Scientific Notes from the Books and Letters of John Winthrop, Jr., (1606-1676)
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Source: *Isis*, Vol. 11, No. 2 (Dec., 1928), pp. 325-342
Published by: The University of Chicago Press on behalf of The History of Science Society
Stable URL: http://www.jstor.org/stable/224425
Accessed: 17/04/2009 07:07

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First Governor of Connecticut.

The outstanding figure in the history of science in America during the seventeenth century is JOHN WINTHROP, Jr., obtainer of the Royal Charter of Connecticut and first Governor of this colony from 1659 to 1676, founder of Ipswich, Saybrook, New London and other New England towns, member of the Royal Society, promoter of colonial industries, soldier, pioneer, lawyer, statesman, physician, philanthropist, man of business and lover of science.

As one who has had under preparation for a number of years a history of colonial science in America, I wish to give in the present paper a few indications of the many-sided interest of the younger WINTHROP in science. The material presented is taken partly from books of his library (a large remnant of which, consisting of 270 volumes, is preserved in the Society Library of New York City) and partly from his papers and correspondence, preserved among the priceless WINTHROP papers of the Massachusetts Historical Society in Boston. JOHN WINTHROP, the younger, (portrait, fig. 1) was a graduate of Trinity College, Dublin, and, after being admitted to the bar in London in 1625, spent the next five years in travel and adventure, Padua, Venice, Constantinople and other cities being visited. It was during this time that he formed an acquaintance with many of the scientists and scholars with whom in after years he corresponded in Latin. When WINTHROP sailed in 1631 for Boston, which his father had founded the previous year, he had shipped to his new home his private library of over 1000 volumes. This collection of books was increased by donations and private purchase until the time of his death in 1676. The library then passed successively to his

son, WAIT WINTHROP, to his grandson, JOHN WINTHROP, also a distinguished scientist and Fellow of the Royal Society, and to his great grandson, JOHN STILL WINTHROP. The eldest son of the latter, FRANCIS B. WINTHROP, donated 270 of the books that belonged to his great great grandfather to the Society Library. Another son of JOHN STILL WINTHROP was THOMAS L. WINTHROP and it was a son of the latter, ROBERT C. WINTHROP, the famous statesman and orator, who donated the collection of manuscripts known as the Winthrop Papers to the Massachusetts Historical Society. A third JOHN WINTHROP, who was also distinguished as a scientist and Fellow of the Royal Society, was the Hollis Professor of Mathematics and Natural Philosophy at Harvard during the Revolution; he was a great grandson of ADAM WINTHROP a brother of the JOHN WINTHROP, Jr., whose scientific books and correspondence are referred to in the present sketch. (See Appendix of WINTHROP Genealogy).

The younger WINTHROP's interest in all branches of science is indicated by the nature of his books as well as by the character of his correspondence. Of the strictly scientific books in the WINTHROP collection of the Society Library 52 relate to chemistry or alchemy, 33 to medicine, 10 to physics, 9 to astronomy, 8 to mathematics and geometry, 8 to natural history, 3 to navigation, and a dozen or more scattered volumes to geography, metallurgy, military science, agriculture, and political economy. Of the other books, which are of the non-scientific class, 61 are of a religious character, 23 relate to history and travel, 13 are of a literary type, 12 are treatises upon witchcraft, astrology, magic and other occult subjects, 11 are grammars and textbooks of European languages, 10 relate to metaphysics and philosophy, 3 to law, 1 to horsemanship and 1 to mnemonics. In their special fields the books are well selected, the authors, for the most part, being men of note. The collection as it stands is unquestionably the largest fragment of a colonial scientific library now extant in the United States. The only similar library which in its time could compare with it was that of another Fellow of the Royal Society, Col. WILLIAM BIRD, of Westover, Virginia, but of which unfortunately all that now remains is the auctioneer's list of the titles, when BIRD's library and scientific apparatus were sold in 1778.

The linguistic accomplishments of the younger WINTHROP are

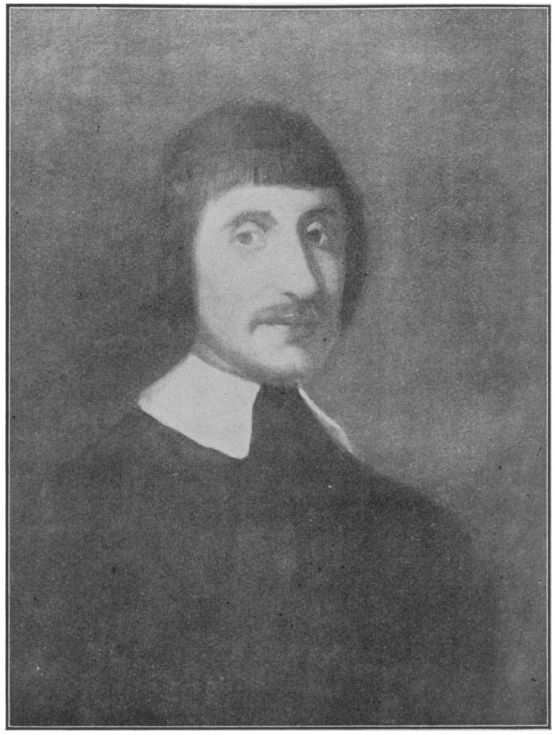

Fig. 1. JOHN WINTHROP, jr., as a young man, from a contemporary oil painting.

