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The Southern Historical Collection (SHC) at the University of North Carolina at Chapel Hill holds over 15 million manuscript items, thousands of which have not been viewed by researchers since they were placed on the shelves. Some of these items are eighteenth and nineteenth century American cipher books, bound manuscript books illustrating rules and examples of mathematical calculations. The SHC cares for over 50 cipher books, some of which represent the author's artistic talent as well as his or her abilities in arithmetic.

The purpose of this paper is to examine the potential research value these unknown manuscripts contain by providing a history of education during the time period, and a brief description of each manuscript. Some more ornate books have accompanying images to display the intricacies and care in creating these mathematical workbooks. Subject areas which may benefit from further study of cipher books include early American education, history of the teaching of mathematics, gender roles in colonial education, and cultural influences of education. The paper can be used as a guide to the cipher book collection.

Headings:

Education, colonial

Education -- United States -- History

Mathematics -- Problems, exercises, etc -- History -- 19th century

Mathematics -- Study and teaching -- United States -- History

# CIPHER BOOKS IN THE SOUTHERN HISTORICAL COLLECTION

by
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# CHAPTER ONE: INTRODUCTION

The Southern Historical Collection (SHC) at the University of North Carolina at Chapel Hill is a treasury of information. Researchers of any and all types visit the SHC looking for unique insights into their respective fields. Currently housing well over 15 million manuscript items on the fourth floor of Wilson Library, in the center of The University of North Carolina at Chapel Hill campus, it is awe inspiring to walk among the stacks. With the plethora of collections which are frequented by researchers for various purposes, there are thousands of materials which have not seen the light of day since they were processed and placed on the shelves. Some of these materials are part of popular collections, but their descriptions do not always relate their value to the right type of researcher.

This is an unfortunate occurrence, but for archivists, time does not permit detailed descriptions of every item in a collection. Processors are granted the power to decide what minimal information they believe to be most useful and to promote it in the finding aids available to the public. Some of these items, (while they have not yet found glory through researchers) have found fame through the archivist's watchful eye and experience in viewing unique items. These items usually make their mark in exhibits which feature the truly remarkable pieces selected from the overall collection. One such example is the cipher book of Martha Ryan, which is pulled out from the darkness of its protective box and placed on display beneath glass and proper lighting to showcase its uniqueness to all of those who would never otherwise see it.

A cipher book is not really a book at all, but a manuscript, bound between paper boards, or homespun fabric, illustrating rules and examples of mathematical calculations. Such works are called cipher books, because that is what their creators titled them, as in "Ebenezer Pettigrew's Ciphering Book", though they are many times referred to as "mathematic exercise books," "arithmetic workbooks," or simply "student notebooks displaying arithmetic". "Cipher" itself has various meanings, from a mathematical symbol indicating zero, to secret writing, but in regards to these manuscripts, it simply means to calculate[1].

It is generally thought that these books were lesson books of students or teachers used for the education of simple arithmetic to more complex mathematics. The dates encompass the last quarter of the eighteenth century and continue throughout the nineteenth century. The SHC has just over fifty, all accessioned, processed and stored within separate collections, accessible through the online catalog using various search terms. Until this research project, the staff of the SHC was aware of only a handful of these manuscripts, and was not able to discuss the history and plausible purpose of cipher books with any certainty. This paper will attempt to prove useful as a resource for the staff and researchers of the SHC, who are interested in new avenues of research into eighteenth and nineteenth century America, with an emphasis on the South. Cipher books have the potential of being a valuable research tool if appropriately examined; it is the purpose of this paper to illustrate the unique information which can be cultivated from this form of material.

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NOTES:

[1] Lexico Publishing Group, LLC. Dictonary.com. 2006. 18 Feb. 2006 <http://dictionary.reference.com/search?q=cipher>.

In order to do this, an inventory and description of each book will be provided, focusing on the possible questions and answers they can provide. Each cipher book will be described in context of its collection, and in order of collection number. Some volumes will be described in detail, and provided images will allow the reader a brief glimpse of their intricacies. It is the writer's hope, that upon finishing this paper, the reader will be intrigued enough by cipher books to look for them in archives and not be disillusioned by the sometimes misguiding descriptions, such as "mathematics workbook", and to think instead of the possible extent of unseen information contained within. Cipher books are unique because of the insight they provide into the educational system, pedagogies, social status, gender roles and the cultural reflections and influences of the time period in which they were created.

# CHAPTER TWO: LITERATURE REVIEW

The educational system of eighteenth and nineteenth century America is well documented by many scholars, but very few have focused on the teaching of arithmetic and mathematics. These disciplines may only receive a page of dedicated general information, which is often found repeatedly in different sources. Though there are a few accounts from the student perspective, the majority of information regarding the teaching of arithmetic and more advanced mathematics was summarized by historians by looking at the text books available; this was also found to be true for researching reading and writing educational pedagogies during this time. It is agreed upon by historians that general education was not an option for everyone during the eighteenth and nineteenth centuries, but believed necessary for the survival of the nation. If such a young country was going to successfully break away from Britain, its future leaders must be well educated and prepared to defend her politically and forcefully.

Education in the Northeast was somewhat more progressive than in the South, due to the more densely populated areas, whereas the South was much more spread out and separated, making community education difficult. In the South the principal vocation was farming and agriculture, and parents needed their children for labor and could not spare them to be sent to school. Wealthier families in the South hired tutors or sent their children to academies or boarding schools, in similar practice to families in the Northeast, often resulting in southern children being sent as far away as Rhode Island for their

education. For families who still had relatives or connections in the North, children were often sent to be housed with them for the benefit of their scholarship (Clifford 1978).

When home schools and free schools were established and survived, reading and writing was the primary focus of education. Because families would not permit their children off the farm during certain seasons, education was limited to what was considered most important. Reading was far more valuable than writing, and arithmetic was reserved for those with the time and money to hire an instructor who could actually teach it. If nothing else, children could at least learn to read and study the Bible and to sign their names, however, writing was often not considered necessary for the poorer children to succeed in their future employment:

> Writing…was regarded more as an art or as a technical skill for certain occupations such as bookkeeping and commerce. It was also more expensive: paper was scarce; writing texts were costly; and students had to purchase quills and powder ink (Allison, 1997).

Girls were generally taught sewing instead of writing as it was thought to be much more valuable to them in their future.

Between 1754 and 1783, only New England had established laws requiring all children to learn to read, and port towns throughout the colonies had a higher percentage of literate citizens than did regions further from the coast (Allison, 1997). This seems appropriate because of the access the port towns would have had to new resources such as text books and supplies from England and Europe, whereas the more rural towns would not have the capabilities to import needed materials and would rely on what was available within their community. Even though the port towns may have had better resources for education, few of them allowed for advancement in mathematics and still focused on spelling and reading books (Allison, 1997).

Home schools, called such “because of their close affiliation with home life”, were similar to the traditionally called “dame schools” which were typically run by women in small neighborhoods who attempted to make a few dollars by teaching the local children basic spelling and numbers (Eaves, 1936). They were designed for middle to upper class families who could afford the tuition, only permitting a few poorer children for free per term. As time progressed the curriculum began to include reading, writing, arithmetic, and grammar, and often more young girls attended than did boys, as it was more fashionable, if a family could afford it, for the boys to be educated at home with a private tutor (Eaves, 1936). In poorer families, very young children were taught the basics of the alphabet and numbers through ten by their mothers or older siblings before being permitted to attend school outside the home. Sometimes, local children of about 15 years of age were hired by families to teach the neighborhood children (Clifford, 1978). Because no formal education system had yet developed in the South, different types of schools surfaced in different communities depending on what resources and possibilities were available. Home schools, free schools and dame schools, primarily taught very basic elementary practices, and when possible, students continued their education in private schools, Latin grammar schools, English schools or academies which would prepare students for particular professions such as law, ministry or college, if desired.

Latin grammar schools began in the North around 1635. Similar to private schools they were often started by a family of higher education in an attempt to make a living by having the students live and learn within their households. The curriculum of Latin grammar schools, “was based on classical languages and literatures, but reading, arithmetic and writing were also taught” (Allison, 1997). English schools evolved in the eighteenth century as an alternative to Latin grammar schools and offered a more

practical approach to learning, with more of an emphasis on reading, arithmetic, English grammar, history and less on religious and classical instruction (Allison, 1997). Academies developed later in the eighteenth century and never really caught on until about 1787. They based their curricula on a combination of Latin and English school instruction, but provided more advanced study parallel to many of the college courses taught at the time. Described by Phillip Jones as a "common man's version of the Latin Grammar School…they were still private, but they put a little more stress on preparation for commercial enterprises" (Jones, 1967). During the colonial period commerce and merchandizing expanded so that it became necessary to include courses such as accounting, bookkeeping, business, surveying, navigation, leveling, and mechanics to the curriculum (Allison, 1997). Leisure studies such as dancing, singing, painting and drawing were also included to expand student's cultural interests.

The teachers of many of the institutions had barely adequate educations for teaching in these schools. Some had more formal educations, but many had professional experiences in occupations such as surveying which allowed them the knowledge to instruct in these disciplines and sometimes to venture in writing their own textbooks for use in their classes (Allison, 1997). Though around the 1820s, women's roles allowed them to become the primary school teacher, prior to this, most teachers were men, though women sometimes supplemented their husband's classes.

In the South in particular, fewer grammar schools existed, and because of the scattered communities, the organization of a formal education system was a very slow process. Other types of schools were created in the process, such as charity, publicly endowed free, parish, old-field and church-sponsored. Typically organized by the parents who hired a teacher and paid fees to allow their children to attend, old-field schools were

established in old tobacco fields using abandoned buildings as school houses while parish and church-sponsored schools were exactly that; supported by parishes or churches (Allison, 1997). The curriculum of virtually all types of establishments predominantly focused on classical instruction, but by the mid eighteenth century, instruction expanded to include "mathematics, natural science, English literature, and modern languages – changes [which were] influenced by the spread of European Enlightenment..." (Allison, 1997).

Prior to declaring Independence, arithmetic was not a required discipline anywhere, and was believed to be too difficult for many children to learn or for instructors to teach. In general, community heads and school masters believed arithmetic to be so difficult for boys that girls would be "saved from such efforts" of learning it and instead taught to sew, which was more beneficial to the future societal roles they would take on (Meriwether, 1907). Arithmetic in secondary schools was seen as necessary means for survival in the world of trade and business and not for the betterment of the mind, therefore focusing on teaching bartering, dealing with fellowmen, and making and exchanging money. In more rural schools, mathematics was taught only by request, if the instructor had access to resources such as a textbook or cipher book of his own:

> The teacher might or might not possess an arithmetic of his own, but the instruction to pupils was dictated and copied instruction. Each pupil made his own written book of rules and solved problems and most pupils never saw a printed arithmetic (Cubberley, 1962).

Because of the limited availability of paper, students learning to "cipher" often relied on bark, old used envelopes and other forms of scratch paper, to copy out of the teacher's text or manuscript. Instruction was virtually non-existent, so any student who was able to deduct the process of solving problems was considered exceptionally competent:

> In secondary schools, 'ciphering' … consisted generally in drilling students in the manipulation of integral numbers. He was an exceptional teacher who possessed a fair knowledge of 'fractions' and the 'rule of three,' and if some pupil of rare genius managed to master fractions, or even pass beyond the 'rule of three,' then he was judged a finished mathematician (Cajori, 1974).

The lack of textbooks demanded that ciphering be taught by dictation in similar style of the many of the other disciplines of the time. Rules were given, with examples and then practice problems were dictated for the student to work. The student's only instruction in how to solve the problems came from the stated rule and previous examples, turning the problems into something not unlike a riddle. This instruction technique focused on memorization while mental arithmetic was completely ignored; the theory being that committing rules to memory was the best method for students to learn.

Other characteristics of "old American Arithmetic" included the deficient treatment of fractions, the use of English numeration (as compared to the French, though the change was beginning to occur), a complete avoidance of teaching the underlying principle of proportion, then titled the "Rule of Three", the use of Single and Double Position to solve problems (which has since vanished almost completely), and finally the absence of cancellation, which at the time was unknown (Cajori, 1974). Cajori further states that ciphering was a very complicated and misguided theory to teaching arithmetic which had its beginnings in England:

> The result of this cumbrous rule-system is that the scholar acquires the art of solving problems, provided he knows what rule it falls under, which is not always sure to be the case, for the first practical problem which will arise may be one requiring not one rule, but a combination of rules which can therefore not be solved directly by the rules in his book. And here he is fairly aground, for he has no mastery of principles, but is the object slave of rules. Such a system of arithmetic has been ever appropriately called *ciphering*, since intellect goes for nothing throughout (Cajori, 1974).

This English attempt at instruction was eventually overrun by the Swiss pedagogy of Johann Heinrich Pestalozzi which Warren Colburn brought to America in 1821 with his published work *First Lessons in Arithmetic on the Plan of Pestalozzi*. But even though there was to be a paradigm shift in education, and a rapid replacement of textbooks, the change in actual classroom instruction took much longer, possibly not making an obvious change in lessons until the late eighteenth century. A. W. Richeson depicts the instruction of arithmetic prior to Colburn's influence:

> Instruction was given by the 'ciphering' method; that is, there was practically no teaching or instruction whatever. Few of the children were provided with texts and as a result the teacher set the 'sums', as they were called, and the child went back to his seat and attempted to solve the problem. After he had worked over the problem, it was again brought to the teacher; if the solution corresponded to the one in the copy-book, he was given another to work; if not, he was sent back to his seat to work on it further. Often it is questionable whether or not the teacher was able to work many of these problems (Richeson, 1935).

What is interesting to note about this depiction of events is that because of the lack of instruction and demonstration, when the instructor set the sums, he wrote the problems and lessons in the child's manuscript book and left the child to interpret and solve the problems. Cajori supports this action by the instructor when he states that it was custom for the instructor to write a problem or two in the student's manuscript every other day as writing and arithmetic were never performed on the same day (Cajori, 1974).

The other point worth mentioning is that it was often the case that the instructor could only verify the students work by comparing it to the text or manuscript he had in hand and not because he, himself, could work the problem. Teachers who could accurately instruct in mathematics were hard to find outside of colleges, and as Meriwether describes, only a low level of mathematical competency was necessary to instruct:

> A little mastery of figures was sufficient for the pedagogue. If he could enumerate the minutes in a year or the inches in a mile he was competent to instruct in this branch. He was hardly expected to tackle anything but integral numbers, but if he could handle fractions and make excursions into the rule of three he was a marvel…(Merriwether, 1907).

