culture methodology aids in this situation. This methodology allows the objects in the collection and the acquisition of those items to convey the history of David Eugene Smith’s mathematical collection of curiosities.
Historical Research Methodology

Isaac & Michael (1971) describe the purpose of historical research as one of “reconstructing the past systematically and objectively by collecting, evaluating, verifying, and synthesizing evidence to establish facts and reach defensible conclusions, often in relation to particular hypotheses” (p. 44). Historical research was used in this study. More specifically, the documents, images, and instruments in the David Eugene Smith Collection at the Rare Book and Manuscript Library of Columbia University were analyzed.

This study follows the general historical methodology as described by W. H. McDowell in *Historical Research: A Guide* (2002). McDowell considers historical research as a way to eloquently and accurately depict the events of the past. He states that it is not always possible to rebuild every event but the goal of this type of research is to provide educational, and sometimes entertaining, insights into a bygone era (McDowell, 2002).

As part of any historical study, the archival materials that exist and are available are what drive the research. This study uses a variety of sources of many different mediums. The archived collections of university documents in the David Eugene Smith Collection of Professional Papers at the Rare Book and Manuscript Library of Columbia University provided the most information for this study. The majority of the primary sources examined were correspondence between Smith and James Earl Russell, as well as, Smith and administration staff at Teachers College and Columbia University Libraries.
The David Eugene Smith Collection of Professional Papers is quite extensive and contains 143 boxes of material. These include Smith’s own notes and manuscripts, as well as, an abundant amount of correspondence and manuscripts from Smith’s “students, family, contemporary mathematicians and teaching colleagues about the history of teaching of mathematics, his many committees, administrative matters at Teachers College, and his travels and collecting” (Online Finding Aid, 1998). Within this large collection, the documents that pertained specifically to Smith’s collecting, the Educational Museum of Teachers College, and Smith’s donation to Columbia University were identified. This involved inspecting almost every box in the collection to find materials related to this study. After the appropriate items were found, they were digitally photographed to preserve for use in this study. Then the author arranged the digital files by subject, author/recipient, and date of the item. This aided in the organization of the dissertation and possible further research.

**Similar Museum Studies**

Unfortunately, mathematically focused museums are hard to come by in this country and internationally. Science and natural history museums are more common and thus have more opportunities to be studied historically. Mathematical instruments and related objects are often included in those types of museums. Some examples of similar museum histories involve the Manchester Museum (Alberti, 2009), the Whipple Museum (Taub, 2006; Taub & Willmoth, 2006), and the Leverian Museum (King, 1996).

Samuel J. M. M. Alberti is the first to take the Manchester Museum the subject of a historical study. His methodology for historical studies of museums and collections is
described in the following section. Alberti’s book *Nature and Culture: Objects, disciplines and the Manchester Museum* (2009) describes the collection in terms of material culture and how the objects in the museum were collected, catalogued, and displayed. The study also incorporates how the visitors to the museum interacted with the objects. This museum is still open and part of the University of Manchester in the United Kingdom.

The history of the Whipple Museum is similar to this study because the museum was based on a gift of scientific instruments, related objects, and books given by Robert Stuart Whipple (1871-1953) in 1944 to Cambridge University, similar to Smith’s own collection and Columbia University. Liba Taub, Director and Curator of the Whipple Museum, has written many works on the Whipple Museum and the history of scientific instruments. Taub (2006) describes the museum as “an internationally known collection and an important centre for teaching and research in material-based history and philosophy of science” (p. 204). This would have been a similar vision for Smith, had his collection been housed in an active museum.

The Leverian Museum is especially relevant because, like Smith’s collection, it no longer exists as a complete collection. Sir Ashton Lever’s collected over 26,000 items relating to natural history and European antiquities. The museum existed from 1771 until 1806, when it was sold and separated into about 8,000 lots. In the 1990s, the Library of the Department of Ethnography at the British Museum acquired part of Lever’s collection, some 1,000 Sarah Stone watercolors of artifacts from his collection (King, 1996). The historical study by J. C. H. King (1996) describes Lever’s collection from the genesis to its eventual sale. Through detailed study, where many original excerpts from
letters, pamphlets, and other correspondence are used throughout the paper, the reader understands the true history and struggle of Lever, his partners, and the collection. The study also describes many of the artifacts and includes numerous images from the collection providing a visual representation of the museum.

Material Culture Methodology

For the methodology related to material objects, the study focused on the method described in Samuel J. M. M. Alberti’s work, *Objects and the Museum*, where he reveals how the history of a museum can be written by exploring and analyzing the history of the objects in the collection. Alberti explains material culture as, “[d]rawing on anthropological work on the cultural biography of things, [while seeking] to explore some ways that historians of science might approach the study of collections through the trajectories of specific items and the relationships they form with people and other objects” (Alberti, 2005, p. 560). The understanding of how objects, such as mathematical images, instruments, and tools, are directly connected with people and the culture of the time is precisely the goal of the study. Through studying the “life” of an object in the collection: the journey to the collector, the incorporation in a museum, how it was used or displayed, and the public reaction to the object, the study provides a history of the collection and its place in mathematics education history.

Alberti’s method highlights the fact that the people associated with the museum are what bring the history to life – a culture surrounding the objects. This would be especially true in relation to David Eugene Smith’s contribution to the Educational Museum of Teachers College. It is well known that Smith was an exceptional historian of
mathematics, thus he must have had a direct influence over what was deemed important and unique enough to be displayed in the museum. Through Alberti’s methodology, the study analyzes the different ways that collectors, curators, educators, students, and the general public interacted with the mathematical collection.

The study of a museum, especially a mathematics educational museum, combines many facets of research. Alberti summarizes this by stating that at its core the histories of objects will deliver a historical narrative for the research and that:

By studying what curators then did with objects in their collections, this approach contributes to constructivist histories of science by embedding the study of scientific practice in material culture. Exploring the status and personnel involved in this museum work provides insights into the role of museums in scientific and civic culture. Finally, [he] argue[s] that a museum object can be a prism through which to view various publics’ experience of science. (Alberti, 2005, p. 561)

Many other historians have explored similar research of using material objects to study mathematics and scientific history. Some authors focus on specific persons in history and how they used or invented instruments (Eagleton & Jardine, 2005; Kidwell, 2009). Others concentrate on the institution or museum that housed the objects (Bennett, 2003; Taub, 2009). While others study the objects themselves (Daston, 2004; Mosley, 2007).

In Tools of American Mathematics Teaching, 1800-2000, Kidwell, Ackerberg-Hastings, and Roberts (2008) describe their method briefly as “grounded in the examination of objects and the perusal of texts: trade literature and archival collections, journals, newspapers, textbooks, monographs, and reference works” (p. ix). This is a method that corresponds to the work being done in this study. Kidwell is the curator of
the mathematics collections at the National Museum of American History, Smithsonian Institution and therefore has expertise and expansive knowledge on history of mathematics and mathematics instruments in a museum. A previous publication by Kidwell, “American Mathematics Viewed Objectively: The Case of Geometric Models” in *Vita Mathematica: Historical Research and Integration with Teaching* (1996), describes how historians tend to rely on written texts solely when researching mathematics history, yet mathematical objects provide a different type of research:

From ancient times, however, people have used mathematical objects. The general increase in material abundance that has characterized the western world from the eighteenth century, accompanied by rapid changes in mechanical, electrical, and electronic technology, has brought with it a profusion of objects fulfilling mathematical functions. Examining these yields valuable insight into the place of mathematics in society at large; the history of mathematics teaching; the role of mathematics in business, engineering, and the sciences; the development of mathematical communities; and even the practice of mathematical research. (p. 197)

**Summary**

This study uses historical research methods and material culture analysis to describe and analyze David Eugene Smith’s collection in the Department of Mathematics and the Educational Museum of Teachers College. The goal of the study is to make sense of the past through the systematic analysis of the materials available. These materials range from documents and texts to artifacts and instruments. The purpose of the study is
to write the history of the collection and unveil to the public the importance and effort in which the faculty and administration of Teachers College, specifically David Eugene Smith, placed on the history of mathematics as an educational tool.
Chapter III: Context for the Study

This chapter provides historical background of the time period before David Eugene Smith became a faculty member in the Department of Mathematics at Teachers College. The three foci will be the origins of Teachers College, the genesis of the Educational Museum of Teachers College, and the early life and career of David Eugene Smith. The respective histories each could comprise an entire dissertation on their own, and some already have; thus, the following accounts will be brief and are meant to offer context for the study.

Origins of Teachers College

This history of Teachers College is a fascinating and complex subject. The origins can be traced back to 1880 when the Kitchen Garden Association was established in New York City due primarily to Grace Hoadley Dodge (1856 – 1914). This association was a philanthropic institution for young girls to learn the domestic industrial arts (“Kitchen Garden Association,” 1880). It was soon realized that the “teachers” of these students were in need of their own proper training, which resulted in official instruction classes taught by the leaders of the Association. After four years, the Kitchen Garden Association realized that it had grown both in enrollment and philosophy. It was no longer solely interested in philanthropy but had an educational focus as well. In 1884, it was reorganized as the Industrial Education Association. This new association allowed boys and adults to enroll, held more sophisticated classes in the industrial arts, and included men and women as organizational leaders. The president of the Association was General Alexander Webb, who was also the president of the College of the City of New
York at the time, with Grace Dodge as the vice-president. Since Webb was rather busy with his other work, Dodge would assume presidential roles on many occasions (Cremin, Shannon, & Townsend, 1954).

In 1886, the Industrial Education Association had major achievements. A prominent push towards becoming focused on education was organizing the Children’s Industrial Exhibition in April of 1886. James Earl Russell, future dean of Teachers College, described the exhibition in his *Founding of Teachers College*, as “participated in by some sixty schools and institutions, attracted visitors from many other cities and led eventually to the introduction of household arts and manual training into the schools of New York City” (1937, p. 5). This exhibition would be the very beginning of what would soon be known as the Educational Museum of Teachers College.

Later in 1886, the Industrial Education Association moved its growing cohort to where the Union Theological Seminary was located at No. 9 University Place. The building was described as, “a five-story structure…[containing] offices, an assembly hall, and a model cooking room on the first floor, classrooms and a large museum for exhibits on the second. The three top floors were reserved for residents, while in the basement was located a ‘little housekeepers’ classroom’” (Cremin et al., 1954, p. 13-14). The Association had little funds to lease such a building, but Dodge stepped in and paid for the space from her own finances for eight and a half years. The official opening of the new building was on December 14, 1886, where the President of John Hopkins University was the main speaker (Cremin et al., 1954).

The Children’s Industrial Exhibition was such a success that it was decided that the new focus of the Association needed to be on education. The expanding enrollments
and the lack of properly trained teachers created the need for a Training College. This aspect of the Association demanded an experienced educator to be at the head. In February 1887, Professor Nicholas Murray Butler, from Columbia College’s Department of Philosophy, became the president of the Industrial Education Association. This opportunity for Butler was not thought of as some sort of extra-curricular activity, it turned out that the study of education at the university level was a deep-rooted goal for him substantially fueled by his mentor, President Frederick A. P. Barnard of Columbia College. One of the major contributions of Butler to the Industrial Education Association was transforming it into the New York College for the Training of Teachers along with keeping the ‘Number 9’ model school intact, although eventually renaming it the Horace Mann School (Cremin et al., 1954). This was accomplished within one year of Butler becoming president, and thus began the future Teachers College.

The idea of teacher education as the focus of a school was not new to Butler. During his time at Columbia College, he became very close to their president, Frederick Barnard. The importance of the study of education was something about which Barnard was passionate. In fact many years prior, in 1858, he proposed a school of education to be established at the University of the South. He continued this thought in 1881 during his inaugural address at Columbia College where he wished to create a department for the study of education. The Board of Trustees at Columbia College did not share his passion and did not approve the establishment of the department. Barnard entrusted his student, Nicholas Butler, to join forces with him to incorporate the study of education into the College. After Butler graduated with his Ph.D. in 1884, he returned with the goal of “turning the Trustees around” on the idea. In 1886, Barnard and Butler thought that a
series of lectures on the topic, which they believed would motivate the public and persuade the Board of Trustees, would satisfy their goal. They were proven correct in one aspect; the lectures were “attended by more than two thousand hearers” (Russell, 1937, p. 6). The Board of Trustees was still skeptical and rejected the plan yet again. Thus the chance in 1887 for Butler to be the president of the Industrial Education Association, where he could influence the study of education to be the primary focus in higher education and succeed where his mentor had not, was a perfect fit for Butler (Cremin et al., 1954).

During his presidency at the New York College for the Training of Teachers, Butler promoted his views on education through initiating multiple publications such as the *Educational Leaflets*, the *Educational Monographs*, the *Educational Review*, and the “Great Educators Series”. The Training College had gained a respectable reputation throughout the country. Walter L. Hervey, the Dean of the Training College, took over the presidency in 1891 when Butler was promoted to the head of the Department of Philosophy, Ethics, and Psychology at Columbia College. In December 1892, the name of the New York College for the Training of Teachers was officially changed to Teachers College (Cremin et al., 1954).

After Butler’s resignation as president, Teachers College somehow lost its will to be its own entity. In 1892, the Trustees of Teachers College wanted to hand over Teachers College to Columbia College. Since the Board of Trustees at Columbia College was never in favor of including a department of educational studies under their name, they refused; stating, “there is no such subject as Education and more over it would bring into the University women who are not wanted” (Russell, 1937, p. 26). They did agree
upon an alliance in 1893, in the effect that Columbia would have a place to send students for “instruction in pedagogy” and Teachers College would benefit by availabilities of university instruction, scholarship, atmosphere, and library (Cremin et al., 1954).

As time went on, the enrollment of students of the College and pupils of the Horace Mann School grew beyond the capacity of No. 9 University Place. A location in upper Manhattan seemed the perfect spot. Due to last minute donations by George W. Vanderbilt and an anonymous donor from New Zealand, Teachers College found its current home on the north side of 120th Street (Russell, 1937). At the same time, Columbia College was also expanding and purchased the land on the south side of 120th street. This was not a coincidence that these two colleges ended up in such close proximity. Dr. Butler was part of Columbia’s relocation committee and asked Vanderbilt, part of the Trustees of Teachers College, to choose a location adjoining Columbia (Cremin et al., 1954); thus helping to continue the two institutions deep-rooted relationship. Teachers College officially moved into Main Hall on 120th Street in 1894.

A major figure in Teachers College history is James Earl Russell, Dean of the College from 1897-1927. Russell, who originally came to Teachers College to fill a professor position for the technical training of teachers, quickly became the Dean due to his educational viewpoint, the unsettled nature of Teachers College, and President Seth Low of Columbia (Cremin et al., 1954). To survive as an institution, it seemed necessary to become a professional school of education under a university; yet again, Columbia was the obvious choice to call upon. Russell provided the basis for the agreement and President Low, who also had an appreciation for the study of education, finalized the plan, with the Board of Trustees agreeing, in 1898. Unfortunately, it seems that this
arrangement was not as Russell imagined; he stated, “our children might have the University name but we were required to feed and clothe them” (1937, p. 28).

Russell had a huge influence on Teachers College’s educational philosophy. He implemented many innovative ideas. One was a very popular course that was specifically for graduate students who had reading knowledge of French and German. He lengthened the undergraduate time to four years rather than two and encouraged students and professors to work together as collaborators. His resourcefulness of acquiring soon to be leaders in education allowed Teachers College’s superb reputation to be known worldwide. Russell states that he “knew [the] teachers should be scholars, not only masters in their respective fields but also products of a wider culture, who had the gift of inciting students to scholarly endeavor” (1937, p. 51). Some of these figures include, Paul Monroe of History of Education, Edward L. Thorndike of Educational Psychology, John Dewey of Educational Philosophy, and most relevant to this study the hiring of David Eugene Smith of Mathematics Education in 1901 (Russell, 1937).

![Figure 3.1. From left to right: Grace Hoadley Dodge, Nicholas Murray Butler, and James Earl Russell. Images are provided courtesy of the Gottesman Libraries at Teachers College, Columbia University.](image-url)
Three legacies of Teachers College: Grace Hoadley Dodge, Nicholas Murray Butler, and James Earl Russell, have been discussed to bring the study to the time when David Eugene Smith joined Teachers College (see Figure 3.1). Their influence on the College does not end at this point and will be intertwined in the history of David Eugene Smith’s collection.

**Genesis of the Educational Museum of Teachers College**

As previously mentioned, the Educational Museum of Teachers College started out as the Children’s Industrial Exhibition given by the Industrial Education Association in 1886. The Industrial Education Association, housed at No. 9 University Place, had many exhibits scattered throughout the school’s departments of manual training, art, domestic science, domestic art, and natural science – with no real “home” (Andrews, 1909). Once the institution had moved to its 120th street building in 1894, the process of distributing the Museum’s materials among departments was continued.

Dean James Russell officially established the Educational Museum in 1899 with the appointment of a curator, George S. Kellogg (Russell, 1899). Russell believed in the importance of the Museum and thought of it “to provide a systematic way of collecting illustrative material” (Russell, 1908). This meant that a proper room for the Museum would be in the near future. Ultimately in 1901, the Educational Museum found a special room of its own on the second floor of Main Hall – currently Zankel Hall – in room 215 (see Figure 3.2).

The Educational Museum of Teachers College grew to be a specialized museum to showcase educational objects and historical artifacts in many subject areas, including
mathematics (Andrews, 1909). The story of the Educational Museum of Teachers College will continue throughout this study and will be explored further in its relationship to the Department of Mathematics and David Eugene Smith’s collection.

Figure 3.2. Educational Museum of Teachers College. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University.

Early Life and Career of David Eugene Smith

David Eugene Smith was born on January 21, 1860 in Cortland, New York to a middle class family (see Figure 3.3). Smith’s father was a lawyer and his mother was a daughter of a physician. He, along with his three siblings, learned Greek and Latin at home from their mother (Dauben, 2002). His parents instilled in him a respect for education, love of the arts, the classics, books, and a deep interest in collecting and travel.
As a family they would visit museums and historic landmarks, which encouraged his lifelong appreciation of history. As a young man of nineteen, he traveled to Europe for a two-month adventure and then to Central and South America when he was twenty-three years old (Donoghue, 1998).

Figure 3.3. Photograph of Smith as a young child. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University.

After he had read Augusta J. Evans’ *St. Elmo* (1866), young Smith dreamed of how he would hold his historical collections in beautifully furnished rooms, an excerpt from Evans’ book follows:

On a *verd antique* table lay a satin cushion holding a vellum MS., bound in blue velvet, whose uncial letters were written in purple ink, powdered with gold-dust, while the margins were stiff with gilded illuminations;...A small Byzantine picture...hung over an étagère,...where lay a leaf from Nebuchadnezzar's diary,
one of those Babylonian bricks…Several handsome rosewood cases were filled with rare books—two in Pali—centuries old; and moth-eaten volumes and valuable MSS.—some in parchment, some bound in boards—recalled the days of astrology and alchemy. (Simons, 1945, p. 41)

He was determined that someday he would have a room just like that – and in fact, he eventually did.

![Figure 3.4. Smith, age 21. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University.](image)

It may be surprising that the educational background of Smith is not mathematics. His formal education began at the State Normal School in Cortland. He continued his studies at Syracuse University focusing on art, classical languages, and Hebrew (Dauben, 2002). Smith graduated in 1881 and followed in his father’s footsteps by studying law at his father’s office and at Syracuse University; he was admitted to the bar three years later (see Figure 3.4). He soon realized that this was not his passion and accepted the offer of a mathematics instructor position at his alma mater, the State Normal School in Cortland; which began the foundation of his long teaching career. At the same time, however, he
was still pursuing his own education and received his Ph.M. degree in 1884 and a Ph.D. in art history in 1887, both from Syracuse University. “In the summer of 1885, he visited Europe again, this time in search of mathematical texts to add to Cortland’s library and portraits of past mathematical giants to illustrate his lectures on mathematics and its history” (Donoghue, 1998, p. 360). In 1887, he married his first wife Fannie Taylor (Fite, 1945).

In 1891, after seven years of teaching at Cortland, the Michigan State Normal College in Ypsilanti offered him a chair in mathematics position (see Figure 3.5). He accepted and thus began his publishing career. In 1895, Ginn & Company published his first textbook, *Plane and Solid Geometry*, coauthored with Wooster Woodruff Beman; and only one year later, wrote his *History of Modern Mathematics*. These are only the beginnings of what would become an extensive catalogue of writings. During his time in Ypsilanti, he “reformed the department, organized a prototype program to train mathematics teachers, and built an impressive mathematics library of over 700 volumes” (Donoghue, 1998, p. 361).

Figure 3.5. Smith, age 35, teaching at Michigan State Normal College in Ypsilanti. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University.
It seems that teaching, writing, and an academic setting suited Dr. Smith perfectly. He was selected to be the principal of the State Normal School at Brockport in 1898. This career choice, that only lasted three years, brought him back to the state of New York. Even at this early stage in his profession he was being acknowledged internationally, more specifically, in Germany, where Dr. Rudolf Knilling wrote an article for a German magazine entirely devoted to David Eugene Smith (Lawler, 1938).

Smith became acquainted with George A. Plimpton, president of the publishing firm Ginn & Company, in 1900, due to their shared interest in collecting. Plimpton invited Smith to his home, in New York City, to view his textbook collection. This visit, exposing Smith to New York City, and with all of his previous accomplishments led him to accept the new position of chair in mathematics at Teachers College offered to him by Dean James Earl Russell in 1901.

**Summary**

Brief histories of the founding of Teachers College, the Educational Museum of Teachers College, and David Eugene Smith prior to 1901 have been provided as context for this study. At this moment these three entities joined forces to promote historical aspects of mathematics education at Teachers College and throughout the world. The purpose of this chapter was to begin this narrative. This dissertation is dedicated to the study of David Eugene Smith’s collection at Teachers College. The history of the objects contained in his collection will begin in the following chapter.
Chapter IV: D. E. Smith’s Collection

Part I – Smith Travels the World

From a young age, David Eugene Smith was a world traveler. As stated previously, at twenty-three years old he had already traveled to Central and South America, as well as, a two-month excursion to Europe four years earlier (Donoghue, 1998). It was in Smith’s heart to travel, collect, and share his findings. He was fortunate to share his travels and adventures with his family. His typical travel companions were his first wife, Fannie Taylor, and later his sister, Mrs. Clara L. Jewett, and her daughter, Mrs. Helen Jewett McAleer (see Figure 4.1). Smith and his family shared a deep interest in traveling and education, this was especially true for McAleer. Along with Smith, she was an avid collector and owned her own gallery, Helen Jewett’s Little Bungalow Shop, which was located in their family home in Cortland, New York (see Figure 4.2).

Throughout their visits to Europe, Japan, China, India, countries in the Far East, and the Mediterranean, they studied the school systems and met with varied educational leaders. His travels were not just for collecting. Smith wanted to learn about the teaching of mathematics abroad while also giving addresses on education in America (Smith, n.d.a).

![Figure 4.1. Smith (center), Helen McAleer (front left), and Clara Jewett (far right) in 1937. David Eugene Smith Professional Papers, 1860-1945 (Box 121). Rare Book and Manuscript Library, Columbia University.](image)
In 1936, Smith reflected on some of his journeys to Italy, Burma, India, China, Japan, Sumatra, Thailand, and Persia (Smith, 1936a). These notes on his travels focused on his collecting and interesting incidents that happened in his pursuits. The source for these recollections is contained in twenty-four typed pages that seem to have been part of a “little folding book” that was never published (Smith, 1936a). Scattered throughout the text are side comments from Dr. Smith, as well as, remarks from Miss Bertha M. Frick, who was the curator of the George A. Plimpton, Smith, and Samuel S. Dale Libraries at Columbia University. The narratives in these notes seem to have been transcribed from interviews with Smith; however, the interviewer is not named. Yet with more detailed

Figure 4.2. (Left) Flyer sent to loyal customers of Helen Jewett McAleer, Smith’s niece, in 1930. (Right) Smith in her shop in 1934. It was common for Smith to visit the family home to get away from New York City. He also gave presentations on the items in McAleer’s gallery from time to time. David Eugene Smith Professional Papers, 1860-1945 (Box 32, Box 121). Rare Book and Manuscript Library, Columbia University.
study of materials related to Smith, a memoriam dedicated to Smith in the 1945 Bulletin of the American Mathematical Society written by Lao Genevra Simons includes some direct quotations from the narratives. Thus it appears that Simons was the interviewer. Indeed, Simons was a close friend to Smith. In a September 21, 1944 letter from Jekuthiel Ginsburg to Miss Bertha M. Frick in response to Smith’s passing, he states “with the exception of the members of his immediate family and Professor Lao G. Simons, we have more reasons to mourn his loss than anybody else” (Ginsburg, 1944, p. 1). These experiences of Smith, in the act of collecting, provide an illustrative background on how his collection was formed.

**Italy – 1904.** One of Smith’s travels to Italy was during 1904 while he was not only buying books and artifacts for himself but for George A. Plimpton’s collection as well (Smith, 1936a). Smith described this particular trip, during the summer of 1904, as beginning by staying with Leo S. Olschki, editor of the Olschki Publishing House in Florence, who “at that time…probably had the largest and best collection of medieval manuscripts and incunabula of any dealer in Europe” (Smith, 1936a, p. 14).

After Florence, Smith traveled to Venice in the hopes of perusing Mr. Rosen’s bookshop for some mathematical books; Mr. Rosen being Olschki’s son-in-law. Smith was unsuccessful in finding any items of interest in the shop, yet Smith recounts that “after I left, and was walking along the piazza, I heard him calling to me and I stopped and he said that it had just occurred to him that Professor Jacoli had a large library on the history of Italian mathematics and he wished to dispose of it” (Smith, 1936a, p. 14). Professor Jacoli’s son had recently committed suicide by drowning himself in the Grand Canal when his fiancé abandoned him. Sadly, Professor Jacoli and his wife lived in an
apartment overlooking the Grand Canal. They no longer wished to live there or in Venice because of their son’s tragic death and planned to go back to their home in Modena (Smith, 1936a).

Professor Ferdinando Jacoli was a professor in the naval college in Venice and had been a great friend of Prince Baldassarre Boncompagni (1821 – 1894). Boncompagni was an Italian historian of mathematics and considered to be the “most prominent and influential figure in this field” (Dauben, 2002, p. 80). Using his own printing press and publishing funds, he created the renowned *Bulletino di bibliografia e storia delle scienze matematiche* (1868 – 1887). Jacoli had written a number of articles for the *Bulletino*. Smith had read these articles and was therefore familiar with Jacoli. With arrangements made by Mr. Rosen, Smith met with Jacoli in his apartment library, “which was a mass of piles of books of all sorts. [Smith] spent two or three hours looking them over, and asked [Jacoli] how much he would expect to receive for the entire lot. The bargaining continued for a couple days, and eventually we came to terms” (Smith, 1936a, p. 15).
In Smith’s view, among the most important items from Jacoli’s collection was a portfolio of letters from Boncompagni to Jacoli (see Figure 4.3), a complete collection of the *Bulletino*, and an exceedingly rare copy of the first impression of Guillaume Libri’s *History of Mathematics in Italy* (see Figure 4.4). Smith described the rarity of the latter:

The day on which the printing was finished for Volume I of that book in Paris, Libri stopped at the printing office and took a few copies of the book to his home. An hour later the printing establishment was burned, and every copy of the History was destroyed except the few that he had carried home. One of these, Libri gave to Jacoli, who was one of his greatest friends. Libri went to work at
once to revise the book, and there are a large number of corrections in his handwriting and in Jacoli’s. It was not until four years later [1838] that the so-called first edition was printed and put on the market. (Smith, 1936a, p. 15)

It is interesting to note that around 1897, Boncompagni’s entire personal library had been put on the market. At that time, Smith was still in Ypsilanti and attempted to find someone to help him purchase the collection, but was unsuccessful. He did manage to obtain a good number of Boncompagni’s collection during this trip in 1904, when it was eventually dispersed to dealers in Florence and Rome (Smith, 1936a).
Figure 4.4. Libri’s *History of Mathematics in Italy* (1835). Title page (top left), page showing Libri’s handwritten corrections (top right), note written by Jacoli, in Italian, explaining the rarity of the text (bottom left), and translated note from Jacoli (bottom right). These notes, among a few other pieces, are placed in the front of the text. Smith Ref R510.9 L611. Rare Book and Manuscript Library, Columbia University.
Burma, India, Sri Lanka, Japan, and China – 1907. In November 1907, while on leave from Teachers College, Smith traveled to Burma and spent time in Mandalay and Rangoon. He became privy to the fact that a man, who had a collection of some interesting books, had just died. He went to visit this man’s home with his interpreter, David Abraham, his sister and his niece. Smith recollected, “I sent David up to announce our approach, and we climbed a ladder that took us up into the house. They had only one chair and that was very rickety. I was given that, [while] the ladies sat on the floor and the family…gathered in a semi-circle around me” (Smith, 1936a, p. 3). The collection consisted of a large amount of palm-leaf books related to Buddhism. Two specific items caught the attention of Smith. He described them as:

One was written on gilded copper, and the other on thick paper, also gilded. The one on copper had beautiful lettering in sepia lacquer, and the other was written in India ink. I looked at all of the books very carefully, and then I said to my interpreter: ‘David, there are only two books in that lot that I want. You needn’t be looking at them now, and I am not looking at them, we don’t want to beat the people down unduly but I want you to understand that when we leave this place you are to carry these books in your arms.’…I found two long strips of linen fabric. In this had been woven the lines of a song, and while we were bargaining I asked the family if they wouldn’t chant this for me, which they did. (Smith, 1936a, p. 3-4)

Smith also traveled to Lahore, India in 1907 and inquired at a local Christian college about obtaining manuscripts from dealers in the area. He learned about a Persian dealer
named S. Bahadur Shah and went to his home where the collection was stored. Smith recounted the meeting as follows:

He gave me a chair, and I told him that I wished to get any mathematical books or manuscripts that he might have. He at once said he didn’t have anything of the kind, but I said ‘Haven’t you any work on Mathematics?’ and he said no, he had never bought any. He added, however, that he had a few books that I might care to look at, and so he brought out about a bushel and dumped them all on the floor. He then said that he had a few more, and would bring these in, and he left me with the pile of books. The first one I picked up was an exceedingly rare translation from the Greek into Arabic of Euclid’s *Geometry*. I also found perhaps a dozen other books manifestly on Geometry or Astronomy. When he came back into the room I showed them to him and said that was what I wanted. His reply was ‘But I though you wanted Mathematics!’ It was evident that that term was not familiar to him. If I had a said ‘Geometry’, which is practically the same in Hindustani as in the Greek word, he would at once have known. As a result I bought, I suppose, about forty books, all of them in manuscript form. (Smith, 1936a, p. 7)

Smith reported how the dealer and he could not come to an agreement on the price for a particular manuscript written by Ulugh Beg (1394-1449). Ulugh Beg was an astronomer, mathematician, and sultan of Timurid, a Central Asian dynasty. Smith was trying to get a lower price from the dealer, and told the dealer that he was leaving the next morning to Delhi, and if the dealer would agree to Smith’s price then the book could be delivered to the train station. Unfortunately, the dealer stuck to his ground and Smith left for Delhi without the text. Smith was persistent and immediately wrote to the dealer when he
reached his destination and agreed to the dealer’s price of $84.25. Smith explains his reason as, “I consider this the finest mathematical manuscript that I ever bought in the East. Since that time, I have purchased through him or other dealers three other manuscripts of the same work. They are older than the one that I got at Lahore, but are not so beautifully written” (Smith, 1936a, p. 8).