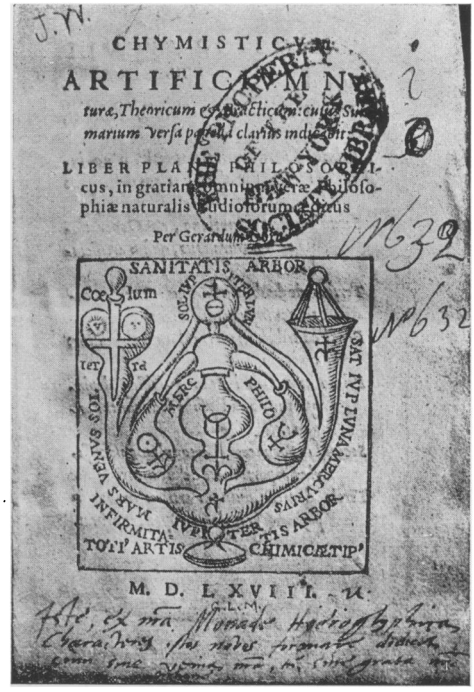

Fig. 2. Title page of *Chymisticum Aritficium* of GERARD DORN (1568) with autograph initials and annotations of Dr. JOHN DEE.

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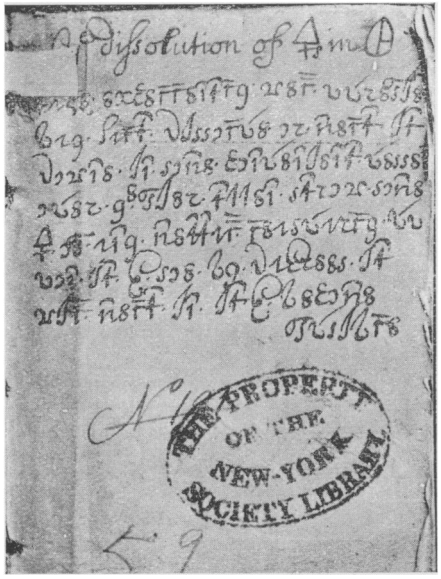

Fig. 3. Secret alchemistic recipe for dissolving sulphur in vitriol on blank page of *Cheiragogia Heliana*.

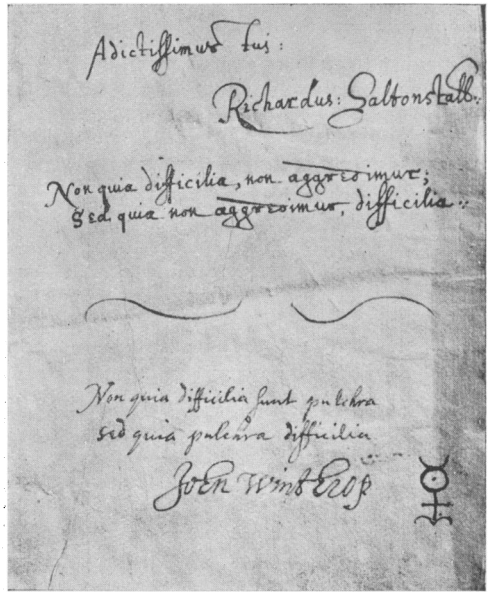

Fig. 4. Autographs and Latin annotations by RICHARD SALTONSTALL and JOHN WINTHROP, jr., on blank page of NORWOOD's *Trigonometria*. WINTHROP has attached to his signature the monadic emblem of Dr. DEE.

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Isis, XI, pl. 4

indicated by a division of his books in the Society Library according to language; 133 of them, or practically one-half, are in Latin, 71 are in English, 23 in German, 17 in French, 12 in Dutch, 7 in Italian, 4 in ancient Greek and 1 in Spanish. Latin was the international means of scientific communication in WINTHROP's time and his command of this language was such that he not only read it with ease but used it for his foreign correspondence and for private notes. Among the WINTHROP books is a copy of the « Janua Linguarum Reserata » of that famous humanist J. A. COMENIUS (1592-1671) with whom WINTHROP corresponded and whom he is reported by tradition to have once approached for the purpose of offering him the presidency of Harvard College. The method of COMENIUS was to teach Latin and other tongues by giving, in parallel columns, sentences in the vernacular and language to be taught which conveyed useful information in the form of dialogues upon the facts of everyday life. He was one of the first to advocate the teaching of science in schools and in his « Janua Linguarum » are conversational dialogues upon geometry, arithmetic, astronomy, optics, medicine and other sciences. No better method has been devised for gaining colloquial use of a foreign language.