As already inferred, the teacher was mostly likely the only person in the community to have an arithmetic text book, and if a student was lucky enough to posses one, it was typically the same book his father and grandfather used when they were students and was not necessarily the same book the instructor was using to teach. In Cajori's 1890 report to the government on the history of mathematical instruction, he describes the process of instruction and the resulting creation of the cipher book:

> Since few or none of the pupils had text-books it became necessary for the teacher to dictate the "sums." A in the colleges of that time, so in elementary schools, *manuscript books* were used whenever printed ones were not accessible. To advanced boys the teacher would give exercises from his manuscript or "ciphering book," in which he problems and their solutions had been previously recorded (Cajori, 1974).

The problems were written down either by the student or instructor on a spare sheet of paper, and students were allowed to take as long as they needed to attempt to solve the problems set before them. When they believed they found the correct answer, each brought their work to the schoolmaster for it to be compared to the original problem. Should the instructor find errors, the student was returned to his desk to rework them, but if they were found to be correct, the student was instructed to copy them into a blank book. Cajori quotes from and account by James Pyle Wickersham to illustrate the view of the classroom when the students believe they had solved the problems:

> When a pupil was unable to solve a problem he had recourse to the master, who solved it for him. It sometimes happened that a dozen or twenty pupils stood at one time in a crowd around the master's desk waiting with problems to be solved. There were not classes in arithmetic, no explanations of processes either by master or pupil, no demonstrations of principles either asked or given. The problems were solved, the answers

> obtained, the solutions copied and the work was considered complete (Cajori, 1974).

Because of the lack of available text books, the instructors often used cipher books they created while in school or that were handed down to them. Cajori demonstrates this in his report by quoting an account taken from Barnard's Journal, stating "Master Tileston had thus been taught by Master Proctor [his predecessor], and all the sums he set for his pupils were copied exactly from his old manuscript" (Cajori, 1974). Teachers possessing textbooks were considered fortunate to have as their guide a published work. The resulting books the students created became the text books for their brothers or sisters, and then passed down through generations as trophies of accomplishments.

Phillip Jones writes that there were three important aspects to having mathematics in the curriculum of grammar schools, private schools and academies; these being the purpose, method of presentation and context (Jones, 1967). The purpose of mathematics was their practicality for life, and the mental discipline, the idea being that "uses of arithmetic and geometry in mensuration, calculating money in different currencies" would be an advantage for the young in business and the work force, and that it was good for the "mental muscles to wrestle with Latin and arithmetic" (Jones, 1967). The method of presentation was the layout of rules to be memorized, examples to be studied and problems for the students to complete on their own. The context was established by making the pupils problems solvers and potentially ready to enter college. Cajori disagrees with any notion that this method of educating the young in arithmetic was ever really beneficial. It was his belief that the problems created by the textbooks could have been remedied by competent and knowledgeable instructors:

> The statement of rules took the place of explanation and reasoning. If the schoolmasters had been competent and well trained, then the defects of

> bad books might have been remedied by skilful teaching, but the teaching was generally of the poorest kind (Cajori, 1974).

Women were not generally believed to benefit from being taught arithmetic prior to the Revolutionary War. Women's education fell way below that of men in every regard because they were only responsible for maintaining the home and watching over the children, and would seek a husband who would tend to all business matters requiring more education. Typically, women were only taught to read so that they could study the Bible to reinforce what they were taught by men, but not to the extent to be able to think for themselves or interpret the scriptures on their own (Conway, 1974). Jill Conway's paper entitled *Perspectives on the History of Women's Education in the United States* makes evident the difficulty men found in understanding the need of women's education. Like most men of his time, Benjamin Franklin never considered the possibility that women's pursuit of happiness might involve an education which made them independent of men, and likewise women were so conditioned as to have rarely thought to consider it (Conway, 1974). Prior to the Revolution, only 33% of women in North Carolina could sign their names, while 80% of men in all the colonies could sign their names (Allison, 1997). There were religious sects who valued the education of every child, such as the Quakers and Moravians, and men and women in the public eye which strived to make show the value of educating daughters as well as sons. Attendance to town schools by girls increased by the mid eighteenth century, but the quality and quantity of learning was still far below that of boys (Allison, 1997). Women's education focused on providing them with the tools they would need to fill their roles as "helpmates" to men:

> …most formal secondary education and all higher education were open only to men. Women were regarded as helpmates of men, and their education was defined in terms of what would be most useful in making them good wives, mothers and homemakers. Therefore they were not

> educated in the same manner as men, as this would be unnecessary preparation for their roles in society; they would for the most part not be involved in the public sphere of men by rather the private sphere of the home and family and as such were under the authority of their husbands unless the husbands were absent of deceased (Allison, 1997).

Because of the Revolutionary War, women's roles began to change slightly, increasing their responsibilities outside the home while they're husbands and sons were at war, and this continued into the eighteenth century where women began to keep businesses such as inns and taverns, small shops, and being involved in printing and publishing (Allison, 1997). Women such as Abigail Smith Adams and Mercy Warren served as role models for many young girls during the 1770s, and helped to steer this change in societal roles. Women within wealthier families often received more advanced educations, as it was important for them to be well instructed in the manners of all household duties so as to maintain power over the servants who may take advantage of new mistresses (Smith, 1973).

Benjamin Rush was a champion for the education of women, being more concerned with women's formal education than most other men of his day. Prior to 1790, education for women at most covered reading, writing and some arithmetic, usually learned at a dame school with some housekeeping skills (Smith, 1973). Girls from middle or upper classes were taught dancing, art, singing and other culturally feminine disciplines to ensure their social status. Rush's view of women's education allowed the new nation to see the benefit of teaching their daughters more advanced curricula when, as mothers, they would be responsible for the education of their young children and the future of the United States. In an address collected and reprinted by Wilson Smith, Rush continues this point of view:

> The state of property in America, renders it necessary for the greatest part of our citizens to employ themselves, in different occupations, for the advancement of their fortunes. This cannot be done without the assistance of the female members of the community. They must be stewards, and guardians of their husband's property. That education, therefore, will be most proper for our women, which teaches them success and reputation…Some knowledge of figures and bookkeeping is absolutely necessary to qualify a young lade for the duties which await her in this country. There are certain occupations in which she may assist her husband with this knowledge; and should she survive him, and agreeable to the custom of our country be the executrix of his will, she cannot fail of deriving immense advantages from it (Smith, 1973).

Rush further demonstrates that as men's responsibilities take them further away from the household, duties which were once the responsibilities of men now fall to their wives, and to understand the domestic economy, women must be properly educated in arithmetic.

Text-books, especially arithmetic and mathematic books, were few and far between, and all but very few of them were imported from England and Europe. Prior to Warren Colburn's *First Lessons in Arithmetic on the Plan of Pestalozzi*, in 1821, most mathematics books followed very similar ideas in instruction: "Before Pestalozzi, arithmetic had meant ciphering and either commercial counting or the solution of complicated problems. Pestalozzi replaced ciphering with simple and rapid mental calculations" (Cubberley, 1962). Phillip Jones makes the point that the study of mathematics was slow in arriving to America; that it was "imported and stressed practical uses" (Jones, 1967). Though this method was rapidly accepted by scholars and the text was widely distributed, instruction in the classroom was slow to change.

This slow change could also be attributed to the lack of students able to purchase or otherwise be provided with Colburn's text. Their parents and guardians may not have

seen the value of a new method of instruction, believing that the education they received in arithmetic was sufficient enough, therefore making it easier for the instructors to teach from texts they had always used and that the students had better access to. Because many of the teachers were not necessarily skilled in mathematics themselves, they probably preferred to teach in the method that they were taught, and most comfortable with. Prior to Colburn, there were a handful of other texts which served the schoolmaster's purposes. Among them were Hodder's *Arithmetick*, which was published in Boston in 1719, Fisher's *The American Instructor*, published in Philadelphia in 1748, Cocker's *Arithmetic*, also published in Philadelphia in 1799 (28 years after Cocker's death), Dilworth's *Schoolmaster's Assistant*, published in America in 1769, Greenwood's *Arithmetic, Vulgar and Decimal* printed in 1729, Hawney's *Complete Measures* printed in 1801, and Barnard's *A Treatise on Arithmetic* published in 1830. A few other notable authors of arithmetic books included Nicholas Pike, Daniel Staniford and John Vinall.

Dilworth's text, though originally published in England in 1743, was the most popular text in America, partly because, as Meriwether illustrates, "he was seen as a prophet to recognize that type was far more likely to please the pupil and assist the teacher than any other device" referring to the habitual nature of each pupil and master in making their own manuscript books (Meriwether, 1907). Cubberley attributes Dilworth's work for popularizing arithmetic as a subject worth studying, though at the time it was found more commonly in colleges (Cubberley, 1962). Dilworth focused on three distinct rules: rule of three for integers, rule of three for vulgar fractions and a rule of three for decimal fractions (Cajori, 1974).

Isaac Greenwood's book, *Arithmetic, Vulgar and Decimal* had the following layout of chapters which was similar to the majority of the books of the time:

Numeration, Addition, Subtraction, Multiplication, Division, Reduction, Vulgar Fractions, Decimal Fractions, Roots and Powers, Continued Proportion, Disjunct Proportion, Practice, and finally Rules Relating to Trade and Commerce (Cajori, 1974). The format of the book was to provide rules, followed by examples and then problems for practice. The rules were often written in Question and Answer format, following the Socrates theory of learning by dialog. None of the texts before Barnard's *Treatise* (1830) had any illustrations to aid the student in understanding the arithmetic set before him (Cubberley, 1962), and Hawney's *Complete Measures* (1801) was the first text with geometric content: "it dealt largely with simple surveying, weights, measures, cordwood, barrels of wine, etc" (Jones, 1967).

Through the nineteenth century schools began to become more established within communities and town governments began to take responsibility for the community's education in regards to elementary and secondary schools. It is possible that at about this time, Colburn's book and Pestalozzi's theories really came into fruition in the classroom, and ciphering was gradually replaced with inductive instead of deductive arithmetic:

> One can barely conceive that such a far-reaching change in text-book writing should occur so suddenly as that made by Colburn. In the United States there was not a gradual change from the old deductive texts to the inductive texts. To the contrary, on the appearance of the text of Colburn many others of a similar nature followed, and consequently there came about a change in the methods of teaching both arithmetic and elementary algebra. It should be born in mind that the changes in the methods of teaching these subjects did not take place as rapidly as the change in the writing of the text-books (Richeson, 1935).

The rapid change in the use of text books affected college and scholarly study more than community level education, with the possible exception of prominent academies which equate more to colleges than secondary schools.

There is some debate between Jones and Cajori over which higher education institutions required arithmetic first. Jones states that Harvard was the first to require arithmetic for admission in 1807, followed by Yale and Princeton in 1847 and 1848 respectively. Jones continues by stating that by 1865, Yale was the first to require geometry, and by 1870, Princeton, Michigan and Cornell all required geometry and that Harvard was last to require geometry, but when it finally did, Harvard also required logarithms (Jones, 1967).

Cajori stated in his report in 1890 that the University of North Carolina in Chapel Hill (UNC) required arithmetic up to the Rule of Three for admission by 1800, and furthered it's requirements to include up to the Square Root by 1834 (Cajori, 1974). College level mathematics were still taught in similar style of ciphering, which still required the laborious manuscript books transcribed from the instructor's by each student. In 1795, UNC offered the following list of mathematics courses in the order the students were to take them: Arithmetic, Algebra, Euclid's Elements, Trigonometry (including mensuration, surveying, and navigation), Conic Sections, a Doctrine of Sphere and Cylinders, Projection of Spheres, Spherical Trigonometry, a Doctrine of Fluxions and a Doctrine of Chances and Annuities. By 1818, Algebra, Geometry, Plane Trigonometry, Logarithms, Astronomy and Natural Philosophy were added to the curriculum (Cajori, 1974). Students at Harvard who were studying advanced mathematics often wrote their theses in very elaborate styles. As Meriwether describes them,

> …most of them are large and elaborate, showing the minutest pains, evidently designed for exhibition purposes. Thy also indicate the bent of the teaching as the topics are drawn largely from surveying and measuring. The astronomical ones are very ornate, some of them having very credible maps of the world. There are questions in algebra, but largely elementary, though they are worked out with a vast display of tabulation and beautiful lettering (Meriwether, 1907).

These theses would no doubt be an interesting comparison to many of the cipher books which have still survived to find differences in instruction and composition between colleges and schools.

Though almost all previous study of education during the colonial and national period of America has been based on the text books available at the time, there is very little to base what true instruction was actually like for the students who received it. There are few personal accounts of everyday school activity, and historians primarily focus on overall education with an emphasis on the more important areas of study, reading and writing. Cajori is the only individual who focused particularly on the instruction and learning of mathematics. His report, while very credible and probably more accurate because of its close association in time to the period being studied, does very little to describe what cipher books meant in recording student's lives while in school or other influences on their lives and the recording of these while at school. Meriwether makes the statement that, "a textbook is not the ideal mirror for reflecting the actual education. Even now the difference between the book and the instruction in the classrooms is often a mighty gorge" (Merriwether, 1907).

Very little information is available regarding how students incorporated their studies together and how these courses interacted and overlapped with one another to effectively educate the student. There are not many accounts of what the students thought about the education they were receiving, or if their teachers instructed them to create cipher books in particular ways. Problems given for the student to work often reflect cultural influences referring to important people of the day. The subjects and notes may indicate the student's interest in, or lack there of, a particular lesson or their difficulty in resolving it. The lessons taught may also serve as a point of reference for

what the student's most likely occupational options would be upon completing school, which may in turn give a clue to their social standing. After reviewing the available literature, the author has come to understand the primary function of cipher books, and hopes that it has been made apparent to the reader, however, there is supplemental information which can be derived from virtually all cipher books and applied not only to the individual, the family and the community, but also to education as a whole. Studies of mathematics instruction are particularly lacking in historical contexts compared to the amount of literature on reading, writing, and gender differences in education.

Cipher books were often kept safe for generations as artifacts similar to trophies of accomplishment and evidence of education. Because they were handwritten and created with care, sometimes used to record fanciful thoughts in poetry, stories, and drawings, and often used as diaries to record birth and death dates, cipher books allow a more personal view into the lives of those who created them, and the social influences of the time.