Although David Eugene Smith was a well-known authority and respected historian of mathematics, he was not always accepted with open arms. After Lahore, Smith traveled to Bombay, where he met with a dealer in Sanskrit manuscripts. During the meeting, Smith inquired about mathematical manuscripts in Oriental languages and assured him that these manuscripts would be purchased for Columbia University for educational purposes rather than commercial sale. Smith described the experience as follows:

[The dealer] seemed to be somewhat skeptical about this, and told me that if I would come back the next day he would consider the matter more carefully. His shop was a small room, and he must have had some thousands of manuscripts piled on the shelves there and in the adjoining room. The next day I went back to see him at the time appointed, and I found six pundits besides the dealer himself. He gave me a seat by his side, he sitting on the floor. The pundits…all sat on cushions. He then began to ask me questions as to why I wanted the books since I couldn’t read them, and I told him that I was not buying them for my own direct reading, but for the reading of scholars who might be working in Columbia University in the years to come. (Smith, 1936a, p. 9)
Smith explained that the dealer wanted to know specific names of authors for the works that Smith was interested in purchasing – almost as if the dealer was testing Smith’s knowledge of Hindu writers. This was not a difficult task for Smith, and he provided the dealer with numerous names and dates. Smith was very confident in this task and believed that he knew more names than the dealer and his pundits. In fact, when the dealer and pundits began to ask him questions on the subject, Smith turned the tables on them. He described the situation:

I asked them about their belief in astrology, and about the difference in the works of the two Aryabhattas. They evidently had not heard that there were two, even if they had heard of one, and at the end of an hour or more they all rose and bowed to me and said that they were convinced that it was a legitimate reason that I had for wishing to get the books. [The dealer] had brought out all of the mathematical manuscripts that he had. He pointed to them and said that they would all be at my disposal. As a result, I brought out from Bombay a large number of manuscripts. They included the famous work on astronomy by Varāhamihira. I was afterwards told that there were only six complete copies of that in Sanskrit known to Oriental scholars. (Smith, 1936a, p. 9; Smith Indic 14/14A, 15, 37, 38, 106, MB II)

On the other hand, Smith was able to meet and interact with a variety of people through his journeys who respected and admired him greatly. He visited Colombo, Sri Lanka and visited the high priest of the Buddhists in the outskirts of the city. As Smith approached the monastery, he was greeted by three priests who told him that the high priest was not accepting any visitors at this time – due to the high priest’s illness and approaching death. Smith explained further:
I gave them my card telling my affiliation with the University and the American Mathematical Society, and asked that it be presented to him after I left. I noticed, however, that they had called in two or three other priests, and in the corner of the room they looked over my card and then one of them left the room and I was asked to wait a few moments. Soon he returned, saying that His Reverence, the High Priest, wished to see me. I passed through a long corridor, and was admitted to his bedroom, where I saw him lying on his bed in the darkness, the curtains having been lowered. It was rather an embarrassing situation, to be going to a man’s deathbed and talking mathematics to him. I found him, however, one of the finest gentlemen I ever met. He was interested in my inquiry, and he finally said that there was nothing in the library of Ceylon [Sri Lanka] that related to mathematics or astronomy. There was, however, he said, a well-known book on astrology, which necessarily had some mathematics in it, and he sent the servant out and he brought back a palm-leaf manuscript, which the high priest told me was well known among all the scholars of Ceylon. He said that it would be impossible to buy one, but that it would give him great pleasure to have a copy made and sent to me…I had been seated in a small child’s chair, the priest having told me that in the presence of His Reverence no one was allowed to sit, but that in this case, if I would sit in the chair of a child, I would be welcome to that rest. When the time arrived for leaving, I arose, and to my astonishment, the dying high priest threw off the bedclothes, arose, and conducted me with great courtesy to the door. I treasure that copy that was made, not only for its own value, but also for the great kindness that this man, an invalid, showed me, a stranger. I was glad
to learn afterwards that he recovered, and that he lived some years thereafter.

(Smith, 1936a, p. 12-13)

During Smith’s travels to Japan and China in 1907, it was his goal to purchase every worthy mathematical manuscript or book that was available. He believed that he accomplished this goal; as whenever he returned to that area, there was nothing left for him to acquire. When writing his *History of Japanese Mathematics* (1914) with Yoshio Mikami, Smith realized that in his own collection he had all the important works needed to write the book (Smith, 1936a).

Smith could also be considered a detective in the realm of the history of mathematics. One of Smith’s more famous discoveries was one that earned him George A. Plimpton’s respect and loyalty as a fellow collector. During an early meeting with Plimpton in 1901, Smith was inspecting a manuscript of *Liber Abaci* written by Leonardo Pisano in Plimpton’s collection. Through comparing Plimpton’s manuscript with others written by Pisano, he discovered that it was not solely the *Liber Abaci* but “a compilation of 15th-century Latin manuscripts that contained a translation of part of al-Khwarizmi’s Algebra et almuchabila. Smith loved the role of literary detective and remarked that ‘[t]he most interesting part of all will be to find the sources of the other extracts’” (Donoghue, p. 362, 1998).

Another example of Smith as a keen investigator concerned a seal displaying the head of Galileo, which had been owned by Sir Isaac Newton, exhibited at the South Kensington Museum. Smith recognized it was not the head of Galileo and reported it to the Museum; it was immediately removed from exhibition, although it had been used by Newton (Smith, 1936a).
During his travels to China in 1907, Smith hurriedly purchased several volumes on geometry. Unfortunately, he did not have any time for translations of the texts, but did note they were written by Li Ma Do. Smith recollected:

I never had heard of such a mathematician, but I bought the book and shipped it with the other material to New York. Coming up the Red Sea, one day, I kept thinking about this book of Li Ma Do’s, and then suddenly it came to my mind who the man was. I knew that the Chinese could not pronounce ‘r’ and used ‘l’ instead…then the name of the author might have been Ri Ma Do. Then it suddenly dawned upon me that the principal name, which we would put at the end of a signature, ought to go at the beginning, according to their plan. The author, then, might have been Madori, and then the whole thing came to me. ‘Mado’ was ‘Matteo’, the ‘Ri’ was the beginning of ‘Ricci’, and I apparently had a manuscript copy of the translation of Matteo Ricci from a Latin edition of Euclid into Chinese. I have now in this library a complete manuscript of this epoch-making translation of Euclid, the first that was attempted in the Far East. (Smith, 1936a, p. 16-17)

During this journey in 1907, Smith had collected the majority of his items of Japan, China, or India origins (Broomell, 1908). Although Smith was always on the lookout for the curios, he was a dedicated professor at Teachers College. Thus, only after his retirement in 1926, did he become even more of an active traveller and collector.

**Sumatra, Thailand – 1930.** His acquisitions often took Smith to unique locations, where he met curious people of all ages. In 1930, Smith traveled to Sumatra
and visited the Batak Museum. The curator told him that there was only one book related
to Smith’s interest in a small village not far from where they were. Smith remembered:

We [Smith, his sister, and niece] climbed over the mud walls surrounding the
little village, and asked to see the headman. He came out dressed in a scanty robe
and one tooth hanging in the front of his mouth. I stated my problem to him, and
he said, yes, they had a copy of a book of that kind, and he sent out to get it.
Meanwhile [the entire] village had gathered around us – men, women, children,
poultry and pigs…. I asked him to read some of [the book] for me, which he did.
This being [said] to the chauffeur and thence to the interpreter and thence to me. It
seems that the book has a little astrological material, but chiefly it was made up of
incantations of one kind and another. The headman told me that there were a
number of medical recipes in it, but that it was very potent in relieving illness by
being bound on the part of the body that had the most pain. If that were done, the
pain would all be gone the next day. This piece, therefore, has probably been
bound upon hundreds of sores and ailments of every kind. Not leprosy, however!
He also said that they had some writing on bamboo sticks, which contained
charms against disease….The writing is scratched with a jack knife and rubbed in
with lamp black. After a good deal of bargaining, I bought two of the bamboo
cylinders and the one book, which was said to be the only one on the island
outside of the museum. We then climbed over the mud wall and walked to…our
car. (Smith, 1936a, p. 1-2)
Numerous people with items to sell contacted Smith; these included friends, colleagues, scholars, and even young children! As described by Smith in what followed the meeting with the headman that day:

As we were going up the hill, I noticed a boy running across the meadow and waving his hands at us...[he] stood in the road so that we couldn’t pass. He came to the automobile with two other books in his hands. He said we must not tell the headman of this, but that they had had two books in their family and he wanted to sell them. Then resulted the usual bargaining, and I came away with the books, so that instead of there being only one known book on the island there were at least three, and I have no doubt there were others. (Smith, 1936a, p. 2-3)

During Smith’s 1930 trip to Siam he visited the museum in Bangkok. The curator told Smith that in order to purchase any materials from dealers in the area it would have to be cleared by Prince Damrong Rajanubhab (1862 – 1943). Prince Damrong was the founder of the modern Thai education system and an avid historian (Bunnag, 1977). By direction from the curator, Smith wrote a letter to the Prince noting that he was interested in obtaining any items related to mathematics or astrology “that showed some excellence in calligraphy” (Smith, 1936a, p. 18). This message was immediately sent over to the Prince, as Smith received a response only ten minutes later from him asking Smith to come visit at once. Smith described the visit as follows:

My sister and niece were with me and I couldn’t take them around there because they had not been invited, but we took our carriage, automobiles being somewhat out of the question at that time, and we drove around to the entrance to the grounds and were at once admitted. I told the driver to take me to the palace and
then take my sister and niece up to a place I saw in the park where there was a

good shade. Soon, however, we reached the palace. The door opened, and the

Prince came out, and I apologized for bringing my sister and niece when they had

not been invited to come. He was most gracious, and at once invited all three of us
to have tea with him. Then began an acquaintance, which lasted for two or three
years. The result of the whole matter was that he gave me the name of the only
dealer of any consequence in the town, and gave me much information

concerning the kind of books that would be available. As a result of all that, there
were two barrels of manuscripts...to be sent to America. I was entertained the
next day at a tea given by the librarian [at the palace] and I met there a number of
the literati. I said to the Prince that I understood that I could not export any books
or manuscripts without the permission of the Government, and that that would
take a couple of weeks, whereas I had to leave in a few days. He smiled
pleasantly, and said I should leave that to him. The books would be examined
quickly, and there would be no question about the transportation. (Smith, 1936a,
p. 18)

Smith and his family met the Princess, daughter of Prince Damrong, during their visits to
the palace and remained in contact with both the Prince and Princess until the coup d’etat
of 1932 when the family was exiled to Malaysia (Smith, 1936a).

**Persia – 1933.** In 1933, Smith published a translation of the *Rubaiyat* of Omar
Khayyam for which he received decoration from the Shah of Iran (Fite, 1945). Due to
this, he was quite popular as a potential buyer of antiquities in Persia (see Figure 4.5); in
fact, the literati of the area gave a reception in his honor when he arrived. Many dealers
who had searched for and obtained numerous books on Persian poetry and mathematics for Smith to purchase approached him. Smith explained further that he purchased about twenty manuscripts from them. In this group was a manuscript from the tenth century, a translation from Greek into Arabic of Archimedes’ work on the sphere and cylinder (Smith, 1936a).

As can be expected in traveling throughout the world, there were times when Smith was not completely safe. One specific incident occurred in Teheran, the capital of Iran, during the month when pilgrimages were made to Meshad. Smith was on a mission to view a specific Koran that was located in a shrine in the city. Since this was during the holy week, it would be sacrilegious for Smith to enter the shrine, as he was an infidel. The Governor, who was considered an open-minded man, told Smith he would do everything that he could to let him see what was considered the most beautiful example of calligraphy in existence. He warned Smith though by saying, “I can get you into the shrine, but I can’t get you out alive”; however, he said that he would find a way to get him into the shrine and get the book out for Smith to view (Smith, 1936a, p. 22). Smith retold the event:

At the prescribed hour I went there, leaving the ladies [Smith’s sister and niece] in the compound, for they of course were not permitted anywhere near the holy place. They in fact apparently knew nothing about the projected adventure. The Chief of Police, the Secretary of the Governor, the Secretary of Education, and one other person, took me around through one of the bazaars to a side entrance to the compound. I was dressed with the Persian hat, but with European clothes – which was not at all uncommon in the case of Mohammedans. I was taken in as
an Egyptian who lived in Istanbul and couldn’t speak Persian, so they had to translate for me. Well, we walked in. I was in the middle, and I was warned not to speak a single word. As a matter of fact, I got enthusiastic and did speak one word. At that the Chief of Police squeezed me so hard in warning that he almost broke my hand. He was afraid someone might hear me. I passed as far away as possible from three or four priests who were preaching to groups of the Faithful, all sitting on the ground. I saw one of the priests looking at me in a very curious way, and I looked at the ground – in a very curious way! We spent about a half an hour going around, and finally reached the entrance gate to the compound, and I must say I drew a long breath of relief when I got out. I returned to the Governor’s house, and he said, ‘I will get the book you want to see.’ He did more than that, though. He sent out to the librarian of the shrine, that was the Holy of Holies, and they brought as many as ten large manuscripts and put them on the table in front of me. For two hours I sat there and talked to the Governor and held in my hand that one book, which I still think is the most beautiful book in the world…They had brought over the best books they had to show me – this, too, seems to have been strictly against the Mohammedan tenets, for they were not supposed to be looked at by an infidel – but apparently the librarian of the shrine was another “broad-minded” man. But they were taking no chances of losing them and saw to it that they were well guarded. The head librarian came himself, and brought his servants as well. Besides this they carried the books over to the Governor’s house under a cover so that no one would know that they had been taken out. (Smith, 1936a, p. 23-24)
Part II – Step Inside the Collection

Educational Museums. Teachers College’s beginnings created a special situation that was conducive to an educational museum. Andrews (1909) defines this type of museum as “an institution that contains objective collections which have an illustrative, comparative, or critical relation to the schools and to school work, or which are concerned with education as a profession, a science, or a social institution” (p. 3). The college had developed into two kindergartens, two elementary schools, a high school, an undergraduate, and a graduate school. Thus an educational museum was a perfect addition and product of the environment.

Andrews (1909) claimed that the first educational museums began during the 1860s and the trend had continued throughout the world up to the time of his study. At the beginning of the twentieth-century, a renewed interest in educational museums occurred in the United States. St. Louis had a major educational museum that, through some alterations through the years, is still in existence today. At the beginning of the
twentieth century, American universities attempted to create their own educational museums; besides Teachers College in 1899, this included the University of California at Berkeley, Clark University, Harvard University, the University of Illinois at Champaign, and Indiana University at Bloomington. The collections in each of these institutions varied in materials and organization. For example, Harvard did not maintain a museum but exhibited materials in Massachusetts towns focused on student work from schools in the area; while Indiana University used its material as a type of reference book for the teachers, similar to that of a library. There were seventy-four educational museums outside of the United States at the time of publication of Andrews’ 1909 study. He organized them in a directory if further study is desired (Andrews, 1909).

**Smith’s Influence on the Educational Museum of Teachers College.** In the 1899 *Columbia University Quarterly*, it is noted that:

“A unique feature of the report is the discussion of the possibilities and the requirements of an educational museum, designed to illustrate various educational systems, class work and general educational problems and methods. Teachers College has definitely taken up this museum problem, and a good beginning has been made toward making available in all departments the photographs, lantern slides and other illustrative material scattered about the buildings” (p. 80).

Smith was part of the Educational Museum as soon as he arrived to Teachers College. In 1902, he was the chairman for arranging the educational exhibit at the St. Louis Exposition – the precursor to the St. Louis World Fair in 1904. Smith’s exhibition was awarded a gold medal. The Educational Museum was gaining popularity due to its special
exhibits in various fields, including anthropology, oriental art and industry, textbooks, and religion (Columbia University Quarterly, 1902).

In need of some guidance, Dean James Earl Russell asked for Smith’s advice on how the Educational Museum could be better organized. In an eleven-page letter to Russell on December 8, 1902, Smith stated: “You [Russell] have twice suggested that I tell you definitely what I think should be done with the Educational Museum. My proximity to the room has led me to see more of it than the rest of the faculty, and a rather natural instinct for collecting has stimulated my interest in it, and therefore I am prompted to follow your suggestion” (Smith, 1902, p. 1). Smith had a specific vision for what the Educational Museum could become with the proper guidance. He began the letter by stating that the museum should not be merely a storeroom for materials needed by the faculty. Smith believed that this type of material should be kept in each department, for easy access. He further explained that the museum should not solicit its material to dealers, which would cause unnecessary items being included in the collection. A final, but major point, Smith stressed, was that the current curator, George S. Kellogg, should be removed from the position. Smith was adamant about that even to say, “I find that the faculty will positively decline to take any interest in [the museum] so long as he has control of it” (Smith, 1902, p. 2).

In the letter, Smith gave six explicit propositions on how he envisioned the Educational Museum. These suggestions were very specific as to what should be in the cases and how the cases should be organized. He proposed that there should be “a series of large cases, one for each grade from kindergarten through the high school…[it should include] the world’s best illustrative material…[yet avoiding] the extravagant, the bizarre,
and all that is not usable and valuable for our American schools” (Smith, 1902, p. 3).

Smith thought of the museum as a place for teachers to visit and view not only the historical side of education but also the practical side; “a label on each piece of material should state its purpose, the price, and where it can be purchased. A superintendent, principal, or teacher should be able to go to the cases and see the best and most modern material, and ascertain the prices and the makers, without looking over catalogues or making further inquiry” (Smith, 1902, p. 3).

As can be expected, Smith valued instruments and tools in education, hence he wanted to have these types of items properly showcased in the museum. He specified the actual apparatus to be displayed rather than the student’s work with the tool. Smith had an idea for the organization as well: “hand work (only the tools, not the product), domestic art, domestic science, fine art, geography, mathematics, [and] natural science” (Smith, 1902, p. 4).

Smith did value student work, especially from other countries. He told Dean Russell that “after such a collection has been established, and possibly while establishing it, the best specimens of pupils’ work should be collected, and this, too, should be arranged by grades” (Smith, 1902, p. 4). He discussed further that Teachers College already had some examples of work from Japanese students; however, since it was not properly organized and far from being complete, it had “no real value” (Smith, 1902, p. 5). All of these suggestions were focused on the practical part of the museum, as opposed to its historical items. In Smith’s final suggestion for what the museum could become he stated, “not a thing should go into the collection of school supplies that we cannot
indorse, and when it becomes obsolete or is considered unworthy, it should be thrown out entirely, or put in a case of historical material” (Smith, 1902, p. 5).

Since it was still in the early years of the Educational Museum, Smith had high expectations of having such a museum at Teachers College. He had visited a few other similar organizations; however, in Smith’s opinion there existed only three or four “serious attempts” at such a thing, and found that they were failures because of a lack of organization. These were in Russia, Germany, and France. Smith claimed, “the movement was started at Ypsilanti five years ago [1897], but on a wrong basis, and it failed. It is, I believe, safe to say that there is, today, no well arranged, modern, helpful collection of this kind anywhere” (Smith, 1902, p. 7). Smith felt that with the proper guidance the Educational Museum of Teachers College could be a pioneer in the field.

Even though at this moment Smith was new to Teachers College, Dean Russell acknowledged that Smith was an authority on these matters. Smith commented that the cost of establishing such a museum would be $2000, not including the cost of the cases. He described further that $500 a year would keep it running, while $1000 a year would be needed for all other necessities besides wages (Smith, 1902).

Smith concludes his letter by further drilling in the point to Dean Russell that the success of the museum is contingent upon Kellogg being replaced by a faculty member acting as curator. This would ensure the cooperation from the faculty, which as it seems, was lacking with Kellogg as the current curator. Smith understood that it would be a huge undertaking by a faculty member and suggested to Russell to allow for additional remuneration. He suggested two colleagues for the position, Professors Samuel Dutton and Frank McMurry (Smith, 1902, p. 11). Dutton was the Superintendent of the Teachers
College Schools and a Professor of School Administration and McMurry was a Professor of the Theory and Practice of Teaching (Columbia University Catalogue, 1901).

As it turns out, Russell followed many of Smith’s recommendations as evident through Andrews’ 1909 study where he describes the organization and management of the Educational Museum of Teachers College. During the 1907-1908 academic year, Andrews reports that there were specified collections: curriculum and methods of elementary and secondary education, educational administration, school buildings and equipment, history of education, foreign school systems, art, biology and nature study, domestic art, domestic science, geography, history, kindergarten education, language and literature, mathematics, manual training and industrial arts, natural science, physical education and anatomy, and religious education (Andrews, 1909). This list was very similar to Smith’s in 1902.

In Andrews’ 1909 study, the Educational Museums of Teachers College is described as a well-organized system, possibly due to Smith’s urgency to the Dean in 1902. They used the “Dewey numerical classification” for the lantern slides and photographs, along with card catalogs for the collections as a whole. There were case guide cards to provide even more clarification for a direct reference to where the item would be located in the museum. The care taken in designing the display cases was recognized by many museums. They copied them for their own collections (Andrews, 1909).

The staffing situation about which Smith was concerned was rectified in 1903 when Benjamin R. Andrews was selected as the Supervisor of the museum until 1906, followed by David S. Snedden, Adjunct Professor of Educational Administration, as

During the museum’s active years, there were exhibits in varying disciplines. One that is similar to Smith’s line of work is an exhibit of George A. Plimpton’s mathematical books. In a letter to Smith from Plimpton on December 4, 1902, he stated, “next winter I want to exhibit my mathematical books and get you to give a talk on them” (Plimpton, 1902, p. 1). This exhibit occurred during the Fall semester of 1903. Benjamin R. Andrews, wrote to Plimpton on December 11, 1903 and described how over 1,700 people visited the exhibit during the two weeks. He continued “Dr. Smith has doubtless already told you of the value of this particular exhibit to his students and the College at large, as well as to the many outsiders who came in” (Andrews, 1903, p. 1).

**Smith’s Collection in the Department of Mathematics and Educational Museum.** The Educational Museum of Teachers College used special exhibits to present the materials in Smith’s collection both in the designated museum rooms, as well as, in the Department of Mathematics offices. As early as 1904, Smith was opening up his collection to students, as noted in the 1904-1905 *Columbia University Quarterly*, “Professor Smith, of the department of mathematics, has made available for the use of students his private mathematical library of 4,000 volumes and 6,000 pamphlets, and his unique collection of 2,000 manuscripts and 1,100 portraits of mathematicians. Selections from the last have been reproduced for use in other institutions” (p. 379-380).
The Department of Mathematics of Teachers College had its own Mathematical Library in Room 212 Main Hall (see Figure 4.6). This was where Smith’s extremely large collection of books, pamphlets, instruments, manuscripts, engravings, and portrait medals were displayed. The adjoining room, Room 211, contained the collection of mathematical apparatus and models related to number games and mensuration (Department of Mathematics of Teachers College, n.d.). Smith’s collection in the Department of
Mathematics was actively promoted through detailed descriptions in journal articles and bulletins. For example, a 1907 piece in *Science* was entitled, “A Mathematical Exhibit of Interest to Teachers” (A mathematical exhibit, 1907).

The years around 1909 seem to be the pinnacle for the Educational Museum, as well as, Smith’s collection at Teachers College. This could be due to the fact that this was the year that Smith officially took over responsibilities as director of the museum. During July of that year, the entire collection was recognized in *Scientific American* (Wade, 1909) in a multi-page article containing photographs of the remarkable instruments in Smith’s collection. It was during 1909 that Smith through the Department of Mathematics printed “several facsimile pages from a manuscript of about 1300 A.D., representing the earliest English use of Arabic numerals, and has provided for the use of students an illustrated catalogue of Professor David Eugene Smith’s collection of one hundred and twenty-two portraits of Sir Isaac Newton” (Columbia University Quarterly, 1909, p. 97). Smith’s mission was always to allow access to his collection as much as possible. The Educational Museum itself also loaned its material, “11,460 loans in 1910 with one-fifth of those being to other institutions” (Columbia University Quarterly, 1910, p. 325).

**Two Exhibition Pamphlets.** Two pamphlets, one from the Department of Mathematics and another from the Educational Museum of Teachers College, exist in the David Eugene Smith Professional Papers collection in the Rare Book and Manuscript Library at Columbia University. These two pamphlets are included in Appendix E. The pamphlet from the Department of Mathematics is a general description of all that is included in Smith’s collection. This would have been viewed by anyone who would have
come to the collection, or possibly as a way to promote the collection. It is unfortunately, not dated, but it can be assumed that this was around 1909.

As a guide for visitors to the Educational Museum, the second pamphlet is dated January 4, 1909 and February 13, 1909 because it promoted an exhibition of Smith’s collection during that time. A special activity of this exhibit was Smith’s presentation and explanation his own material on January 9th. This exhibit consisted of:

Mathematical instruments, measures, medals, manuscripts, early printed books, portraits, and curios, collected in various parts of the world and illustrating the history and teaching of mathematics in various periods. There are also photographs of many rare manuscripts and early printed works in various libraries of Europe and America, supplementing the original material in the collection” (Educational Museum of Teachers College, 1909, para. 3).

The pamphlet is organized by the cases in the actual museum. It describes twenty-six cases, as well as, a disclaimer that there are also materials scattered around the walls and that:

Owing to the lack of room in the museum it is impossible to exhibit a great many books and objects that should supplement what is here displayed. These include books showing the early history of the calculus and analytics, portraits, autographs, photographs of rare inscriptions, and illustrations of primitive instruments. (Educational Museum of Teachers College, 1909, Final page, para. 2)
Smith’s Collection. To write a detailed report on each object in Smith’s collection would be impracticable, as it contains over 20,000 items. Yet, even within one category of Smith’s collection, it would be unfeasible to give an account of each item. Thus, to give a description of Smith’s collection, only the major pieces of which Smith designated in talks and journal articles will be discussed.

Printed Material. Smith’s collection of printed books and pamphlets comprises about 10,000 pieces of printed material. It ranges in texts ranging all the way back to the fifteenth century, with the majority being from the sixteenth and seventeenth centuries (Frick, 1936b). Smith once described his printed material as, “mathematical classics, such as the first great printed algebra, the second one, the third, and the fourth. The Bombelli work belonged to the grandson of the author…I have also the first editions of all the Hindu classics in mathematics” (Smith, 1920, p. 12). Smith’s collection also includes the first printed edition of Euclid’s Elements from 1482. Other material from that century includes Pacioli’s Summa de arithmetica, geometrica, proportioni et proportionalita, of 1494 and Boethius’ Opera of 1499 (Frick, 1936b).

As described previously, Smith also had one of the half dozen copies with handwritten notes of Guillaume Libri’s History of Mathematics in Italy, saved from the fire that consumed the remaining first edition in 1835 (Smith, 1936a). Smith also included in his collection major Japanese and Chinese mathematical texts, such as “the Chinese encyclopedia of mathematics published by the Jesuit influence in the seventeenth century; the first Chinese edition of Vlacq’s table of logarithms; an early Chinese edition of Euclid; numerous Japanese manuscripts and printed works, and an early Manchu treatise on mathematical astronomy” (Educational Museum, 1909, para. 7). One of these
works is of Shunzo Yoshio, b. 1787, titled *Rigaku nyushiki: ensei kansho zusetu* [Introduction to science: Western meteorological observation illustrated] (1823; Smith Japanese Ms. E-11).