WINTHROP's major interest in science, as indicated by the catalogue of his library, was in chemistry. It is impossible here to enumerate all the titles of his books in this field. Nearly all the old writers are represented, ARTEPHIUS, ARNALDUS, BASIL VALENTINE, CEPHALUS, CROLL, DORN, FLAMMEL, GLAUBER, HAPELIUS, LIBAVIUS, LULLY, MAIER, PARACELSUS, RULAND, SUCHTEN and many others. Some of these books WINTHROP brought with him from England, others were added after his arrival in America. His scientific friends in England and in Europe kept sending him books and book catalogues. This is shown, for example, in an old bill submitted by his friend, FRANCIS KIRBY, in March, 1633, (the first recorded bill for a shipment of chemicals and chemical apparatus to America) at the bottom of which is mentioned the sending of 3 book catalogues.

Fortunately for the antiquarian the younger WINTHROP made annotations in some of his books regarding the previous owners of his volumes, many of whom have left their autographs and notes upon the pages.

Two of the most interesting books in the WINTHROP collection are a pair of thin quarto volumes, one in paper and the other bound in vellum, written by PARACELSUS. The first is « Das Buch Meteororum» composed, as the title indicates, in that queer mixture of German and Latin of which PARACELSUS was so fond, and published at Cologne in 1566. The other is the little German « Baderbüchlein », of 6 treatises on baths, published at Mülhausen in 1562. It bears at the top the autograph « JOHANNES DEE 1562 » and in the middle a note in Latin signed with DEE's initials « Agi, hic assero, non de vulgaribus solum Balneis sed de secretissimis etiam Philosophorum Thermis. J.D. », which is to the effect that the reader must consider not only such baths as are ordinarily understood but also those most secret thermal baths which are known only to the philosophers.

On the front fly leaf of this volume is a copy in Dr. DEE's handwriting of the table of contents of the nine books of PARACELSUS, upon the Mysteries of Nature. Below this in the handwriting of WINTHROP is the following note :

« This above written and the name on the top of the frontisspiece of this book, and the note in the middle of the frontisspiece and the several notes in the margent through the whole booke, was written by that famous philosopher and chimist JOHN DEE, with his owne hand. This J. DEE was he that wrote the philosophicall treatise called Monas Hieroglifica, also Propaideumata Aphoristica, also the learned preface before EUCLIDES Elements in English in folio. He was warden of Manchester. I have divers bookes that were his wherein he hath written his name and many notes and for which they are worthyly the more esteemed. »

« July 25, 1640. JOHN WINTHROP. »

The margins of this book bear many annotations both in English and Latin in Dr. DEE's handwriting. One page containing the short second chapter of the fourth treatise upon the transmutations produced by water contains marginal references in Latin to underlined passages in the text « ferrum in cuprum », « lignum in lapidem », and « ex sale gemma », while at the bottom in English is the note :

« In England at Knaresborough, by Wetherby in York Shyre is a well by the river syde which in the space of a wynter turneth any wood to stone. »

The four-hundredth anniversary of the birth of Dr. DEE has just been celebrated. He was born in 1527 and died in 1608, having won great fame as a mathematician, astrologer and alchemyst; in the latter capacity he spent some time at the Court of RUDOLPH II of Bohemia. Dr. DEE was the author of over fifty works upon geometry, navigation, alchemy and other subjects. A good life of him has been written by CHARLOTTE FELL SMITH. He died in poverty and his life, filled with romantic adventure, will always be of interest to students of the history of science.

Another book of Dr. DEE, which WINTHROP acquired, is the « Chymisticum Artificium » published by GERARD DORN, in 1568, Its title page (fig. 2) bears an emblematic diagram showing various combinations of the symbols of alchemy, iron-copper-gold upon the left, gold-tin-silver at the top, and lead-tin-silver-mercury at the right. In the centre of the diagram is a composite character of all seven symbols. Dr. DEE, whose initials, J. D., appear at the top of the page, has written at the bottom in Latin that DORN took these new symbols out of his Monas Hieroglyphica (published in 1564) and forgot to mention the fact or to give him credit. As a simple convenient sign which symbolized the whole art and mystery of alchemy, this monadic emblem of Dr. DEE enjoyed a wide popularity, and it was used as a private book mark by the younger WINTHROP (see fig. 4).