# CHAPTER THREE: CIPHER BOOKS

The following chapter's purpose is to serve as a sort of inventory of the cipher books within the SHC. Because of the number of manuscript books, entries will be brief and focus on their peculiarities which make them distinct from one another. Some similarities will be brought to the reader's attention in order to form common threads which may link these volumes together. The mathematics they focus on will be discussed, but not every subject will be listed to avoid repetition. It is the hope of the author to be able to provide to researchers an overview of what each cipher book may have to offer in regards to identifying possible topics of research which these books could influence.

Regardless of the information pertaining to mathematical instruction, these books serve as artifacts of life between 1760 and 1870. The cipher books consist of similar mathematics, with only a few exceptions. Nearly all of them begin with basic arithmetic which includes Numeration and tables of weights and measures for Troy Weight, Avoirdupois Weight, Apothecaries Weight, Long Measure, Cloth Measure, Land Measure, Wine Measure, Beer Measure, Ale Measure, Dry Measure, and Time Measure, typically in that order. They generally move along through addition, subtraction, multiplication, division, with sub chapters on how to perform these functions with the same weights and measures mentioned above. Eventually, the arithmetic becomes more complicated with compound addition, subtraction, multiplication and division, and then continues into reduction, proportion ("Rule of Three," "Direct" and "Indirect", inverse

proportion, “Double Rule of Three,” “Direct,” “Indirect” and “Reverse”), and then varies somewhat in whether all the following or just some of the following were recorded:

> Algebra, Alligation: Alternate and Medial[2], Astronomical Calculations, Barter, Decimals, Dialing[3], Differential/Integral Calculus, Equation Payments, Exchange Of Money, Gauging, Geometry/Analytical Geometry, Insurance Commission and Brokerage, Interest, Laying On/Taking Off Percent, Loss/Gain, Mensuration[4], Navigation, Powers, Practice, Rebate/Discount, Promiscuous Questions, Single/Compound Fellowship, Square/Cube Root, Surveying, Tare and Tret, Trigonometry, Vulgar Fractions

In the following descriptions, cipher books which feature arithmetic only through the Rule of Three are considered to be on the elementary level, while books which have a high concentration on the mathematics listed above tend to represent secondary and a higher educational level.

What makes these cipher books so unique is the way in which these pages represent the person who created them. In some cases it is very obvious that the

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[2] Alligation is described by *Webster’s Revised Unabridged Dictionary, ©1996, 1998 MICRA, Inc.* as a rule relating to the solution of questions concerning the compounding or mixing of different ingredients, or ingredients of different qualities or values. They note that the rule is named from the method of connecting together the terms by certain ligature-like signs. Alligation is of two kinds, medial and alternate; medial teaching the method of finding the price or quality of a mixture of several simple ingredients whose prices and qualities are known; alternate, teaching the amount of each of several simple ingredients whose prices or qualities are known, which will be required to make a mixture of given price or quality.

[3] Dialing is defined by *American Heritage® Dictionary of the English Language, Fourth Edition, © 2000, By Houghton Mifflin Company* as to measure with the use of a dial, such as a sundial. Many of the cipher books describe instructions for constructing a properly aligned sundial.

[4] Mensuration is defined by *The American Heritage® Dictionary of the English Language, Fourth Edition, © 2000, By Houghton Mifflin Company,* as the act process or art of measuring, and the measurement of geometric quantities. In cipher books, Mensuration is often used with the tern “Superficies” which according to *American Heritage Dictionary* means the outer surface of an area or body, therefore meaning the measurement of surfaces; what we would generally refer to as finding the area of a geometrical object.

instructors wrote down the rules and problems for the student to solve, in others, it served as a book to record thoughts, weather, poetry, riddles and art. The level of mathematics each student was being taught may provide information to the future occupation he/she would have, and particularly for women, these student notebooks may have clues to what young women were actually being taught during a time period when girls were taught sewing before arithmetic. It is these features which cannot be accurately represented in the finding aids created to describe them; and it is these features which I would like to bring to the attention of the researcher.

Because the inventory will be listed in collection number order, it is first important to understand how the collection numbers are arranged at the Southern Historical Collection. Collection numbers are similar to call numbers, in that they identify a collection created by a certain individual, family, organization or business, and originally, the SHC housed these collections in numeric order. However, as the SHC grew, there came a time when some reorganization needed to occur. Therefore, some smaller collections (usually fewer than about 20 items) were removed and re-categorized as "Z" collections. They kept their original collection number followed with a "Z" to indicate that they were a small collection and stored as such. They are treated within the SHC as smaller in numeric order than a non-Z classified collection; for example, Green Nicholson's Cipher Book is a one item collection consisting solely of the cipher book with the collection number 5221z; this collection number is smaller than the Cameron Family Papers, number 133 consisting of 33,000 items. The following inventory follows the same principal. Subjects of mathematics or arithmetic may appear in quotes if it the title given in the cipher book is unusual or in other ways special.

**#944z Josiah Baldwin Books**:

There are two cipher books in this collection; the first volume is in two parts, in two folders. The first volume records dates between May and October of 1811 and containing the name of Alfred Baldwin. The level of mathematics taught is higher than most other cipher books, consisting of "Navigation by Trigonometry", "Astronomical Calculations", "Geographical Projections of the Spherical Globe" and Dialing. What is most interesting about this volume is the use of 3D inserts into the pages of the book for a more accurate representation of the diagrams constructed. The inserts are slipped through a cut page, in the middle of a circle drawn on the page to represent, for example, a sundial. The insert is then glued to the verso of the drawing and usually written on for subsequent lessons, as if it were not there. Within the drawing of the sundial, the insert acts as the central pointer allowing for greater accuracy in solving given problems. This cipher book is the only one to use the inserts within the SHC's collections.

The second volume is more rudimentary and is attributed to William Baldwin of Richmond County, N. C., though the names Astin or Justin Baldwin have also been recorded. The finding aid states that the book was written in 1820, though the only date found may be as late as 1852. There are very few arithmetic lessons, mainly problems under the title Promiscuous Questions, followed by writing exercises which include practice at writing bonds. The following was recorded to illustrate the thoughts of the student in completing his work: "I improve in my writing and will continue my attention until I can write an even plain hand fit for business."

The contrast in these books may indicate that Alfred Baldwin was much older when his book was created versus William's age when the second volume was created.

Alfred may also have been William's father or older relative, and the elder's book may have been used by William at a later date.

**#1375z Ludwic Summers Papers:**

The Ludwic Summers papers consist of two cipher books, both bearing Ludwic's name, and the first recording Ludwic's birth date as 6 August 1795. The first volume is dated 1808, and the second 1810 through 1814; there is no direct indication of a location. Both volumes contain typical recordings of arithmetic lessons; the first starting with a numeration table, basic arithmetic, weights and measures, Superficial Measure, Rule of Three (both direct and indirect), Commission, Interest, Rebate/Discount, Barter, Loss and Gain, and ending with Gauging, Alligation, and Positions, while the second involves more work of these subjects and introduces Vulgar Fractions, Square and Cube Roots and Decimals. Summers' books in particular are in very good condition and are nice to examine. The pages are not heavily damaged, and the penmanship and drawing of lines is finely done. This book does have some simple drawings similar to those which a child would draw, and the layout of this book is similar to many others in the collection, where it appears that the teacher has written out a series of numbers or problems to be continued and finished by the student according to the rules and examples given. Ludwic's books also show usage of different colored inks, which is rare among cipher books. Most are written in iron gall ink, which usually writes in black and fades to brown over long periods of time. Iron gall ink can also severely damage the paper it is written on, due to the high acidity within the ink which literally burns through the pages. Ludwic's use of

red ink is somewhat of a mystery, as its composition has not been researched for the purpose of this paper.

The first volume shows additional evidence of the instructor by the writing of the riddle: “Thom and Dick went out a hunting, Thom neither went behind Dick, nor before Dick; pray Ludwic tell me, where did he go?” The last page of the second volume bears instructions for taking medicines and when to use drops, though for whom this was intended is not clear. It is important to note that the front of the book is inscribed to Elisabeth Gilman G[sic] for “good scholarship” in 1924. Some research suggests that it was often the practice to reward excellent students with books in the possession of an instructor; however, no other information about Elisabeth could be identified.

**#1960z Dainel G. Marsh Cipher and Account Book:**

This collection consists of one volume which served as an account book and cipher book. Daniel Marsh’s name is written on the cover, and the book includes dates between 1785 through 1792 with the location of Providence, R.I. This cipher book is interesting because many of the problems written in the book were never solved. The accounts in the book refer to shipping in Newport, Rhode Island, Bath and Ocracoke North Carolina. The relationship between Rhode Island and North Carolina is not clear, though this may be evidence of Marsh being sent north for his education at a particular academy or school. The mathematics learned within this book are higher than most, starting with Vulgar Fractions and including Decimal Fractions, Practical Geometry, and Board Measure of Squared and Round Timber. The volume also contains invoices for

particular ships in Massachusetts and Marsh's "Adventure Accounts" while in Providence and a poem, possibly written by him.

**#4151z William Franklin Strowd Papers:**

This volume, like many others in these collections, is not obviously linked to any known member of the family. This is unfortunate for context, as we do not know, nor are we able to identify, direct relationships between those who wrote the book, and those who came into possession of it. There is no definite location specified within the text, but the collection itself has roots in Chatham and Orange Counties of North Carolina. Unfortunately, this is not enough to suppose that the cipher book also originated there. The book is titled "Alvis Durham's Ciphering Book" and is dated 20 January 1820. The arithmetic is fairly basic, beginning with Numeration, simple functions, weights, measures, and different currencies. There are instructions to Alvis, regarding the importance of memorizing the tables: "Let this be your plan, learn all that you can" and "Alvis Durham, this table must be perfectly got by heart"; and a mistake in a title stating the explanation of an improper use of a letter: "When I made this letter, I thought it was D. Durham's book" which may indicate that Alvis had a sibling, and that the teacher was instructing both of them, with different, though probably similar, ciphering books.

**#5221z Green Nicholson Cipher Book:**

This particular book was written between 1829 and 1832, and shows evidence of being created in Orange County, North Carolina. The arithmetic is general, beginning

with Addition, Subtraction, Multiplication, and those same functions using Federal Money. There are weights and measures, advancing through the Rule of Three and concluding with Simple Interest. There is the possibility that someone else may have used the book, as the section dated 1832 bears the following, "When this you see remember me that I may not be forgotten when I am dead and rotten – W. L. Jones, January 18, 1832". Nicholson's name still appears throughout the book, so the nature of the relationship to Jones is not evident. Nicholson also used this book to record the births of his children and those of the Payne family, and any deaths which may have occurred. These were clearly added to blank spaces of the text much later, as the dates vary within the 1850s.

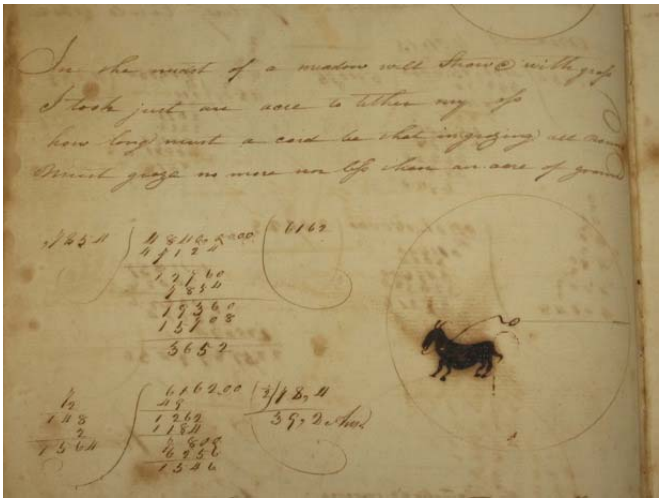
Though the cipher book is the only bit of information we have about Green Nicholson, the book provides an account of his life which no one may have otherwise gotten. Because of the records within the book, we know he was born in 1811, married Artia E. Brown on October 4th, 1832, who later died on the 15th of April, 1841, and that they had at least three children. There are 5 other children with the name Payne recorded with birthdates written under the title "Ages of My Children" following Green Nicholson's date of birth. Because of the closeness in age between Nicholson and the other Payne children, it is possible that these are his siblings, though again, because no other information is available, this is purely speculative.

**#5222z James Tillman Cipher Book:**

James Tillman was from Person County, North Carolina, and according to the SHC finding aid is believed to have been a traveling schoolteacher, though no direct

evidence of this was found within the book itself or within the control file. This book is dated 1817, and the mathematics within this book are of a higher level than most, beginning with Decimal Fractions and conducting addition, subtraction, multiplication, etc, with Decimal Fractions. The instruction continues with Vulgar Fractions, Square and Cube Root, Gauging and Mensuration. What is interesting about this cipher book is that the mathematics continues into particular vocational practice, such as "Glazier's Work", "Painter's Work", "Lawyer's Work", etc. The problems described often have illustrations which help to visualize the work which needs to be done. In the picture below, the problem to be solved is stated as:

In the middle of a meadow well sown with grass
I took just and acre to tither my ass
How long must a cord be that in grazing all round
Must graze no more nor less than an acre of ground?



Though not necessary to solve the problem, a perfectly round circle is drawn and tethered within it, is a very nice and simple drawing of the ass described in the problem. This is not an unusual occurrence for cipher books, but this perfectly illustrates the author's ability in quick drawings, and its usefulness in figuring the problem's solution. It is

known that this drawing did not accompany the problem in a text book, since prior to 1830, no illustrations were used in text books, so the design is likely Tillman's own creation.

**#96 Bryan Family Papers**

There is one cipher book in the Bryan Family Papers, which was created by James A. Bryan while in school at Princeton, in 1858-1859. He was originally from New Bern, N. C. and according to the family history, he returned there before the Civil War. The manuscript is inscribed on the first page "Room 12 E. C. Junior Mathematics by Professor John L. Duffield" and contains the few subjects of Analytical Geometry, Differential Calculus and Integral Calculus. This text, when compared to the other cipher books at the SHC, appeared to be more similar to math notebooks created by today's students, but it is also one of the latest dated books identified. There are references to page numbers, most likely referring to a text book used for the instruction of the course, and interspersed between the lessons are lecture notes. It is an interesting comparison to the earlier cipher books, and may show some influence of Pestalozzi.