During a trip to Florence in 1908, Smith purchased Paolo Casati’s (1617-1707) *Fabrica et uso del compasso di proportione* (1685). This text demonstrates the beginnings of decimal fractions on its plate (see Figure 4.7). During that same visit, Smith purchased a book on astrology and it had a signed drawing of a compass rose by Galileo hidden inside (Lee, 2002). Another interesting find is John Napier’s (1550-1617) *Rhabdologia Neperiana. Das ist newe und sehr leichte art durch etliche stäbichen allerhand zahlen ohne mühe, und hergegen gar gewiss zu multipliciren und zu dividiren*
(1623), which was the first German edition of Napier’s original of 1617 that included the “Napier’s Bones” version of multiplication (Lee, 2002; Smith 510.78 1623 N16).

Some of the printed materials included special autographs. For example, Tonstall’s *De Arte Supputandi* (1529) with the autograph of Thomas Digges (1546-1595) who was an English mathematician (see Figure 4.8); “the proof sheets of Lord Brougham’s address on Newton, with his corrections; the copy of Leslie’s *Plane Trigonometry*…he gave to Arago, the great French astronomer” (Smith, 1920, p. 13).
Others of interest include Johann Stoeffler’s (1452-1531) *Elucidatio fabricae ususque astrolabii* (1513) that included diagrams depicting lines in an astrolabe plate with fold-out tabs (Smith 522.4 1513 St65). This work on the astrolabe was considered the standard at this time up until the early seventeenth century. Another to point out is a first edition of Gemma Fresius’ *Arithmeticae practicae methodus facilis* (1540) where the title page depicts Fresius in his study (Lee, 2002; see Figure 4.9). Smith had quite a humorous side as he recreated this image, though with himself rather than Fresius, for his own bookplate (see Figure 4.10).
Figure 4.10. Smith’s bookplate (1907), modeled after Fresius’ bookplate where Smith used his own image instead. Image courtesy of the Rare Book and Manuscript Library, Columbia University.

**Manuscripts.** Smith believed that his manuscripts were the most interesting in his collection of texts (Smith, 1920). His collection of manuscripts came from all over the world. He had a complete set of the Chinese classics, with special focus given to an early copy of a translation of Euclid by Matteo Ricci c. 1600. Ricci was a celebrated Jesuit missionary in China, whose name was deciphered by Smith as mentioned previously (Smith, 1936a). Smith considered the Japanese manuscripts in his collection beautiful both artistically and mathematically (Educational Museum, 1909).

Smith described the importance of mathematical manuscripts, in particular, ones from Persia, as “they translated the Greek classics into their own languages at a time when these classics were in danger of being utterly lost in the West. Thus it came about that the first knowledge that awakening Europe in the twelfth and thirteenth centuries had of writers, like Euclid, came through translations from the Arabic into Latin” (Smith, 1920, p. 14). Smith had collected many of these manuscripts, including, a “manuscript of Euclid’s complete works of 1348 (747 of the Hegrira), the two manuscripts of El Tusi’s [Nasir al-Din al-Tusi] work, one of 1297 and the other of 1352, and several early
manuscripts of Beha Eddin, the prince-mathematician of the sixteenth century” (Smith, 1920, p. 14-15).

Before Smith had translated the *Rubaiyat* and was honored by the Persian government in 1933, he described the manuscript and others in 1920 as “a Persian manuscript of the greatest Hindu classic, the *Lilavati* of Bhaskara [from the twelfth century], and while I have only the printed edition of Omar Khayyam’s algebra (a manuscript belonging to me being still in India), you may be interested to see a beautiful little manuscript of his *Rubaiyat*” (Smith, 1920, p. 15). Another interesting manuscript was an unpublished life of Galileo (Educational Museum, 1909; see Figure 4.11). Smith collected other types of manuscripts as well; these documents include “tax and census rolls…deeds…marriage contracts…units of measure for various cities, rent rolls and wills” (Frick, 1936b, p. 80).
Figure 4.11. Unpublished Manuscript of Galileo. MS 520.1800. Description: “Manuscript written in the late 18th century. Apparently the author was a contemporary of Galileo. Numerous errors corrected in red, perhaps by Ferdinando Jacoli, to whom this ms. probably belonged.” Rare Book and Manuscript Library, Columbia University.

**Portraits and Medallions.** Smith’s collection of portraits consists of 3,000 portraits of mathematicians. In 1920, Smith wrote, “my collection of portraits of mathematicians started some thirty years ago in a desire to extra-illustrate Cantor’s German *History of Mathematics*. It soon grew beyond this ambition, and now it numbers about 2500 titles [as of 1920]. These are rarely important as works of art, but they form an historical collection that is unique” (Smith, 1920, p. 11). Several of the portraits are black and white etchings; one of l’Hospital is unique in that it includes some color (see Figure 4.12). The Department of Mathematics at Teachers College produced many
lantern slides from these portraits. A complete list of the portraits currently at the Rare Book and Manuscript Library is included in Appendix C.

Figure 4.12. Portrait of Guillaume de l'Hôpital. Smith Portraits (Box 6). Rare Book and Manuscript Library, Columbia University.

Besides the typical medium of a portrait, such as oil, pencil, or photograph, Smith also collected medals to honor mathematicians. Smith stated, “It does not seem as if a mathematician would ever be looked upon with sufficient favor to have a medal struck in his honor, and yet I have about a hundred and fifty such evidences of the popularity of certain members of the guild” (Smith, 1920, p. 12). Among this collection includes the
images of Newton, Descartes, Fermat, Galileo, Neudorfer, Bertrand, Arago, and Le Verrier (Department of Mathematics, n.d.). The collection also included a complete set of mathematical portrait medallions by David d’Angers (1788-1856), a French sculptor (Smith, 1920).

*Autographs.* Along with the autographed copies of texts, Smith collected letters from notable mathematicians. Yet again, his desire to “extra-illustrate” a book led him into the world of collecting letters (Smith, 1920). His collection consists of more than 4,000 items. In some instances Smith collected all known correspondence of the author. The most notable mathematicians and scientists are included in his collection (Frick, 1936b). These include Newton, Leibniz, Mersenne, and the families of Cassinis and Bernoullis.

Smith described some quite interesting and rare finds of correspondence in his collection as:

Letters written from the field by Delambre when he was surveying for the purpose of finding the basis of the metric system; a letter from Mechain, the unfortunate scientist who made the error in the survey which affected the length of the meter; letters from Libri relating to the serious charge of theft made against him in forming his two remarkable libraries; letters from Lewis Carroll of Alice in Wonderland, who was Charles Lutwidge Dodgson the Oxford tutor in mathematics [see Figure 4.13]; the letter written by Daniel Bernoulli to the Secretary of the French Academy in acknowledging the prize for his work on the tides; a page of Newton’s manuscript; a love letter written by the great French mathematician Dupin; a poem written by Sylvester, England’s great
mathematician who gave the first real start to our science in America. (Smith, 1920, p. 16)

Other autographed letters in Smith’s collection are from Sir William Rowan Hamilton, Euler, and an interesting chain of letters between Poncelet, Liouville, Direchlet, and Arago (Smith, 1920).

Figure 4.13. Letter from Charles Lutwidge Dodgson (Lewis Carroll) to the Mathematical Editor of “The Educational Times.” David Eugene Smith Collection of Historical Papers [ca. 1400-1899]. (Box 9). Rare Book and Manuscript Library, Columbia University.
**Instruments.** Smith’s collection of mathematical and astronomical instruments included about 275 pieces, which he used in his lectures (Smith, 1936b). The texts and manuscripts Smith had collected throughout the years included many of these instruments in their descriptions; thus his textual collection was directly connected with his instruments and tools.

Some of Smith’s instruments, especially related to astronomical work, are quite beautiful. For example, his collection contains two seventeenth century celestial spheres of bronze, where the stars are inlaid with silver (Smith 27-244 & Smith 27-198). This type of instrument “represents a phase in the progress of the world from fear of the influence of the unknown to the appreciation, through mathematics, of what the stars really are, and where they are, and how they move, and what their substance is” (Smith, 1920, p. 4) as described by Smith. A Japanese papier maché celestial sphere ca. 1600 is also in Smith’s collection (Smith 27-200).

Smith collected numerous armillary spheres – a mechanical model of the universe, quadrants, and astrolabes (see Figure 4.14). One notable example of these is an Italian astrolabe from 1558 signed by Bernard Sabeus of Italy. Inscribed twice on the astrolabe is the signature of Sabeus; thus, he was quite proud of his work. Smith described these instruments as “used for measuring the angles of the stars above the horizon, for measuring angles from star to star, for determining the seasons and the latitude, for leveling, for running lines, and for the varied purposes for which we use our transit instruments today” (Smith, 1920, p. 5). Another astrolabe that was dear to Smith was a Hindu piece. In 1920 Smith portrayed it as, “only about 150 years old, but it has particular interest because it was bought by me from the last of a noted family of royal astrologers and was used as the model in the restoration of one of the largest astrolabes in a great Indian observatory [in Jaipur]” (Smith, 1920, p. 6). This subsection of Smith’s collection contained three pairs of bronze compasses from Roman tombs (see Figure 4.15). Smith thought these were quite interesting since one pair displays that “one form of proportional compasses was as well known to ancient draftsmen as to those of our day” (Smith, 1920, p. 7).

Figure 4.15. Ancient Roman compass, about the beginning of the Christian era. Smith 27-286. Rare Book and Manuscript Library, Columbia University.
Smith was very interested in ancient dice (see Figure 4.16). He collected seventy different dies, including, items “from the Etruscan tombs with the pre-Roman arrangement of dots, pieces from the period of the Persian invaders of Greece, pieces that show the transition from the primitive knuckle bones to the cubical form, glass dice from Egypt, icosahedral dice of the Ptolemaic period, and loaded pieces of the Roman gambling houses” (Smith, 1920, p. 7).

Although the instrument section of his collection only consisted of about 275 pieces, he was quite broad in his collecting. He collected counters, some dating back to the Romans. As Smith explained, “the Roman boy carried his bag of calculi [counters] to school as some of us carried our slates” (Smith, 1920, p. 9). This method of counting continued as the universal method in Europe until the eighteenth century. Smith also collected pieces displaying the Roman numerals, such as tesserae, which are similar to counters but were used as “tickets” for admittance to games and performances (Smith, 1925a; see Figure 4.17).
Smith’s collection included numerous examples of ancient computing devices, such as the Chinese bamboo rods, that were replaced around the thirteenth century by the suan-pan, which is the Chinese version of an abacus. The “rod” type of computing was translated to Japan in the form of the Japanese sangi (see Figure 4.18), which was followed by the Japanese saroban, a type of abacus. Other examples in Smith’s collection include Korean bones, the Russian schoty, Napier rods, and the Armenian abacus (Smith, 1920).
Related to the ancient computing devices are the methods of recording results, for example the tally stick, of which Smith had some dating back to 1296 (see Figure 4.19). This form of recording was used in many countries, but in England, counting sticks had an interesting history. Smith retold the story as:

[In England], these tally sticks were used for centuries, and it [was] only within a hundred years that an act of Parliament ordered the vast accumulation of these wooden records burned. The carrying out of this law resulted in the burning of the Houses of Parliament, so [to this piece of calculation] we owe the beautiful piece of modern Gothic now overlooking the Thames. (Smith, 1920, p. 10)

As a result of the fire, English tally sticks are extremely rare.
Figure 4.19. English tally sticks of 1296. (Top) Leather covered, silk lined decorative box. (Middle) Four wooden tally sticks. (Bottom) Descriptive label used when exhibited. Smith 27-312. Rare Book and Manuscript Library, Columbia University.

Other items in this collection include compasses, protractors, diagonal and gauger’s scales, sundials (see Figure 4.20), calendar medals, calendar rolls, eighteenth century drawing instruments, and a Ramsden telescope of 1775 (see Figure 4.21). Items that depicted the magic square interested Smith as well (see Figure 4.22). Smith also
included some modern calculating machines, such as the Goldman and Stanley
arithmometers, slide rules, and other adding machines (Department of Mathematics, n.d.).
A complete list of the instruments currently at the Rare Book and Manuscript Library is
included in Appendix D.

Figure 4.20. (A) Nuremberg, signed by Hans Tröschel, 1603. Ivory, with string gnomon horizontal dial and
pin gnomon for vertical dial. Smith 27-225. (B) Cubical sundial. Bavarian, 18th century. Horizontal and
vertical. North, south, east, and west. Smith 27-222. Images courtesy of the Rare Book and Manuscript
Library, Columbia University.
Figure 4.21. Ramsden Telescope. Description: Telescope said to have been made by Ramsden of London, the great maker of mathematical instruments about 1775. Smith 27-267. Rare Book and Manuscript Library, Columbia University.

Figure 4.22. Representations of the Magic Square. (A) Magic square on reverse of medal showing Venus (contains errors). Smith 254a. (B) Arabic (?) Amulet, found at Karnak. Illustrates the degeneration of the Magic Square. Smith (253) 27-311. (C) Amulet. Christian-Kabbalistic. On the rim are Greek and Hebrew words separated by a cross. Magic square that adds to 175. Smith 27-318. Rare Book and Manuscript Library, Columbia University.

**The Educational Museum Disperses.** Dean Russell was continually attempting to create more space for Smith’s collection. As evident in a letter to Smith from Russell on October 11, 1907, “I am hoping to provide in the museum more rooms for your jimcrackery. However, while this new building will not give the relief counted on, in some respects it will make things much more comfortable” (Russell, 1907, p. 1).

Russell’s 1909 *Report of the Dean* included a section on the Educational Museum, noting
that “with more floor space next year we shall make available for student use the extensive private collections of Professor Smith on the history of mathematics and of Professor Monroe on the history of education” (p. 12).

While Smith was supervisor of the Educational Museum of Teachers College, his assistant was Sarah Mitchell Neilson. The 1910 *Bulletin of the Buffalo Society of Natural Sciences* was dedicated to producing a Directory of American Museums. The Educational Museum was included in this directory where Smith is named curator and Neilson as assistant. It describes the museum’s three functions: “a repository of exhibits showing the work of various departments…an agency to collect and circulate illustrative material for the use of the college and its schools…a place for temporary exhibits of educational nature, about [six] of these being held during the academic year” (Buffalo Society of Natural Sciences, 1910, p. 203). It states that the museum was completely funded through the general budget of Teachers College.

The collection received many visitors while it was active. Sometimes this would include entire classes from other universities to visit Teachers College in the hope of viewing Smith’s collection and possible speak with him regarding his acquisitions (Peters, 1911). Smith knew that his collection was quite unique and valuable. In a letter on April 12, 1911 to Dr. C. T. McFarlane, the Controller of Teachers College, Smith made an argument to allow for Teachers College to provide insurance on his collection. Smith valued his collection at that time at $15,000 (Smith, 1911).

Smith was concerned with the state of the museum in 1912 and sent out Miss Neilson to visit the Bureau of Education and the museums in Washington, D.C. In an eight-page letter to Smith, Neilson describes how she attempted to gain as much insight
into how an educational museum should be organized and administered. The authorities in Washington suggested to keep the museum organized as special exhibits, and it remained that way until it closed (Neilson, 1912). This was unfortunately towards the end of the life of the Educational Museum of Teachers College, but Miss Neilson would continue working with Smith, his collection, and the contents of the Educational Museum after it closed.

The closing of the museum came from the recommendation of Smith. “It is with much regret that I [Smith] am compelled to recommend the closing of the Educational Museum until the time shall come when we have room for an adequate display of our material” (Smith, 1913, p. 1). It seems that, a dilemma for most growing educational institutions, more and more lecture rooms were needed rather than exhibition rooms. Smith had a passion for the museum and believed that Teachers College should have the best educational museum in the world. Due to the constraints of space, the museum was not able to purchase new material, as it would have nowhere to be displayed. Thus, the collection was remaining dormant. Smith believed that this lack of consideration of adding more exhibit space to the museum was a huge disservice to the students and the integrity of Teachers College, as they were falling behind other great institutions that were moving forward with their museums (Smith, 1913). Smith remained the supervisor until 1914 when the museum dispersed its collection and closed.

**Smith’s Collection in the Permanent Educational Exhibit.** The 1913-14 *Teachers College School of Education Announcement* publicized that “as this announcement is going to press the College has just made arrangements to transfer its museum interests to the Permanent Educational Exhibit recently established by Mr.
George A. Plimpton at Fifth Avenue and Thirteenth Street where there is installed in special rooms the greatest exhibit of modern school equipment ever brought together besides a valuable exhibit of historical material relating to education” (p. 123). It seems that through Plimpton’s creation of a museum-like institution, Smith found a place to continue his exhibit of historical mathematics material. The problem of space no longer existed, as Plimpton owned entire floors in the building (Neilson, 1913).

Although the Educational Museum was officially closed, Smith was hopeful that it would be resurrected at some time. In a letter on November 3, 1915, Smith urged Dean Russell to give some consideration in reinstating a better museum at Teachers College:

I [Smith] wish to also call attention to the needs for a first-class educational museum. The one which we had was becoming well known, and with a good curator it would have been of great value to the College and to the profession in general. It was visited by distinguished educators and was frequently mentioned in educational articles. Such a museum requires, however, at least twice the space which ours had, and it requires the entire time of an intelligent curator. We have nothing in this country which meets the need, nothing, for example, as good as the educational collections in Dresden, Paris, and Leipzig, to mention those with which I am fairly familiar. The need for a fire-proof building for the library, museum, and executive offices is very pressing. (Smith, 1915, p. 1)

He continues this matter in a letter to Russell on February 19, 1916. Smith stated, “I have attended to the packing up of other museum material and storing it in the basement awaiting the time when we may have space and money for a large educational museum such as this college certainly ought to have” (Smith, 1916a, p. 1).
Smith’s assistant in the museum, Miss Neilson, began a dual position both at Teachers College, as well as, the secretary of the Permanent Educational Exhibit Company. She finished her duties at Teachers College in May 1913, about the same time as the Museum was officially closing. Unfortunately, the Permanent Educational Exhibit, which focused more on displaying modern educational material for use by teachers and possible sales, closed towards the end of 1917 (Neilson, 1917). This is most likely due to the fact that Plimpton needed to consolidate due to World War I. Smith soon found a new venue for his collection.

**Smith’s Involvement in the Museums of Peaceful Arts.** George F. Kunz (1856-1932) was the president of the Association for the Establishment and Maintenance for the People in the City of New York of Museums of Peaceful Arts. In 1912, at the annual meeting of the American Association of Museums, he proposed the formation of twenty museums dedicated to the industrial arts, which would be named the Museums of the Peaceful Arts. This plan was enacted as of 1913 and continued until the 1930s with the headquarters at 24 West 40th Street (Kunz, 1927).

As the Educational Museum of Teachers College and the Permanent Educational Exhibit had now closed, Smith’s collection had remained in Smith’s possession in the Department of Mathematics as he used it extensively in his coursework. It was also part of the Bryson Library and Columbia’s Libraries through special exhibits (Upton, 1916; Refior, 1926; Williamson, 1926).

Not until 1926 did Smith become involved in the Museums of Peaceful Arts. He began with an exhibit of calculating machines and asked Clifford B. Upton, then the secretary of Teachers College and eventually a leader in the Department of Mathematics
of Teachers College, what would be an appropriate type and size of exhibition for his materials (Upton, 1926). Smith was connected to Kunz before that, as Smith was involved in a men’s Hobby Club in New York City. Each member of this club had a distinct type of hobby, such as, rare books, clocks, Shakespeare, or mathematics. Members included Kunz, whose hobby was gems, Plimpton, and many other “notable gentlemen” (New York Times, 1920).

Smith continued to have the Museums of Peaceful Arts exhibit his material and in 1928 convinced Ernest G. Yalden, an expert in sun dialing, to write a monograph on the subject that would include Smith’s collection. Smith wrote to Yalden in 1928 regarding this matter, “I shall be glad to meet you at the Museums of the Peaceful Arts on Tuesday, January 31st, at one-thirty. The temporary rooms are at 24 West 40th Street, and I shall be on the seventh floor. I suggest that special place because my material is displayed there, and we can talk over both propositions better than at any other place” (Smith, 1928, p. 1). Smith’s collection was again recognized as being one of a kind in a letter to Smith from Kunz on February 20, 1928, “We believe this is the only exhibit of this kind that has been made in this country up to date and are very happy to have it in our museum” (Kunz, 1928, p. 1). Not until 1930 did Yalden’s paper get published along with an essay by Jekuthiel Ginsburg on astrolabes and a catalogue of Smith’s mathematical instruments. This was due to the fact that the original president of the Museums of Peaceful Arts, George Kunz, had requested those materials from Smith, Yalden, and Ginsburg. But Kunz was not reinstated as president and thus the publication was pushed to the side (Smith, 1929). Upton believed that the catalog of instruments in Smith’s collection would be “an important reference book for all of us” (Upton, 1930, p. 1). Unfortunately, the
Museums of Peaceful Arts would disband in the 1930s. The collections were then housed in the New York Museum of Science and Industry (Shaw, 2011). This included Smith’s mathematical instruments. In a letter to an inquiring mind regarding the Educational Museum of Teachers College and his instruments on July 26, 1934, Smith stated, “I gave all that material to the [New York Museum of Science and Industry] some years ago” (Smith, 1934a, p. 1). Smith would soon secure the final resting place for his collection.

**Part III – Smith’s Collection Exists Outside Exhibitions**

Besides being exhibited throughout the Educational Museum of Teachers College, the Department of Mathematics of Teachers College, the Permanent Educational Exhibit, the Museums of Peaceful Arts, and the New York Museum of Science and Industry, the collection was actively used throughout Smith’s publications and teaching.

**Smith’s Collection in Slides.** Stereopticon slides, also called sciopticon, magic lantern, or lantern slides, were popular for about one hundred years – beginning in the mid-nineteenth century. By 1880, the stereopticon slides were becoming more popular in colleges and universities because a machine had been developed to mass-produce the slides (Spindler, 1988). Not until 1907, did Smith and the Educational Museum of Teachers College produce a set of slides based on his and George A. Plimpton’s collections. The series of slides was called “Illustrations for Lectures on the History of Mathematics,” reproduced in Appendix A, and were made by James Huntington, 610 St. Johns Place, Brooklyn, NY (Smith, 1907).

Smith must have produced his own set of slides for his teaching before that, as evidenced by a letter to Smith from Louis Charles Karpinski on June 5, 1905 where
Karpinski states “I thank you very heartily for consenting to loan me a set of the ‘mathematical slides.’ I assume the responsibility for their safe return. I realize that the set of slides is something quite unique not only in the teaching of the history of mathematics but in the teaching of any history” (Karpinski, 1905, p. 1). Creating slides to display historical information was a common practice during the early twentieth century. In 1933, Karpinski created his own set of slides for the Chicago Exposition where he had four series consisting of arithmetic, algebra, geometry, and trigonometry (Karpinski, 1933).

Many professors and teachers made inquiries to attain the series of slides from Smith. Professor Arthur Gale of the University of Rochester wrote Smith on March 2, 1907, that he planned on using the lantern slides in his teaching of freshman; since it might interest those who are not planning on continuing mathematics (Gale, 1907). On March 28, 1911, R. B. McClenon of the Mathematics and Astronomy Department of Grinnell College in Iowa wrote to acquire the set of slides; the professor had read that the set was used in Smith’s History of Mathematics course and he planned on teaching a similar course at Grinnell (McClenon, 1911). McClenon would become the Librarian for the Mathematical Association of America, of which Smith was president in 1920. Scattered throughout the correspondence in Smith’s Professional Papers at the Rare Book and Manuscript Library are numerous letters asking for the slides to be sent. A complete collection of the first series of 119 slides commissioned by Smith is available at the University of Kansas (University of Kansas, n.d.).

After the Educational Museum of Teachers College closed in 1914, the slides could no longer be purchased. They were, however, able to be loaned inside of Teachers
College and Columbia University. As Neilson, former assistant to the Educational Museum of Teachers College, wrote to Smith’s secretary Mrs. E. A. Mitchell in 1914, “the rule was, and I suppose still is, that no slides can be loaned outside of the University. You will get into a peck of trouble if you do not keep to this, as I know to my sorrow” (Neilson, 1914, p. 1). Eventually the set of slides were kept only in the Department of Mathematics rather than in Bryson Library, as stated in a letter of December 11, 1933 from Clifford B. Upton and William D. Reeve to Smith; they also noted that they would keep the stereopticon viewer in the Department as well (Upton & Reeve, 1933).

The catalog of slides contained about 275 items. These were from both Smith and Plimpton’s collection. The slides that the current Mathematics Education Program has are published in Appendix B in relation to the 1907 “Illustrations for Lectures on the History of Mathematics.”

**Smith’s Collection in Text.** Another popular request in the correspondence of Smith’s Professional Papers at the Rare Book and Manuscript Library of Columbia University is that of a series of portraits. This request was sent in by varying types of institutions; for example, many universities, such as the University of Chicago, a savings bank in Massachusetts, and numerous secondary school teachers wished to acquire copies of these valuable portraits (Montgomery, 1912).

This publicity was due to the fact that Smith had published with Ginn & Company in 1916 a series of portraits of notable mathematicians throughout history titled *Mathematical Portraits and Pages* (Smith, 1916b). A few years earlier, Smith had published with Open Court Publishing Company the *High School Portfolio of Mathematicians*. It seems that these photos were rather small, as explained in a letter on
December 4, 1913 to Smith from a schoolteacher in Worcester, Massachusetts, “I purchased…‘High School Portfolio of Mathematicians’ expecting to frame and hang on school room walls. I find the pictures so small that they are of little use for such purpose. I write you as editor of the portfolios to know if it is possible to get these pictures in larger size” (Parker, 1913, p. 1). As state previously, throughout Smith’s travels, he had obtained over 3,000 of such portraits.

As can be expected, Smith’s collection of mathematical history would have been a continual place for inspiration for his own publications. He wrote numerous items in Professor Paul Monroe’s *Cyclopedia of Education* (1911-1913), journal articles, and pamphlets related to the history of mathematics that included direct links to his collection (Frick, 1936a). A specific example of this was his three-part series in 1925 published in the *American Mathematical Monthly*. In each installment of the series entitled “The Surnamed Chosen Chest”, Smith listed major sub-sets in his own collection based on association copies, oriental works, and portrait medals in his collection (Smith, 1925b).

Smith’s *Rara Arithmetica* was a catalogue of George A. Plimpton’s mathematical collection. As the present study is dedicated to Smith’s collection, his other works will be the focus for discussion. Specific attention will be paid to *A History of Japanese Mathematics*, *Number Stories of Long Ago*, *The History of Mathematics Volume I and II*, and *The Wonderful Wonders of One-Two-Three*. Within all of these texts, Smith beautifully illustrated the history of mathematics. All of the photographs in *A History of Japanese Mathematics*, co-authored with Yoshio Mikami, were taken from Smith’s collection. As a final note in the Preface of said text, Smith wrote:

> It is only just to mention at this time the generous assistance rendered by Mr. Leslie Leland Locke, one of my graduate students in the history of mathematics, who made in my library the photographs for all of the illustrations used in this work. His intelligent and painstaking efforts to carry out the wishes of the authors have resulted in a series of illustrations that not merely elucidate the text, but give a visual idea of the genius of the Japanese mathematics that words alone cannot give. (Smith & Mikami, 1914, p. v)

Leslie Leland Locke eventually became a major collector of calculating machines. His collection was donated to the Smithsonian in 1939 (Leland Locke, 1939).

Smith’s recognition of how a photograph, or any visual aid, can enormously affect the understanding of the history of mathematics is further displayed in *Number Stories of Long Ago* and *The Wonderful Wonders of One-Two-Three*. Both of these texts were meant for a younger audience, so perhaps the need for visualizations was even greater. Throughout these texts are numerous images and illustrations taken from Smith’s collection as well as the collections of others, such as Plimpton.
The two-volume collection of *The History of Mathematics* was meant for students and teachers as a practical text for learning the historical side of mathematics (Smith, 1923). Smith commented to the reader regarding the illustrations throughout the book:

> In the selection of illustrations the general plan has been to include only such as will be helpful to the reader or likely to stimulate his interest. It would be undesirable to attempt to give, even if this were possible, illustrations from all the important sources, for this would tend to weary the reader. On the other hand, where the student has no access to a classic that is being described or even to a work, which is mentioned as having contributed to the world’s progress in some humbler manner, a page in facsimile is often of value. (Smith, 1923, p. viii)

As with the distribution of the lantern slides, Smith was always considerate to the fact that not all students or teachers would be able to have access to such a remarkable collection as he and others had owned. Thus, providing images from such a collection in his texts, articles, and other publications was a gift from Smith to society.

**Smith’s Collection in the Classroom.** Throughout Smith’s tenure at Teachers College he annually gave courses on the history of mathematics. These courses were very popular and the students thoroughly enjoyed learning the history of mathematics through Smith’s collection. One student’s appreciation of attending his course is evident in an article written in the *Mathematics Teacher* in 1924. The student, Sophia Refior, stated how “the inspiration derived from examining these priceless objects” motivated her to publish the descriptions of some rare items in Smith’s collection (Refior, 1924, p. 269).