Another volume in the WINTHROP library,consisting of a collection of alchemistic treatises by FLAMMEL, ARTEPHIUS and PONTANUS, published at London in 1624, is of particular interest as it was once borrowed from Connecticut's first Governor by JOHNATHAN BREWSTER, the son of Elder BREWSTER of Mayflower fame. In a letter dated January, 1656, BREWSTER writes to WINTHROP as follows :

« The many signs given in this booke I really fynd trew — some opperations which before I understood not, now I do by ARTEPHIUS' booke, as the head of the Crowe, Virgine's Milke, etc. — I may say with ARTEPHIUS (page 200) it is of a work soe easy and short, fitter for women and young children than sage and grave men. — I would have kept this booke longer but your letter to me desyres to have it sent spedily and carefully and therefor, having this opportunity, I could retaine it no longer. »

As we verify the many references which BREWSTER made to the pages of this little volume, we are carried back irresistibly

to the early time when this son of Plymouth's famous elder, at his trading port of Mohican in the Connecticut Colony, set out to discover the Philosopher's Stone with the hostile Indians howling outside his door.

Another interesting association book in the WINTHROP collection is a small duodecimo volume, bound in leather, containing two works by that mythical writer of alchemistic tradition, BASIL VALENTINE. One is entitled « Von den Naturlichen und ober-naturlichen Dingen, » published in 1624; the other « De Occulta Philosophia, » published in 1603. The fly leaves of this old volume are much annotated. On the last blank page is a note by WINTHROP, in Latin, German and English, respecting other works by BASIL VALENTINE, but the most interesting annotation is the one penned by WINTHROP upon the first fly-leaf.

« This was once the booke of that famous philosopher and naturalist, CORNEL. DREBBEL, who usually carried it with him in his pockett and after his death was given me by his sonne-in-law, Mr. ABRAM KEFFLER

JOHN WINTHROP. »

The associations of this old book not only with WINTHROP but with CORNELIUS DREBBELL and ABRAHAM KEFFLER are most interesting. The memorandum is only one of many examples of the extent of WINTHROP's acquaintance with the scientists of his day.

In the library of the Massachusetts Historical Society there is a letter to WINTHROP by the ABRAHAM KEFFLER above mentioned. It is dated June 12, 1639, and reads in part as follows :

« I know you desirous to heare of my prosseeding in Alchimie; all my proseeding therin is lost, by reason of my long sicknes, so that I am now beeginning agayne » — « I now onely follow dieing of scarrllett, in which I have so much to doe that I can follow nothing elles ».

This old letter of KEFFLER to his friend WINTHROP, with its reference to the « dieing of scarrlett, » recalls one of the most interesting discoveries ever made in the technology of dyeing. The account of it, as given in BECKMANN's « History of Inventions, » is as follows :

« The well-known CORNELIUS DREBBEL, who was born at Alkmaar, and died at London in 1634, having placed in his window an extract

of cochineal, made with boiling water, for the purpose of filling a thermometer, some aqua regia dropped into it from a phial, broken by accident, which stood above it, and converted the purple dye into a most beautiful dark red. After some conjectures and experiments, he discovered that the tin by which the window frame was divided into squares had been dissolved by the aqua-regia, and was the cause of this change. He communicated his observation to KUFFELAR, an ingenious dyer at Leyden, who was afterwards his son-in-law. The latter brought the discovery to perfection, and employed it some years alone in his dye-house, which gave rise to the name of Kuffelar's colour. BECHER calls him KUFFLER; KUNKEL, in a passage which I cannot again find, makes his name KUSTER, and says that he was a German. In the course of a little time the secret became known to an anabaptist called GULICH, and also to another person of the name of VAN DER VECHT who taught it to the brothers GOBELINS in France. »

With this story in mind it is with a strange quickening of interest that we turn the leaves of the ancient volume which CORNELIUS DREBBEL once carried in his pocket. DREBBEL is credited by some with the invention of the modern form of the thermometer and of other apparatus. He wrote two books, one upon the « Nature of the Elements » and the other upon the « Quintessence ». Like Dr. DEE, he was a practising alchemist and, like Dr. DEE, gave exhibitions before RUDOLPH II. of Bohemia and other sovereigns of Europe.

An old, paper-covered duodecimo volume among the WINTHROP books is entitled « Cheiragogia Heliana, » which was a famous work in its day owing to the belief that it pertained in some way to that great Messiah of Alchemy, ELIAS THE ARTIST. One of WINTHROP's chemical friends, Dr. ROBERT CHILD, of whom a very interesting biography has recently been written by Prof. KITTREDGE of Harvard University[1], wrote to him in May, 1648, that ELIAS THE ARTIST had actually been born according to communications from the brotherhood of Rosicrucians, but that he was not of the English nation. Upon the front fly-leaf of this « Cheiragogia Heliana » is written a heading « Ye Dissolution of ♁ in ⊕ » beneath which are seven lines in a secret character (fig. 3). Cyphers such as this, but with different characters, are frequently noted

(1) Boston, 1920. See Review in *Isis*, 9, 440-45.

in the letters and correspondence of the younger WINTHROP, who was greatly interested in the subject of cryptography. In a letter written to his friend, Dr. ROBERT CHILD, in March, 1648, he requests him to procure a copy of BLAISE DE VIGENIRE's « Traite des Chiffres ou Secrète Maniere d'Ecroire. » EDWARD HOWES, another friend who supplied WINTHROP with chemicals and chemical books from England, sent him in one letter a new secret alphabet, in which the characters resemble the lines and curves now employed in stenography. In other letters to WINTHROP, HOWES used a cypher in which artificial words were used, the true word being found by taking the odd numbered letters of the substitute. The methods of secret writing employed by our colonial ancestors is a subject upon which much could be written.