**#133 Cameron Family Papers**

The Cameron Family Papers are one of the most heavily used collections at the SHC. They represent life in Orange and Durham Counties from the early eighteenth century through the Civil War, with detailed documents on large land holdings, running plantations, slave ownership and business. The collection contains three cipher books;

one dated February 1810, and two small incomplete books which are undated. The small ones are sloppily and appear to have been hastily written, making references to figures which must have been in an accompanied book or other material. One of them contains the name Thomas G. Amis, and both seem to focus on geometry or something close to geometry.

The third book dated February 1810, is inscribed as "Dominic Bennehan's Cyphering Book". It contains numerous arithmetic problems with practical applications, starting with a Numeration and Pence table, and continuing with basic addition and subtraction of integers, money, weights and measure, multiplication, division, barter, etc, finally ending with Vulgar Fractions. This particular book is similar in layout and style mentioned in the Ludwic Summers collection, where there appears to be evidence of problems and number strings written out by an instructor for the purpose of creating a workbook for the student.

**#230 Edward Dromgoole Papers**

The Dromgoole book is from Virginia and dated 1813, inscribed with "George C. Dromgoole's Arithmetic", who was apparently born in 1797, and was a lawyer, militia leader, Virginia legislator and a U. S. Representative. It is a basic arithmetic book covering the functions of Numeration, Addition, Compound Addition including weights in Troy, Avoirdupois and Apothecaries, and measures of Cloth, Long, Land, Liquid, Wine, Dry, Winchester, Time, and Motion. It concludes with Subtraction, Division and Multiplication of all the weights and measures.

**#592 Pettigrew Family Papers**

The Pettigrew Family papers are another well used collection at the SHC. This book is older than many with the date of 1792, the first page identifying the student as Ebenezer Pettigrew who was born in 1783. This is a simple arithmetic book, featuring lessons in Numeration, Addition, Subtraction, Multiplication, etc, through Vulgar Fractions and Square and Cube Roots. It is nicely written, with clean straight lines, but there is a noticeable difference in ink between some of the problems set forth and the ink used to solve them. It is speculated that very little of the book was actually written by Ebenezer, as the writing is too fluid and smooth to represent a nine year old boy. Later in the book, the writing is not as smooth, and this may be his attempt at writing it, but it is fairly obvious that the instructor was responsible for the creation of most of the book.

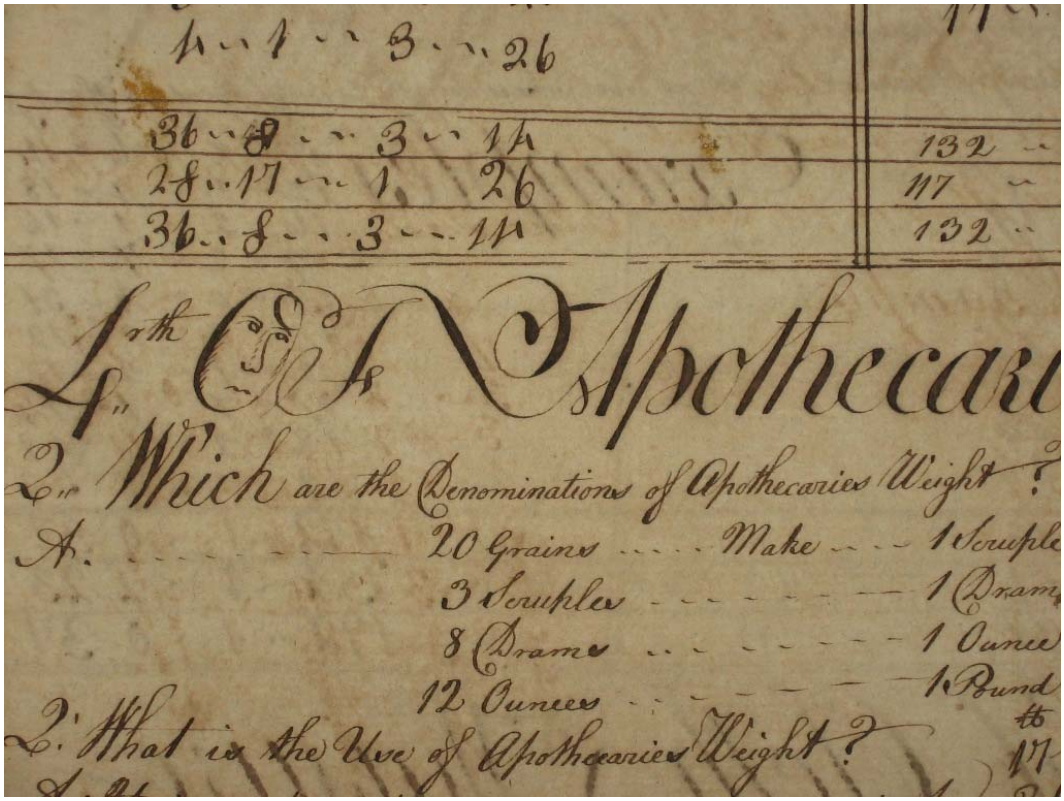
**#613 Prudhomme Family Papers**

The Prudhomme papers are an extensive collection of about 41 linear feet. The papers reflect the lives of a prominent family in Louisiana, and the cipher book within this collection is unlike any other. It was written by Lise Metoyer in 1832, entirely in French. There are no drawings, or attempts at artful expression, but the book is very nicely written and uses red ink for underlining and in drawing tables. This book is also unique because it was written by a young woman, and is one of about five in this collection identified as such. This book is interesting because it provides an example of students work in one of the oldest female academies in America, Ursulines Academy in New Orleans. It is similar to many others in the book's overall layout, and includes

Addition, Subtraction, Multiplication, Division, Money and Measures in table form, Reduction, Fractions, Decimals, Gain and Loss and Interest.

**#615 Quince and Waters Family Papers**

The cipher book in this collection is truly unique. It is one of three books in this collection which warrant as much attention as can be given. Its overall condition is poor; a crumbling binding and water damaged pages. However, the artwork which delicately surfaces on the pages is intact and makes this book one of the author's favorites. Written in 1783 by James Sanders (b. 1762 according to the finding aid), this specimen is one of the oldest in the SHC's collections. The arithmetic which this book represents is fairly common, starting with Numeration, Addition, Subtraction, Multiplication, etc, and continuing through the Rule of Three (often referred The Golden Rule in cipher books dated around the same time), Mensuration, Decimals, Vulgar Fractions and into Surveying and some Navigation. The book follows a question and answer format, all written in the same hand, followed by rules and examples and problems to be solved. There are also family records documenting some of the births and deaths of the Sander's family, though no clear relation to the Quince and Watters families was identified. The most noticeable features of this book, other than the sometimes very intricate titles themselves, are the very subtle faces which appear in the lettering of the titles, as on the following image of the page showing Addition and Addition of Apothecaries Weight:



1 .. 1 .. 3 .. 26

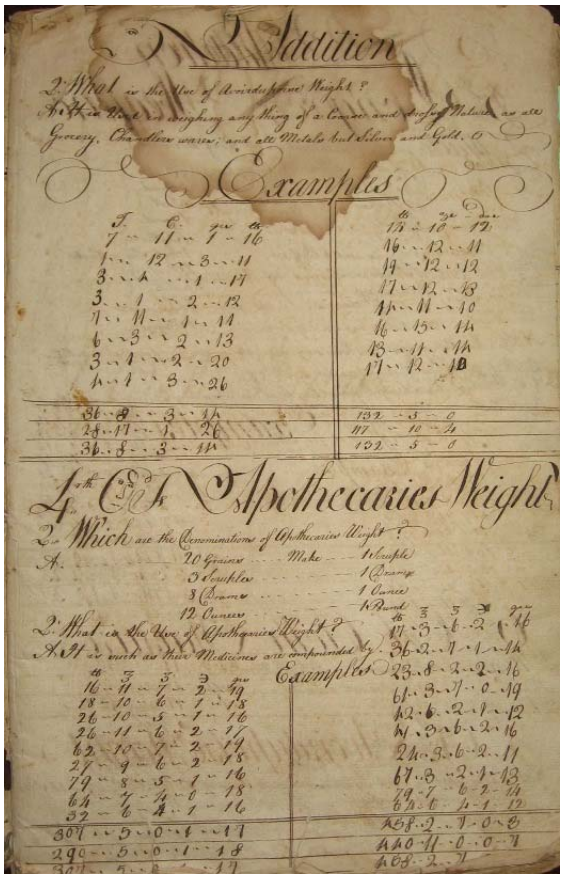
36 .. 8 .. 3 .. 14 — 132 ..
28 .. 11 .. 1 .. 26 — 117 ..
36 .. 8 .. 3 .. 14 — 132 ..

1st Rule of Apothecar

2. Which are the Denominations of Apothecaries Weight ?

A. 20 Grains ..... Make ..... 1 Scruple
3 Scruples ..... 1 Dram
8 Drams ..... 1 Ounce
12 Ounces ..... 1 Pound

2. What is the Use of Apothecaries Weight ?



Addition

2. What is the Use of Avoirdupois Weight ?

A. It is used in weighing any thing of a Coarse and Drossy Nature, as all Grocery, Chandlery wares, and all Metals but Silver and Gold. &c

Examples

| lb | C. | qr | lb |
|---|---|---|---|
| 7 | 11 | 1 | 16 |
| 1 | 12 | 3 | 11 |
| 3 | 4 | 1 | 17 |
| 3 | 1 | 2 | 12 |
| 7 | 11 | 1 | 11 |
| 6 | 3 | 2 | 13 |
| 3 | 1 | 2 | 20 |
| 4 | 1 | 3 | 26 |

| lb | oz | dr |
|---|---|---|
| 15 | 10 | 17 |
| 16 | 12 | 11 |
| 19 | 12 | 12 |
| 17 | 12 | 13 |
| 15 | 11 | 10 |
| 16 | 15 | 14 |
| 13 | 11 | 14 |
| 17 | 12 | 18 |

36 .. 8 .. 3 .. 14 — 132 .. 3 .. 0
28 .. 11 .. 1 .. 26 — 117 .. 10 .. 14
36 .. 8 .. 3 .. 14 — 132 .. 3 .. 0

1st Rule of Apothecaries Weight

2. Which are the Denominations of Apothecaries Weight ?

A. 20 Grains ..... Make ..... 1 Scruple
3 Scruples ..... 1 Dram
8 Drams ..... 1 Ounce
12 Ounces ..... 1 Pound

2. What is the Use of Apothecaries Weight ?

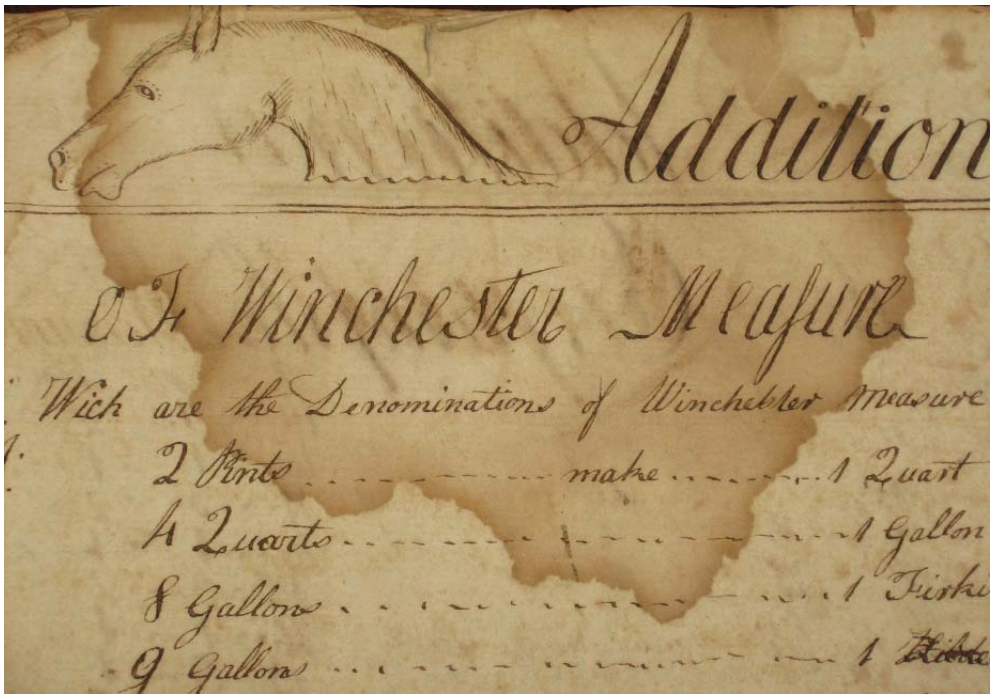
A. It is such as that Medicines are compounded by

Examples

| lb | ℥ | ʒ | ℈ | gr |
|---|---|---|---|---|
| 16 | 11 | 7 | 2 | 19 |
| 18 | 10 | 6 | 1 | 18 |
| 26 | 10 | 5 | 1 | 16 |
| 26 | 11 | 6 | 2 | 17 |
| 62 | 10 | 7 | 2 | 14 |
| 27 | 9 | 6 | 2 | 18 |
| 79 | 8 | 5 | 1 | 16 |
| 64 | 7 | 4 | 0 | 18 |
| 32 | 6 | 4 | 1 | 16 |
| 307 | 5 | 0 | 1 | 17 |
| 290 | 5 | 0 | 1 | 18 |
| 307 | 5 | 0 | 1 | 17 |

| lb | ℥ | ʒ | ℈ | gr |
|---|---|---|---|---|
| 17 | 3 | 6 | 2 | 16 |
| 36 | 2 | 7 | 1 | 14 |
| 23 | 8 | 2 | 2 | 16 |
| 61 | 3 | 7 | 0 | 19 |
| 42 | 6 | 2 | 1 | 12 |
| 61 | 3 | 6 | 2 | 16 |
| 21 | 3 | 6 | 2 | 11 |
| 67 | 3 | 2 | 1 | 13 |
| 79 | 7 | 6 | 2 | 14 |
| 67 | 0 | 4 | 1 | 12 |
| 268 | 2 | 7 | 0 | 6 |
| 440 | 11 | 0 | 0 | 7 |
| 408 | 2 | 7 | | |

These images continue throughout the book, though not in every title. There are drawings of dogs, horses, faces, creatures, and beautifully written titles. Below are a few examples:

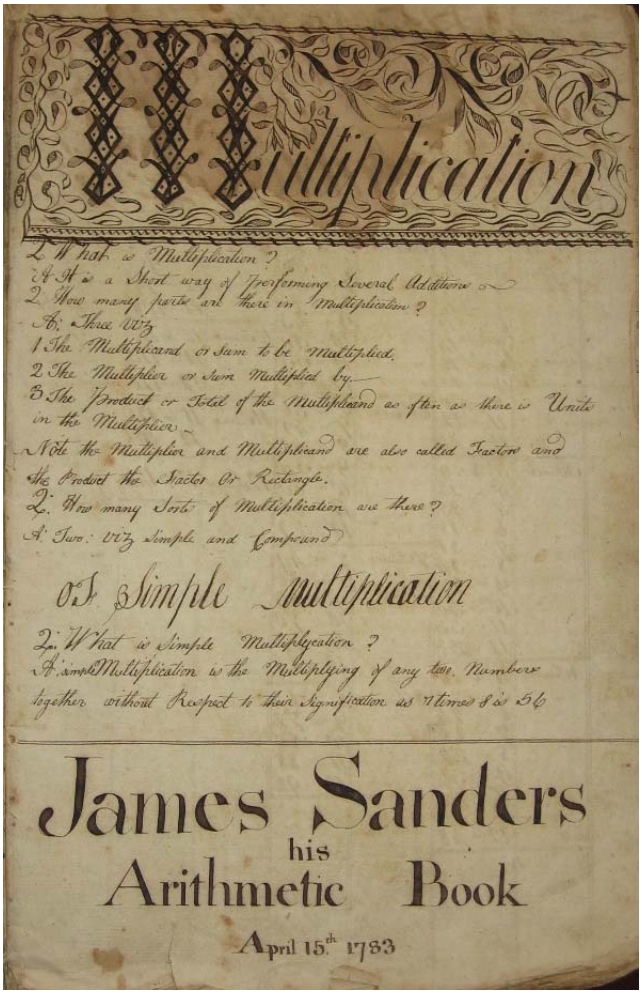


Addition

Examples

| C | | | P |
|---|---|---|---|
| 17 | 11 | | 3 |
| 16 | 10 | | 2 |
| 19 | 11 | | 1 |
| 17 | 12 | | 3 |
| 16 | 19 | | 3 |
| 17 | 11 | | 1 |
| 17 | 11 | | 3 |
| 17 | 14 | | 1 |

Qur
14
16
19
16
17
16
12
37



Multiplication

2. What is Multiplication?
A. It is a Short way of Performing Several Additions
2. How many parts are there in Multiplication?
A. Three Viz
1 The Multiplicand or Sum to be Multiplied.
2 The Multiplier or Sum Multiplied by.
3 The Product or Total of the Multiplicand as often as there is Units in the Multiplier.
Note the Multiplier and Multiplicand are also called Factors and the Product the Factos Or Rectangle.
2. How many Sorts of Multiplication are there?
A. Two: viz Simple and Compound

Of Simple Multiplication

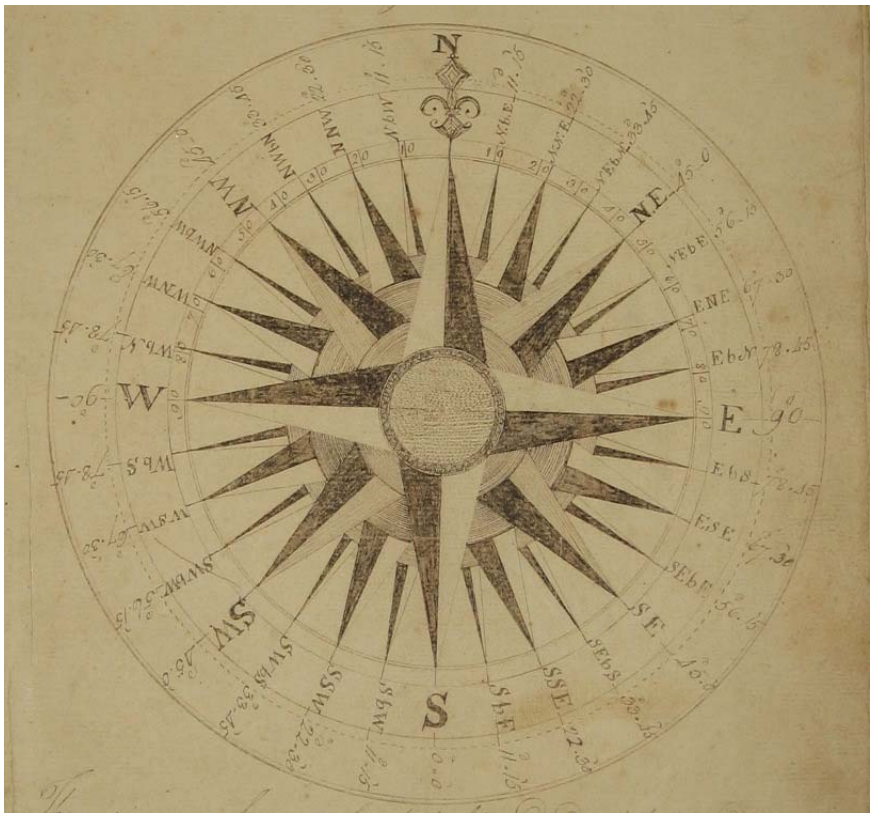
2. What is Simple Multiplication?
A. Simple Multiplication is the Multiplying of any two Numbers together without Respect to their Signification as 7 times 8 is 56

James Sanders
his
Arithmetic Book
April 15th 1783


Often on the bottom of the pages with the date the lesson was taught, Sanders also recorded a brief report on the weather of the day, "being an exceedingly warm day for the season, but turned cloudy in the evening and like for that leafs begin to appear in spring branches and in burnt wood." He also recorded his thoughts on the subjects being taught, sometimes commenting on the level of difficulty he had with it, "This day being the 4th of May 1873, I Ja. Sanders finished Division to my no small comfort". Throughout the book, small writings appear commenting on women, and the maxims which a young man must adhere to, according to "Wood, Abecedarian of Surry County, N. Carolina". The mention of a schoolmaster named Wood is interesting to the researcher because of the possible link to another cipher book within the SHC's collection. Within the Mary Hunter Kennedy Papers (#3242) there is a cipher book attributed to "Bennet Wood School Master" dated 1796, which is described later, but a more detailed comparison of these two cipher books is warranted.

Sanders' book also contains some riddles, an example of which is given below and followed by an intricately drawn compass which was used to illustrate Sanders' ability to read, interpret and construct a compass of his own.

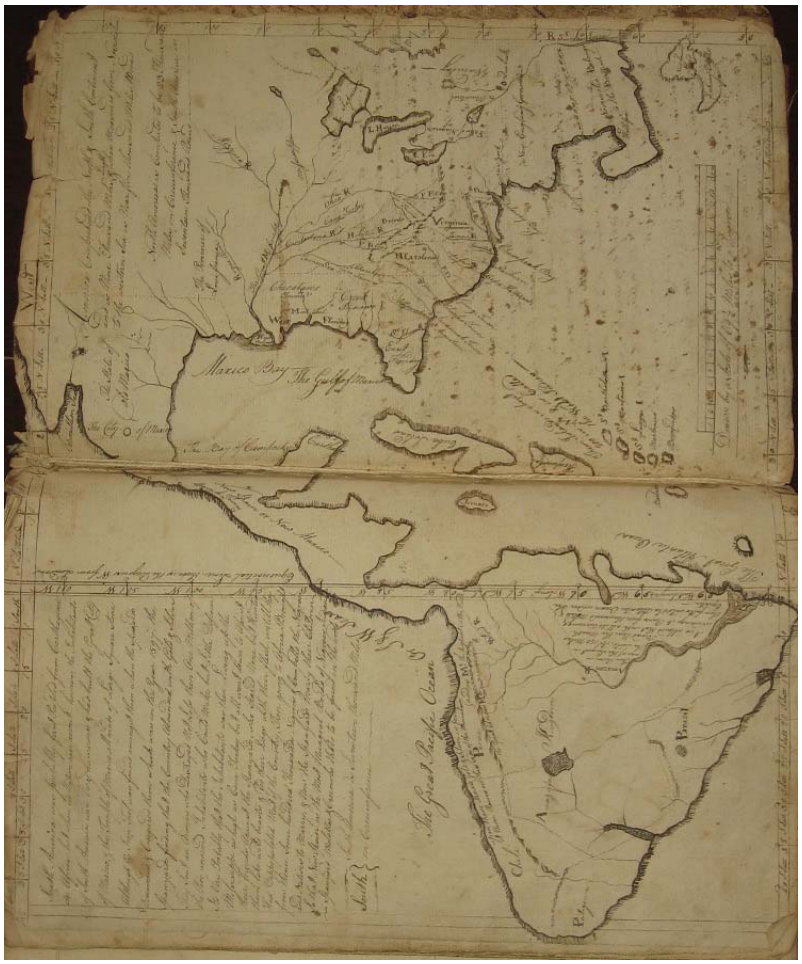
Long before Sol, Had displayed his glorious flame, I was in being I had a name, I was with Adam when his innocent eyes beheld the amazing scenes of paradise, I went with Noah, into the Ark but there I did not stay, I made my escape from that dark place of [sic] the floods I took my way, The God of nature made me free, yet the kings of Earth have laid a tax on me, I am neither sun, moon, nor stars, hail, rain, frost nor snow, yet through the midst of them I must naked go, Now find out this riddle if you can and you shall be deemed a judicious man.




The back of the book holds some other interesting features which should be commented on. One is the statement made by William Hodge before his execution in Oglethorpe County, Georgia as written down by William Sanders, in August of 1799. Hodge was apparently being executed for his many crimes involving stealing, robbing, and counterfeiting. His final words were a plea to those young who were witnessing not to follow in his foot steps and to find good company in which to become involved with. Though it is unclear what William's relationship is to James, it would make some sense

that this was written in the book as a reminder for young men that they are responsible for their actions and an effort to produce worthy members of society.

The second item is a two page spread of the eastern seaboard of North and South America which seems to serve as a geography lesson. The purpose of this map is not entirely clear, though it was created painstakingly detail to illustrate rivers, oceans and some American Indian native regions. Some regions have accompanied statements providing facts about the area. And the larger paragraphs provide facts about the size of the earth and the dimensions of North and South America. The following images represent the map, when turned on its side and a close up of the description given to the Amazon River:




The finding aid for this book does not mention anything in regards to the drawings, diagrams or maps which were so painstakingly crafted into it. The Quince and Watters collection is small, and not frequently used. The existence of this cipher book was virtually unknown to the staff, and hopefully will receive some much needed repair by the resident conservationist.

**#792 William Henry Wills Papers:**

The cipher book in this collection is interesting because it was written by two brothers, one who attended a boarding school in Alexandria, Virginia. Because of the extent of information found about schools in Alexandria, this book could potentially serve as a great resource for anyone interesting in learning more about the student's perspective while at a boarding school in Alexandria. Swain Swift Norman started the

book in 1850 in Washington County, N. C. and his brother Thomas Joshua Norman began using it in 1856 at the boarding school, titling one section, “Thomas J. Norman’s Sums in Algebra, Davies Algebra Alexandria Virginia”. The mathematics lessons involved are more advanced and start with Plane Trigonometry, Dimensions of a Survey Problem, and when used by Thomas Norman, the subjects include Equations of the First Degree, Elimination by Substitution, Elimination by Comparison, and Powers. There are references to chapters and the mention of “Davies Algebra” could indicate the text book being used, as there was a Davies Algebra in print during this time. The book also provides an insight into Thomas’s life while attending Lynchburg College in V. A., presumably after finishing school in Alexandria.

**#1022 Ravenel Family Papers**

The Ravenel and DuBose Families were very prominent planter families in South Carolina, which were joined into one family in the 1850s through the marriage of William Ravenel and Ellen DuBose. The cipher book was written by William DuBose while he attended the Newport Academy in Rhode Island in 1802. The relationship between Ellen and William DuBose is unclear, though the time period of his education, and her brother, Theodore’s birth date of 1785, could make William a brother. The book is nicely written, and provides a page explaining the mathematical characters used in the book (symbols for addition, subtraction, multiplication, division, etc.), and conversion charts for different types of measurements. The subjects include basic arithmetic starting with Numeration, Addition, etc, Rule of Three, Vulgar Fractions, Decimals, Money Exchange (considering monies from Great Britian, Ireland, France, the Netherlands,

Germany, Spain, Portugal, and East India), all written in fluid calligraphy. There is also a table of contents of sorts, listing all the subjects contained within the book and including the page numbers they can be found. DuBose also included a closing statement for each subject, "William DuBose Book Finished, Cloth Measure, 2 April 1802", and at the end of the book a final statement concluding the entirety of the work, "William DuBose's Book began at Newport Academy February 16th 1802, and finished August 8th 1802". These careful notations are an excellent indication of how long students spent on a particular function.

**#1682 Arithmetic Books:**

This collection is probably the most difficult to describe. It is an artificial collection of miscellaneous cipher/mathematic books which were grouped together because they had no other information regarding their authors, or families in which they may have originated. These books, therefore, have no contextual information, and unfortunately are in very bad shape. Most of them are falling apart and are heavily damaged from rodents, insects, water, mold, and time. There are twelve volumes, all by different authors, from various locations, during different time periods. Research about cipher books was started primarily because of this collection. It was considered that if some interesting information could be identified about them, then perhaps an exhibit could made to focus on them, however, because very little contextual information can be identified, these books may only be referenced as cipher book examples. Some of them do contain information not relevant to mathematics, such as family data and remarks about purchasing slaves.

The first volume is from Orange County, N. C., and dated 1793-1794. It contains basic arithmetic, including Addition, Subtraction, Multiplication, Division and Reduction of weights and measures. There are various names of a Thompson family recorded throughout the book and inserted pages of writing practice of the alphabet and signing names. Some of the writing varies drastically between a fluid hand and childish scribbles and obvious doodles, indicating the ages of the children who had access to the book, and sometimes writing birth dates. As is common with almost all cipher books, this volume shows evidence of being bound after it was written, as some of the pages are sewn in upside down and out of order.

Volume two is undated, and no location could be identified. The student of this book was most likely known by the last name of Fowler, as the subject titles are usually followed by the words “by Fowler”. The subjects include Promiscuous Questions, the Double Rule of Three, Practice, Interest/Discount, Tare and Tret, Barter, Loss and Gain, Partnership, Exchange of Money and Vulgar Fractions. Throughout the pages, the lessons are garbled by other computations, as though someone needed a mere scrap of paper to workout a solution to a problem written elsewhere. There are also references to possible texts such as Perkin’s Arithmetic, and, “Field Notes for George Palmer by William Shell on acreage” which may indicate that this book was also used to record information for a surveying job conducted in the following years.