Smith was dedicated to teaching a proper history of mathematics course. In fact, towards the end of his teaching career, he was teaching three sequences of year-long
history of mathematics courses. In the first course, the usual lecture style was implemented to get an understanding of the development of mathematics. In the second semester of the first level, students who showed strength in researching were allowed access into Smith’s collection for study of source material. The second course had the first course as a prerequisite. “The class was small, ordinarily made up of about a dozen students who had the scientific and linguistic ability to begin a year of pre-seminar work” (Smith, n.d.b, p. 4). This class was given direct access to Smith’s collection and since his collection contained a considerable amount of scholarly work in varying languages, these students had reading knowledge of two languages besides English. “In this course each student was asked to select a topic and to work upon it as long as he chose. Some worked upon three or four in a year; others continued the work upon a single topic through this and the seminar year” (Smith, n.d.b, p. 5). The third course was for individual work towards their doctoral dissertation and the student worked with Smith individually to develop the thesis. After Smith officially retired in 1926, he continued to work with students – who were not even registered at Teachers College – to produce publications based on Smith’s collection (Smith, n.d.b).

Smith believed that it was necessary for other colleges and universities to provide similar courses, though he felt that it was only successful if the library at those institutions had a collection of original material. He claimed:

It is possible to secure this [original material] at a reasonable expenditure so far as early printed books are concerned, if one avoids incunabula and specially rare books. Any university library can afford to purchase fifty volumes of the 16th and 17th centuries, a set of the Bibliotheca Mathematica, one of Boncompagni’s
Bulletino, and the leading histories. Even the smaller college libraries can form a working collection at not too great expense. (Smith, n.d.b, p. 6)

Smith understood that such libraries as he and Plimpton cultivated could not be duplicated; however, he suggested that portraits be acquired through travel abroad and commented that it took him forty years to collect the 3,000 portraits in his collection. He believed that autograph material is still possible to attain, but that the major universities have already picked up the most rare pieces. The ancient mathematical instruments at this time were too expensive for institutions to purchase, thus they would have to rely on the illustrations in texts (Smith, n.d.b).

In Smith’s 1936 description of his donation of his mathematical instruments to Columbia University, he stated that he used his collection, especially the instruments, in his lectures (Smith, 1936b). It is obvious that Smith felt that teaching mathematics education properly required a proper history of mathematics course that included working with primary sources and artifacts.

Part IV – Columbia University Receives a Gift

Smith’s Donation. Since Smith was such an avid bibliophile, in November 1928, he formed the “Friends of the Library of Columbia University.” Smith was secretary, Plimpton was president – through persuasion by Smith, and Frank Fackenthal as treasurer. Fackenthal had many roles at Columbia University, including student, secretary, provost, and acting president (Hyde, 1971). Library Friends Associations began during the 1920s and grew in popularity with each decade.
The purpose of the association (basically the purpose of all Friends groups) was to give supplementary aid beyond the yearly library budget, which, everywhere, provides barely enough money for the purchase of current books and journals. This is why there is always emphasis upon rare books and manuscripts – the material that scholars need and the library cannot afford. (Hyde, 1971, p. 7)

Through this group, the *Bibliotheca Columbiana*, was issued. Although, it only lasted four years consisting of four issues in total, it was written and edited by Smith. It promoted the activities of the libraries of Columbia and Teachers College. Since the “Friends” were attempting to receive aid and donations from outside parties, Smith started the trend with the donation of his library of “mathematical works, Orientalia, medieval and renaissance documents and manuscripts, and letters and portraits of prominent mathematicians. The collection totaled some 20,000 pieces” (McAleer, 1961, p. 19). Although, before then, he had deposited various materials that he had collected through his travels. For example, in 1930 Smith wrote Prince Damrong to assure him that the three manuscripts that were given to Smith for Columbia University had been delivered (Smith, 1930a).

Smith had specific requests in regards to how his collection would be treated in the Columbia Libraries. On December 8, 1930 Smith wrote to C. C. Williamson, the Director of Columbia’s Libraries, and Roger Howson Esq, the Librarian of Columbia University:

I contemplate giving to the Library of Columbia University, in installments from time to time, the major portion of my personal library, excluding books that may more appropriately go to the Library of Teachers College. This part of my library
is very rich in books, manuscripts, portraits, letters, pamphlets, and other material relating to the history of mathematics, medieval life, and the development of books. At present I am prepared to present a considerable part of my orientalia and of my early autograph material. I wish to inquire if this material will be acceptable on the condition that I may retain, or withdraw from the library from time to time, any books or other material thus presented, and to keep the same as long as I may wish and without incurring any risk for loss or damage, this condition applying to future as well as to present gifts. I wish also to place the further condition upon the gifts, that so far as possible the one in charge of these books be authorized to arrange these loans to me without the formality of requiring me personally to draw the material through the general loan desk or to be held responsible for its return at any special time.

My purpose in the matter of retention of loans is to allow me to keep in my home or office as long as I may wish a certain number of rare or interesting pieces.

Upon receipt of an official confirmation of this understanding, I shall prepare as rapidly as I can for the labeling of the books by the Library authorities and the transfer of such material as I do not need for my work or interests.

When Mr. Plimpton presents his library to the University, I hope that as much of my material as he cares to have with his books may be so placed as part of the Plimpton Library, the bookmarks showing that they are presented by myself. (Smith, 1930b, p. 1-2)
About ten days later, on December 17, 1930 Columbia agreed to Smith’s terms. In Williamson’s response confirming this, he wrote two versions of the same letter. The first version contained the following paragraph:

I find it impossible to express adequately our feeling of gratitude and appreciation for such a splendid addition to the book and manuscript resources of the University Library. In the fields in which you have been especially interested it will make the Columbia Library the richest collection to be found in this country, if not in the world. Students and scholars for generations to come will be drawn to Columbia to use the materials which could have been brought together only by a man of your thorough scholarship, broad interests, sound judgment, an bibliographical skills. In due time the Trustees will of course make suitable recognition of your generous gift of a collection which will at once and hereafter take rank as one of the most important ever received by the University.

(Williamson, 1930b, p. 1)

This version of the letter, which was sent only to Smith, and not meant to be viewed by Plimpton because it was felt by Howson that “[it] may seem to Mr. Plimpton to be detracting from the value of his” (Williamson, 1930a, p. 1).

In 1932, Plimpton began donating his collection to Columbia. It seems that Smith, Plimpton’s main advisor on historical mathematics texts, had a major influence in this act as well. On September 30, 1929 C. C. Williamson wrote to Columbia University’s President Nicholas Murray Butler regarding acquiring Plimpton’s collection. It seems that Plimpton’s original proposal for how he wished his collection to be cared for was not exactly what Columbia desired. Williamson stated:
It seems to me that we must be very cautious about turning down the proposal he makes. Next to the interest of Professor David Eugene Smith such an arrangement as might grow out of his proposal would seem to me to be the greatest possible influence in persuading Mr. Plimpton to give his library to Columbia. If we reject his offer he will almost certainly decide, as he seems inclined to anyhow, that Columbia does not appreciate his collection and is not interested in it.

(Williamson, 1929, p. 1)

By 1935 Plimpton had his entire collection formally presented to Columbia. Smith’s initial deposit of a magnificent collection started a trend with many notable collectors, besides Plimpton, and Columbia’s Libraries grew. This was quite remarkable as it was during a time when people were conserving and not broadcasting their wealth due to the depression. Yet, Smith was such a respected and well-liked man, that he was able to continually bring in big donations. He remained at the forefront of the “Friends” association until 1936 when due to age and failing health had to resign. At that moment the Bibliotheca Columbiana also stopped and only two years later, in 1938, the entire “Friends” collaboration disbanded (Hyde, 1971).

Miss Bertha M. Frick was assigned as the curator/librarian for the Plimpton, Smith, and Samuel S. Dale libraries. The Dale Library consists of a collection of 1,200 books and manuscripts along with 700 pamphlets regarding measurements throughout history and countries. Frick was responsible for the current organization of Smith’s collection (Columbia University Libraries, n.d.).
Not every piece in Smith’s collection ended up being included in the Columbia Libraries. As demonstrated in a letter to Professor Lao G. Simons of Hunter College, on April 21, 1931:

In sorting out my portraits my niece found a considerable number of duplicates in the mathematical field. The duplicates are not of any value, and in general they are small pieces. It occurs to me, however, that you may wish in your department for some of these…and I wish you would select such as you wish. After you have made your selection, I shall suggest to Dr. Vera Sanford that she do the same when she is here this coming summer. (Smith, 1931, p. 1)

Thus, part of his collection, even if it is duplicates or reproductions of his pieces, have been scattered throughout the world.

Smith continued to make installments from his collection to Columbia. His next large donation would be his mathematical instruments. Since Smith had given his mathematical instrument collection to the New York Museum of Science and Industry, he needed to have all of those items sent over to Columbia (Smith, 1935). In 1935 he gave his collection of about 275 astronomical and mathematical instruments. These included “an Alexandrian terra cotta zodiacal table through telescopes, abaci, spheres, tally sticks, and the like, which he gathered in the various countries he visited” (McAleer, p. 19, 1961). This donation was widely recognized and Smith responded by writing an article related to his gift to provide descriptions of some of his pieces (Smith, 1936b).

Smith’s collection had a new home and now even more publicity as directly associated with Columbia University. Some of the major institutions would refer their inquiries to Smith. A letter on September 17, 1934 to Smith from A. van Niekerk, stated
“recently I wrote the Smithsonian Institute for some information relative to logarithmic tables; in the reply I received from the Librarian of that Institute, the suggestion was made that I should take up the matter with you” (van Niekerk, 1934, p. 1).

Frick helped organize numerous exhibits throughout the years and was a trusted friend to Smith. As can be expected, Smith remained involved with his collection until his death in 1944. Two years after Smith’s death Frick resigned as curator, though many of her original organizational plans for his collection have remained (Columbia University Libraries, n.d.). In response to Smith’s death, many newspaper and journal articles were dedicated to him in memoriam. Most of these stated that his collecting was what stood out among his lifelong accomplishments.

**Smith’s Collection Today.** The exhibitions of Smith’s collection continued at Columbia University, public libraries in the New York area, and the American Museum of Natural History, to name a few, through the years after it was donated to the University. Once at Columbia, Smith’s collection was housed in the Rare Book Department in Low Memorial Library in Room 209 – consisting of a fireproof vault. As of July 1, 1944, the Smith, Plimpton, Dale, and Typographic Libraries along with the Special Collections of the West Wing of Low Memorial Library were merged into the Department of Special Collections. Smith, Plimpton, and Dale’s collections were housed in room 210 of Low Memorial Library at this time. Not until 1950 were these libraries transferred to Butler Library, where they are today (Columbia University Libraries, n.d.).

The most recent exhibit, “‘The Ground of Arts:’ Mathematical Instruments and Illustrated Books from the David Eugene Smith Collection,” was from December 5, 2002 to February 28, 2003 (see Figure 4.23). Currently, Smith’s collection is available to view
on an individual basis through the Rare Book and Manuscript Library on the sixth floor of the Butler Library.

Figure 4.23. Part of Case X at the 2002 Exhibit. Includes nests of weights and money changer’s balances. Image courtesy of the Rare Book and Manuscript Library, Columbia University.

Smith’s collection was widely dispersed as photographs, slides, and other formats for over 100 years. Throughout those years, it has also been the inspiration for numerous research publications both domestic and internationally. Thus, it is almost impossible to log all citations in research from his collection. It can, however, be assumed that the majority of mathematician portraits, documents, mathematical manuscripts, and instruments currently used in research and teaching either came from Smith’s collection in some form or was represented in Smith’s collection.
Chapter V: Summary and Conclusion

The purpose of this study was to provide a history of David Eugene Smith’s collection beginning with its time at Teachers College, as part of the Educational Museum of Teachers College, to its current location at the Rare Book and Manuscript Library of Columbia University. The primary sources of the study came from the archives of Smith’s Special Collection at the Rare Book and Manuscript Library. These were examined to discover the history of his collection and included documents, images, and objects kept at Columbia University. Through this study, it should be understood how Smith had a deep passion for collecting pieces of mathematics history and believed it was instrumental to the proper teaching of the history of mathematics and mathematics education in general.

Summary

The origins of Teachers College, the genesis of the Educational Museum of Teachers College, and Smith’s life before coming to Teachers College in 1901 provide a backdrop to the study. It allows the reader to understand how the Educational Museum and David Eugene Smith were part of the institution from practically the beginning. Dean James Earl Russell believed that an educational museum would be beneficial to the students and faculty of Teachers College, and he was correct. It brought in thousands of visitors and helped Teachers College to shine and be recognized as a major teaching institution.

Smith’s collection has been presented in four parts: Smith’s travels around the world, Smith’s collection at Teachers College, Smith’s collection outside of exhibitions,
and Smith’s collection at Columbia University, each part answering one of the four research questions. The first three parts provide the major history of the collection, as well as, give detailed accounts of the items included in his mathematical collection. The final part brings the collection to present day and provides a conclusion for the travels of the Smith collection.

The research questions were:

1. What was the genesis of David Eugene Smith’s desire to establish a history of mathematics collection?

2. What was the origin of the Department of Mathematics Collection that was housed in the Educational Museum of Teachers College?

3. How did David Eugene Smith incorporate the history of mathematics collection into his research and teaching?

4. How did David Eugene Smith disperse his collection and how is the collection used today?

Part I of Chapter IV, which answers the initial research question, describes how the life of a collector is not as easy as going to the local bookshop and picking up a magnificent, rare collection envied by all. As evident from Smith’s recollections, it takes knowhow, time, effort, connections, money, and sometimes most of all, luck. The process of collecting involves not only knowledge of the items sought after but also the interesting people and places that draw the collector to them. In some cases, bravery and fearlessness to complete an acquisition are required – not to mention the strength to barter. The stories included in this study are only a few of Smith’s experiences in collecting. To be able to learn of his collecting achievements in Smith’s own voice is a
unique opportunity. It is evident that Smith had an intense passion for collecting and all the effort it entailed. It allows the reader to feel that they are in Smith’s own library as he discusses the history of each piece in his collection. It can be imagined that there must have been many more stories that will remain untold.

Part II of Chapter IV answers the second research question. It explains how the Department of Mathematics and the Educational Museum were closely related due to Smith and his involvement in both. Through his dedication and vision for the museum and the special collections in the Department of Mathematics, he was able to provide for the students, educators, and public a remarkable place to come view both current and historical pieces of mathematics education. When the Educational Museum had to close, his collection was able to live on and be viewed by the public through George A. Plimpton’s Permanent Educational Exhibit, George F. Kunz’s Museums of the Peaceful Arts, and the New York Museum of Science and Industry.

The third research question is answered in Part III of Chapter IV. It looks at the collection as accessible through illustrative material, such as lantern slides, its influence on Smith’s writing, and how it was incorporated into his teaching. Smith had a desire, with a very generous nature, to provide access to his collection to students and educators throughout the country; thus, he produced a set of lantern slides depicting his collection. He expected other teachers to use these slides as he and other professors at Teachers College had employed. Smith lectured with these slides when it was convenient rather than using the original piece from his collection. It was common for Smith’s texts to be beautifully illustrated. These images were usually taken directly from his collection, and in some cases, the need for illustrations lead Smith to collect even more items. Although
Teachers College and Columbia University were quite lucky to have such amazing collections of Smith and George A. Plimpton, Smith believed that any college library could and should attempt to collect primary resources and artifacts. Smith was strong in his view that proper mathematics education training and research was directly related to studying the history of the subject with actual artifacts for demonstration.

Part IV of Chapter IV responds to the final research question and provides insight into Smith’s connection with Columbia University’s Libraries and how he eventually donated his collection to them. Smith’s influence on the academic realm grew beyond the mathematics education community, as he was the founder of the “Friends of the Library of Columbia University” which began the trend of donating exceptional collections, including Smith and Plimpton’s, to the University. The collection is now located in the Rare Book and Manuscript Library of Columbia University located on the sixth floor of Butler Library. In a 2002 exhibition, Smith’s collection was once again exhibited to display his mathematical and astronomical instruments along with his rare books related to those instruments. Currently, students, educators, and visitors are able to view Smith’s collection through the Reading Room of the Rare Book and Manuscript Library.

Conclusion

Smith has been recognized by his many accomplishments and contributions to mathematics education. He was a mathematics professor, historian, textbook author, librarian, editor, and collector. One of his long running positions, 1902-1920, gave Smith much satisfaction as the librarian of the American Mathematical Society; and besides that he was also an editor for their Bulletin. One of his major contributions to mathematics
education was the organization and leadership of the International Commission on the Teaching of Mathematics from 1908-1912. He was the president of the Mathematics Association of America in 1920, where he also was an editor for the *American Mathematical Monthly*. Smith founded the History of Science Society in 1924, and along with Jekuthiel Ginsburg established the *Scripta Mathematica* journal in 1932 (Donoghue, 1987). Besides those remarkable achievements, Smith was also a full-time tenured professor, wrote numerous textbooks and history of mathematics books, and travelled around the world collecting. It is hard to imagine that one man did all this, and yet, he did it brilliantly.

The importance of incorporating the history of mathematics by way of objects and artifacts was one of Smith’s goals in teaching. Smith described it best as:

My hobby is the human side of the cold and austere science of mathematics. I like to see how mathematics has woven itself into human life through millions of years, and to see how millions upon millions of our race solved the problems of this science before they solved the greatest of all the problems of the universe. I like to see in the story of mathematics is the story of the escape of humanity from the prisons of superstition, how through the measurements of mathematics it recognized, as other worlds, the stars which it had once thought to be merely silver points in crystal spheres; how it struggled to learn its number systems, write its figures, and to appreciate the marvels of a mere zero. I like to see its efforts at computing and to watch it as we watch a child count his blocks, his pebbles, or his fingers and toes. (Smith, 1920, p. 2)
It is clear to see that, as a student or anyone who met Smith, it would have been impossible not to join him in his quest for discovering the history of mathematics. This alternate side of mathematics may reach out to students who might be fearful of the subject and inspire them to take a different approach. It is a bridge that can join the abstract with reality, and Smith knew the power of it as a teaching tool. It was evident that his collection was a way to draw in a student. It was not merely a collection of beautiful and rare pieces of mathematics history – but an extension of Smith as a person. Students of Smith were not shy in their admiration; for example, upon his retirement they commissioned a portrait of him and mathematical clubs were even named after Smith (Williams, 1935).

By the end of 2012, a new mathematics museum will be opening in New York City. This museum is focused on igniting a passion for mathematics to younger children through a series of hands-on exhibits. This museum is claiming to be the only one dedicated to mathematics in the United States; though, it is not historically focused, as was Smith’s collection. Some current museums focus on the historical side of mathematics. These are most likely found outside of the United States, for example the Garden of Archimedes Museum in Florence, Italy. Many history of science museums occasionally exhibit materials related to the history of mathematics; these include the Museum of the History of Science at Oxford, the Whipple Museum of the History of Science at Cambridge, the Boston Museum of Science, the Smithsonian’s National Museum of Natural History in Washington, D.C., as well as, the American Museum of Natural History in New York City.
It is hard to imagine that most students that graduate from Teachers College and Columbia University today will never come in contact with David Eugene Smith’s Collection as it was during the early twentieth century, even though students are quite aware of his influence on the program. For example, in 1906, the program was the first in the United States to have doctoral graduates in mathematics education, under Smith’s guidance. The commissioned portrait of him hangs in the Mathematics Education Program office of Teachers College, and recently some copies of portraits of mathematicians in Smith’s collection were framed and placed on the walls of the office, similar to how it was decorated during Smith’s tenure (see Figure 5.1). A statement that is as true today as it was almost one hundred years ago by Clifford B. Upton on July 30, 1930, “I had not realized before that the Smith Collection contained so many individual items. It is certainly a remarkable collection. I wish we had it at Teachers College” (Upton, 1930, p. 1).

Figure 5.1. Department of Mathematics Office, with prints of celebrated mathematicians on the back wall. Image is provided courtesy of the Gottesman Libraries at Teachers College, Columbia University.
Limitations of the Study

As the major portion of this study included the history of the Educational Museum of Teachers College, it was necessary to collect as much information on this museum as possible. Unfortunately, this was quite demanding. As this museum had been closed for nearly a century, it was challenging to find any remaining illustrative material from this museum, not only related to mathematics but in any subject that it exhibited. It is difficult to accept that such an interesting piece of Teachers College history is nearly lost. The primary sources relating to the Educational Museum throughout this study come from Andrews’ 1909 study and items found in the Rare Book and Manuscript Library Archives.

Historical studies have the limitation of only finding what was purposely left behind. Moments occurred when the author would wish to find a certain piece of information that would fit into the history of Smith’s collection, yet the missing piece would not always make itself known. Thus the drawing together of what was found is vital to this study. The author is fortunate that Smith and his colleagues did keep organized records and that the curators of Rare Book and Manuscript Library have continued that tradition.

Recommendations for Further Study

David Eugene Smith has been studied quite thoroughly, as a pioneer and advocate for mathematics education and now as a collector. Further study could be conducted to understand the effects of using the history of mathematics and primary sources in mathematics classrooms of today. Perhaps a case study of two mathematics classrooms:
one traditionally taught, while the other having the historical side of mathematics as a major focus. It would be interesting to discover if it has any effect on how the students view mathematics.

More research could be conducted on the Educational Museum of Teachers College. The present study focused on the mathematical portion. Yet this museum contained material from almost all departments at Teachers College, including religion, anthropology, and history of education. The latter was Teachers College Professor Paul Monroe’s passion and he commissioned his own sets of lantern slides for distribution. A set of over 500 of those slides is located at the University of Kansas, along with 119 of Smith’s previously mentioned in Chapter 4 (University of Kansas, n.d.).

Another topic of research that could be addressed would be to complete a similar study with a different collection. An example, Leslie Leland Locke, collected calculating machines and his archives and instruments are located in the Smithsonian Libraries. As he was directly connected to Smith, it would be interesting to research the subject from Locke’s perspective as a collector. Smith also collected materials not related directly to mathematics, such as Korans and diplomas; these could serve as their own research subjects.

Relating to Smith’s collection directly, any piece in his collection of over 20,000 items could be studied in detail. This has been the case for many researchers of material culture in mathematics, for example, Peggy Aldrich Kidwell’s article about Albert Sexton’s omnimetre (2009), which is part of a collection at the Smithsonian. A unique treasure trove of possible research is waiting discovery in Smith’s collection.
Final Remarks

Through this study, it is the goal to generate a revived interest in Smith’s collection and to encourage students and educators to use historical primary resources in mathematics education. These objects provide a direct link to the past that can ignite inspiration by simply glancing at a certain item. It would have been incredible to be alive during Smith’s lifetime. To have known him, hear his stories, and visit his home to view his treasures – as was a usual invitation for anyone he knew – would have been quite an honor. As Miss Bertha Frick was close to him and his collection, she understood that side of Smith quite well and described him as:

One of the clearest cut pictures of Dr. Smith is of him seated in his spacious living room surrounded by his dearest art objects – rugs from Persia and Afghanistan on the floor, Russian ikons and Chinese sketches on the walls, bowls from Java, Buddhas from Burma, delicate glass from Syria in cases and on tables where he could see and touch with loving hands each of these treasures. As he often said, ‘I love to sit here and let my eyes wander, wherever they fall I live again my experiences in finding it, down a river infested by crocodiles, seated cross-legged in the mud hut of a native chief, wandering among the ruins of an ancient Buddhist monastery, ghostly in the moonlight.’ How he loved to tell these stories to an interested visitor! And his guest traveled with him to these far-off places.

(Frick, 1944, p. 2)

The intention of this study is to take the reader on that journey, as Smith would have described it. Tracing his collection through its many adventures around the world, its journey through numerous museums, and the powerful inspiration it conjures for research
opportunities. Although this amazing collection has had many homes and David Eugene Smith has passed on almost seventy years ago, his collection remains at Columbia University while Smith’s passion lies in the hearts of mathematics historians worldwide.
References


Appendix A:

David Eugene Smith’s “Illustrations for Lectures on the History of Mathematics,”
Series I and II

Reproduced under permission from the Rare Book and Manuscript Library, Columbia University.

In response to requests for the use of stereopticon slides illustrating the history of mathematics, the Educational Museum takes pleasure in announcing that it has made arrangements for supplying this material to schools and colleges. Since the demand thus far has been greatest for illustrations showing the development of arithmetic, the following list relates chiefly to that subject. If, however, there should be a demand for slides illustrating the growth of algebra, geometry, trigonometry, analytic geometry, and the calculus, these can also be supplied. The large collections of instruments, rare books, portraits, manuscripts, and photographs of material in foreign museums and libraries of the University and Teachers College, as well as, those in George A. Plimpton, Esq., and Professor David Eugene Smith, afford opportunity for the preparation of illustrations in nearly every branch of the subject. Brief accounts of these collections will be sent upon request.

Should a sufficient demand be expressed the Museum will consider the question of making similarly available the resources of other departments of the College.

The slides will be furnished only to schools and colleges, or to those who give courses in such institutions. Since the price represents merely the cost to the Museum, no discount can be allowed, whatever the number purchased. The arrangement with the photographer requires that no order for less than twenty-five (25) slides shall be accepted. The price is $10 for twenty-five slides, and 40 cents each for any number in excess.

Since many of the slides are not kept on hand, there will be a delay of two or three weeks in filling any order. Orders should be addressed to

The Educational Museum,
Teachers College,
Columbia University, New York City

EGYPTIAN

1. First trace of Egyptian mathematics, a pottery inscription of the first dynasty.
2. Page from the Ahmes papyrus, c. 1700 B.C., the oldest extant textbook on mathematics.
3. Page from the Akhmim papyrus, possibly of the 8th century A.D., showing the same primitive treatment of fractions as in Ahmes.
OUR NUMERALS

5. Same in detail.
6. Page from a MS. Of Boethius of 1286, showing forms of numerals.
7. From a MS. of Rollandus of 1420, showing forms of numerals.
8. From a MS. of Sacrobosco’s “Algorismus” of 1444, showing forms of numerals.
9. From a MS. of the 15th century, showing forms of numerals.
10. Table from Treutlein’s “Zahlzelchen,” showing the changes in the numeral system from ancient to modern times.

NUMBER NAMES

11. Page from Borghi’s arithmetic of 1488, showing one of the early uses of “million” in print.

PRACTICAL USE OF ROMAN NUMERALS

12. The Roman numerals in practical use in 1514, from Kohel’s arithmetic.
13. The same, showing the curious use of Roman numerals with Arab fraction forms.

ABACUS, OR LINE RECKONING

14. Page from an “Algorithmus Linealis” of c. 1490, showing the reckoning with counters.
15. Page from Licht’s “Algorismus” of 1501, showing addition by means of counters.
16. Picture from the “Margarita Philosophica” (1503), showing the old (counter) and new (algorism) reckoning.
17. Title page of one of Adam Riese’s arithmetics (1538), showing merchants reckoning “on the line.”
18. The same, from Gemma Frisius (1565 edition).
19. The same, from Recorde’s “Ground of Artes” (1558 edition).
   (Riese, Gemma Frisius, and Recorde were the most popular arithmeticians of their time.)
20. Addition by counters, from Recorde’s “Ground of Artes” (1558 edition).
21. Chinese swanpan, Russian tschotü, and Korean rods, the modern relics of the counter reckoning.

MODERN MECHANICAL COMPUTATION

22. Machines for adding, multiplying, and dividing.

FINGER RECKONING

23. The ancient finger reckoning as illustrated in the “Abacus” of Aventinus (1532).
24. The same, from Recorde’s “Ground of Artes” (1558 edition).

SYMBOLS

25. Early use of the symbol =, before it was used for equality, from an anonymous MS. of c. 1450.
26. Earliest use of a decimal point (Pellos, 1492), about a century before decimal fractions were understood.
27. First printed page containing the signs + and – (Widman, 1489), as symbols of excess and deficiency.
28. Early use of the same as algebraic symbols (Stifel, 1545).
29. Symbols of addition and subtraction from Curtius (1619), with curious processes of multiplication.

FUNDAMENTAL OPERATIONS

30. Numeration by the catechism method, from Willichius (1540).
31. Addition, from Hylles (1579), showing curious rhyming rule, and catechism method of teaching arithmetic.
32. Subtraction (substraction), from Baker’s “Well Spring of Sciences” (1580).
34. Multiplication per scachiero and per quadrato, from a 15th-century MS.
35. Multiplication per gelosia, from Feliciano’s arithmetic of 1545.
36. The old complementary multiplication from Huswirt’s “Enchiridion” of 1501.
37. Multiplication, with curious illustration, from a student’s MS. of 1561.
38. Multiplication and division as performed in the first printed arithmetic (Treviso, 1478).
39. Division by the galley method and multiplication by the common (scachiero) plan, from a MS. of the 16th century.
40. Division by the galley method, showing the galley, from a Venetian MS. of c. 1550.
41. Division by the galley method, from a MS. of c. 1600.
42. A very early specimen of the modern form of division, from a MS. of c. 1450.
43. The first printed example of our modern (a danda) form of division, from Calandri (1491).
44. Modern division, with curious forms of the numerals, from a MS. of c. 1550.
45. Division of fractions, with curious symbols and proofs, from a MS. of 1545.
46. Cube root by the galley method, from the first arithmetic printed in England (Tonstall’s “De Arte Supputandi,” 1522).

MEDIAEVAL PROPORTION

47. From a MS. of Boethius written in 1288, giving the arithmetical, geometric, and harmonic proportion.
48. The same, with musical proportion from the first printed edition of Boethius (1488).
49. Proportion as the Rule of Three. Examples from Fisher (1775 edition).

**SLATE AND BLACKBOARD**

50. The first printed mention of a slate (Prosdocimo de Beldamandi, 1488).
51. Curious illustration from a MS. of Sacrobosco, written in 1444, showing master teaching the new numerals.
52. Title page of Boschenstein’s arithmetic of 1514, showing merchants using the blackboard.