In his correspondence upon chemical subjects and in his private notebooks WINTHROP made extensive use, as did all his contemporaries, of the symbols of alchemy. The characters employed are identical with those printed in the « Basilica Chymica » of OSWALD CROLL, one of the books in the WINTHROP collection.

One other chemical book of the library of WINTHROP to which I wish to refer on account of its associations is the « Antimonii Mysteria Gemina » by ALEXANDER VON SUCHTEN. At the top of the title page is the inscription « ROBT. CHILD, his booke, 1656, » and at the bottom the signature of WINTHROP's grandson with Dr. DEE's monadic emblem. This is in fact one of the numerous scientific books which Dr. ROBERT CHILD sent to WINTHROP during the course of their long friendship. In a letter written in 1641 he mentions sending him FABRE's « Alchymista Christianus» ROCHA's « Des Eaux Minerales, » the « Arcana aperta » and other books from his library. He also writes « I have sent you a catalog of my chemical bookes; if you like them, they are at your service. » It was my good fortune in 1921, while examining various unpublished WINTHROP papers in the Massachusetts Historical Society library to discover this catalog of Dr. CHILD's Chemical Books, which had always been regarded as lost. It contains 114 items, arranged in 4 columns, the first column having at the top the words « Libri Chymici quos possideo. » The books are classified according to language under the 5 headings Germanici, Italici, Gallici, Anglici and Latini. While this document does not bear Dr. CHILD's signature, its cheirography exhibits the

same peculiarities shown by his letters and it was written by him beyond all doubt. A further proof is the presence in this list of various books, such as the « Arcana aperta, » « Alchymista Christianus, » « Des Eeaux Minerales » and others mentioned in CHILD's correspondence. The eleventh book of the first column (marked 9 by mistake), » SUCHTENIUS upon Antimony, » is without question the identical « Antimonii Mysteria Gemina » of ALEXANDER VON SUCHTEN, which is found in the WINTHROP books of the Society Library.

Another interesting book in the WINTHROP collection of the Society Library is GEORGE STARKEY's « Natures Explication and Helmont's Vindication ». STARKEY was a graduate of Harvard College in the class of 1646 and this book deserves to be remembered as the first chemical treatise published by an American college graduate. STARKEY spent the last years of his life in London where he died of the plague in 1665. He probably owed his initiation into the study of chemistry to Connecticut's first Governor and in the Massachusetts Historical Society is an interesting chemical letter, written by STARKEY to WINTHROP at his home in Pequot or New London, which reads as follows :

« To the Worshipful Mr. JOHN WINTHROP at his house at the Pequot these. Sir : — After my hearty respects, greeting. Your love hath soe far ingaged me to you, that I cannot but take this opportunity of writing unto you. I hope you are in health, with al yours. I heare you shortly intend to come to the Bay; if by water, if you could spare any ♃ and ☿, I should content you for it & rest ingaged. If you could spare one or two of your greater glasses, you would doe me a great pleasure. I wish, if you could find HELMONT de Febribus, I might borrow him of you, as also de Lithiasi, also the little booke intituled Encheiridion Philosophiae restitutae, with Arcanum Philos. at the end of it. If your Worship would be pleased to remember the keyes of the cabinets wherein your bookes are, I should count it an extreame felicity once to have the view of chemical bookes, which I have not read a long time. Theatrum Chemicum I should chiefly desire. I have built a furnace, very exquisitely, but want glasses, ♃ & ☿. Mr. BARKLY is gone. This day two ships arived from London, bringing sad newes, especially in London, particulars I know not, being not at home. Thus hoping the continuance of your Worship's friendship, I rest

Yours in al service

« Aug. 2, 1648. » GEO. STARKEY. »

It must not be inferred from the large number of treatises upon alchemy in the WINTHROP collection that the interests of the younger WINTHROP in chemistry were purely of a visionary character. He was, in fact, an intensely practical man, and did much towards the establishment of infant chemical industries, such as those of iron, salt, and gunpowder, in the New England colonies. This interest is indicated in a vote of the General Assembly of Connecticut in 1651 which awarded to WINTHROP and his heirs any « mines of lead, copper or tin, or any minerals as antimony, vitriol, black lead, allum, stone salt, salt springs, or any other the like » within its jurisdiction, which he might discover and maintain. It is also indicated in WINTHROP's papers and correspondence which are filled with references to tar, pitch, potash, indigo and other products of chemical industry. One of these documents is a proposal in WINTHROP's handwriting to the merchants of Boston to form a stock company for manufacturing saltpeter.