Volume three is also undated, and possibly from Virginia, though there is no direct evidence to confirm this. This book was created by John B. Bobbitt, in the same style as Ludwic Summers, showing strings of numbers to be continued and carefully written problems to be solved. The book covers basic arithmetic, from Numeration

through weights and measures, Vulgar Fractions, Gauging, and Square and Cube Roots. Some later problems are written in the form of riddles.

Volume four is dated 1829, by Henry Grayson of Wythe County, Virginia. Grayson has made some attempts at artwork, trying his hand at decorative boarders and more intricate calligraphy, and there are a few rough sketches of plants and birds. The arithmetic is basic, following the same order as many listed above, including functions for weights and measures, not advancing past the Double Rule of Three.

The fifth volume bears the date of 1835, and the name of Ann Maria A. Bixler. The arithmetic is fairly simple, but starting with Long Division and continuing with basic functions of addition, subtraction, etc of Federal Money. The lessons end with the Rule of Three. What is interesting about this book, is the sporadic poems written in the margins of the pages, which usually have a morbid quality to them:

Lines on the Death of my much beloved infant
I laid my hands upon her brow and it was damp and cold
Her deep blue eye was glazed and fixed, the fearful tale was told
I gently pressed her little lips, I felt her parting breath
I gazed upon her little face I asked can this be death?
I laid her little body down the vital spark had fled
I gazed upon my child the lovely and the dead

Other poems like this one refer to a sick child who is now out of pain, and the torment of wanting to morn her death, but the relief of knowing she is no longer suffering. It is unknown if Bixler wrote these poems about her own experience with losing a child, indicating her possible older age as a student, or if the poems simply spoke to her because of the conditions she experienced in life, possibly losing a younger sibling, or knowing of young children dying from a spreading illness in the area.

The sixth volume is dated 1842, but does not appear to have been identified with any particular person, though there are names and ages of other children. The arithmetic is simple, starting with Numeration, weights and measures (though calling "Time" by the completely different title of "Division of the Circle"), and concluding with Reduction and Interest. This book however does provided brief accounts of the weather for particular days the lessons were taught. This information could be interesting if the location could be identified, but unfortunately no indication was found.

Volume seven is dated between 1799 and 1806, under the names Angus, Neil, and Alexander Cameron of Moore County, presumably North Carolina. Fortunately, it is known that this book was given as a gift to the SHC by Orton Cameron of Sanford, N. C., indicating a strong provenance. It is assumed that Angus, Neil and Alexander were brothers, though no actual birth dates were recorded, and that they shared the book. The lessons begin under Angus's name and continue with Neil's though no obvious transition was noted. The lessons focus on basic arithmetic and advancing through Position, Arithmetical Progression, Geometrical Progression, Reduction and other simple function of Vulgar Fractions, and concluding with Plain Sailing, Trigonometry, Navigation, Geometry and Surveying. Alexander's name becomes apparent within the Geometry section. Other names are written throughout the book, sometimes upside down, which may have occurred through the time the book has been handed down. The applications for instruction seem very straight forward and practical, possibly indicating a more vocational approach, though this is speculative. The tables and diagrams toward the end of the book are nicely drawn, and include a calendar for the days of the year.

Volume eight is from Lincoln County, N. C. dated 1842-1843. It is thin, covering only the few subjects of Geometry, Trigonometry, Surveying and Dialing. The book is

titled, “Practical Geometry, Trigonometry and Surveying by R[ufus]. M[ilton]. Derr”. The presentation of the subjects and the instruction which accompanies them makes this particular cipher book appear to have been used more for instruction than the creation of a student. Because it is relatively thin and only covering a few pages, there is not enough information to make a plausible theory as to its purpose. There is a reference to John Gummere’s text entitled *Gummere’s Surveying*, which may also indicate that this was a book designed for use by a teacher.

The ninth volume was created between 1829 and 1838, apparently from Person County, N. C., by Jefferson Whitfield, born September 13, 1813. This book was donated to the SHC by Whitfield’s grandson, D. G. Whitfield. The book contains instructions for simple arithmetic, through Decimals, Square/Cube Roots, and Computing Interest. There is the possibility of a connection between this volume and another in the Miscellaneous Student Notebooks (#3286), which refers to a “Whitefield School” in Person County, and is dated 1829. It could be possible, with further investigation, to identify if this volume has any relation to the school mentioned in the other collection, which bears a very close resemblance to the student’s name.

Volume ten is in two sections and in severe disarray. It is dated between 1817 and 1830 with the name William Clark Hinshaw. The arithmetic starts with weights and measures, Fellowship, Proportion, Vulgar Fractions, Rule of Three Direct and Indirect, Decimals, and Alligation and continues into Geometry. He does make some personal notations about his future, mentioning that he expects to cross the Rockies by 1844, and he apparently used some of the pages in the back for drafts of letters.

The eleventh volume is from Nansemond and Southampton Counties in Virginia. It is dated between 1807- 1809, with lessons covering basic arithmetic through the Rule

of Three and including Gauging. The name of the student is hard to identify, but appears to be something similar to Joseph Pretlow. The only other features in the book are some birthdates written in the back of the book, and some small attempts at drawing Herons.

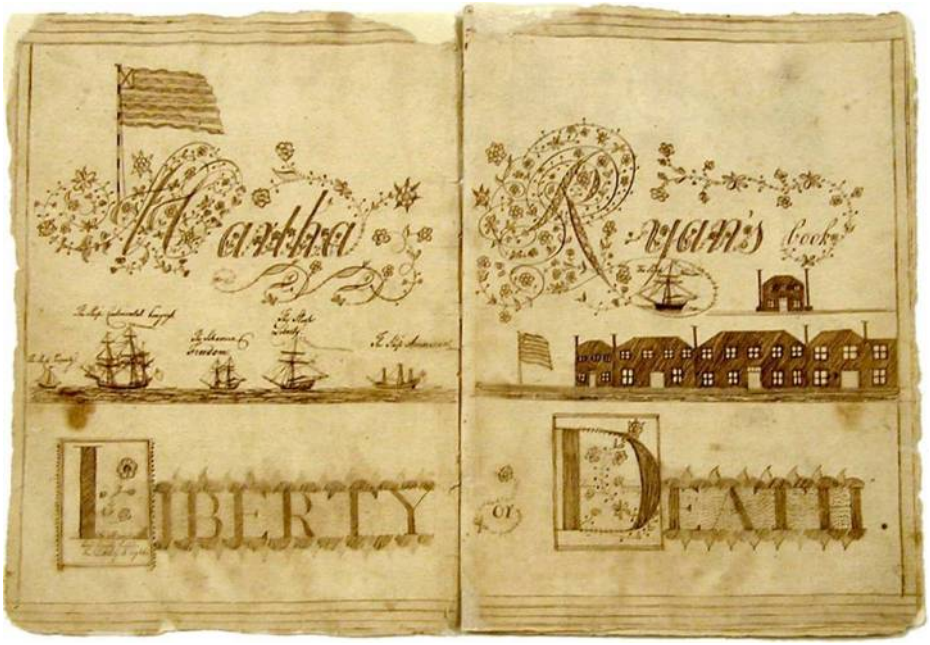
The final volume in this collection, volume twelve, was written by William Weston Utley of Wake County N. C. He was born in 1795, and began the book in 1812, completing it in 1815. The mathematics are basic, consisting of Numeration, Addition, Subtraction, Multiplication, Division, etc, through the Rule of Three, Reduction and some work with Fractions and concluding with Geometrical Progression. There are notes on weddings and other matters and some vague remarks on the purchase of slaves.

**#1940 Martha Ryan Cipher Book**

Martha Ryan's cipher book is one of the SHC's most prize collections. It typically resides in the conservationist's office undergoing continual repairs and extensive conservation work started a number of years ago. Martha's book is truly remarkable. It is by far the most ornate, with delicate artwork gracing each page of every lesson. It was used by Martha and her sister Elisabeth Ryan, between 1777 and 1781. This book is incredibly difficult to describe because of the detail and amount of work that went into each page to make it unique and beautiful. Not every page was available for study by this researcher, as the conservationist was apprehensive to let go sections she was continuing to work on. The arithmetic in this book is fairly basic, starting with Numeration, Addition of Whole Numbers, Subtraction, Multiplication, Division, Reduction, and continuing each with different weights and measures, through to the Rule

of Three (Direct, Indirect, and Double and Inverse), Fellowship, etc, and continuing through Profit and Loss, Alligation and Vulgar Fractions.

The first page, shown below, is a familiar site to many who have experience with the SHC, as they tend to use this image frequently for publications and for exhibit purposes.




This image is a perfect example of the artwork throughout the book, but does not show any of the mathematical content within it, which is substantial. The titles of each subject are often written in the delicate flowery style of Martha and her sister Elisabeth. It is generally believed that this book was started when Martha was eleven years old, but her birth date was not found in the sections available for study, so this could not be confirmed. According to the finding aid, the Ryan's were believed to have been from Perquimans County, North Carolina, but upon closer observations, the only county which is made reference to is Bertie; across the river from Perquimans County. The influence of Independence is obvious throughout the book, with poems about particular ships and

their fearless fighting, and occasional references to Generals who fought and died, as illustrated in the following image:

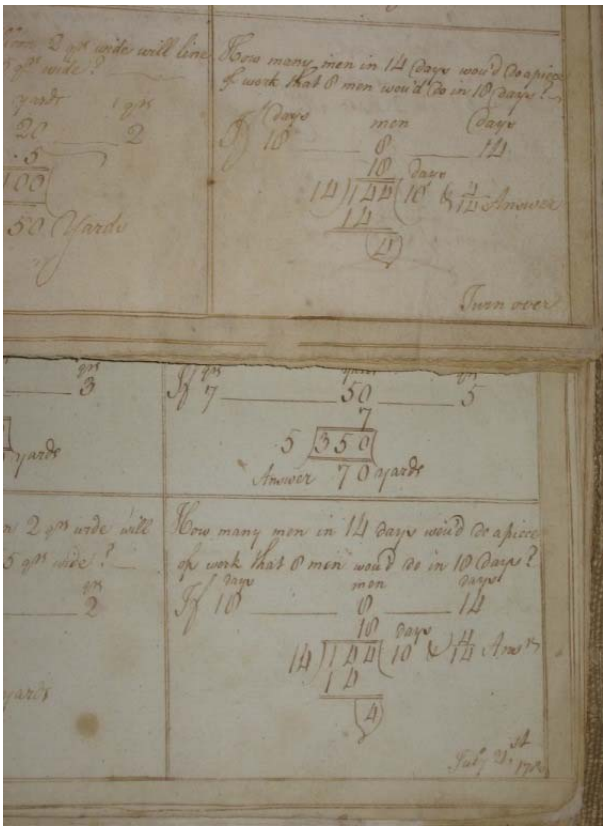

Here, within the “M”, Martha provides a quick tribute to a fallen General: “A.D. 1775. The Brave General Montgomery in defending the rights of America fell at Quebec.” At least 34 named ships have been identified and delicately represented within these sections of the cipher book, some bearing the names, “The Ship Martha” and “The Schooner Elisabeth”. Because of the lack of information regarding the Ryan family, this raises questions about the connections the family may have had to the shipping industry, and the battles which took place in the War for Independence. One ship is identified as coming into harbor for repairs after losing its foretop mast, and another, the largest drawing of a ship, is drawn on the verso of the title page for Indirect Proportion and has a poem dedicated to her and her captain:

The Brig Standall: Commanded by Captain Fearnot
Our Brig's prepared to go
And arm'd with men of might
Our enemies to over throw
In them we'll take delight.
We'll make our enemies to know
Of them we're not afraid
Our sails shall spread to cruise the seas
And to protect our trade.

So Fearnot is my name
No danger will I dread
I'll make the tyrants bend to me
Or soon I'll strike them dead
Farewell my friends to you
Till I shall come again
My foes I will subdue
No British tyrants reign

Finis, January 31, 1781

There is direct evidence that both girls took precisely the same lessons and created their own books, which were eventually bound together. Following the first quire, ending with Single Fellowship, another, slightly larger, quire begins with Addition of Whole Numbers and starts through Addition, Subtraction, Multiplication, etc, all over again. Upon comparing the quires, the problems are identical. In the following image, the page at the top is by Martha Ryan, while the lower page is by Elisabeth. Elisabeth dated her page, July 21st, 1781, however, Martha's initials and name has also been written on pages within the same year, though her name also appears on lessons as early as 1777.




There are questions that arise about whether the girls learned the same lessons at the same time, or whether one was learning from the other. It is unfortunate that more information is not known about the Ryans, however, along with some examples of Discount, Elisabeth did record that she was the daughter of James and Ann Ryan, which

may prove with further research in identifying her family and their work in Bertie County.

**#2005 Archibald Ray Black Papers:**

There are two cipher books in this collection and according to an inscription within the first book, written in 1884 by W.A. McDuffee, the first volume was created by James McDuffee in 1816 and 1817. There are references to Black River, which forms the Bladan and Pender County line in North Carolina. It is known that James McDuffee was Archibald Black's father-in-law, and that A.R. Black acted as McDuffee's executor in concerns of land and money. The book features basic arithmetic, Addition, Subtraction, Multiplication and Division of weights and measures, Reduction, Rule of Three, Practice, Interest, Rebate/Discount, Barter, Loss and Gain, Fellowship, Double Rule of Three, Alligation, and Vulgar Fractions. Almost every subject is dated, providing a fairly good estimate for how long each lesson was studied. In the section devoted to Practice, there is some evidence to support the before mentioned method only being given a problem every other day to work on and solve.

The second volume is attributed to Catherine Jane Murphy, between 1825 and 1826. It is very similar to the first volume in layout and the lessons it contains, though starting with Multiplication and ending with Barter. It is believed that she may have died in 1876, as there is reference to the execution of her will bearing that date. There was no other information provided.