**THE ANCIENT SCHOOL**

53. A class in arithmetic in the Middle Ages, from an old engraving.
54. A mediaeval school, from an old engraving.
55. The seven liberal arts, from an old engraving.
56. The sciences illustrated (Arithmetic with the counters), from an old engraving.

**THEORY OF NUMBERS**

57. From a MS. of Boethius of 1286, showing figurate numbers.
58. From the first printed edition of Boethius (1488), showing other figurate numbers.
59. From an anonymous chapter on Rithmimachia (1496), showing this famous mediaeval number game.
60. The first printed Magic Square, from Dürer’s “Melancholia.”

**TOPICS STUDIED**

61. Title page of Paciulo’s great work of 1494 (1523 edition), giving a list of the important topics.
63. Old treatment of Partnership, from Masterson’s arithmetic of 1592.
65. Early American problems from Pike (1788).
66. Problems of the Civil War, from Johnson’s arithmetic (Raleigh, N. C., 1864).

**THE ILLUSTRATING OF ARITHMETICS**

67. The problems of the jealous husbands, and the jugs, from a 14th-century MS.
68. The chessboard problem of the grains of wheat, from a 14th-century MS.
69. From Sacrobosco’s “Sphaera” (Venice, 1488), showing mediaeval theory of the apparent rotundity of the sea.
70. From the first printed arithmetic having illustrations. Calandri’s book of 1491.
71. From Widman’s arithmetic of 1489, showing illustration in exchange.
72. From Kobel’s arithmetic (1544 edition), showing one of the problems of the couriers.
73. From the same, showing the problem of the market women.
74. Humorous illustrations from Crowquill’s arithmetic (1848).

FAMOUS ARITHMETICS

75. Last page of the first printed arithmetic (Treviso, 1478).
76. First page of the rare “Ars Numerandi” (c. 1485, but possibly as early as the Treviso).
77. Last page of the first German arithmetic (1482).
78. Last page of the second German arithmetic (1483).
79. Last page of Calandri’s arithmetic (1491).
80. First page of Paciolo’s great treatise of 1494 (1523 edition).
81. First page of the part on arithmetic in Capella’s work (1499).
82. Last page (colophon) of Tzwiefel’s arithmetic (1507).
83. Title page of Bonini’s arithmetic (1517), with De Morgan’s autograph.
84. Title page of Feliciano’s arithmetic of 1526 (1536 edition).

ALGEBRA

85. From the Rollandus MS. (c. 1420), showing the names for the powers of the unknown, and a multiplication table of such powers.
86. Introduction to algebra, from an Italian MS. of c. 1450.
87. From the same MS., with a reference to the work of Leonardo of Pisa.
88. From the MS. of Scheubel’s algebra, 16th century, showing his symbolism for surds.
89. The first printed solution of the cubic equation, Cardan’s “Ars Magna” (1545).
90. From Masterson’s work of 1592, showing the Renaissance symbolism for the unknowns.
91. From a MS. of c. 1620, showing the extraction of the square root of a binomial surd.

GEOMETRY

92. Page from the Campanus translation of Euclid, showing the Pythagorean theorem. Original MS. of c. 1260, in the Plimpton Library.
93. Page from a later Campanus MS. of Euclid, c. 1288.
94. Illustration of Geometria, with quadrans, from the “Margarita Philosophica” (1503).
95. From Foeniseca’s “Opera” (1515), showing the construction of the Platonic bodies.
96. From Recorde’s “Castle of Knowledge” (1596 edition), showing the geocentric idea of the universe.
97. From the “Protomathesis” of Finaeus (1532), showing the two forms of the quadrans.
98. From Beutel’s “Lustgarten” (1600), showing the use of primitive instruments in mensuration.
GREAT MATHEMATICIANS

99. Pythagoras, from Calendri’s arithmetic (1491).
100. Euclid, from an old engraving.
101. Ptolemy and Boethius, from a drawing by Raphael.
102. Claude Ptolemy, from the “Margarita Philosophica.”
103. Leonardo of Pisa, from an engraving.
104. Adam Riese, the most influential German textbook writer in the 16th century, from an old lithograph.
105. Gemma Frisius, the most successful writer of a Latin arithmetic in the 16th century, from a contemporary engraving.
106. Clavius, one of the first writers of a practical textbook on algebra, from a contemporary engraving.
107. Cardan, from a contemporary engraving.
108. Tartaglia, from a contemporary engraving.
109. Napier, from a rare lithograph.
110. Bachet de Meziriac, editor of Diophantus, and the first to compile a noteworthy collection of mathematical recreations.
111. Descartes, from an engraving after the Hals painting.
112. Fermat.
113. Pascal.
114. Newton.
115. Leibnitz.
116. Euler.
117. Cocker, the greatest writer of arithmetics in England in the 17th century.
118. Dilworth, Cocker’s successor in the 18th century.
119. A collection of autographs, including Hermite, Euler, Legendre, Monge, Johann Bernoulli, Lagrange, Sylvester, Laplace, and other.

To this list may be added the illustrations in Professor Smith’s “Rara Arithmetica” (May, 1907), and these may be ordered by specifying the pages. This work also furnishes descriptive matter for many of the slides mentioned in the above list.

The slides above described are prepared largely from the original works in Mr. Plimpton’s library.

The circular of the Department of Mathematics, containing Miss Benedict’s article on “Algebraic Symbolism,” will be sent to teachers interested in the history of mathematics who will send their names and addresses to the Secretary of Teachers College, Columbia University, New York City.
Second Series

On account of the great demand for stereopticon slides illustrating the history of mathematics, resulting from the circulation of the first list prepared by the Educational Museum, it has been decided to prepare this supplementary list of later acquisitions. The first circular, containing 119 titles, will be sent on request.

The illustrations here mentioned are prepared chiefly from works in the library of Professor David Eugene Smith, although some are from the collection of George A. Plimpton, Esq., and a few are from other sources.

The slides will be furnished only to schools and colleges, or to those who give courses in such institutions. Since the price represents merely the cost to the Museum, no discount can be allowed, whatever the number purchased. The arrangement with the photographer requires that no order for less than twenty-five (25) slides shall be accepted. The price is $10 for twenty-five slides, and 40 cents each for any number in excess.

Since many of the slides are not kept on hand, there will be a delay of two or three weeks in filling any order. Orders should be addressed to

The Educational Museum,
Teachers College,
Columbia University, New York City.

MISCELLANEOUS

120. From Tagliente’s arithmetic (1515), showing curious forms of multiplication.
121. Form an anonymous MS. (c. 1500), giving the horseshow nail problem.
122. From Bungus, Numerorum Mysteria (1614 edition), showing curious forms of Roman Numerals.
123. First page of a MS. of Luca di Firenze, copied c. 1475, showing interesting forms of our numerals.
124. From a MS. of Sacrobosco’s Sphaera, copied c. 1475, showing the idea of an eclipse.
125. From Reisch’s Margarita Philosophica (1504 edition), showing the temple of learning, with Boethius representing arithmetic and Euclid geometry.
126. Title-page of Reisch’s Margarita Philosophica (1504 edition), showing goddesses of arithmetic and geometry.
127. First page of Treviso arithmetic (1478). (see No. 75).
128. Last page of a MS. copied by Eustachius de Feltro (1469). Shows only the forms of a few numerals used at that time.
129. Elaborate multiplication table from a Florentine MS. (c. 1500).
130. From an early anonymous work on trigonometry, showing the quadrans.
131. From the Treviso arithmetic (1478), showing elaborate treatment of fractions. (see Nos. 75, 127.)
132. From Tartaglia’s arithmetic (1556), showing the galley form of division.
133. Title-page of Coutereels’ Dutch arithmetic (c. 1690 edition), showing a reckoning school.
134. From a German arithmetic (c. 1520), showing the Testament problem.
135. Multiplication table, from an anonymous MS. (c. 1400).
136. Title-page of Werner’s arithmetic (1561), showing the list of topics then studied.
137. Multiplication table from the arithmetic of Boethius (1488).
139. Two pages from a 1460 MS. of the arithmetic of Benedetto di Firenze, showing the hound and hare problem.
140. From the 1494 edition of Paciolo’s *Summa*, showing finger symbolism. (See No. 80.)
141. From Calandri’s arithmetic (1491), showing two pages of illustrated problems. (See No. 70.)
142. Product tables, from the arithmetic of Alexandre Jean (1637).
143. From a child’s primer on arithmetic, anonymous (c. 1820), with curious illustrations.
144. Portrait of Erasmus.
159. Multiplication table from Kobel’s arithmetic (1514).
160. From the Papyrus Sailier, with an old Egyptian account.
161. From an Italian arithmetic of c. 1525, showing the testament problem illustrated.
169. Title-page of the first (1494) edition of Paciolo’s *Summa*, showing the topics studied. (See No. 140.)
266. From the Ahmes Papyrus. (See No. 2.)
274. Portrait medallion of Laplace, by David d’Angers.
275. Portrait medallion of Cauchy, by David d’Angers.

OLD MATHEMATICAL INSTRUMENTS

145 to 150. From the geometry of Finaeus (Paris, 1556), showing the various uses of the quadrans, baculus, speculum, and other instruments.
151 and 152. From the *Libro del Misurar*, by Belli (Venice, 1569), showing curious methods of measuring horizontal distances.
154 to 157. From the *Modo di Misurar* of Bartoli (Venice, 1589), showing the uses of the quadrans squadro, baculus, etc.
158. Primitive leveling. From the geometry of Pomodoro, Rome, 1624.
159-161. See after No. 144.
162 to 168. From *De Quadrante geometrico*, by Cornelius de Judeis (Nurnberg, 1504), showing various uses of the quadrans.
169. See after Nos. 144 and 161.
170 to 185. From the *Apiaria Philosophiae mathematicae* (4th edition, Bologus, 1645), by Maria Bettino, showing curious work in the mensuration of distances and surveying.

186. From a German MS. of 1660, with a drawing of the quadrans.

187. From a German MS. of 1660, showing the use of the quadrans.

276. Astrolabes. (1) Italian, 1509; (2) Arabic.

277. Astrolabes. Italian, 1450 and 1558.

278. Sector compasses. Renaissance period.

188 to 199. From Bion’s work on *Instrumens de Mathematique* (La Haye, 1723), showing various mathematical instruments and their uses.

200 to 204. From the *Nova Fabricandi Horaria* of Johannes Paulus Gallucius (Venice, 1596), showing various forms of dials.

205. From *L’uso della squadro mobile* by Ottavio Fabri (Venice, 1598) showing the quadrans.

206. From *Del Modo di Misurare* by Bartoli (Venice, 1589), showing the astrolabe in mensuration work.

207. From Forestani’s *Arithmetica* (Venice, 1602), showing unusual method of measuring heights.

208-265. See next page.

267. From Alessandro Capra’s *Geometria* (Cremona, 1673), showing curious work in leveling.

268. From Fiammelli’s *La Riga* (Rome, 1605), showing the surveyor’s riga.

269. The groma used by the Roman and Etruscan surveyors. Drawing from an ancient monument.

270. The Lituus or Augur’s staff as used by the Roman surveyors. Drawing from an ancient monument.

271. Monument of Lucius Faustus, a Roman surveyor, showing ancient surveying instrument.

272. Monument of M. L. Macedonus, a Roman surveyor, showing ancient levels.

**MODERN MECHANICAL CALCULATION**

208. The Comptometer.


210. Multiplication on the Comptometer.

211. Type of Comptometer work.

212. The Mechanical Accountant.

213. Beach Adding Machine.

214. The Calcurometer.


216. The Universal Adding Machine.


219. The Comptograph.

220. Split key-board of the Burroughs machine.

221. Statement of an account made on a listing machine.
222. Statement of an account made on a listing machine.
223. Invoice made on a listing machine.
225. Deposit slip made on a listing machine.
226. Trial balance made on a listing machine.
227. Tax accounts made on a listing machine.
228. The Ellis Adding Typewriter, and the National Typewriter Adding Machine.
229. The Arithmograph.
231. Statement of account made on the adding typewriter.
232. Sales sheet made on the adding typewriter.
234. Check writing done on the adding typewriter.
235. The National Cash Register.
236. Printed sales-strip made by the Cash Register.
237. The National Cash Register for department stores.
238. Sales-slip printed by the department store Cash Register.
240. The Hollerith Electric Tabulating and Adding Machine.
241. Card used in the Hollerith machine.
242. Punch used with Hollerith machine.
244. Principle of Thomas Arithmometer.
245. The Autarith.
246. The Brunsviga Calculating Machine.
249. Manufacturing cost sheet computed by the multiplying machine.
250. Least square solution made by the multiplying machine.
251. The Slide Rule.
252. Sperry’s Pocket Calculator.
253. From the Paris (1740) edition of Newton’s Fluxions showing symbolism.
254. From Cavalieri’s *Geometria Indivisibilibus* (Bologna, 1653), showing a geometric figure.
255. From Haye’s *Treatise of Fluxions* (London, 1764), the first work in English on calculus, showing Newtonian symbolism.
257. From Descarte’s *La Geometrie* (1637, 1705 edition), showing first steps in analytics.
258. From Viviani’s *De Max. et Minimis* (Florence, 1659), showing early progress towards calculus.
259. From the *Elementa Conica* of Apollonius (Rome, 1679), showing the nature of the definitions.
260. The *Opera* of Archimedes (Rome, 1679), showing first pages *De quadratura parabola*.
261. From the works of Pappus (Bologna, 1660), showing his ratio definition of conics.
262. From Newton’s *Arithmetica Universalis* (Leyden edition of 1732), showing symbolism.
263. From Euler’s calculus (St. Petersburg, 1708), showing symbolism.
264. A mathematical MS. of Newton in Professor Smith’s collection.
265. A mathematical MS. of Leibnitz in Professor Smith’s collection.
266. See after Nos. 144 and 169.
267-272. See after No. 207.
273-275. See after Nos. 144 and 266.
276-278. See after No. 187.
Appendix B:

Teachers College’s Set of Lantern Slides from the “Illustrations for Lectures on the History of Mathematics”

The following are digitized versions of the slides available at the Mathematics Program at Teachers College. On each page, the larger image is the specially scanned version of the slide to display the image portrayed on the lantern slide. The smaller image is a scanned version of the lantern slide in its original state. Each slide is approximately 3”x4”. The description at the bottom of the page is taken from the “Illustrations for Lectures on the History of Mathematics” publication. In most cases, this same description is handwritten directly on the slide. Although some use a double numbering system, the slides are organized according to the publication’s ordering. Several of the slides in the set are not from that publication, and thus, are not specifically identified. These most likely came from items in George A. Plimpton’s collection.
10. Table from Treutlein’s “Zahlzelchen,” showing the changes in the numeral system from ancient to modern times.
11. Page from Borghi’s arithmetic of 1488, showing one of the early uses of “million” in print.
16. Picture from the “Margarita Philosophica” (1503), showing the old (counter) and new (algorism) reckoning.
17. Title page of one of Adam Riese’s arithmetics (1538), showing merchants reckoning “on the line.”
19. The same, from Recorde’s “Ground of Artes” (1558 edition).
21. Chinese swanpan, Russian tschotü, and Korean rods, the modern relics of the counter reckoning.
22. Machines for adding, multiplying, and dividing.
26. Earliest use of a decimal point (Pellos, 1492), about a century before decimal fractions were understood.
27. First printed page containing the signs + and – (Widman, 1489), as symbols of excess and deficiency.
29. Symbols of addition and subtraction from Curtius (1619), with curious processes of multiplication.
31. Addition, from Hylles (1579), showing curious rhyming rule, and catechism method of teaching arithmetic.
32. Subtraction (substraction), from Baker’s “Well Spring of Sciences” (1580).
34. Multiplication *per scachiero* and *per quadrato*, from a 15th-century MS.
36. The old complementary multiplication from Huswirt’s “Enchiridion” of 1501.
39. Division by the galley method and multiplication by the common (scachiero) plan, from a MS. of the 16th century.
43. The first printed example of our modern (*a danda*) form of division, from Calandri (1491).
52. Title page of Boschenstein’s arithmetic of 1514, showing merchants using the blackboard.
53. A class in arithmetic in the Middle Ages, from an old engraving.
55. The seven liberal arts, from an old engraving.
58. From the first printed edition of Boethius (1488), showing other figurate numbers.
59. From an anonymous chapter on Rithmimachia (1496), showing this famous mediaeval number game.
60. The first printed Magic Square, from Dürer’s “Melancholia.”
Two merchants made a company. A put in 300 pounds for 3 months, and then put in yet in 400 pounds, and 6 months after that took out 600 pounds, and 3 months after that took out 600 pounds, and 6 months after that took out a certain sum of money, and with the rest remainer went the years end, and then finde to have gained together 1271 pounds.

<table>
<thead>
<tr>
<th>Month</th>
<th>Put In</th>
<th>Time</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>300</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>400</td>
<td></td>
<td>700</td>
</tr>
</tbody>
</table>

Fair broke out 1271 pounds.
65. Early American problems from Pike (1788).
74. Humorous illustrations from Crowquill’s arithmetic (1848).
75. Last page of the first printed arithmetic (Treviso, 1478).
Ars numerandi.

Initiatum est dividuo, quin
numerus deponiat in quo docet
modo, quo ordinatur, variatur
et attingat terminum dividendi numeri.

Quamvis numerus dividendi dividendi
sit

Duraplica est dividendo.

Quod numeris

nulla nula

sit numeri.
85. From the Rollandus MS. (c. 1420), showing the names for the powers of the unknown, and a multiplication table of such powers.

<table>
<thead>
<tr>
<th>Power</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unity</td>
</tr>
<tr>
<td>2</td>
<td>Square</td>
</tr>
<tr>
<td>3</td>
<td>Cube</td>
</tr>
<tr>
<td>4</td>
<td>Fourth</td>
</tr>
<tr>
<td>5</td>
<td>Fifth</td>
</tr>
<tr>
<td>6</td>
<td>Sixth</td>
</tr>
<tr>
<td>7</td>
<td>Seventh</td>
</tr>
<tr>
<td>8</td>
<td>Eighth</td>
</tr>
<tr>
<td>9</td>
<td>Ninth</td>
</tr>
<tr>
<td>10</td>
<td>Tenth</td>
</tr>
</tbody>
</table>
86. Introduction to algebra, from an Italian MS. of c. 1450.
88. From the MS. of Scheubel’s algebra, 16th century, showing his symbolism for surds.
89. The first printed solution of the cubic equation, Cardan’s “Ars Magna” (1545).
90. From Masterson’s work of 1592, showing the Renaissance symbolism for the unknowns.
91. From a MS. of c. 1620, showing the extraction of the square root of a binomial surd.
92. Page from the Campanus translation of Euclid, showing the Pythagorean theorem. Original MS. of c. 1260, in the Plimpton Library.
94. Illustration of *Geometria*, with quadrans, from the “Margarita Philosophica” (1503).
95. From Foeniseca’s “Opera” (1515), showing the construction of the Platonic bodies.
101. Ptolemy and Boethius, from a drawing by Raphael.
103. Leonardo of Pisa, from an engraving.
107. Cardan, from a contemporary engraving.
108. Tartaglia, from a contemporary engraving.
113. Pascal.
114. Newton.
115. Leibnitz.
129. Elaborate multiplication table from a Florentine MS. (c. 1500).
139. Two pages from a 1460 MS. of the arithmetic of Benedetto di Firenze, showing the hound and hare problem.
141. From Calandri’s arithmetic (1491), showing two pages of illustrated problems. (See No. 70.)
154. From the *Modo di Misurarci* of Bartoli (Venice, 1589), showing the uses of the quadrans squadro, baculus, etc.
169. Title-page of the first (1494) edition of Paciulo’s *Summa*, showing the topics studied. (See No. 140.)
191 or 198. From Bion’s work on *Instrumens de Mathematique* (La Haye, 1723), showing various mathematical instruments and their uses.
191. From Bion’s work on *Instrumens de Mathematique* (La Haye, 1723), showing various mathematical instruments and their uses.
208. The Comptometer.
then 3 on the units

Fig. 3.

Fig. 4.

The manner in which the depression of a key causes the wheel to turn a certain part of a revolution is shown in

210. Multiplication on the Comptometer.
212. The Mechanical Accountant.
213. Beach Adding Machine.
214. The Calcumeter.
214. The Calcumeter.
216. The Universal Adding Machine.
219. The Comptograph.
220. Split key-board of the Burroughs machine.
228. The Ellis Adding Typewriter, and the National Typewriter Adding Machine.
229. The Arithmograph.
235. The National Cash Register.
237. The National Cash Register for department stores.
240. The Hollerith Electric Tabulating and Adding Machine.
242. Punch used with Hollerith machine.
245. The Autarith.
247. The Millionaire Calculating Machine. [Photo of inner workings.]
247. The Millionaire Calculating Machine. [Photo of inner workings.]
248. Manufacturing cost sheet computed by the multiplying machine.
249. Least square solution made by the multiplying machine.
250. The Slide Rule.
251. The Thacher Slide Rule. The Fuller Slide Rule.
 Từ donnee la Relation des Quantités Fluctantes, trouver la Relation de leurs Fluxions.

SOLUTION.

I. Disposez l’Equation par laquelle la Relation donnee est exprimee suivant les Dimension de l’une de ses Quantites Fluctantes x par exemple, & multipliez les Termes par une Pro- gression Arithmetique quelconque, & ensuite par faire cette Opéra- tion separément pour chacune des Quantites Fluctantes ; apres quoi egalisez a zero la somme de tous les produits, & vous aurez l’E- quation cherchee.

II. Exemple I. Si la Relation des Quantites Fluctantes x & y est x³ = ax² + ax + ay = y³ = 0, disposer d’abord les Termes suivant x, & ensuite suivant y, & multipliez-les comme vous voyez.

<table>
<thead>
<tr>
<th>x³</th>
<th>ax²</th>
<th>ax</th>
<th>ay</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x</td>
<td>2x²</td>
<td>2x</td>
<td>2y</td>
</tr>
</tbody>
</table>

Vous aurez 3x³ - 2ax² + axy = 0.

la somme des produits est 3x³ - 2ax² + axy - y³ = 0, qui etant egalée a zero, donne la Relation des Fluxions x & y, car si vous donnez a volonté une valeur a x, l’Equation x³ = ax² + axy - y³ = 0, donnera la valeur de y ; ce qui etant determine,

l’on aura x = y³.

III. Exemple II. Si la Relation des Quantites x, y & z est exprimee par l’Equation x³ + x²y - 2zx + 3yz = 0

<table>
<thead>
<tr>
<th>x³</th>
<th>x²y</th>
<th>2zx</th>
<th>3yz</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x</td>
<td>2x²</td>
<td>2x</td>
<td>2y</td>
</tr>
</tbody>
</table>

Vous aurez 4x³ + y² + z³.

253. From the Paris (1740) edition of Newton’s Fluxions showing symbolism.
254. From Cavalieri’s *Geometria Indivisibilibus* (Bologna, 1653), showing a geometric figure.
258. From Viviani’s *De Max. et Minimis* (Florence, 1659), showing early progress towards calculus.
259. From the *Elementa Conica* of Apollonius (Rome, 1679), showing the nature of the definitions.
266. From the Ahmes Papyrus. (See No. 2.)
276. Astrolabes. (1) Italian, 1509; (2) Arabic.
277. Astrolabes. Italian, 1450 and 1558.
278. Sector compasses. Renaissance period.
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in "Illustrations for Lectures on the History of Mathematics."
QUADRATIC EQUATION.

48. Rule for elimination of the middle term: \(\S\) 32, 33. Take absolute number from the side opposite to that from which the square and simple unknown are to be subtracted. To the absolute number multiplied by four times the [coefficient of the] square, add the square of the [coefficient of the] middle term; the square root of the same, less the [coefficient of the] middle term, being divided by twice the [coefficient of the] square, is the [value of the] middle term.²

49. Question 16. When does the residue of revolutions of the sun, less one, fall, on a Wednesday, equal to the square root of two less than the residue of revolutions, less one, multiplied by ten and augmented by two? The value of residue of revolutions is to be here put square of \(yācat-tācāt\) with two added: \(ya v 1 ru 2\) is the residue of revolutions. This less two is \(ya v 1\); the square root of which is \(ya 1\). Less one, it is \(ya 1 ru 1\); which multiplied by ten is \(ya 10 ru 10\); and augmented by two \(ya 10 ru 8\). It is equal to the residue of revolutions \(ya v 1 ru 2\) less one: viz. \(ya v 1 ru 1\). Statement of both sides \(ya v 0 ya 10 ru 8\). Equal subtraction being made \(ya v 1 ya 0 ru 1\).

Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
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Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Chap. XVII.

A most brief & compendious way of working all manner of Questions of Interest upon Interest.

Example.

First, State your Question thus:

If 100 l. gain 6 l. what is the Principal?

2. Multiply the second and third Numbers together, and divide by your first, which is done by cutting off two first Figures of the Pounds with a line.

3. Multiply them by 20, by 12, and 4, and all above 2 figures in each Multiplication carry over the line unto the left, as you see in these following Examples.

If 100 l. in 12 Months gain 6 l. what will 356 l. gain in 18 Months?

If 100 l. ——— 6 l. ——— 356 l.

6

L. s. d.
12 Mon. fa. 21 —— 07 —— 2 ½
6 Mon. fa. 10 —— 13 —— 7
32 —— 00 —— 9 ½

240

1/60

K 3

275 l.

Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
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Not listed in “Illustrations for Lectures on the History of Mathematics.”
Not listed in “Illustrations for Lectures on the History of Mathematics.”
Tare and Tret.

Tare is an allowance made to the buyer for the weight of the hoghead, barrel, box, or whatever else contains the goods bought, and is calculated at so much per hoghead, barrel, &c., or at so much per cent. or at so much in the gross weight.

Tret is an allowance made to the buyer of 4 pounds in 100, for wulfe and dust in some sorts of goods.

117 pounds weight is called a gross hundred, and 700 pounds a neat hundred; some sorts of goods are sold by one weight and some by the other. When an article is sold by gros hundreds, the price is generally specified at so much per hundred, and the tare per cent. is upon 117 pounds. When an article is sold by neat hundreds, the price is generally specified at so much per pound, and the tare per cent. is upon 700 pounds.

The whole weight of an article, and the hoghead or whatever contains it, being weighed together, is called the gross weight, whether the article be sold by gros hundreds or neat hundreds.

The weight of the article itself, after all allowances are deducted, is called the neat weight, whether the article be sold by gros hundreds or neat.

Case I. When the tare is at so much per hoghead, barrel, &c., multiply the number of hogheads or barrels by the tare, and the product will be neat hundreds; reduce this product to gross hundreds if the article is specify'd in gross hundreds, and subtract it from the gross weight; the remainder is the net weight.

Case 2d. When the tare is at so much per cent. and is the aliquot part of parts of an hundred weight, divide the whole gross by the said part or parts which the tare is of an hundred weight; the quotient thence arising gives

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Rebate or Discount.

Rebate or discount is when a sum of money due at any time to come, is satisfied by paying so much present money, as being put out to interest, would amount to the given sum in the same space of time.

Find the amount of £100 for the time and rate per cent. given, which interest added to £100; then by a relating the rule of three, say, as that sum is to £100 so is the debt or sum proposed to the present worth required. The difference between the present worth and the given sum is the rebate.

Equation of Payments.

When several sums of money are to be paid at different times, and it is required at what time the whole shall be paid together, without loss to debtor or creditor; this is called equation of payments, or equating the time of payment. Multiply each payment by its time, add the products together, and divide this sum by the whole debt, the quotient is the equated time.

Fellowship.

By Fellowship the accounts of several partners, trading in a company are so adjusted or made up, that every partner may have his just part of the gain, or sustain his just part of the loss, according to the proportion of share of money he hath in the joint stock. There are two kinds of fellowship, viz. single and double. Single fellowship is when the stocks of all the partners continue an equal term of time, and is usually called fellowship without time. Double fellowship is when the stocks continue an unequal term of time, and is

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The rule relating to the *Mūla* variety (of miscellaneous problems on fractions):

33. Half of (the coefficient of) the square root (of the unknown quantity) and (then) the known remainder should be (each) divided by one as diminished by the fractional (coefficient of the unknown) quantity. The square root of the (sum of the) known remainder (so treated), as combined with the square (of the coefficient) of the square root (of the unknown quantity dealt with as above), and (then) associated with (the similarly treated coefficient of) the square root (of the unknown quantity), and (thereafter) squared (as whole), gives rise to the (required unknown) quantity in this *mūla* variety (of miscellaneous problems on fractions).

*Examples in illustration thereof.*

34. One-fourth of a herd of camels was seen in the forest; twice the square root (of that herd) had gone on to mountainsides; and 3 times 5 camels (were), however, (found) to remain on the bank of a river. What is the (numerical) measure of that herd of camels?

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Not listed in “Illustrations for Lectures on the History of Mathematics.”
ARCHIMEDES: ON THE SPHERE AND THE CYLINDER.
II.4. TO CUT A GIVEN SPHERE BY A PLANE SO THAT THE VOLUMES OF
THE SEGMENTS ARE TO ONE ANOTHER IN A GIVEN RATIO.

\[ x^2(a - x) = b^2c, \quad \text{whence } x^3 - ax^2 + b^2c = 0. \]

Solved by intersection of the conics, and \((a - x)y = ac.\)
Proposition 29.