« Upon long observation and after hearing the complaints of the difficulty of these Colonies for want of returnable merchandise, having had very serious consideration about the raising of some staple fitt for returnes and being as well satisfied of the probability as of the necessity and usefulnesse thereof : I thought fitt to make knowne something of my positive thoughts about the same, w^{ch} are to this effect. That upon good and demonstrative grounds it appeares to me that some very usefull and staple comodotee may be produced in N: England, w^{ch} may advance the traffick of the country, by making returnes thereof fro hence. And because a profitable way thereof canot be so well demonstrated to the full satisfaction of others as by the thing it selfe in some degree compleately effected, w^{ch} cannot be done w^{t}t out a considerable stock, I thought it therefore necessary to make this proposall to ingagement for the forwarding thereof, that if any desirous to promote a publique good, shall see cause to accomodate that businesse wth a stock of 3000 li or 4000 li I shall indeavour (God permitting) to raise such comoditie, as may be convenient for returnes, and in particular that staple of salt peter of which some ( ) of tunes are yearly carried into England, Holland, Portugall and other parts : and that no adventure of detriment may be to any, doe hereby ingage that the said stock wth-in ( ) yeares dully repaied to them, wth some convenient consideration (if God please to add a blessing to the designe so farre as it be profitably effected); and when it shall appeare demonstratively incouraging, they may, if you please, to joyne in the business and to a further proceeding, advance to a stock of 10000 or 20000 li or more. »

This memorandum of about 1650 is so far as I know the first proposal by a resident of the American colonies to promote an industrial stock company.

But the chief chemical interests of the younger WINTHROP, as might be inferred from his books by PARACELSUS and STARKEY, were along medical lines. He was in fact a chemical practitioner and his patients comprised all classes from sick Indians up to Colonial Governors. The appeals to him for medical aid were frequent and the preparation of remedies often kept him from other obligations. « I am now intent upon extracting nitre, » he writes his son, « and cannot think of any journey till that be accomplished. » According to COTTON MATHER, WINTHROP gave away his remedies « upon all occasions insomuch that wherever he came, the diseased flocked about him as if the healing Angel of Bethesda had appeared in the place. » Another picture of the philanthropic old Governor manufacturing medicines in his laboratory for the poor, holding the bellows in one hand and stirring the coals of his furnace with the other, has been left by a contemporary New England poet, BENJAMIN THOMPSON.

Records are preserved in WINTHROP's notebooks of the patients whom he treated and from these it appears that the principal chemical remedies which he used were saltpeter, antimony, tartar, copperas, white vitriol, sulphur, and iron, with occasionally a little calomel. In addition to the above, WINTHROP also prescribed red coral, powdered ivory, rosin, saffron, sassafras, aloes, balsam, rhubarb, and various simples of the Galenists, such as wormwood and anise.

The chemical remedies employed by WINTHROP are usually indicated in his letters and records by the old alchemistic symbols, the details of his cases being sometimes written in Latin. A mystery exists about some of his remedies, a secret alphabet being used to conceal particularly private information. This secrecy was especially marked as to the medicine called « Rubila » which was invented by WINTHROP and employed by him for treating ague, small-pox, worms, coughs, and other complaints. The fame of this remedy spread over all New England and even to Great Britain. Its composition has never been determined with certainty. According to Dr. OLIVER WENDELL HOLMES, it probably consisted of diaphoretic antimony, nitre, a little salt of tin and some substance for

« rubifying » or giving the mixture a red color. A paper found by me in the WINTHROP collection some years ago was stained with a red powder, which was perhaps Rubila, and this on microanalysis by Prof. CHAMOT, of Cornell University, was found to contain nitre and antimony sulphide.

Reference can be made to only a few of the many interesting medical books in the WINTHROP library. There are old copies of WECKER's « Antidotarium », of CAMPY's « Or Potabile », of DUNCAN LIDDEL's « Ars Medica » and « Tractatus de Dente aureo, » (which related to the prodigy of a Silesian boy who possessed a tooth of gold), of the « Responsio de Experimentis Anatomicis, » by THOMAS BARTHOLINUS, celebrated both as mathematician and physician, of the « Sylloges Memorabilium Medicinae » by J. R. CAMERARIUS, distinguished in both botany and medicine, and of the « Universa Medicina » by J. F. FERNEL, celebrated as mathematician, astronomer and physician, and who by his schemes for examining the urine and feeling the pulse sought to revise the diagnostic methods of the old Greek Medical writers. A book of special interest is THOMAS JOHNSON's English translation of the « Chirurgical Works » of AMBROISE PARÉ, who by his use of ligatures and other devices accomplished great reforms in surgery. PARÉ's book is remarkably free from the superstitious ideas of his time; this is well shown by his doubting the existence of the fabled unicorn, the horn of which was supposed to have remarkable curative powers. A so-called Unicorn's horn was in fact owned by the younger WINTHROP and lent by him to his ailing friends.