**#2391 Roberty Lazenby Papers:**

There are two volumes in the Lazenby papers both of which seem to have derived from Iredell County. According to the finding aid, Lazenby was a schoolmaster and farmer in Iredell County and the collection represents him and his descendants. Only one of the books is dated, though the entire collection dates from as early as 1786. The first book is in bad condition, and actually shows signs of being used by a mouse as a nest. It is thin, and only contains arithmetic lessons for the Rule of Three, Double Rule of Three, Inverse Proportion, and Practice. It does bear the name Keriah E. Lazenby, but no other information could be identified.

The second volume belonged to Robert Lazenby, with the date of 1802. It is possible that this was his student notebook. It includes lessons for Numeration, Addition and Subtraction of Integers, Multiplication, Division, Weights and Measures, Reduction, Rule of Three, etc, through Money Exchange, Alligation, Single Position, and into Geometrical Problems, Cross Multiplication, and Surveying. This book is similar in layout to Ludwic Summer's book, with strings of numbers to be continued and evidence of problems given by a teacher. It also has similarities to the Quince and Watters book, in types of land areas used in surveying and the diagram of a compass.

**#2493 Hobbs and Mendenhall Family Papers:**

Shared by two brothers, Stephen and Richard Mendenhall possibly of Guilford County, the inside cover of this volume is dated 1798, while the Geometry section is dated 1797. Subjects are recorded in a question and answer format, and include Addition and Subtraction of money and weights, Multiplication, Geometry (some labeled

"Geometrical Problems York Town"), Logarithms, Decimals, Multiplication and Division by Logarithms, Evolution and Extraction of Roots, Proportions, Plane Trigonometry, and Surveying. The Surveying section does include a Survey of York Town, which may have been for practice. This volume also includes poems written by other Mendenhall family members, and one entitled "Queen Victoria's Daughter is 40 Days Old", with the date January 1, 1841.

**#2711 George Washington Allen Papers:**

There are three volumes in this collection all belonging to Francis A. Wheat, while he was at the Franklin Academy in Upson County, Georgia. According to the finding aid, there were members of the Allen family who were school teachers, but not apparently on the Wheat side. The first volume is dated July 15, 1828, and begins at the Rule of Three. It continues with Federal Money, Inverse, Tare and Tret, and Simple Interest. There is one drawing of a house, and the book itself was nicely made, with good penmanship and solid lines. There are notes from Francis about his reasons for not completing an assignment; an essay on a given subject which he either does not understand or feel strongly enough to support it:

> The reason for my nonperformance in writing on the subject which was chosen for me is that I felt and unwillingness to support it. – Francis A. Wheat.

There are a few of these statements written throughout the book, addressing the reader, which could be indicated for the instructor, or could simply be a way for Francis to express quietly his dislike for the work.

The second volume is dated July 5, 1831 and contains Geometry, Surveying, Trigonometry (By the Square Root) and Surveying by Logarithms. This book is also nicely written, and includes an index and appendices for reference. There is at least one note pointing out a mistake in a calculation, though it is unclear whether this was made by Wheat or his teacher.

The third volume is more of a section, titled "Part II of the Chain", and giving instruction for "How to take the survey by the Chain only" and providing rules and examples for the "Protractor of Heights" and of "Distances", the "Contents of Ground", "Computation of Areas", "Division of Lands" and "Leveling" and finally, the "Variations of a Compass". This was most likely a quire of another book, or originally part of one of the previous two books. It is dated 1831 with Wheat's name, and concludes with one inscription on the final pages that reads, "Mr. F. A. Wheat discontinued school 2nd September 1831".

**#3242 Mary Hunter Kennedy Papers**

The family and the collection are from Iredell County though only one of the seven cipher books included mentions any county at all. The first volume is dated 1821 and seems to have been used by two individuals whose relationship is unknown: W. B. Hampton and Lucy M. Houston. The layout of the book is similar to Ludwic Summers' and actually has some of the strongest evidence for having the book written by the instructor and then filled in by the student. There is another possibility that the instructor was Lucy Houston, and the student was Hampton, as the lowercase "I's" in all the titles are dotted with little drawing of flowers, but this is purely conjecture. The lessons

involve mostly weights and measures, and basic arithmetic, through Division and Reduction.

The second volume is in very poor condition, containing the name of John A. Young and the date 1831. Though the binding is falling apart, the quires are still strung together, though inaccurately, with some sections bound right side up, and then upside down and completely out of order. The lessons are a bit more advanced than typically found, though the order of the book makes it difficult to follow. The dates at the end of the book start with 1831, with Subtraction and Multiplication of Fractions and advancing into more advanced mathematics with Practical Geometry, through Trigonometry, Mensuration, Surveying, Promiscuous Questions, Alligation, Composition, Assumption with the use of Algebra, Reduction of Vulgar Fractions into 1833.

The third volume is titled, “Thomas Franklin Houston’s Exercise Book of Geography, Algebra and Arithmetic, 1833-1837”. The subjects include Promiscuous Questions, Geographical Problems, and the “Resolution of Equations by Algebraic Equations”. It is possible that Thomas and Lucy are siblings, though there is nothing evident which confirms this. The problems in this cipher book often refer to Latin and Greek historical persons and there is some use of these classical languages along with shorthand within the text. There is one drawing of a young woman with a parasol, which is followed by the following verse, “Fair Lady, Put your parasol over your head, or you may have your beautiful white face sunburned”. There are some loose pages written by Houston on the importance of gratitude and proper mathematics.

Volume four is attributed to Samuel and Andrew Mitchell and dated 1805. It includes fairly simple arithmetic, beginning with Multiplication and Multiplication of Money, Division, Reduction, Ascending and Descending of Weights and Measures and

Time, up to the Rule of Three, and Practice. There may be evidence of a correction with the phrase, “Let down wrong” on one of the practice problems in the Division section.

Volume five is a small gathering of paper, undated and unnamed. It does contain mathematics, yet the layout is completely different, almost more of a solution book. The pages only refer to page numbers, most likely out of another text, theorems and cases, but no actual instruction.

The sixth volume is undated, except for one date, 1796, recorded by Bennet Wood, who also identifies himself as a schoolmaster. It is this cipher books which would make an interesting comparison to the before mentioned book by James Sanders in the Quince and Watters Collection. The volume starts with Vulgar Fractions, continues with Reduction, Decimal Arithmetic, Square Root, Mensuration, Solid Measure, Instrumental Arithmetick, and Surveying by Instrument. This book may the only book in the collection to have been properly identified as a cipher book created by a teacher, presumably for the purposes of teaching. Following the instructions for Vulgar Fractions, he did provide the following note:

> These I might proceed to Addition, Subtraction, Multiplication, Division, The Rule of Three, etc, all in Vulgar Fractions, but as it would be both time lost and paper wasted I shall therefore show a never failing rule to turn all vulgar numbers into decimals where you may work them with as much ease as if they had never been in fraction.

The final volume in this collection is known to be from Iredell County and bears the name of Thomas A. Sharpe, 1814. The arithmetic includes Reduction, the Rule of Three, Practice, Interest, Reduce/Discount, Equation of Payments, Loss and Gain, Fellowship, Double Rule of Three and Mensuration of Superficies. The book itself is in

poor condition, and has the appearance of being messy. There are a lot of doodles, but none which stand out as truly artistic.

**#3286 Miscellaneous Student Notebooks:**

Both volumes in this collection are believed to be from Person County, North Carolina, though only one has the county written upon its pages. The first volume was written by Sydney O'Briant in 1825, and continued by James O'Briant in 1850. Both of these students are believed to have attended the Whitefield School in Person County, though no actual evidence was found to that effect. The arithmetic in this volume begins with Addition of weights and measures, Subtraction, Inverse Proportion, Promiscuous Examples, Practice, Interest, and Insurance Commission and Brokerage. Some lessons are followed with brief weather reports, and the book shows clear evidence of having been written by another for the pupil to fill out. Later, there appears to be attempts of the student in writing the lessons himself. It is interesting to note that this volume is accompanied by an article clipping and Xeroxed copies of photographs (which have been removed to Photographic Services) of the one room building which used to serve as the Whitefield School. Whether these were in the cipher book originally is not clear, but these may be why the book is believed to have been from the school.

The second volume belonged to James William O'Briant, who is presumed to be the same James O'Briant as above. The book is dated 1849 - 1860, and tells us that James O'Briant was born June 10, 1836. In addition to the mathematics lessons, this volume also contains notes on family history, the weather and other information. It includes the same subjects as the first volume, and some problems are identical between

the books. This may indicate that one was used in instructing the other, or that they were created from the same text. This book also uses some blue ink, which is unusual. A poem entitled, “C.M. Parting Hymn, 1856” and some bonds from Prospect Hill, Caswell County, North Carolina are written toward the end.

**#4187 Bessie Daniels Papers:**

This collection consists of the Daniels’ family papers of Person County, N. C., and this particular book was written by Allen H. Lunsford, though no direct relationship could be established. It is dated 1837-1841, and includes arithmetic fairly common in all these cipher books, starting with Addition and other simple functions and giving rules and practice to be used with weights and measures, through the Rule of Three, Vulgar Fractions, Square and Cube Roots, Alligation, Positions, and into Geometrical Progression, Bonds, and specific types of Gauging, such as “to Gauge a Rum Hogshead” and “to Gauge a Corn House”. It follows the same style as the Ludwic Summers book, providing more evidence of the book being pre-written for the student to fill out. This text does feature the use of a more yellow ink in designing the tables and subject titles.

**#4689 James Benson Papers:**

There are two volumes in this collection, both from Hyde County, North Carolina, and dated fairly close to one another, between 1841-1847 and 1842-1846, respectively. Both are written by Rueben Benson, which begs the question of why there were two books by the same student during the same time period. It is possible that these books

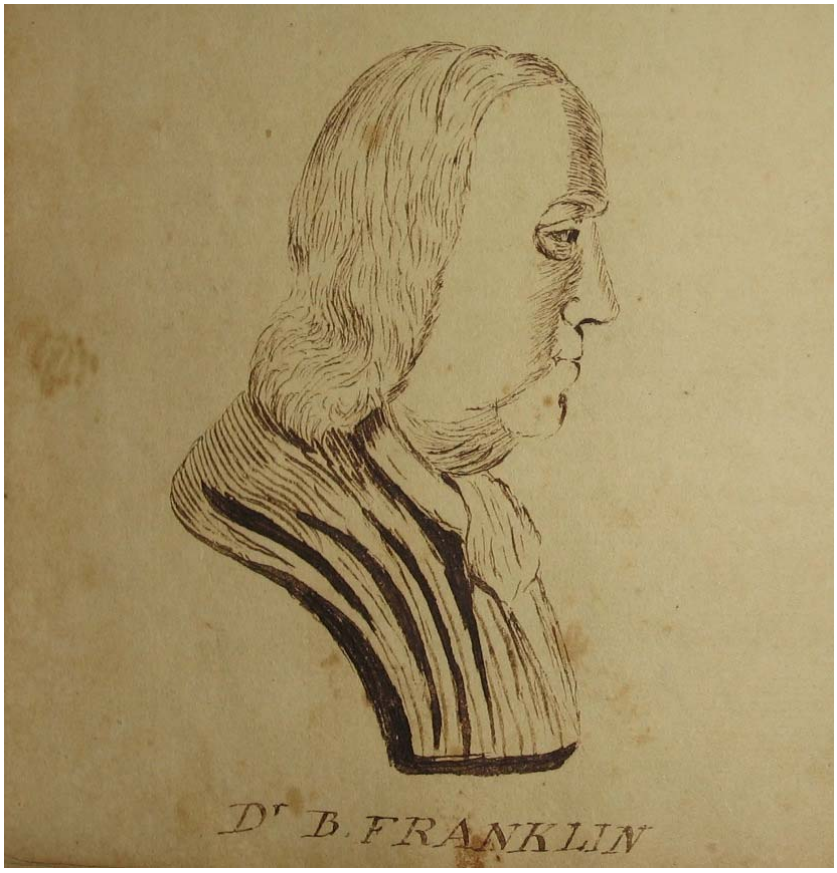
were incorrectly organized before being sewn together, making them into two separate but complimentary cipher books. Both books cover some of the same subjects, like addition, though this could be attributed to them being improperly bound. The first volume begins with Addition, Reduction, Multiplication, Division, Decimal Fractions, Rule of Three, Inverse Proportion, Vulgar Fractions, Practice, Tare and Tret, Fellowship, Interest, Algebra, Proportions and Progressions, and ends with writing practices. The Proportions and Progressions section did refer to a "Chapter VII", a style in titles which had not been used previously in the book, so this is assumed to be referring to another text.

The second volume also contained Addition, Subtraction, Multiplication, Decimal Fractions, Rule of Three, Vulgar Fractions, and many more of the same subjects above, but also including Square and Cube Roots. In this book, he does make two interesting notes, one which may be an indication of a text used in his study or his teacher's name: "This is the last sum of Daball's Arithmetic done by Rueben Benson in the Year of Our Lord, July 17, 1886"; and the other finalizing the completion of the cipher book, found on the last page: "I consider this Book Finished by me Rueben Benson in the Year of our Lord July 17$^{th}$ 1846, Finis, The End".

**#5144 Harrison and Smith Family Papers:**

The final cipher book to be examined is the Harrison and Smith book and it is one of a kind in the SHC collections. It is a fairly new acquisition, which was received as an addition to the papers in 2005. The book is bound in leather boards, which are disintegrating, and several of the first pages are missing, but most of the book is till in

tact. There is an inscription on the inside cover which reads, “A Treaties on Mathematics in General by My Grandfather Benjamin Spyker of Tennessee Originally Reading Pennsylvania”. This cipher book is not a really a cipher book at all, but a text book in the making. It is a 300 page volume analyzing mathematical functions, and comparing the works of several published mathematicians. No date could be found, but with closer observations, it is possible that a time period could be identified. There are countless drawings and ornate titles, some of which infer Independence, and mention names, but those are not enough to identify the source of their inspiration. The first page, which is in shambles, having been eaten away by iron gall ink, depicts a portrait of Pythagoras, and within the text of the book there are two drawings of Benjamin Franklin:


Dr B. FRANKLIN


Dr BENJN FRANKLIN

These images represent Spyker's influences in his work, and could also indicated the time period in which he wrote the book, but it is unclear if he was a contemporary to Franklin or a student of his works.