To a given straight line to apply a parallelogram equal to a given rectilineal figure and exceeding by a parallelogrammic figure similar to a given one.

Let $AB$ be the given straight line, $C$ the given rectilineal figure to which the figure to be applied to $AB$ is required to be equal, and $D$ that to which the excess is required to be similar; thus it is required to apply to the straight line $AB$ a parallelogram equal to the rectilineal figure $C$ and exceeding by a parallelogrammic figure similar to $D$.

Let $AB$ be bisected at $E$; let there be described on $EB$ the parallelogram $BF$ similar and similarly situated to $D$; and let $GH$ be constructed at once equal to the sum of $BF$, $C$ and similar and similarly situated to $D$. [vi. 25]

Let $KH$ correspond to $FL$ and $KG$ to $FE$.

Now, since $GH$ is greater than $FB$,

therefore $KH$ is also greater than $FL$, and $KG$ than $FE$.

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PROPOSITION 30.

To cut a given finite straight line in extreme and mean ratio.

Let $AB$ be the given finite straight line; thus it is required to cut $AB$ in extreme and mean ratio.

On $AB$ let the square $BC$ be described; and let there be applied to $AC$ the parallelogram $CD$ equal to $BC$ and exceeding by the figure $AD$ similar to $BC$. [vi. 29]

Now $BC$ is a square; therefore $AD$ is also a square.

And, since $BC$ is equal to $CD$, let $CE$ be subtracted from each; therefore the remainder $BF$ is equal to the remainder $AD$.

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We cannot have a real solution of this unless
\[ x > \frac{1}{5} (x^3 - 60) \text{ and } x < \frac{1}{4} (x^3 - 60). \]
Therefore
\[ 5x < x^3 - 60 < 8x. \]
(1) Since
\[ x^3 > 5x + 60, \]
x is a number greater than 60,
whence x is not less than 11.

(2) \[ x^3 < 8x + 60 \]
or
\[ x^3 = 8x + \text{some number less than 60}, \]
whence x is not greater than 12.
Therefore
\[ 11 < x < 12. \]
Now (from above) \[ x = (m^3 + 60)/2m; \]
therefore \[ 22m < m^3 + 60 < 24m. \]
Thus (1) \[ 22m = m^3 + \text{some number less than 60}, \]
and therefore m is not less than 19.

(2) \[ 24m = m^3 + \text{some number greater than 60}, \]
and therefore m is less than 21.
Hence we put \[ m = 20, \]
and
\[ x^3 - 60 = (x - 20)^3, \]
so that \[ x = 11\frac{1}{3}, \]
x is \[ 132\frac{1}{3}, \text{ and } x^3 - 60 = 72\frac{1}{3}. \]
Thus we have to divide \[ 72\frac{1}{3} \] into two parts such that \[ \frac{1}{4} \]
of one part plus \[ \frac{1}{2} \] of the other = \[ 11\frac{1}{3}. \]
Let the first part be 5x.
Therefore \[ \frac{1}{4} \text{ (second part) } = 11\frac{1}{3} - x, \]
so second part = \[ 92 - 8x; \]
therefore \[ 5x + 92 - 8x = 72\frac{1}{3}. \]
and \[ x = \frac{79}{12}. \]

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Appendix C:

List of Portraits in Smith’s Collection

The following list of names is modified from the finding aid available at the Rare Book and Manuscript Library, Columbia University, upon request. The organization of the list is alphabetical, as it is in the Library. The formats of the portraits in this collection include: negatives, engravings, busts, medals, paintings, sketches, photographs, and bas-reliefs.

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Abbe, Ernst
Abel, Niels H.
Abelard
Accum, F. Christian
Adams, John Couch
Adrain, Robert
Aenae, H.
Agassiz, Louis
Agnesi, Gaetana
Agostino, Baptista di
Agrippa, Henri Corneille
Agrippa, Marcus
Ahrens, W. E. M. G.
Airy, George Biddel
Alciatus, Andreas
Alcott, Amos Bronson
Alfonse the Tenth
Allamand, Jean N. S.
Allen, Thomas
Allman, George S.
Alsop, John
Amaldi, Ugo
Amodeo, F.
Ampere, Andre Marie
Anacharsis,
Anaxagoras
Anderson, D. M.
Anderson, John
Angelis, Steffanus
Anich, Petrus
Apianus, Petrus
Apollonius
Arago, Francois J. D.
Arago, Jacques
Araldi, M.
Aratus
Archimedes
Archytas
Arenhet, E.
Argol, Andreas
Aristophanes
Aristotle
Arkwright, Sir Richard
Arnauld, Antoine
Aston, Francis William
Astorini, F. Elia
Astronomy (Allegorical)
Aubert, Alexander
Auwers, Arthur von
Babbage, Charles
Bacon, Francis
Bacon, Roger
Bagwell, Guelmi
Baier, Johann W.
Bailey, Francis
Bailly, Jean Sylvain
Ball, Robert
Ball, W. W. Rouse
Ballantine
Baltzer, Richard
Banfi, Johannes
Banus, J.
Barlaam, Calabrese
Barozzi, Jacopo
Barre, Francois
Barrow, Isaac
Bartholomae, Sounvers
Bartoli, Cosimo
Basedow, Johann B.
Bassus
Battagline, Guiseppe
Bauernfeind, Carl M.
Bayle, Pierre
Beckmann, Johann
Bede, Venerable
Beethoven, Ludwig van
Belgrado, Jacopo
Bell, Eric Temple
Bellows, C. F. R.
Beltrami, Eugene
Beman, Wooster W.
Benel, F. W.
Beneventano, Marco
Berkeley, George
Bernardinus
Bernardus, Jacobus
Bernoulli, Daniel
Bernoulli, Jacques
Bernoulli, Jean
Bert, Paul
Bertius, Petrus
Bertrand, Joseph
Bertrand, Louis
Besant, W. A.
Bessel, Friedrich Wilhelm
Bessemer, Sir Henry
Betti, Enrico
Beyerus, Hartmann
Bezout, Stefano
Bianch, Luigi
Bickerdike
Bidder, George
Biddle, D.
Binet, M.
Bion, Nicholas
Biot, Jean B.
Birkhoff, George
Bjerknes, C. A.
Bjornbo, A. A.
Blackwood, Elizabeth
Blagrave, Joseph
Blagrave, John
Blake, James Gibbs
Blanchino, Francisco
Bliss, G. A.
Blissard, J.
Boaz, Franz
Bobart, Jacob
Bocher, Maxime
Bode, I.
Boehm, Andreas
Boerhaave, Hermann
Boetius, Anicius
Bohr, Niels
Boijs, Johann
Bolyai, Farkas
Bonati, Teodore
Bonnet, Ossian
Booker, John
Booth, James
Borchardt, C. W.
Borelli, Giovanni
Borgesius, Johannes
Borromius, Alexander
Bortolotti, Ettore
Boscovich, Roger Joseph
Bossut, Charles
Bouillaud, Ismael
Boulton, Matthew
Bowdick
Bowditch, Nathaniel
Boyle, Robert
Bradley, James
Brahe, Tycho
Brander, George F.
Brashear, John A.
Brechfeln, Christopher F.
Brewster, David
Brindly, James
Brioschi, Francesco
Brocard, H.
Brook-Smith, J.
Brooks, Edward
Brougahm, Lord Henry
Brouncker, W.
Brown, Miss
Brown, Colin
Brown, Ernest W.
Bruno, Giordano
Bruyant, Nichlaus
Bryan, Mrs. Margaret
Buchan, David Stewart E.
Bude, Guillaume
Bunsen, Robert Wilhelm
Burali-Forti, C.
Burgatti, Pietro
Burkhardt, Heinrich
Burkhardt, Jean Charles
Burnside, W.S.
Busch, Johann
Bush, Vannavar
Butler, Nicholas Murray
Buxton, Jedidiah
Caesar, Julius
Cagnoli, Antonio
Cain, William
Cajori, Florian
Calkoen, Jan Fred
Calvin, Jean
Calvis, Seth
Campanella, Tommaso
Campensi, Albertus P.
Canovani, Stanislav
Cantor, Georg
Cantor, Moritz
Caramuel, Joahnnes
Caravelli, A. Vito
Carcavy, P. de
Cardan, Jerome
Carey, Mathew
Carneade
Carnot, L.M.N.
Carnot, Nicholas Leonard
Carr, G.S.
Carus, Paul
Casamia, Petrus G. P.
Casey, John
Cassini, Giandomenico
Catalan, Eugene Charles
Cauchy, Augustin
Cavaliere, Bonaventuro
Cayley, Arthur
Cellarius, Christopherus
Cellerier, Charles
Cellini, Benvenuto
Ceva, P.
Challis, James
Chamberlain
Chamberlin, Thomas C.
Chandler, Charles F.
Chappe, Abbe d' Auteroche
Chase, Pliny Earle
Chasles, Michel
Chatelet, Emilie du
Chevalier, Charles
Christoffel, Elain Bruno
Chrysippus
Chute, Horatius
Clairau, Alexis Claude
Clark, Edwin
Clark, Samuel
Clarke, A. R.
Clausius, Rudolf Julius
Clanius, Christophorus
Clayton
Clebsch, Alfred
Clifford, William Kingdon
Clinton, De Witt
Coble, Arthur
Cocker, Edward
Cockle, James
Fontand, Padre Mariano
Fontenelle, Bernard
Forsyth, Andrew Russell
Fortey, H.
Foster, G. Carey
Foster, W. S.
Foucault, Jean B. L.
Fouquet, Nicolas
Fourcroy
Fourier, Joseph
Fowler, R. H.
Fox, Henry
Fracastorius, Hieronymus
Franceshinis, Francesco
Francoeur, Louis B.
Franklin, Benjamin
Frederick II, King of Prussia
French, John R.
Fresnel, Augustin
Frisi, Paolo
Frontinus, Sextus Julius
Fuchs, Emmanuel Lazarus
Fujisawa, R.
Fulton
Furtenbachy, Joseph
Fuss, Paul Henri
Galgenmair, George
Galileo
Galliers, F.
Galois, Evariste
GWant, Francis
Galvani, Luigi
Garnier, J. G.
Garvin, J. L.
Garicus, Lucas
Gassendi, Pierre
Gauss, Carl Friedrich
Gay-Lussac
Gaza, Theodore
Gehler, Johann Samuel Traugott
Gelkie, Archibald
Gelder, Jacob de
Gemena, Reinerus Frisus
Genese, R. W.
George of Trebizoud
Gerbert, Sylvester II, Pope
Gerhard de Jode
Germain, Sophie
Gernerus, Johannes
Gervis, Henri
Gibbs, Walcott
Gilbert, Davies
Gile, David
Gilliss, James Melville
Ginsburg, Jekuthiel
Gioja, Melchiore
Giorgini, Gaetano
Gisze, George
Gladstone, William E.
Glaisher, James
Gocchen
Godward
Goethe, Johann
Goldenberg
Goldmayer, Andreas
Goode, George B.
Granville, Earl
Grashof, Franz
Grassmann, Hermann
Gunther
Gravesande, Guilielmus
Greaves, John
Greene, George S.
Greenstreet, W. J.
Greenwood, J. M.
Greer, W. R.
Gregory, David
Gregory, James
Gregory, Olynthus
Guccia, Giovanni B.
Guericke, Otto de
Guglielmini, Domenico
Guicciardini, Francesco
Guillaume, Charles E.
Guyau, A.
Hachette, Jean Nicolas Pierre
Hadamard, Rudolph W.
Haecckel, Ernst
Hagen, Rev. John G.
Hajek Z Hajku, Tadeas
Hall, Asaph
Hall, G. Stanley
Hall, Spencer
Halley, Edmund
Halstead, George Bruce
Hamilton, William R.
Hammond, J.
Hanlon, G. O.
Hanow, Michael
Hanumanta, Nan B.
Hariot, Thomas
Harley, Rev. Robert
Harris, Johannes
Harris, W.
Harrison, John
Harrod, Benjamin M.
Hartgill (or Hartgyll), George
Hartle, Heinrich
Harvey, Gideon
Hassler, Ferdinand Rudolph
Hatton, Edward
Hauck, Guido
Haughton, Samuel
Hayashi, T.
Heard, Robert Lynn
Heath, Sir Thomas
Heath, Royal V.
Hedrick, E. R.
Heis, E.
Hellwig, Johann Christ Ludwig
Helmart, Hermann L.
Helmholtz, Hermann L.
Henderson, Archibald
Hendricks, Joel E.
Henry, Joseph
Hensel, Kurt
Heppel, George
Heraclitus
Herbert, Johann Friedrich
Hermite, Charles
Herschel, Caroline
Herschel, John, baronet
Herschel, William, Sir
Hesse, Otto
Hevelius, John
Hiernon, King of Syracuse
Hilbert, David
Hildericus, D. Edo
Hill, George William
Hind, John
Hipparchus
Hippocrates
Hirst, J. Arthur
Hirth, Friedrich
Hobbes, Thomas
Hobson, Ernest William
Hogendijk, Steven
Holbein
Holz
Holzmuller, Gustao
Hooper, Franklin
Hopkins, Rev. G. H.
Hopkinson, J.
Hopps, W.
Houel, Guillaume
Houel, Jean Hubert
Hoe, Elias
Hudde, Johannes
Hudson, C. T.
Hudson, W. H. H.
Humboldt, Alexander
Humboldt, William von
Huniades, Johannes
Hunt, Charles Warren
Hutton, Charles
Huxley, Thomas H.
Huysgens, Christian
Hypatia
Iacopo, Vincenzio di
Iezeler, Christoph
Inaudi, Jacques
Indagine, Imones
Ingleby, C. Mansfield
Irving, W.
Isbister, Alexander
Isbister, Kennedy
Isbister, Jackson, C. S.
Isbister, Jackson, Sir Herbert
Isbister, Jacobi, Carl Gustav F.
Isbister, Jacobi, Ferdinand
Isbister, Jacobi, J. G.
Isbister, Jacotot, Joseph
Isbister, Jacquier, Francois
Isbister, Jenkins, Morgan
Isbister, Jenner, Edward
Isbister, Jolliois, Jean-Baptiste
Isbister, Jolliois, Prosper
Isbister, Jones, Sir William
Isbister, Jordan, Camille
Isbister, Joule, James P.
Isbister, Junius, Ulricus
Isbister, Jurdak, M. H.
Isbister, Kaestner, Abraham
Isbister, Gotthelf
Isbister, Kant, Emmanuel
Isbister, Kapteyn
Isbister, Karsten, W. I. G.
Isbister, Kasner, Edward
Isbister, Kealy, James A.
Isbister, Keeny, Abner C.
Isbister, Kelland, Philip
Isbister, Kelvin, William
Isbister, Keppler, Johann
Isbister, Kersey, John
Isbister, King, Clarence
Isbister, Kircher, Athanasius
Isbister, Kirchoff, Gustav
Isbister, Kirman, Thomas
Isbister, Penygon
Isbister, Kirkwood, Daniel
Isbister, Kitchin, I.
Isbister, Klebs, Arnold C.
Isbister, Klein, Felix
Isbister, Knight, W. M.
Isbister, Knilling, Rudolph
Isbister, Knowles, R.
Isbister, Koertenblok, Joanna
Isbister, Konigsberger, Leo
Isbister, Kowaleaski, Sophie
Isbister, Kowalski, Marian
Krafft, George Wolfgang
Krafft, Nicolas
Krazer, Adolf
Kroneker, Leopold
Krupp, Alfred
Kruse, Jurgen E.
Kummer, Ernst Eduard
La Caille, Nicolas Louis
Ladd, Christine
Lagrange, Joseph Louis
Lahire, Phillipe de
Lalande, Joseph Jerome
Lefrancais de
Lambert, J. G.
Lame, Gabriel
La Mettrie, Julien de la
Lamor, Sir Joseph
Landau, Edmund
Landry, Etienne N.
Langley
Lansberg, Mathieu
Lansberinus, Philipus
Lao-tze
Laplace, Pierre
Laurent, P. J.
Laval, Gustaf de
Laverty
Lavinal
Lavoisier, Antoine
Leaderdorf, C.
Lebesgue, Henri
Leclerc, Sebastien
Le conte, Joseph
Leeuwenhoek, Anthony
Leeuwenhoek, Anthony van
Lefevre
Legendre, Adrieu-Marie
Leibnitz, Gottfried
Leibnitz, Gottfried Wilhelm
Leigh, C. W.
Lemaitre, Abbe
Lemoine, Emile-Michael-Hyacinthe
Lenoir
Lenzio
Leonardo of Pisa
   (Fibonacci, Leonardo)
Lescher, S.
Leslie, Sir John
Lessing, Gotthold
Leucipus
Leunecshlos, Johannes A.
Leuschner, Armin
Le Vaillantm Francois
Le Verrier, Jean Joseph
Levi-civita, T.
Lewis, E. P.
Leybourn, Gulielmi
L'Hopital, Guillaume
Francois Antoine
L'Huillier, Simon
Liagre
Lie, Sophus
Lilly, William
Lindelof, Lorentz Leonard
Lindsay, James L.
Lipschitz, R.O.
Littrow, F.F.
Lobatchefsky, Nicolas
   Ovanovitch
Locke, John
Lockyer, Sir Norman
Lodge, Oliver J.
Lombard, Pierre
Long, Roger
Lorentz, Hendrik Anton
Lorenzoni, Guiseppe
Loria, Gino
Loschmidt, J.
Louisa, Queen consort of
   Frederick William III,
   King of Prussia.
Love, A. E. H.
Loyson, Charles (Pere
   Hyacinthe)
Lubbock, Sir John
Ludemann, Johann
   Christophorus
Ludolf van Collen
Ludovici, Jacobus
Lullus, Raymundus
Luys, Jan
Lycurgus
McAlister, Donald
McCasy, W. S.
McClintock, Emory
McColl, Hugh
McCormick, Cyrus Hall
McDowell, J.
MacFarlane, Alexander
Mach, Ernst
McKenzie, J. L.
Maclaurin, Colin
MacLaurin, Richard
Cockburn
McCleod, Lyons
McMahon, James
Magini, Jean Antoine
Mairan, J.J. Dortous
Malabri, Domenico
   Antonio
Mallet, Allain Manesson
Malus, Etienne L.
Mandey, Venteri
Mann, Horace
Mannes, Henri
Mannheim
Marat, Jean Paul
Marchetti, Alessandro
Marcus, Aurelius Antonius
Mari, Abate
Marinonil, Giovanni
   Giocomo
Marius, Simon
Marshall, John, baronet
Martin, Artemus
Martin, Benjamin
Martin, Rev. Hugh
Martin, Jacques
Martini
Martino, Nicolo de
Mascheroni, Lorenzo
Maskelyne, Nevil
Mason, Max
Maudit, Antoine R.
Maupertius, Pierre Louis
Maurolycus, Franciscus
Maury, Mathew Fontaine
Maxwell, James Clerk
Mayne, Johannes
Melanchton, Philip
Mendoza y Rios, Jose de
Merrifield, C. W.
Merrifield, John
Mersenne, Marin
Metius, Adriaan
Metzler, W. H.
Meusnier, G. A.
Meziriac, Claude-Gaspard
Michelsen, Johann
   Andreas Christian
Mikami, Yoshio
Miller
Miller, Hugh
Miller, Kelly
Miller, W. H.
Miller, W. J. C.
Millikan, Robert
Milne, W. J.
Milner, Isaac
Minchin, S. M.
Minkowski, Hermann
Mirandola, Pico della
Mitobius, Burchardus
Mittag-Leffler, Magnus
   Gosta
Mobius, August Ferdinand
Moigno, Abbe de
Moissan, Ferdinand
Molk, Jules
Moll, Gerrit
Monck, H.S.
Monge, Gaspard
Monro, C. J.
Montanarius, Geminianus
Montforte, Antonio di
Montgolfier, Joseph
Montgolfier, Stephane
Montreal, Jean de
Montuola, Jean Etienne
Moon, Robert
Moore, Amie Henrietta
Moore, E. H.
Moore, Sir Jonas
Moore, R. L.
Moors, Henry Erskine
Morin, Jean Baptiste
Morley, Frank
Morley, Thomas
Moss, John Calvin
Moul, A.
Mouraud, Salih
Moxon, Joseph
Mukhopadhyay
Mulcaster, J. W.
Mulerius, Nicolas
Muller, Johann Henricus
Muller, Max
Munsterus, Sebastianus
Murphy, Hugh
Murray, Daniel Alexander
Muspratt, James Sheridan
Musschenbroek, Johan
Joosten van
Musschenbroek, Pieter van
Musschenbroek, Samuel
Joosten van
Napier, John, eighth laird of Merchistoun
Napier, John
Nerst, Dr. Walther
Neuberg, J.
Neudorffer, Johannes
Neumann, Franz
Newcomb, Simon
Newmann, Carl
Newton, Hubert Anson
Newton, Isaac, Sir
Niceron, Jean Francois
Nicholson, Peter
Nicolai, Giambattista
Nicomedis
Nieuwland, Pieter
Noether, Emmy
Norden, John
Nostradamus, Michel
Nott, Eliphlet
Nowell, Alexander
O’Cogne
O’Connell, P.
Oddie, Mutii
Ohm, Georg Simon
Olearius, Adam
Oliver, Mrs.
Oliver, James
Olmstead, Denison
Oltramare, Gabriel
Oppolzer, Theodor von
Oreagan, John
Oriani, Barnaba
Origanus, David
Orlandi, Giuseppe
Orsted, Hans Christian
Ortelius, Abraham
Osgood, William Fogg
Ostrogradski, Michel
Oswaldus, Erasmus
Otto, Nicholas August
Ougtred, William
Owen, J. A.
Owen, Richard
Pagan, Blaise Francois de, comte de Merveilles
Painleve, Paul
Palitzsch, Jean George
Palmer, C. I.
Pappus, Johannes
Parrish, Celestia
Parsons, Sir Charles
Algernon
Pascal, Blaise
Pascal, Ernest
Pasini, Claudio
Pasteur, Louis
Patin, Charles
Patot, Simon Tyssot de
Payne, Roger
Peirce, Benjamin Osgood
Peiresc
Perouse, Jean Francois
Galaup
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Porta, Johann Baptist
Postel, Guillaume
Praalder, Laurens
Price, B.
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Proctor, Richard A.
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Ptolemy, Claudius
Pugliesse, Giuseppe
Pupin, Michael Idvorsky
Putnam, T.M.
Pythagoras
Quetlet, Adolphe
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Appendix D:

Catalog of Smith’s Collection of Mathematical Instruments

The following catalog was used during the 2002 exhibition, “The Ground of Arts: Mathematical Instruments and Illustrated Books from the David Eugene Smith Collection.” It is noted throughout the catalog which items were included in the exhibit. This catalog also includes the number of the item in a 1927 catalog of Smith’s instrument collection. The following is reproduced under permission of the Rare Book and Manuscript Library, Columbia University.

*Reproduced under permission from the Rare Book and Manuscript Library, Columbia University.*