With respect to mathematics the WINTHROP collection contains a number of interesting books. There is a copy of the « Eratosthenes Batavus » by the Dutch astronomer and mathematician WILLEBRORD SNELL, who discovered the law of the refraction of light and who in 1617 estimated the length of a degree of a meridian to be about 67 miles. There is also a copy of the famous « Trigonometrie » by RICHARD NORWOOD, who by measuring the distance from London to York estimated in 1636 the length of a degree with an error of less than half a mile. This volume of NORWOOD's trigonometry is an interesting association book for it contains upon the front fly-leaf the autographic signature of RICHARD SALTONSTALL, one of the founders of the Massachusetts Bay Colony and an intimate friend of the WINTHROPS, with a Latin

epigrammatic couplet respecting the difficulties of NORWOOD's text (fig. 4). At the bottom of the page WINTHROP has written his signature with the usual DEE symbol and a modification of the Latin epigram which his friend had written above. Another valuable mathematical book in this collection is a copy of the first edition of JOHN NAPIER's « Mirifici Logarithmorum Canonis Descriptio » printed at Edinburgh in 1614, a work which in the history of British science has been regarded by some as only second to NEWTON's Principia. Bound in with this is a copy of the 1615 edition of the « Opticae » of FREDERICK RISNER. On a black fly leaf of this volume is written the name of ADAM WINTHROP (JOHN WINTHROP, Jr.'s grandfather) and the date 1619. After passing through seven generations of the WINTHROP family the book has remained for over 100 years in the Society Library and is without question the most valuable of all the scientific books in the WINTHROP collection. Passing over the interesting and famous « Recreations Mathematiques » of JEAN LEURECHON, I wish to refer to another interesting association mathematical book of the WINTHROP library, the « Mysterium Arithmeticum » which bears upon the margin of the title page the signature of WINTHROP's intimate scientific friend, EDWARD HOWES. As the title shows, the work deals with the mystical and symbolic properties of numbers and refers specifically to the Fraternity of the Rosicrucians and to the number of the Beast in the Apocalypse. There are numerous references in WINTHROP's correspondence to the Rosicrucians and various books in his library relate to this fraternity and to its mythical founder, CHRISTIAN ROSENCREUTZ.

The WINTHROP library contains several interesting books upon physics, particularly upon optics, such as CHRISTOPHER SCHEINER's « Oculus », J. B. PORTA's « De Refractione Optices », JOHN FLEISCHER's « De Iridibus Doctrina » and an old work entitled the « Isagoge Optica » bound in the parchment pages of an old Latin Psalter, a reminder perhaps of the dissolution of the monasteries under HENRY VIII. Another treatise upon physics in the WINTHROP collection is the Italian work entitled « Le Mechaniche » by GUIDO UBALDO DEL MONTE, celebrated as the early patron of GALILEO. The title page of the volume bears the autograph of WINTHROP with the date 1631 and the customary Monadic symbol of Dr. DEE, which WINTHROP used as a private mark.

The younger WINTHROP was a great lover of astronomy. He possessed a 3½ foot telescope with which he delighted to explore the heavens and in a remarkable letter written to Sir ROBERT MORAY, President of the Royal Society, from Hartford on January 27, 1664, he tells of seeing 5 satellites of Jupiter, but distrusting his observation asks that it be confirmed. His correspondence contains many references to his astronomical observations. In a beautiful letter, to Dr. BENJ. WORSLEY, dated Oct. 27, 1670, he writes « I seldom looke upon the constellations of the heavens or the planets, especially Jupiter, with my telescope, or the glorious constellation of Orion, but the grateful memory of yourselfe is fresh to my thought and soule. » Shortly after this, he donated his little telescope to Harvard College and it is interesting to know that this was the earliest astronomical instrument which Harvard is known to have possessed. Curious to know what use was made of his gift, he writes in April, 1672, to his son « I desire to know whether they could see those satellites about Jupiter at any time by the telescope at the colledge and the moone or any of those things. »

It is only natural, therefore, that the library of the younger WINTHROP should contain numerous works upon astronomy. A volume of special interest among the books at the Society Library is JOHN KEPLER's treatise, « De Stella nova in pede Serpentarii » published at Prague in 1606. This was the brilliant star which appeared suddenly in September, 1604, and remained visible for seventeen months. KEPLER attached a mystical significance to the appearance of this star with a triple conjunction of Mars, Jupiter and Saturn which occurred at the same time. Among other astronomical books in the collection may be mentionned KEPLER's interesting little essay of 34 pages (Prague 1610), entitled « Dissertatio cum Nuncio Sidereo » with reference to GALILEO's recent discoveries, and bound in with this is KEPLER's « Eclogae Chronicae », published at Frankfort in 1615. There are also the « De Principiis Astronomicae », published by GEMMA FRISIUS in 1578, the « Cosmographie » of DENIS HENRION, published at Paris, 1620, and the « Ephemeris Perpetua », or astronomical almanac of JACOB ROSIUS, published at Basel in 1628. But the astronomical work of greatest value in the WINTHROP collection is the first edition of TYCHO BRAHE's famous « Astronomicae instauratae

mechanica », published at Wandsbeck in 1598. It is a large folio volume giving a description of the astronomical instruments which TYCHO employed, with an autobiographical sketch of his life and discoveries.