The mathematics described in this volume are scrutinized and not directly intended for an average student's study. The subjects are more advanced than seen previously, and Spyker is not instructing anyone in doing the arithmetic, but rather studying the instructions of others and using a critical eye on their theories and providing demonstrations of his own thoughts and practices. Almost every page depicts some drawing, either of plants, humans or animals, though animals are most prevalent. The first pages of the book feature the images shown below:

Though this is not the true beginning of the book, because of the unfortunate loss of a few previous pages, this does give us a clue as to world Spyker was living in, and the level of mathematics in which he began his study. A close up of the image on the left page is shown below to illustrate the amount of detail he put into his artwork:

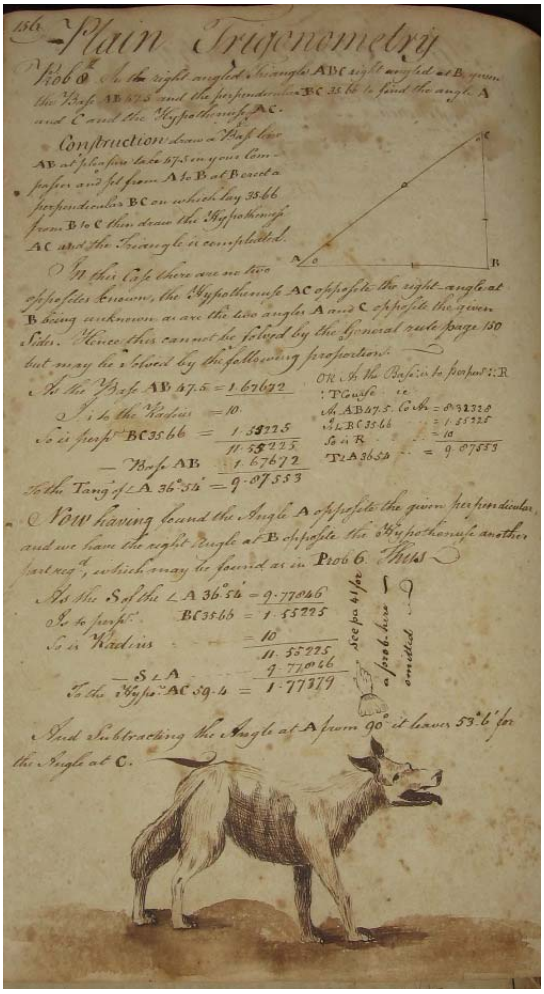
Spyker continues his investigation of mathematics through Contracted Multiplication of Decimals, Division of Decimals, Contracted Division of Decimals, Extraction of the Square Root, Extraction of the Cube Root, Another Method Extracting the Cube Root, Multiplication of Feet, Inches and Parts, Geometry, Promiscuous Questions, Mensuration of Superficies, Mensuration of Solids, Logarithms, Sines Tangents and Secants, Trigonometry, Dialing, Surveying, Correcting Fieldwork, Tracing of Old Sines, Laying out New Lands, Practical Questions, and ends his book with a detailed index of terms, problems and titles.

On many occasions, names of noted Mathematicians like Gummere, Dilworth and even Euclid are mentioned in analyzing their different techniques of instruction and their solutions in solving the problems and examples they provided.

In reflecting on the literature in the beginning of this paper, there is the possibility that this volume served as Spyker's dissertation on mathematics, if he attended a university or college. Though there is no information on Benjamin Spyker in the Harrison and Smith Family papers, it is known that Aristides Spyker Smith (1809-1892) was a minister and principal of women's schools in Virginia and Mississippi, and may have been influenced by Benjamin Spyker, though their relationship has not yet been established.

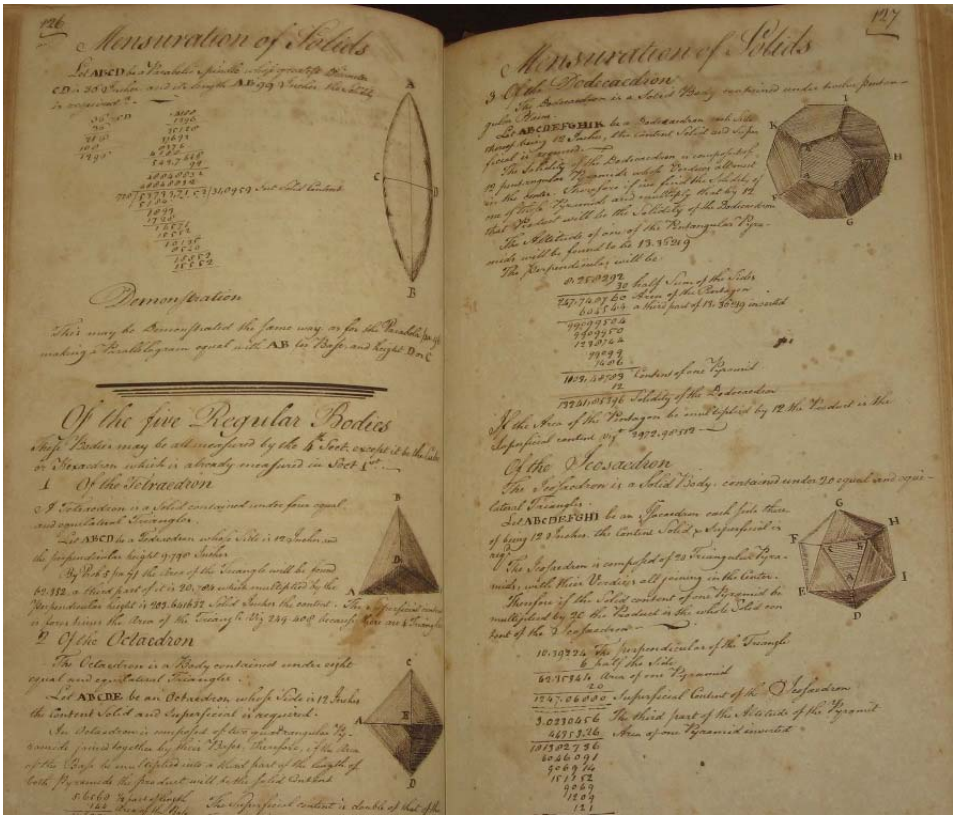
The majority of the drawings are depiction of various animals, which seem to have no apparent significance to the problems being worked, unlike the Tillman book described earlier. These drawings appear to be for Spyker's benefit only, and the reasons used to select certain animals cannot be known.


There are images of swans, lamas, monkeys, dogs, horses, lions, doves, herons, cats, rats, mice, fish, sheep, beavers, pigs, boars, bobcats and the list continues. The creature shown in the following image could not be identified, and is presumed to be a variant of a dog, or bore, though it bears no resemblance to the other drawings of these animals.




One of the most interesting images, which again, cannot be explained, is a drawing of death, followed by the words “Death is finis”.


The only sections of the book which do not usually depict fanciful drawings focus on geometry, dialing and superficies. These pages do have images, but usually involve diagrams and geometrical objects for use in study or demonstration. Below are two page images as examples, one from Mensuration of Solids, and the other from Dialing:



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## Mensuration of Solids

Let ABCD be a Parabolic spindle or Solid generated by the Revolution of the Parabola ACB about its Axis CD. Suppose CD = 20 Inches and AB 9.9 Inches. Then the Solid is required.

Demonstration

This may be Demonstrated the same way as for the Parabolic Spindle by making a Parallelogram equal with AB to Base and Height DnC

## Of the five Regular Bodies

These Bodies may be all measured by the 4th Sect. except it be the Cube or Hexaedron which is already measured in Sect 1st.

### 1 Of the Tetraedron

A Tetraedron is a Solid contained under four equal and equilateral Triangles.

Let ABCD be a Tetraedron whose Side is 10 Inches and the perpendicular height 9.790 Inches.

By Prob 5 to find the Area of the Triangle will be found 43.332 a third part of it is 14.444 which multiplied by the Perpendicular height is 283.661832 Solid Inches the content. The superficial content is 173.328 Inches the Area of the Triangle 43.332 multiplied by 4 the number of Triangles

### 2 Of the Octaedron

The Octaedron is a Body contained under eight equal and equilateral Triangles.

Let ABCDE be an Octaedron, whose Side is 12 Inches the Content Solid and Superficial is required.

An Octaedron is composed of two quadrangular Pyramids joined together by their Bases. Therefore, if the Area of the Base be multiplied into a third part of the Length of both Pyramids the product will be the Solid Content

5.6569 Area of the Base

The superficial content is double of that of the

127

## Mensuration of Solids

### 3 Of the Dodecaedron

The Dodecaedron is a Solid Body contained under twelve pentagonal Plains

Let ABCDEFGHIK be a Dodecaedron each Side thereof being 10 Inches, the Content Solid and superficial is required.

The Solidity of the Dodecaedron is compounded of twenty Pentagonal Pyramids which Bases is almost 12 pentagons. The Superficies of the Pyramids is almost equal to the Superficies of the Dodecaedron, therefore if the Solidity of one of the Pyramids be found and multiplied by 20 the product will be the Solidity of the Dodecaedron

The Altitude of one of the Pentagonal Pyramids will be found to be 13.35219

The Perpendicular will be

0.25 Half Side of the Side

247.7407 Area of the Pentagon

6031.40 a third part of 13.35219 inverted

1.29.3.5709 Content of one Pyramid

12

1549.2509 Solidity of the Dodecaedron

18591.0108 Superficial Content of the Dodecaedron

### 4 Of the Icosaedron

The Icosaedron is a Solid Body contained under 20 equal and equilateral Triangles.

Let ABCDEFGHI be an Icosaedron each Side thereof being 12 Inches, the Content Solid and Superficial is required.

The Icosaedron is composed of 20 Triangular Pyramids, which Heads Vertices all joining in the Center. Therefore if the Solid content of one Pyramid be multiplied by 20 the Product is the whole Solid content of the Icosaedron

10.39224 The Perpendicular of the Triangle

6 half the Side

60.35841 Area of one Pyramid

20

1207.0682 Superficial Content of the Icosaedron

3.0210456 The third part of the Altitude of the Pyramid

4.853.36 Area of one Pyramid inverted

1087

## Dialing

Prob 6 To make an East Direct Vertical Sun Dial

Prob 8 To make a direct Meridian Vertical Sun Dial

Prob 10 To make a Horizontal Dial

Prob 11 To make a moveable universal Sun Dial

Fig 6

Fig 8

Fig 10

Fig 11

Overall, this book is not only unique because of the artwork it contains, but in its entirely different approach in representing mathematics. It is a math book, but not one meant for the everyday student, or at least not yet. It is entirely plausible that this book is a text book in the making; a book which was intended to be used for instructing students, but it does show errors, and areas which Spyker wished to return to for more investigation. It could also be a dissertation of his study of mathematics while attending a university, possibly even Harvard, but there is too little information at this time to be sure.

# CHAPTER FOUR: CONCLUSION

Cipher books contain a great deal of information, not necessarily valuable on its own, but possibly invaluable supplemental information for understanding more about the people who created them. There are substantially more questions that arose from this investigation into cipher books than were answered, but that was in some ways the purpose of this research. The goal was to provide more information about cipher books than has been previously recorded and to hopefully entice further research. These books are not just math books, exercise books, workbooks, or notebooks, but records of individual lives, thoughts, inspirations, and frustrations.

The Southern Historical Collection contains approximately 53 cipher books which are available for study. All these books represent the educational elements of the day, and for a subject that was not heavily studied according to the literature, there are some amazing records which still survive. It is surprising that there are books created by young women from as early as 1777, when sewing was believed to be a much more practical skill. It is possible that these ladies were from more prominent families, who knew the advantages of educating their daughters, and, as in the case of the Ryan sisters, were very knowledgeable about the goings on of their country in such a tumultuous time.

The volumes at the SHC are rich with variety, and would make interesting comparisons to one another on the methodology and problems used in instruction. In comparing cipher books to available text books of the time, there may be enough information to identify which texts were used in the classrooms, or by tutors. There may

be various links between the large numbers of books from Person County, and perhaps that county had a stronger school system than other neighboring counties. These books could provide insight into not just mathematical study, but education in general. They could impact what scholars currently know of how young women were treated and educated in the South, as compared to the North. And they could be another avenue to answering more about the educational system of the time, instead of relying primarily on textbooks, and the few personal accounts.

Some of the cipher books in the SHC are clearly more decorative and intricate than others, and the reason for this is unclear, though upon reflection, there does seem to be a correlation between the older books and the amount of artwork within them. There is at least one speculation which is worth mentioning, as it seems appropriate especially for the Harrison and Smith cipher book. In preparing for this research, a book entitled *Animating the Letter* was sought because of its analysis of the reason medieval manuscripts tend to have so many ornate drawings associated with them. It was an interesting insight into the art of making ornate and beautiful manuscripts, principally for the accessibility of an illiterate society. It is entirely possible that some of the artwork which cipher books display could have at least had their origins in the same principle. In her book, *Animating the Letter*, Laura Kendrick states that manuscripts during the late antiquity through the renaissance were holy documents. There was very little writing for any other purpose, because literacy was not common outside of the church, and things of importance were committed to memory. The Scriptures included imagery to assist the laymen in interpreting them, and it also served as a reminder. Kendrick points out that figurative letters were known to help people remember better, and have been used as symbols to trigger memory for centuries. During medieval times, for example, the Book

of Kells has been studied by several scholars who believe that the design of the letters assisted those who were responsible for memorizing it.

Cipher books were also instruments of memory, designed to assist the student in learning their arithmetic through very little instruction but a concentration on memorization. It is a possible theory that drawings and imagery helped the students to learn their lessons more accurately, and be able to recite the lessons to their teacher when asked. The Harrison and Smith book may be the best example of this. Almost every subject has its own illustration, and though it would take much more study into the subject, it may have assisted Spyker in remembering his work for further explanation or recitation.

Because only a few of the books have actually incorporated artwork onto their pages, it is more plausible that the artworks of the Ryans and of the general titles in many of the other books are a practice of their calligraphy and penmanship. It would be interesting to compare these books with others, particularly created by women, to see if there is a correlation between those of men and women on which tend to be more decorative, as women more typically taught drawing and art, while men were taught more business oriented subjects. Catalogs in other institutions have been searched in hopes of finding additional cipher books, which are probably more prevalent than previously thought, though preliminary searches have turned up few. This is most likely the same problem as was encountered originally at the SHC that cipher books can be categorized and cataloged in many different ways; more time needs to be spent in identifying and locating them.

There are a hundred questions which have arisen in the pursuit of identifying cipher books as a useful research tool, and regardless of their original purpose, they do

hold valuable information which could be mined for various reasons. Hopefully this document has made the cipher books at the SHC more accessible, understandable and appreciated for their uniqueness.

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