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<tr>
<td>1</td>
<td>180</td>
<td>Counter used in number work. Presented by Miss Rebecca J. Slaymaker of Lancaster County, Pa. This counter was found in a house built in 1807, the home of Miss Slaymaker's forefather, and was doubtless used by members of the household.</td>
<td>27-191</td>
<td>A3</td>
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<tr>
<td>2</td>
<td>87</td>
<td>Modern Chinese geomancer's compass. Canton, 1907.</td>
<td>27-194</td>
<td>D4</td>
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<td>3</td>
<td>86</td>
<td>Modern Chinese geomancer's compass. Peking, 1907.</td>
<td>27-195</td>
<td>B3</td>
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<td>4</td>
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<td>Modern Chinese geomancer's compass. Peking, 1907.</td>
<td>27-196</td>
<td>B3</td>
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<td>5</td>
<td>1</td>
<td>Armillary sphere. Italian workmanship of 1550, as indicated by the forms of the numerals. Wooden support of much later date.</td>
<td>27-197</td>
<td>exhibit case</td>
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<td>6</td>
<td>8</td>
<td>Sphere, bronze with stars in silver. Persian, dated 1055 Hegira, for 1645 A. D. The emperor Humayoun had as his chief astronomer on Haddad, and it was his grandson who, as the inscription states, made</td>
<td>27-198</td>
<td>exhibit case</td>
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<td>Column 1</td>
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<td>7</td>
<td>12b</td>
<td>Hindu astrolabe ca. 1900</td>
<td>27-199</td>
<td>C2</td>
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<tr>
<td>8</td>
<td>7</td>
<td>Celestial sphere, papier maché, about 300 years old, of Nagasaki period</td>
<td>27-200</td>
<td>exhibit case</td>
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<td>10</td>
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<td>Universal equinoctial sundial, 1748. Made by Johann Willebrand of Augsburg.</td>
<td>27-202</td>
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<td>11</td>
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<td>Universal equinoctial sundial of Tyrolean workmanship, c. 1650.</td>
<td>27-203</td>
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<td>12</td>
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<td>Universal equinoctial sundial with level. Tyrolese, 17th century.</td>
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<td>13</td>
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<td>Universal equinoctial sundial of Austrian workmanship, c. 1750.</td>
<td>27-205</td>
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<td>14</td>
<td>22</td>
<td>Sundial, universal horizontal and vertical south dial. Venetian workmanship, c. 1650 with noteworthy decoration in steel on the back</td>
<td>27-206</td>
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<td>Sundial, equinoctial, with compass. German workmanship, c. 1750. Signed, Johann/Schretteger in/Augsburg.</td>
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<td>Sundial, only part, made by Dunod of Düsseldorf, gold plated, 18th century. Signed, &quot;Claude Dunod A Düsseldorf.&quot;</td>
<td>27-208</td>
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<td>Universal equinoctial sundial with compass. Signed, &quot;L. Grasel.&quot; 17th century.</td>
<td>27-209</td>
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<tr>
<td>18</td>
<td>27</td>
<td>Sundial, equinoctial, with compass and level arrangement. Gold plated on brass. 18th century. On the top &quot;Krigner Varsaviae.&quot;</td>
<td>27-210</td>
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<td>Sundial of German workmanship, 18th century. On back, &quot;Elev Poli/Lisbon 39 Rom/42 Venedig 45 Wein/Augsburg Munchen/48 Nurnb/ Heidelb/Regensp. 49 Rig/ Moscau 57/ L.T.M.&quot;</td>
<td>27-211</td>
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<td>Universal equinoctial dial with compass. Made by Schretteger of Augsburg, c. 1750.</td>
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<td>22</td>
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<td>Universal horizontal dial with compass. Can be set for various latitudes. Made by Langlois, Paris, 18th century.</td>
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<td>B4</td>
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<td>23</td>
<td>45</td>
<td>Sundial, horizontal and vertical south dial, of Austrian workmanship, c. 1700. Wood. On top of cover latitudes of cities printed on paper.</td>
<td>27-215</td>
<td>D4</td>
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<tr>
<td>24</td>
<td>48</td>
<td>Sundial, horizontal, with lines for marking the hours of sunrise and sunset. Signed and dated, &quot;J.C. Strigelius/Creilsheim. fec./1742.&quot; Also on top, &quot;Creatorit hicce Dies, nescitur origo secundi/ An labor an requies: sic transit fabula mundi.&quot; With compass and level arrangement. Nürnberg.</td>
<td>27-216</td>
<td>B4</td>
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<td>47</td>
<td>Horizontal sundial, German workmanship; dated 1824.</td>
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<td>exhibit case</td>
</tr>
<tr>
<td>26</td>
<td>20</td>
<td>Horizontal sundial. Arab-Hindu workmanship, with numerals used in and about Jaipur, India.</td>
<td>27-218</td>
<td>B4</td>
</tr>
<tr>
<td>28</td>
<td>46</td>
<td>Sundial, horizontal, on pivot, oriented by means of magnet. Made by Magwald, Berlin, 19th century.</td>
<td>27-220</td>
<td>D4</td>
</tr>
<tr>
<td>29</td>
<td>18</td>
<td>Portion of silver gilt sundial. Italian workmanship, with arms of noble family. 17-18th century.</td>
<td>27-221</td>
<td>B4</td>
</tr>
<tr>
<td>30</td>
<td>17</td>
<td>Cubical sundial of the 18th century. Bavarian workmanship. Horizontal and vertical. South, north, east, and west.</td>
<td>27-222</td>
<td>exhibit case</td>
</tr>
<tr>
<td>31</td>
<td>44</td>
<td>Chinese vertical sundial, brass. Purchased at Peking, 1907.</td>
<td>27-223</td>
<td>D4</td>
</tr>
<tr>
<td>32</td>
<td>52</td>
<td>Elaborate sundial of German workmanship, early 19th century.</td>
<td>27-224</td>
<td>B5</td>
</tr>
<tr>
<td>33</td>
<td>49</td>
<td>Sundial, horizontal and vertical, south dial with hour lines. German workmanship. Ivory, 17th century. On under side of lid, &quot;Wan mein Got will/ So ist mein zil dar/ auf Ich mich/verlassen will.&quot;</td>
<td>27-225</td>
<td>B4</td>
</tr>
<tr>
<td>34</td>
<td>43</td>
<td>Chinese vertical sundial. Purchased at Canton, 1907.</td>
<td>27-226</td>
<td>B3</td>
</tr>
<tr>
<td>35</td>
<td>40</td>
<td>Ivory sundial on the hemispherical principle. Purchased at Peking, 1907.</td>
<td>27-227</td>
<td>A8</td>
</tr>
<tr>
<td>36</td>
<td>39</td>
<td>Ivory sundial on the hemispherical principle. Purchased at Peking, 1907.</td>
<td>27-228</td>
<td>A8</td>
</tr>
<tr>
<td>37</td>
<td>51</td>
<td>Sundial. Modern Chinese</td>
<td>27-229</td>
<td>B5</td>
</tr>
<tr>
<td>38</td>
<td>42</td>
<td>Sundial, vertical, Chinese. Modern Canton piece.</td>
<td>27-230</td>
<td>B3</td>
</tr>
<tr>
<td>39</td>
<td>38</td>
<td>Sundial, Chinese-Japanese pocket dial on the</td>
<td>27-231</td>
<td>B3</td>
</tr>
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<tr>
<td>40</td>
<td>37</td>
<td>Sundial, Chinese pocket dial on the hemispherical principle. Purchased at Peking, 1907.</td>
<td>27-232 B3</td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>36</td>
<td>Sundial, Chinese pocket dial on the hemispherical principle. Purchased at Peking, 1907.</td>
<td>27-233 B3</td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>35</td>
<td>Sundial, Chinese-Japanese pocket dial on the hemispherical principle. Purchased at Nikko, 1907.</td>
<td>27-234 B3</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>34</td>
<td>Sundial, Chinese-Japanese pocket dial on the hemispherical principle. Purchased at Kyoto, 1907.</td>
<td>27-235 exhibit case</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>41</td>
<td>Sundial. Japanese pocket dial with lens, colored glass for observing the sun, compass and hemispherical dial. Purchased at Nikko, Japan, 1907</td>
<td>27-236 B3</td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>55</td>
<td>Ivory sundial. 18th century. French</td>
<td>27-237 B4</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>56</td>
<td>Ivory sundial. 18th century. French</td>
<td>27-238 B4</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>73</td>
<td>Japanese surveying instrument. Early 19th century. It shows European influence.</td>
<td>27-239 D2</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>74</td>
<td>Japanese surveying instrument. Same as No. 73.</td>
<td>27-240 E1</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>57</td>
<td>Ivory sundial. 18th century. German</td>
<td>27-241 B4</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>21</td>
<td>Sundial of Bohemian workmanship, dated 1800. Maker's name Joan Engelbreht.</td>
<td>27-242 B5</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>58</td>
<td>Chinese sundial. 18th century.</td>
<td>27-243 E3</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>9</td>
<td>Celestial sphere. Hindu. 1640. Bronze with stars in silver.</td>
<td>27-244 exhibit case</td>
<td></td>
</tr>
<tr>
<td>53</td>
<td>60</td>
<td>Sundial, Chinese. 19th century.</td>
<td>27-245 B4</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>83</td>
<td>Quadrant, Italian. Ivory with cover. Early 19th century.</td>
<td>27-246 A8</td>
<td></td>
</tr>
<tr>
<td>55</td>
<td>88</td>
<td>Compass, French. Used for surveying. 19th century.</td>
<td>27-247 D3</td>
<td></td>
</tr>
<tr>
<td>56</td>
<td>59</td>
<td>Chinese sundial. 18th century.</td>
<td>27-248 B4</td>
<td></td>
</tr>
<tr>
<td>57</td>
<td>50</td>
<td>Sundial. French. 18th century.</td>
<td>27-249 B3</td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>89</td>
<td>Compass, instrument for finding the true north and south direction in plane-table work.</td>
<td>27-250 D3</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>61</td>
<td>Part of sundial. German workmanship.</td>
<td>27-251 B4</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>11</td>
<td>Undated Hindu astrolabe. Probably about 1750.</td>
<td>27-252 E4</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>16</td>
<td>Hindu astrolabe and quadrant combined. 18th century. The tube at the top took the place of the telescope.</td>
<td>27-253 E5</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>15</td>
<td>Hindu astrolabe and quadrant. 17th century.</td>
<td>27-254 C2</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Line</td>
<td>Description</td>
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<td>Notes</td>
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<tr>
<td>63</td>
<td>14</td>
<td>Astrolabe. Italian workmanship of 1558. This remarkably preserved specimen of the complete astrolabe is signed twice on the edge, &quot;Patavii Bernardinis Sabevs Faciebat MDLVIII.&quot; &quot;Patavii Apvd Bernardinum Sabevm.&quot;</td>
<td>27-255</td>
<td>exhibit case</td>
</tr>
<tr>
<td>64</td>
<td>13</td>
<td>Astrolabe. Italian workmanship of about 1450 and 1525. An examination of the numerals show that some maker of about 1525 took an older instrument for the back.</td>
<td>27-256</td>
<td>C2</td>
</tr>
<tr>
<td>65</td>
<td>10</td>
<td>Ancient Arab astrolabe. Presented on behalf of the Rev. James L. Fowle, missionary in Cæsarea, Turkey.</td>
<td>27-257</td>
<td>D1</td>
</tr>
<tr>
<td>66</td>
<td></td>
<td>Astrolabe. Hindu, Jaipur, 18th century. “Mr. Plimpton’s Astrolabe”</td>
<td>27-257a</td>
<td>exhibit case</td>
</tr>
<tr>
<td>67</td>
<td>12a</td>
<td>Undated Hindu astrolabe. Probably about 1750</td>
<td>27-258</td>
<td>C2</td>
</tr>
<tr>
<td>68</td>
<td>2</td>
<td>Armillary sphere. Italian workmanship of the 17th century. Pivot hole and direction of degree marks indicate that it contained an alidade at one time.</td>
<td>27-259</td>
<td>C2</td>
</tr>
<tr>
<td>69</td>
<td>3</td>
<td>Armillary sphere. Italian workmanship of the 17th century</td>
<td>27-260</td>
<td>A7</td>
</tr>
<tr>
<td>70</td>
<td>6</td>
<td>Armillary sphere. Tyrolese workmanship, 17th or 18th century.</td>
<td>27-261</td>
<td>exhibit case</td>
</tr>
<tr>
<td>71</td>
<td>5</td>
<td>Armillary sphere. Hindu. Purchased from the astrologer of the Maharajah of Jaipur. Jaipur, India, 1908.</td>
<td>27-262</td>
<td>C2</td>
</tr>
<tr>
<td>72</td>
<td>4</td>
<td>Armillary sphere. French workmanship. 18th century</td>
<td>27-263</td>
<td>A7</td>
</tr>
<tr>
<td>73</td>
<td>76</td>
<td>Diopter for use in plane-table work.</td>
<td>27-264</td>
<td>missing</td>
</tr>
<tr>
<td>74</td>
<td>75</td>
<td>Surveyor's diopeter. 19th century.</td>
<td>27-265</td>
<td>D2</td>
</tr>
<tr>
<td>75</td>
<td>72</td>
<td>Surveying instrument. German, early 19th century, made by Wiskemann, Meminger.</td>
<td>27-266</td>
<td>E10</td>
</tr>
<tr>
<td>76</td>
<td>71</td>
<td>Telescope said to have been made by Ramsden of London, the great maker of mathematical instruments about 1775.</td>
<td>27-267</td>
<td>D2</td>
</tr>
<tr>
<td>77</td>
<td>147</td>
<td>Part of a circle, brass, for measuring angles. German of about 1700. Evidently connected with a telescope or a surveying instrument.</td>
<td>27-268</td>
<td>C3</td>
</tr>
<tr>
<td>78</td>
<td>80</td>
<td>Level, possibly intended for cannon. A signed piece: &quot;Dav. Beringer fecit.&quot; 18th (?) century.</td>
<td>27-269</td>
<td>A8</td>
</tr>
<tr>
<td>79</td>
<td>81</td>
<td>Level of the nature of No. 80 but more simple. Probably German workmanship of about 1650-</td>
<td>27-270</td>
<td>A8</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Location</td>
<td>Case</td>
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<tr>
<td>80</td>
<td>77 Level. Italian workmanship of the 18th century. Signed, &quot;N.S.&quot;</td>
<td>27-271 A7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>82 Quadrants. Tyrolean workmanship of about 1600. This was the common trigonometric instrument of the medieval times. It ordinarily hung on a nail driven in a four-foot rod, the hole being on the side opposite the &quot;Numvrs vmbræ versae.&quot; The hole at the end of this side is for the support of the plumb line. The hole in the center was used when the quadrant lay on the staff horizontally. The alidade (radius) is new. Pfusterthal, South Tyrol.</td>
<td>27-272 missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>84 Square. Etched brass piece of German workmanship. 18th century. Purchased at Munich. Geometric square. German. 18th century</td>
<td>27-273 B3 exhibit case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>136 Brass diagonal and trigonometric scale. German workmanship of 1733. It is signed by the maker, &quot;Inventor Pappelt 1773.&quot;</td>
<td>27-274 B5</td>
<td></td>
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<tr>
<td>84</td>
<td>170 Japanese clock. 19th century.</td>
<td>27-275 E12</td>
<td></td>
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</tr>
<tr>
<td>85</td>
<td>171 Japanese clock. 19th century.</td>
<td>27-276 E12</td>
<td></td>
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<tr>
<td>86</td>
<td>196 German mechanic's compasses. 18th century.</td>
<td>27-277 C2</td>
<td></td>
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</tr>
<tr>
<td>87</td>
<td>197 German adjustable compasses with screw.</td>
<td>27-278 C2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>198 German adjustable compasses with screw.</td>
<td>27-279 C2</td>
<td></td>
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</tr>
<tr>
<td>89</td>
<td>195 German artisan's compasses with quadrant. Dated 1696.</td>
<td>27-280 missing</td>
<td></td>
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</tr>
<tr>
<td>90</td>
<td>205 German proportional compass of the 18th century.</td>
<td>27-281 C2</td>
<td></td>
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</tr>
<tr>
<td>91</td>
<td>199 German iron compasses. 18th century.</td>
<td>27-282 A6</td>
<td></td>
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</tr>
<tr>
<td>92</td>
<td>200 German mechanic's compasses. 18th century.</td>
<td>27-283 C1</td>
<td></td>
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<tr>
<td>93</td>
<td>204 Ancient Roman proportional compasses about the beginning of the Christian era.</td>
<td>27-284 C2</td>
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<tr>
<td>94</td>
<td>201 Chinese compasses, made of bamboo, 19th century.</td>
<td>27-285 A6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>202 Ancient Roman compasses, about the beginning of the Christian era.</td>
<td>27-286 A5</td>
<td></td>
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</tr>
<tr>
<td>96</td>
<td>203 Ancient Roman compasses, about the beginning of the Christian era.</td>
<td>27-287 C2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>169 Japanese rice measure.</td>
<td>27-289 C1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>63 Sundial curves with the signs of the Zodiac. Bohemian workmanship of 1531. Pencil drawing.</td>
<td>27-290 missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>62 Sundial curves, Mainz, 1676. Engraved.</td>
<td>27-291 missing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>193 Japanese sangi sticks used in solving equations in the Old Japanese algebraic system.</td>
<td>27-292 D6</td>
<td></td>
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<tr>
<td>Item</td>
<td>Description</td>
<td>Exhibit Case</td>
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<tr>
<td>101</td>
<td>Purchased in Kyoto, Japan, 1907.</td>
<td>D2</td>
<td></td>
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</tr>
<tr>
<td>102</td>
<td>Calendar on Dutch tobacco box, dated 1799.</td>
<td>D2</td>
<td></td>
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</tr>
<tr>
<td>103</td>
<td>&quot;Wee&quot; arithmetical slips. Similar to Napier bones. Modern English manufacture.</td>
<td>A4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>104</td>
<td>Small Japanese soroban. 1904.</td>
<td>A3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Child's abacus, modern.</td>
<td>D5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Goldman's adding machine with instruction booklet.</td>
<td>C1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>Wee arithmetical slips. Similar to Napier bones. Modern English manufacture.</td>
<td>D2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>Slide rule. Areas and cubes. 19th century. Slide rule. For areas and cubes, 19th century</td>
<td>C1 exhibit case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>Modern Buddhist number beads, similar to the rosary and related to the ancient abacus. Purchased at Mandalay, Burma, 1908.</td>
<td>A6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>111</td>
<td>Modern Mohammedan finger beads, a relic of the rosary and abacus. Purchased at Constantinople, 1908.</td>
<td>A6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>Old Japanese calendar board. One side marked &quot;dai&quot; (great) and is shown during the long months. The opposite side is marked &quot;she&quot; (small) and is shown during the short months.</td>
<td>D3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>113</td>
<td>Ten-Jin, the prince, who according to tradition, introduced arithmetic into Japan. Shrines in his honor are common in Japan. Early 19th century. Wood.</td>
<td>D3 exhibit case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>114</td>
<td>Napier bones, modern German. Ten bones in a cardboard box for multiplying and dividing.</td>
<td>A6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>German calendar board. One revolving disc missing.</td>
<td>D3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Horn book, modern. Old form of reckoning board.</td>
<td>A4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>118</td>
<td>Korean computing rods (bones), the modern form of the ancient Chinese &quot;Bamboo rods&quot; which Japan discarded about 1700. Brought from Korea in 1896.</td>
<td>A3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>119</td>
<td>Arabic (?) amulet, found at Karnakm, Egypt. It illustrates the degenerate forms of the magic square.</td>
<td>A4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>#</td>
<td>Item</td>
<td>Description</td>
<td>Catalog</td>
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<tr>
<td>120</td>
<td>182</td>
<td>Tally sticks, old English. These tally sticks date from about 1296. Found in the Chapel of the Pyx, Westminster. One of the small pieces in the lot there found bore the name of William de Costello, who was sheriff in 1296. The ancient English tallies were ordered burned in 1834 and it is said to have been owing to the extra fires made up for this purpose that the Houses of Parliament were destroyed.</td>
<td>27-312</td>
<td>C1</td>
</tr>
<tr>
<td>121</td>
<td>189</td>
<td>Napier bones. Modern French manufacture.</td>
<td>27-313</td>
<td>A2</td>
</tr>
<tr>
<td>122</td>
<td>269</td>
<td>Japanese astronomer. Grotesque ivory figure. Purchased at Nikko, Japan, 1907.</td>
<td>27-314</td>
<td>missing</td>
</tr>
<tr>
<td>123</td>
<td>252</td>
<td>Horn book, Armenian. Presented by Professor Farnsworth.</td>
<td>27-315</td>
<td>missing</td>
</tr>
<tr>
<td>124</td>
<td>64</td>
<td>Egyptian terra cotta piece, showing the signs of the zodiac as used by the Greek scholars in Alexandria.</td>
<td>27-316</td>
<td>A7</td>
</tr>
<tr>
<td>126</td>
<td>179</td>
<td>Japanese soroban. Purchased in Japan in 1904 and presented by Professor Richards.</td>
<td>27-321</td>
<td>D5</td>
</tr>
<tr>
<td>127</td>
<td>69</td>
<td>Perpetual calendar. Same as No. 68. Engraved arabesques. Diameter 47 mm.</td>
<td>27-322</td>
<td>A7</td>
</tr>
<tr>
<td>128</td>
<td>68</td>
<td>Perpetual calendar. German, 18th century. Two discs moving on a third. Fixed feasts, lengths of the months, position of the sun, length of the day, hours of sunrise, hour of sunset, length of the night, days of the week and month. Gold plated. Engraved landscape and arabesques. Diameter 38 mm.</td>
<td>27-323</td>
<td>missing</td>
</tr>
<tr>
<td>129</td>
<td>168</td>
<td>German pedometer. 18th century.</td>
<td>27-324</td>
<td>C1</td>
</tr>
<tr>
<td>130</td>
<td>258</td>
<td>Hindu jewel case from northern India, with lock.</td>
<td>27-325</td>
<td>E9</td>
</tr>
<tr>
<td>131</td>
<td>207</td>
<td>A set of drawing instruments in a shagreen case. German workmanship of the 18th century.</td>
<td>27-326</td>
<td>C1</td>
</tr>
<tr>
<td>132</td>
<td>176</td>
<td>Chinese swanpan.</td>
<td>27-327</td>
<td>D6</td>
</tr>
<tr>
<td>133</td>
<td>172</td>
<td>Arab abacus. Brought from Armenia in 1903 and presented by Professor Farnsworth.</td>
<td>27-328</td>
<td>D5</td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Details</td>
<td>Catalogue No.</td>
<td>Storage Box</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>135</td>
<td>Chinese swanpan. Purchased in China in 1904 and presented by Professor Richards.</td>
<td></td>
<td>27-330</td>
<td>D6</td>
</tr>
<tr>
<td>136</td>
<td>Russian abacus. Purchased in St. Petersburg in 1901.</td>
<td></td>
<td>27-331</td>
<td>C1</td>
</tr>
<tr>
<td>137</td>
<td>The Chinese philosopher, Lao-Tze. In his writings he refers to the &quot;knotted cords&quot; used in computation.</td>
<td></td>
<td>27-332</td>
<td>E6</td>
</tr>
<tr>
<td>138</td>
<td>Perpetual calendar. Same as No. 68. Diameter 51 mm.</td>
<td></td>
<td>27-333</td>
<td>A7</td>
</tr>
<tr>
<td>139</td>
<td>Modern abacus for teaching children.</td>
<td></td>
<td>27-334</td>
<td>E4</td>
</tr>
<tr>
<td>140</td>
<td>French slide rule. With half millimeter scale on back.</td>
<td></td>
<td>27-336</td>
<td>C1</td>
</tr>
<tr>
<td>141</td>
<td>Motar and Pestle bought in Nürnberg.</td>
<td></td>
<td>27-337</td>
<td>E8</td>
</tr>
<tr>
<td>142</td>
<td>Brush and ink holder bought in Canton in 1907.</td>
<td></td>
<td>27-338</td>
<td>A5</td>
</tr>
<tr>
<td>143</td>
<td>Roman weight. Age unknown.</td>
<td></td>
<td>27-339</td>
<td>A1</td>
</tr>
<tr>
<td>144</td>
<td>Linkage used in solving cubic equations. Modern.</td>
<td></td>
<td>27-340</td>
<td>C2</td>
</tr>
<tr>
<td>145</td>
<td>Linkage for straight line work. Modern.</td>
<td></td>
<td>27-341</td>
<td>A6</td>
</tr>
<tr>
<td>146</td>
<td>Brass gauger's scale, marked in hundredths of a foot. Nürnberg about 1700.</td>
<td></td>
<td>27-342</td>
<td>B6</td>
</tr>
<tr>
<td>147</td>
<td>Trammel for constructing the Conchoid of Nicomedes. Student's work of 1890.</td>
<td></td>
<td>27-343</td>
<td>A6</td>
</tr>
<tr>
<td>148</td>
<td>English protractor and diagonal scale. A signed piece made by Cox and Son, London.</td>
<td></td>
<td>27-344</td>
<td>B6</td>
</tr>
<tr>
<td>149</td>
<td>Diagonal scale, German, 18th century.</td>
<td></td>
<td>27-345</td>
<td>B5</td>
</tr>
<tr>
<td>150</td>
<td>Measuring rod, French, showing relation between the French and German measures. Signed by Langlois, Paris.</td>
<td></td>
<td>27-346</td>
<td>C3</td>
</tr>
<tr>
<td>151</td>
<td>Brass rule, probably Italian, 17th century. The rule gives distances exact to one hundredth of an inch.</td>
<td></td>
<td>27-347</td>
<td>B6</td>
</tr>
<tr>
<td>152</td>
<td>Diagonal scale, German workmanship giving the Paris and Rhenish feet. 18th or early 19th century.</td>
<td></td>
<td>27-348</td>
<td>B6</td>
</tr>
<tr>
<td>153</td>
<td>Sector compasses. 18th century, signed by Brière, Paris.</td>
<td></td>
<td>27-349</td>
<td>C3</td>
</tr>
<tr>
<td>154</td>
<td>Sector compasses. Signed piece, made by Butterfield, Paris.</td>
<td></td>
<td>27-350</td>
<td>B6</td>
</tr>
<tr>
<td>155</td>
<td>Sector compasses. 18th century, French.</td>
<td></td>
<td>27-585</td>
<td>C3</td>
</tr>
<tr>
<td>156</td>
<td>Sector compasses. 18th century, signed by Chapotot, Paris.</td>
<td></td>
<td>27-586</td>
<td>E2</td>
</tr>
<tr>
<td>157</td>
<td>Compasses and measuring rod. Italian workmanship of the 15th century. Interesting not only for workmanship but also for the comparison between the Roman and the</td>
<td></td>
<td>27-587</td>
<td>E1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>modern units of linear measure.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>149</td>
<td>Sector compasses. Signed piece, made by Butterfield, Paris.  27-588 E2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>158</td>
<td>Sector compasses. 17th century, Italian.  27-589 C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>154</td>
<td>Sector compasses. 18th century, French.  27-590 E2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>161</td>
<td>155</td>
<td>Sector compasses. 18th century, French.  27-591 E2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>162</td>
<td>194</td>
<td>German draftsman's compasses for drafting angles of 45, 40, and 27 1/2 degrees. 18th century.  27-592 A5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>163</td>
<td>157</td>
<td>Sector compasses. 18th century, French.  27-593 C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>153</td>
<td>Sector compasses. 18th century, signed by Chapotot, Paris.  27-594 C3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>145</td>
<td>Protractor, brass. French workmanship of the 18th century. Gives central angles for the various inscribed n-gons where n equals 3, .. .. 12.  27-595 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>140</td>
<td>Brass protractor, German workmanship of about 1700, with baroque decoration.  27-596 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>141</td>
<td>Protractor, German workmanship. Probably early 19th century.  27-597 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>168</td>
<td>142</td>
<td>Protractor, German workmanship. 18th century.  27-598 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>169</td>
<td>137</td>
<td>Part of an instrument for measuring heights. Consists of a protractor and ruler with divisions indicating the umbra versa. The hole in the center was used for the alidade.  27-599 E1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>170</td>
<td>146</td>
<td>Protractor, signed piece made by Langlois, Paris.  27-600 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>143</td>
<td>Protractor, beveled, probably 18th century.  27-601 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>172</td>
<td>138</td>
<td>Protractor, brass, German workmanship of the 18th century. Gives central angles for the various inscribed n-gons, where n equals 1, 2, .. .. 12.  27-602 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>173</td>
<td>139</td>
<td>Protractor, brass, German, probably 18th century.  27-603 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>174</td>
<td>122</td>
<td>Nürnberg linked brass rule. About 1800.  27-604 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>175</td>
<td>119</td>
<td>Bavarian foot rule, brass-linked rule. Early 19th century.  27-605 B5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>176</td>
<td>121</td>
<td>German foot rule of the 18th century. Wood with brass inlays.  27-606 exhibit case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>177</td>
<td>120</td>
<td>Nürnberg foot rule. Early 19th century.  27-607 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>178</td>
<td>161</td>
<td>Brass gauger's scale. Nürnberg. About 1765. Marked in inches and hundredths.  27-608 exhibit case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>179</td>
<td>127</td>
<td>Ruler and measuring rod. German workmanship, dated 1703. Interesting on account of &quot;lines of metals&quot; for lead and iron.  27-609 B6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Origin</td>
<td>Date/Details</td>
<td>Exhibit Case</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>180</td>
<td>French draftsman's instrument. Brass. 18th century.</td>
<td></td>
<td></td>
<td>A5</td>
</tr>
<tr>
<td>181</td>
<td>Gauger's scale of the year 1716. Signed &quot;Louis 1716.&quot; Such scales were used in Visierrechnung in Germany and gauging in Great Britain.</td>
<td></td>
<td></td>
<td>F1</td>
</tr>
<tr>
<td>182</td>
<td>Curious Nürnberg measuring rod. Signed F.I.S. and dated 1781. It gives Bavarian inch and foot and is interesting because of its symbols.</td>
<td></td>
<td></td>
<td>too long, no box</td>
</tr>
<tr>
<td>183</td>
<td>Gauger's scale, of Welsh manufacture. Signed &quot;G M G 1777.&quot;</td>
<td></td>
<td></td>
<td>too long, no box</td>
</tr>
<tr>
<td>184</td>
<td>German cloth measure. Just preceding the metric system.</td>
<td></td>
<td></td>
<td>F1</td>
</tr>
<tr>
<td>185</td>
<td>German gauger's rod, divided into 12 parts, each subdivided into 12 parts. Wood with brass ends. Early 19th (?) century.</td>
<td></td>
<td></td>
<td>F1</td>
</tr>
<tr>
<td>186</td>
<td>Gauger's scale. English manufacture. The units of measure entered on it are: Hogshead, kilderkin, barrel, etc.</td>
<td></td>
<td></td>
<td>exhibit case</td>
</tr>
<tr>
<td>187</td>
<td>Austrian measuring rod, the ell, of 1732. It bears the date &quot;Anno 1732.&quot; The ell varied considerably in different cities. This one if a little less than 26 inches, more exactly 65.8 cm. This rod is interesting on account of the curious indications of fractional divisions.</td>
<td></td>
<td></td>
<td>C3</td>
</tr>
<tr>
<td>188</td>
<td>German gauger's rod. Wood. Early 19th century.</td>
<td></td>
<td></td>
<td>F1</td>
</tr>
<tr>
<td>189</td>
<td>The Bavarian yard. Considerably shorter than the English yard. Early 19th century.</td>
<td></td>
<td></td>
<td>F1</td>
</tr>
<tr>
<td>190</td>
<td>Nürnberg ell measure. Marked &quot;Nürnberg 1718.&quot; Shows fractional divisions.</td>
<td></td>
<td></td>
<td>exhibit case</td>
</tr>
<tr>
<td>191</td>
<td>Chinese money changer's scales, sealed several times. Purchased at Kyoto, Japan.</td>
<td></td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>192</td>
<td>Chinese money changer's scales, 19th century. Purchased at Kyoto, Japan, 1907.</td>
<td></td>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>193</td>
<td>Scales, Chinese money changer's, 19th century. Purchased at Peking.</td>
<td></td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>194</td>
<td>Money changer's scale purchased at Peking, 1907.</td>
<td></td>
<td></td>
<td>B1</td>
</tr>
<tr>
<td>195</td>
<td>Nest of Tyrolean weights, seven weights.</td>
<td></td>
<td></td>
<td>A8</td>
</tr>
<tr>
<td>196</td>
<td>Nest of weights. Tyrolese. One of the official seals bears the date 1807.</td>
<td></td>
<td></td>
<td>exhibit case</td>
</tr>
<tr>
<td>197</td>
<td>A nest of German brass weights. About 1700.</td>
<td></td>
<td></td>
<td>B3</td>
</tr>
<tr>
<td>198</td>
<td>Nest of Austrian weights of the 18th century, selected, like No. 97, to illustrate the ancient,</td>
<td></td>
<td></td>
<td>exhibit case</td>
</tr>
</tbody>
</table>
"Problem of Weights." This is elaborately decorated and is one of the best specimens of the weightmaker's art of that period. It has at least ten official seals, one bearing the date of 1787.

<table>
<thead>
<tr>
<th>Page</th>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>199</td>
<td>98</td>
<td>Nest of Tyrolese weights if about 1800. One of the official seals bears the date 1822.</td>
</tr>
<tr>
<td>200</td>
<td>97</td>
<td>Nest of the Tyrolean weights of about 1700, bearing the official stamp of Jufstein. Selected to show the origin of the &quot;Problem of Weights.&quot; It is made up of seven weights, said to be, respectively, 1, 2, 4, --, 64 quintal, the total being 1 lot or 1/8 pound.</td>
</tr>
<tr>
<td>201</td>
<td>92</td>
<td>Nest of weights, brass, elaborately carved, Bavarian workmanship, 17th-18th century.</td>
</tr>
<tr>
<td>202</td>
<td>91</td>
<td>Nest of German weights with seal. About 1700.</td>
</tr>
<tr>
<td>203</td>
<td>99</td>
<td>Nest of weights, Tyrolean, c. 1800, bearing the official stamp of Kufstein. One seal bears the date 1805. Contains seven weights.</td>
</tr>
<tr>
<td>204</td>
<td>93</td>
<td>Nest of weights. Florentine exchanger's set, 17th-18th century.</td>
</tr>
<tr>
<td>205</td>
<td>100</td>
<td>Nest of weights. German. 18th century.</td>
</tr>
<tr>
<td>206</td>
<td>105</td>
<td>Money changer's weights. Venetian of about 1750. Purchased to illustrate (1) the Renaissance problems in the &quot;Chain Rule;&quot; (2) the late use of the ancient Roman disc notation for fractions of the &quot;as:&quot; (3) the problem in exchange as given in the Renaissance arithmetics. The set is remarkably complete.</td>
</tr>
<tr>
<td>207</td>
<td>101</td>
<td>Case of French weights, dated 1669.</td>
</tr>
<tr>
<td>208</td>
<td>102</td>
<td>Money changer's weights, French, c.1750.</td>
</tr>
<tr>
<td>209</td>
<td>103</td>
<td>Money changer's weights, German, c. 1800.</td>
</tr>
<tr>
<td>210</td>
<td>104</td>
<td>Money changer's weights, probably German, 18th century.</td>
</tr>
<tr>
<td>211</td>
<td>118</td>
<td>Chinese steelyard with wooden beam. Early 19th century.</td>
</tr>
<tr>
<td>212</td>
<td>115</td>
<td>Steelyard. German coin scales. 18th century.</td>
</tr>
<tr>
<td>215</td>
<td>114</td>
<td>Scales for weighing. Germany 18th century.</td>
</tr>
<tr>
<td>216</td>
<td>124</td>
<td>Measuring rod, German, before the metric system.</td>
</tr>
<tr>
<td>217</td>
<td>125</td>
<td>Measuring rod, English, 18th century.</td>
</tr>
<tr>
<td>218</td>
<td>126</td>
<td>Measuring rod, British, 18th century.</td>
</tr>
<tr>
<td>219</td>
<td>113</td>
<td>&quot;Royal Improved Patent Balance.&quot; To weigh and gauge sovereigns and half sovereigns. About 1825.</td>
</tr>
<tr>
<td>220</td>
<td>106</td>
<td>Chinese weights, 18th century.</td>
</tr>
<tr>
<td>221</td>
<td>107</td>
<td>Wosiahedron, Greco-Egyptian of the Ptolemaic period.</td>
</tr>
<tr>
<td>222</td>
<td>268</td>
<td>Ten-Jin, the prince, who according to tradition, introduced arithmetic into Japan. Bronze</td>
</tr>
<tr>
<td>223</td>
<td>270</td>
<td>Shotoku Taishi, c. 600, Japanese prince, considered the father of Japanese arithmetic. He is shown with a soroban, which is an anachronism.</td>
</tr>
<tr>
<td>224</td>
<td>183</td>
<td>Tally sticks indicating number of prayers by the Pilgrims at the shrine of St. Gugan, Barra, Ireland.</td>
</tr>
<tr>
<td>225</td>
<td>184</td>
<td>Canadian tally sticks (two).</td>
</tr>
<tr>
<td>226</td>
<td>185</td>
<td>Philippine tally sticks. One whole piece and two halves in paper box.</td>
</tr>
<tr>
<td>227</td>
<td>167</td>
<td>French callipers, millimeter. 19th century.</td>
</tr>
<tr>
<td>228</td>
<td>148</td>
<td>Sector compasses, English. First described by Galileo, 1606. Nearly a century ago Benjamin Pike, Jr., had a shop at 294 Broadway, New York. From this he issued, in 1848, a small book on mathematical instruments. In it he speaks of sector compasses as follows: &quot;The Sector--Of all mathematical instruments that have been contrived to facilitate the art of drawing, there is none so extensive in its use as the sector. It is a universal scale. It not only contains the most useful lines, but also by its nature renders them of general application.&quot;</td>
</tr>
<tr>
<td>229</td>
<td>259</td>
<td>Iron treasure chest. German, 17th century. Interesting for type of lock used.</td>
</tr>
<tr>
<td>230</td>
<td>260</td>
<td>Iron treasure chest. German, 17th century. Interesting for type of lock used.</td>
</tr>
<tr>
<td>231</td>
<td>78</td>
<td>Pocket level. Early 19th century. Probably German origin.</td>
</tr>
<tr>
<td>232</td>
<td>171a</td>
<td>Clockworks.19th century. Gift of Dr. Mendelson, ca. 1900</td>
</tr>
<tr>
<td>233</td>
<td>171b</td>
<td>Clockworks. Wooden works of an early American clock. Gift of Dr. Mendelson</td>
</tr>
<tr>
<td>Number</td>
<td>Description</td>
<td>Catalog</td>
</tr>
<tr>
<td>--------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>307</td>
<td>Scales. Small English scales. Mid 18th century. Gift of Dr. Mendelson</td>
<td>111b</td>
</tr>
<tr>
<td>308</td>
<td>Modern Chinese Tally Stick. Used as “water money”</td>
<td>183a</td>
</tr>
<tr>
<td>309</td>
<td>Coin of Brabant dated 1478, Arabic numerals</td>
<td>(281)247 T.C.</td>
</tr>
<tr>
<td>310</td>
<td>Roman Bone Styluses for writing on wax tablets. Note the flattened ends, for corrections and obliteration. First century A.D.</td>
<td>273</td>
</tr>
<tr>
<td>311</td>
<td>Amulet. Magic square on reverse of medal showing Venus (contains errors)</td>
<td>254a</td>
</tr>
<tr>
<td>312</td>
<td>Amulet. Chinese, with signs of the Zodiac. 3”diameter</td>
<td>256a</td>
</tr>
<tr>
<td>313</td>
<td>Chinese Ink Slab. Alabaster. Modern</td>
<td>271b</td>
</tr>
<tr>
<td>314</td>
<td>English Tally Stick. Dale Library of Weights &amp; Measures</td>
<td>182a</td>
</tr>
<tr>
<td>315</td>
<td>Magic Cube. Each of the six surfaces is a Magic Square, totaling 194 in every line, horizontal, vertical, diagonal. Also, every quarter totals 194.</td>
<td>C1</td>
</tr>
<tr>
<td>316</td>
<td>Cuneiform Tablet No. 322. “Pythagorean triangles”. Clay tablet, incomplete, ca. 1900-1600 B.C. Old Babylonian cuneiform script.</td>
<td>C1</td>
</tr>
<tr>
<td>317</td>
<td>Cuneiform Tablet 322. “Pythagorean numbers”, ca. 1900-1600 B.C.</td>
<td>C1</td>
</tr>
<tr>
<td>318</td>
<td>Chinese Scribe’s Ink Slab. In tray for rubbing ink.</td>
<td>271a</td>
</tr>
<tr>
<td>319</td>
<td>Brass Die in Box. Nürnberg. Paper weight.</td>
<td>282</td>
</tr>
<tr>
<td>320</td>
<td>Chinese Inch Measure. Modern.</td>
<td>146a</td>
</tr>
<tr>
<td>321</td>
<td>Hourglass. 20 min glass. Early 19th century. Gift of Dr. Mendelson</td>
<td>60a</td>
</tr>
<tr>
<td>322</td>
<td>Astrolabe. Turkish bazaar work ca.1900</td>
<td>(12c)199b</td>
</tr>
<tr>
<td>323</td>
<td>Wooden Chinese sundial with compass. Indicates the 24 seasons used by the farmers, 19th century.</td>
<td>37a</td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Gift Details</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>324</td>
<td>Steelyard. American Steelyard, 19th century. Gift of Dr. Mendelson</td>
<td>118a B2</td>
</tr>
<tr>
<td>325</td>
<td>Scales. Chinese jeweler’s scales. Contemporary. Made in Canton. Scale rod made of camel bone, according to maker’s notice. Gift of Dr. Mendelson</td>
<td>111a B2</td>
</tr>
<tr>
<td>326</td>
<td>Wooden ball (label is missing).</td>
<td>E6</td>
</tr>
<tr>
<td>327</td>
<td>Stove tile (label is missing).</td>
<td>E7</td>
</tr>
<tr>
<td>328</td>
<td>Metric weights (Fairbanks). Incomplete set.</td>
<td>288 E7</td>
</tr>
<tr>
<td>329</td>
<td>Octant. Made by Thomas Howard, Liverpool. Gift of Dr. Mendelson</td>
<td>283 E5</td>
</tr>
<tr>
<td>330</td>
<td>Compass. Italian. Dated 1780</td>
<td>E4</td>
</tr>
<tr>
<td>331</td>
<td>Object with missing label.</td>
<td>E2</td>
</tr>
<tr>
<td>332</td>
<td>Napier’s rods. Ivory in wooden box. England, 18th century</td>
<td>exhibit case</td>
</tr>
<tr>
<td>333</td>
<td>Cuneiform Tablet. Ca. 1900-1600 B.C. (Plimpton 322)</td>
<td>exhibit case</td>
</tr>
<tr>
<td>334</td>
<td>Cylinder Seal. Ca. 2291-2255 B.C. (Cuneiform 46-4). Created in Mesopotamia over four thousand years ago during the Akkad period (2334-2154 B.C.)</td>
<td>exhibit case</td>
</tr>
<tr>
<td>335</td>
<td>Astrolabe. Hindu, Jaipur, 18th century. “Mr. Plimpton’s Astrolabe”</td>
<td>27-257a exhibit case</td>
</tr>
<tr>
<td>336</td>
<td>Sundial. Ivory. Horizontal &amp; vertical. Top of cover has pin missing. Moon calendar reveals number of hours the moon lags behind the sun. Mae by Hans Tröschel in 1603. Nürnberg</td>
<td>exhibit case</td>
</tr>
<tr>
<td>337</td>
<td>Egyptian. Thot, the Egyptian god who, according to Plato, introduced arithmetic into Egypt. From the tombs of Thebes. Miniature, carved in light-green stone.</td>
<td>(280)469 T.C. missing</td>
</tr>
<tr>
<td>338</td>
<td>Number Game. A hexagonal prism, bone, with an ivory handle for twirling. Nürnberg, ca.1800</td>
<td>(250)242 A5</td>
</tr>
<tr>
<td>339</td>
<td>Surveying instrument</td>
<td>E1</td>
</tr>
<tr>
<td>340</td>
<td>Object with missing label</td>
<td>52A E2</td>
</tr>
<tr>
<td>341</td>
<td>Elipsograph</td>
<td>289a C4</td>
</tr>
<tr>
<td>342</td>
<td>Elipsograph</td>
<td>289b E12</td>
</tr>
<tr>
<td>343</td>
<td>Telescope</td>
<td>71a C6</td>
</tr>
<tr>
<td>345</td>
<td>Elipsograph</td>
<td>G1</td>
</tr>
<tr>
<td>346</td>
<td>Abacus</td>
<td>172a D5</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Code</td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>347</td>
<td>Weights for early American clock</td>
<td>D5</td>
</tr>
<tr>
<td>348</td>
<td>Wall chart of Greek, Roman &amp; Arabic number systems</td>
<td>D5</td>
</tr>
<tr>
<td>349</td>
<td>Leon Lalanne. Regle à calcul à enveloppe de verre.1854</td>
<td>D5</td>
</tr>
<tr>
<td>350</td>
<td>Chinese swanpan.</td>
<td>176a</td>
</tr>
<tr>
<td>351</td>
<td>Measuring instruments</td>
<td>D6</td>
</tr>
<tr>
<td>352</td>
<td>Compass in a box</td>
<td>D6</td>
</tr>
<tr>
<td>353</td>
<td>Cast of Euler’s medal</td>
<td>D6</td>
</tr>
<tr>
<td>354</td>
<td>Roman coins with labels 247-258 T.C.</td>
<td>D6</td>
</tr>
<tr>
<td>355</td>
<td>Chinese and Korean coins</td>
<td>D6</td>
</tr>
<tr>
<td>356</td>
<td>Counters</td>
<td>D6</td>
</tr>
<tr>
<td>357</td>
<td>Casts of Roman coins and seals, Henry VIII coin, Newton farthing 1793 T.C.</td>
<td>D6</td>
</tr>
<tr>
<td>358</td>
<td>Dialing Templates</td>
<td>287a</td>
</tr>
<tr>
<td>359</td>
<td>Dialing Templates</td>
<td>287b</td>
</tr>
<tr>
<td>360</td>
<td>Chinese slab of pitch (broken)</td>
<td>286</td>
</tr>
<tr>
<td>361</td>
<td>Computation forms</td>
<td>287C</td>
</tr>
<tr>
<td>362</td>
<td>Instrument</td>
<td>C7</td>
</tr>
<tr>
<td>363</td>
<td>Framed picture</td>
<td>C8</td>
</tr>
<tr>
<td>364</td>
<td>Slide rule</td>
<td>C8</td>
</tr>
<tr>
<td>365</td>
<td>Slide rule</td>
<td>187a</td>
</tr>
<tr>
<td>366</td>
<td>Brick from the house of Sir Isaac Newton</td>
<td>C8</td>
</tr>
</tbody>
</table>
Appendix E:

The Educational Museum of Teachers College and the Department of Mathematics Pamphlets

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Pamphlet #1:

The Department of Mathematics extends to all teachers visiting the University an invitation to inspect and make use of the material available for the study of the Teaching and History of Mathematics in Teachers College. In addition to Professor Smith’s library of several thousand books and pamphlets upon this subject, there is also available his collection of mathematical instruments – some dating as far back as 1450 – of manuscripts, and of engravings and portrait medals of eminent mathematicians.

This material may be examined in the Mathematical Library, Room 212, Teachers College, the room being usually open, except on holidays, from 9 to 12 daily and from 2 to 4 daily except Saturdays.

There is also exhibited in Room 211, adjoining, a collection of mathematical apparatus and models adapted to the needs of the various grades from the Kindergarten through the High School. This includes number games, mensuration blocks, and models usable in geometry and trigonometry.

Early Mathematical Instruments

The early mathematical instruments exhibited included the following:
An Astrolabe of Arabic workmanship.
An Astrolabe of Italian workmanship, signed by the maker, and dated 1509.
An Astrolabe, a part dating from about 1450, and the rest, including the four plates, from the following century.
An Astrolabe of Paduan workmanship, signed by the maker, and dated 1557. A practically perfect specimen, with five finely engraved plates.
A Quadrans of the 16th century, one of the primitive instruments of trigonometry, bearing the early names “Umbra recta,” and “Umbra versa.”
Several Levelling Instruments of the 17th and 18th centuries.
Numerous measures of length and weight, of the 17th and 18th centuries, including the ell and some interesting sets of money changers’ weights.
Several finely engraved Protractors, Diagonal Scales, and similar instruments.
Several Sector Compasses and compasses of other kinds, of the Renaissance period.
A collection of typical forms of Dials to illustrate the application of mathematics to dialing in the Renaissance period.
Several armillary spheres of the 16th, 17th, and 18th centuries.
Medal Portraits of Mathematicians

This collection includes more than a hundred medals and medallions. The following are among the most prominent mathematicians represented:

- Arago, Fr.
- Archimedes
- Aristotle
- Bailly
- Betrand
- Bonnet
- Brahe, Tycho
- Cardan
- Cassini
- Cauchy
- Cavalieri
- Copernicus
- D’Alembert
- De Moivre
- Descartes
- Fermat
- Galileo
- Gassendi
- Gauss
- Grandi
- Halley
- Hutton
- Huygens
- Kepler
- Lacroix
- Lagrange
- Lalande
- Laplace
- LeVerrier
- Lobachevsky
- Maurolicus
- Monge
- Neudorffer
- Newton (7 medals)
- Pascal
- Pestalozzi
- Poinsot
- Poisson
- Pythagoras
- Quetelet
- Stevin
- Thales
- Viviani
- Wolf
- Wren

The complete set of mathematical portrait medallions by David d’Angers is included.

In addition to the portraits there are numerous other medals of interest in the history of mathematics, including the rare Metric System piece of 1872.

Portraits of Mathematicians

There are in Professor Smith’s library about two thousand portraits of mathematicians. Of these it is possible to exhibit only a relatively small number. About forty are framed and can readily be examined, and if visitors wish to examine others in the collection they will be assisted in doing so.

The collection represents the work of a number of years and the repeated examination of the stocks of many European dealers. It is particularly rich in the works of early engravers, although containing a considerable number of photographs and modern process portraits. Reproductions of a number of the portraits have been made for school and college use, by The Open Court Publishing Co. of Chicago.

The collection of Newtons includes all of the most important portraits of this great mathematician and physicist. An effort has also been made to acquire all of the best
portraits of Leibnitz, Descartes, Euler, the Bernoullis, Legendre, Monge, Cauchy, and others who stand out as particularly prominent in the creation of pure mathematics. The collection also includes the portraits of many who have achieved success in the field of applied mathematics, notably of men like Laplace, Lagrange, Huyghens, Bailly, and Arago. Many of these portraits have been reproduced in stereopticon slides for the use of the department.

**Autographs of Mathematicians**

On account of the lack of space, it is possible to exhibit only a few of the more than two thousand autographs of mathematicians to be found in this library. The following are among the most interesting, and are shown in one of the wall cases:

- Newton. A two-page manuscript demonstration written for one of his students at Cambridge.
- Autograph letters of Sir William Rowan Hamilton, Euler, Johann Bernoulli, Mersenne (written about 1625), Maupertuis, Legendre, Wronski, and Arago.
- Documents signed by Gauss, Laplace, and Lagrange.
- Autograph letters from Poncelet to Liouville, Liouville to Direchlet, and Arago to Poncelet.
- Autograph letters of the following mathematicians have been taken from the files so as to be accessible, and are usually displayed:
  - In pure mathematics: Jacobi, Cayley, Sylvester, Kronecker, Cremona, Hachette, Poincare, Hermite, Clebsch, Cauchy, Chasles, Clifford, Binet, Bezout, Monge;
  - In astronomy: Bode, Airy, Delambre, the three Cassinis, Maskeleyne, Flamsteed, Flammarion;
  - In physics: Ohm, Bessel;
  - In the history of mathematics: Montcula, Fuss, Libri, Kastner, P. Tannery, M. Cantor.

**Miscellaneous Material bearing upon the History of Mathematics**

There are also displayed a number of books and curios illustrating certain steps in the history or the teaching of mathematics. These include a Babylonian cylinder with cuneiform numerals, a piece of ancient Egyptian pottery with the zodiacal signs, Roman coins illustrating certain unusual forms in the ancient numeral system, some English tally sticks of 1296, two Renaissance computes medals, and a celestial sphere of the 16th century.

The bibliographical curios include one of the few copies saved from the fire which destroyed most of the first edition of Libri’s “Histoire des Mathematiques” (vol. I), with Libri’s autograph marginal notes. There are also autograph presentation copies of Laplace’s “Theorie des Probabilites” and of Halliwell’s “Rara Mathematica,” over a hundred unpublished autograph letters of Prince Boncompagni on the history of mathematics, numerous first or early editions of works by such writers as Newton, Descartes, Tartaglia, Cardan, Bombelli, Paciulo, Euler, and Barrow, a number of the
The earliest editions of Euclid, an unpublished French translation of Cantor’s “Mathematische Beitrage zum Kulturleben de Volker,” from the library of Chasles, and various similar works of bibliographical interest.

**Mechanical Calculation**

The material used to illustrate the development of mechanical calculation includes the following:

A collection of Mediaeval Counters (Jetons, Reckoning Pennies) of 15th and 16th century workmanship, partly French and partly German, some with the figure of the Rechenmeister seated at the abacus. Books showing the process of calculation by means of counters “on the line” will also be exhibited.

- An Arabic abacus.
- A Russian tschotu.
- A Chinese swanpan.
- A Japanese saroban.
- A set of Napier’s rods.
- A set of Korean bones, the modern form of the ancient Chinese “Bamboo Rods,” or the Japanese Sangi. Some Japanese books of 1698 will be exhibited showing the transition from this form of computing to the saroban, which took place in Japan about that time.

Modern calculating machines, including the Goldman and Stanley arithmometers, slide rules, and similar devices.

There are also available for study, in addition to those displayed, several early treatises showing the use of counters, together with numerous works on the historical development of this phase of arithmetic. This is also extensively illustrated in a collection of stereopticon slides belonging to the department.

**Newtoniana**

There are five framed portraits of Newton, as follows: Mezzotint by Simon, after Thornhill; line engraving by George Vertue, after Vanderbank; line engraving by Houbraken, after Sir G. Kneller; lithograph by G.B. Black, after Wm. Gandy; line engraving by E. Scriven, after Vanderbank.

There are seven medals of Newton, representing the work of Croker (bronze and silver), Dassier, Roettiers, and Petit (two specimens), besides one without the artist’s name.

The Newton manuscript was long in the library of Professor Jacoli, at Venice. It consists of a physical demonstration written by Newton at Cambridge, for an Italian student, c. 1700.

The impression of Newton’s Galileo seal is from the original which was recently presented to the South Kensington Museum.

The bust of Newton is after the original by Roubillac.

The unframed portraits, numbering over one hundred, include specimens of the work of the following engravers: Phillibrown, Zeelander, Lips, Romney, Fry, Rivers, Scott, Tardieu, Ridley, Goldar, Cars, Laderer, Le Coeur, Freeman, Seeman, Krauss,
Pamphlet #2

Educational Museum
Exhibition of Material Illustrating the Historical Development of Mathematics
From the collection of
David Eugene Smith, Ph.D., LL.D.
Professor of Mathematics
In Teachers College

The Educational Museum takes pleasure in announcing an exhibition of material illustrating the historical development of mathematics, from the collection of Professor Smith, beginning on Monday, January 4, 1909, and closing on Saturday, February 13, 1909. The Museum will be open on week days from 9 A.M. to 4:30 P.M., except on Saturdays when it will be closed at noon.

For the special benefit of teachers of mathematics in New York City and vicinity, Professor Smith will be present to explain the exhibit on Saturday morning, January 9, from 10:30 to 12.

The exhibit consists of mathematical instruments, measures, medals, manuscripts, early printed books, portraits, and curios, collected in various parts of the world and illustrating the history and teaching of mathematics in various periods. There are also photographs of many rare manuscripts and early printed works in various libraries of Europe and America, supplementing the original material in the collection.

For the benefit of visitors the following brief description of the contents of the various cases has been prepared, but all objects are carefully labeled.

Case I
Trigonometry and Astronomy
Books and instruments illustrating the early work in surveying, measuring of distances, and astronomy. The Renaissance quadrant is a specimen of one of the best known of the medieval instruments. The brass celestial sphere is a good example of the 16th century Italian work. The old Japanese sphere is of Nagasaki workmanship of about 1600. The Japanese manuscripts on trigonometry and surveying are particularly interesting, artistically as well as mathematically. The Ramsden telescope of 1775 was an excellent instrument for its time.

Case II
Scales and Weights
Chinese and Japanese Mathematics
There are some well-known problems relating to weights, that have been found in mathematical books for centuries. The weights here shown have been selected with a view to illustrating these problems. There are some interesting nests of weights from
various German towns, and several curious sets of goldsmiths weights from different parts of Europe. Some of the scales are also interesting from the standpoint of the study of the lever.

In this case are also some of the more important Japanese and Chinese mathematical classics. These include the great Chinese encyclopedia of mathematics published under the Jesuit influence in the 17th century; the first Chinese edition of Vlacq’s table of logarithms; an early Chinese edition of Euclid; numerous Japanese manuscripts and printed works, and an early Manchu treatise on mathematical astronomy. There are about five or six hundred Chinese and Japanese works in the library.

Case III
The Measure of Time
The study of the calendar represented the chief mathematical interest of early Church Schools, among people of all religions. In this case are shown various forms of sun dials, calendar medals, 16th and 17th century calendar rolls from the Buddhist temples of Japan, kalendaria from Europe, and three of the earliest publications on the Gregorian reform of the calendar.

Case IV
Medals of Mathematicians
An extensive collection of medals struck in honor of mathematicians. Among them are twelve medals of Newton, five of Descartes, four of Fermat, twelve of Galileo, the rare medals of the elder and younger Neudorfer, and some specimens of the best modern French work as seen in the portraits of Bertrand, Arago, and Le Verrier. There is also the complete set of medallions of mathematicians by David D’Angers.

Case V
Compasses, Measures, Astrolabes
Sets of compasses from the Roman to the Renaissance times. Sector compasses of various forms, protractors, and diagonal scales. Early measures of length and gaugers’ scales.

The astrolabes and the armillary spheres include Italian pieces of the 15h and 16th centuries, Hindu, Persian, and Arab specimens, and some with an interesting history. There is one, for example, used by Pandit Joshti in restoring the observatory at Jaipur. It rests on a manuscript copy of the treatise on the astrolabe by the Maharajah Jey Sing.

Case VI
The Development of Number Systems
In this case is shown some of the material available for the study of the growth of various number systems, including the Hindu, Arabic, Roman, Greek, and Chinese. The Coptic manuscripts and Roman tesserae are particularly important.

Case VII
Number Mysticism and Games
This case contains a beautifully written manuscript, on silk, of the Yih King, one of the greatest Chinese classics, in which is found the first trace of the magic square, of
permutations, and possibly of binary numerals. Both the magic square and the mystic trigrams are shown in various works in the case, and on numerous medals and amulets. The development into astrology is also shown, with some interesting Pali and Singhalese manuscripts on palm leaves.

In the right side of the case is shown the historical development of one of the oldest number games, that of dice, now at least three thousand years old, and the instructor in elementary number of more people than have ever learned counting in the schools. Dice from Etruscan tombs, from the remains of the Persian invaders, pre-Christian glass pieces from Karnak, a divinations icosahedral piece of the Ptolemaic period, the long pieces of the Roman conquerors of lower Egypt, loaded pieces from Rome itself, and so on down to the Renaissance period. There are between sixty and seventy pieces in the collection, dating from about 500 B.C. to the 18th century A.D., representing all varieties of marking from the typical Etruscan to the modern.

**Case VIII**
**Mechanical Calculation**

The development of mechanical calculation from the slates and possible abaci of the Neolithic age in Egypt to the modern arithometer that divides one number by another by merely turning a crank. A squeeze of the Salamis abacus (the oldest one known), the Chinese swan pan, the Japanese soroban, Korean bones, the old Japanese sangi, the Russian stchotu, the Armenian abacus, and other similar forms are shown. There are also tally sticks dating from 1296, medieval counters placed on a line abacus, Napier’s rods, and various later types of mechanical calculation.

**Case IX**
**Rare Books**

A few of the rare books from the library are here shown. They include several early European works on mathematics, while a few others are placed in Cases II and XIV. One of the half dozen copies of Libri’s Histoire des Mathematiques, Vol. I, saved from the fire that consumed the rest of the first edition, is also shown.

**Case X**
**Persian, Arabian, and Sanskrit Classics**

A few of the manuscripts of the mathematical classics of Persia, Arabia, and India are here shown. There are in the case between two and three hundred manuscripts in these languages. Among the most interesting pieces in the library are several manuscripts of works by the greatest of the Hindu mathematicians, Bhaskara, who lived in the twelfth century, and these are shown in Case XXV.

**Cases XI-XII**
**Illustrations for the Rara Arithmetica**

The original photographs from which illustrations were made for Professor Smith’s Rara Arithmetica. The works photographed are all in the library of George A. Plimpton, Esq., of New York. They included between three and four hundred arithmetics published before 1601, the largest collection that has ever been brought together.
Case XIII
Mathematics of Babylon
Casts of the mathematical tablets found by Professor Hilprecht at Nippur, and including those in the Imperial Ottoman Museum at Constantinople, with numerous illustrations from Professor Hilprecht’s works. Two original cylinders with cuneiform inscriptions are also shown.

Case XIV
The Influence of Euclid
Arabic manuscript of Euclid written about 1300 A.D., together with a later copy, c. 1650. Manuscript of Matteo Ricci’s Chinese translation of Euclid, written c. 1600. Several editions of Euclid of the 15th and 16th centuries. Several miscellaneous manuscripts on mathematics are also shown in this case, others being exhibited in Case XXVI.

Case XV
Mathematics of Egypt
Fac-similes of the Ahmes and the Akhmim papyri, the former being the oldest extant manuscript on mathematics, dating from c. 1700 B.C., and copied from one of c. 2300 B.C.

Case XVI
Portraits and Illustrations
The reproduction of Durer’s Melancholia to the left, shows the oldest magic square known to exist in print.

Case XVII
Portraits of Mathematicians
A few portraits of eminent mathematicians from a collection numbering over two thousand. This collection contains, for example, about one hundred and fifty portraits of Newton.

Cases XVIII-XXIII
Autographs of Mathematicians
A few autographs from a collection numbering over two thousand. There are shown letters and manuscripts of Newton, the Bernoullis, Laplace, Lagrange, Legenre, Gauss, Halley, Flamsteed, Mersenne, Euler, Bessel, Dupin, Cauchy, and many others who have helped to make the science what it is to-day.

Case XXIV
Rare Pamphlets
Dissertations of famous mathematicians, and rare memoirs and presentation copies.
Case XXV
The Bhaskara Manuscripts

Manuscripts of the mathematical works of Bhaskara, the greatest of native Hindu mathematicians. He wrote at Ujjain, and his Lilavati and Bija Ganita are known all over India, Ceylon, Persia, and other adjacent countries. These manuscripts range in date from c. 1400 to modern times. Other manuscripts of Bhaskara’s works are shown in Case X.

Case XXVI
Manuscripts

A few miscellaneous manuscripts on mathematics, including an unpublished life of Galileo. Other similar manuscripts are shown in Case XIV.

There are shown about the walls a number of casts of early inscriptions from Chittagong, India, containing magic squares. The magic square is also illustrated in Case VII.

Owing to the lack of room in the museum it is impossible to exhibit a great many books and objects that should supplement what is here displayed. These include books showing the early history of the calculus and analytics, portraits, autographs, photographs of rare inscriptions, and illustrations of primitive instruments in addition to those in Cases I, III, and V.
Appendix F:

Countries Visited by David Eugene Smith

The following is a list of 73 places visited by David Eugene Smith. The one-page document is not dated but is signed by Smith. It is located in Box 72 of Smith’s Professional Papers at the Rare Book and Manuscript Library.

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Countries Visited

Provinces and islands are not included unless they are generally referred to as separate states or regions.

Canada     Poland     Mongolia
United States Austria     Manchukuo
Guatemala   Hungary     Korea
Honduras    Chekoslovakia [sic] Japan
Costa Rica  Yugoslavia  Ceylon
Nicaragua   Italy       Egypt
British Honduras Bulgaria  South Africa
Panama      Turkey      Mozambique
Nova Scotia  Greece     Libya
Colombia    Switzerland Tunisia
Ireland     Danzig      S. Kurdistan
Scotland    Syria       Aden (Hadhramut)
England     Palestine   Malay Peninsula
Portugal     Iraq       Albania
Spain       Iran        Montenegro
Morocco     Transjordania Jamaica
Algeria      India      Bahama
France      Burma       Cochin China
Holland     Siam        Senegal
Belgium     Sumatra     Rhodesia
Germany     Java        Orange Free State
Denmark
Norway
Sweden     Malaya
Finland     Philippine Islands
Russia     China