Of the miscellaneous scientific books in the WINTHROP collection I can refer to only a few. A volume of peculiar antiquarian interest is the « Bergpostilla », or metallurgy, of JOHANN MATHESIUS published at Nuremberg in 1578. It is a folio volume of 226 leaves describing the processes of treating the ores of various metals and minerals. The book is permeated throughout with a vein of mysticism and piety, there being included various prayers and hymns to be employed in the dangerous operations of mining. Mining was a subject in which Winthrop was greatly interested and he operated mines in New England for the production of ores of iron, blacklead and other minerals. He was a collector and assembled a small museum of minerals, fossils, ores and other natural curiosities which remained intact down to the Revolution. Among the WINTHROP papers in Boston is a letter which WINTHROP wrote to Prof. SCHLEGEL, of Hamburg, soliciting specimens of various minerals and from which a brief extract is quoted as an example of his style in scientific Latin.

« Hoc tantum a te hac vice preto ut mihi aliqua mineralia ex Germania acquireres, praecipue mineral Argenti, vel Argentum rubrum translucidum, Germanice Rotgulden-Ertz et Glase-ertz, et, si haberi possint, mineral plumbi candidi vel stanni et lapidem ex quo, plumbum excoquitur Goslariae. »

WINTHROP's interest in specific phases of mineralogy is shown by his possession of the « Paradoxes ou Traittes Philosophiques des Pierres » published at Paris in 1635 by ESTIENNE DE CLAVE.

There are also in the WINTHROP library a considerable number of books dealing with the general subject of natural history, or science in its various aspects, such as the « Natura loquax » of FREDERICK CASANDER, published at Frankfort in 1630, the « Nouvelle Lumière Philosophique », of ESTIENNE DE CLAVE, published at Paris in 1641, the famous « Synopsis Physicae ad Lumen divinum Reformatae », published at Amsterdam in 1645 by J. A. COMENIUS and in which this early popularizer of science incorporates various physico-theological theories of his own, and

the very readable « Discours admirables de la Nature », published at Paris in 1580 by the celebrated French potter and scientist BERNARD PALISSY, whose sane opinions upon the follies of alchemy and other superstitions mark him as a man a century or more in advance of this time.

As one who had made the long translatantic trip four times from England to America and three times in the opposite direction the younger WINTHROP was naturally interested in the science of navigation, and we find in his library various books which deal with this subject, such as « La Mecometrie de l'Eymant » of GUILLAUME DE NAUTONIER, published in 1601, a work dealing with the construction of the compass, and its employment in navigation. But the book of greatest interest in this connection is MERCATOR's « Altas Minor », published by the wellknown house of JODOCUS HONDIUS, of Amsterdam, in 1607. HONDIUS had only a few years previous to this date bought the old plates of MERCATOR's original Atlas and the present volume is a much enlarged edition of that work. The antique character of the maps is shown by a chart of the Western Hemisphere, upon which the Great Lakes and many other geographical features are lacking while Lake Parima, of South America, and numerous other mythical places, are inserted. The degrees of longitude were measured eastward from the Canary Islands, according to the old method of PTOLEMY.

In books dealing with the occult sciences the WINTHROP library, as might be expected from the period in which it was assembled, is peculiarly rich. In addition to the books upon alchemy previously mentioned, there are numerous works upon astrology, among them a « Table of the 12 Astrological Houses, » published at London in 1654, and consisting of numerous blank diagrams, some of them filled in as shown by the horoscope of ALICE WILKINS with positions of the planets on January 11, 1656, and notes of her illness. The handwriting is not that of WINTHROP and as the horoscopes are all calculated for the latitude of London the book as annotated was probably sent to him by some English friend. Other WINTHROP books dealing with the occult are the « Astrologia aphoristica », published at Ulm in 1641, the « Monochordum Mundi », and other works of that famous Mystic, ROBERT FLUDD, concerning whose books there are many references in

WINTHROP's correspondence. Of particular interest is « The Triall of Witchcraft », published by JOHN COTTA at London in 1616. The younger WINTHROP died 15 years before the witchcraft persecutions at Salem and there is no evidence from his correspondence that he took an active interest in the subject.

The scientific atmosphere of the seventeenth century was heavily charged with mysticism; it entered even into such matter-of-fact treatises as MERCATOR's « Atlas », in WINTHROP's volume of which is an allegorical illustration, with Biblical allusions, of the destiny of man. It is impossible to understand or to interpret the scientific spirit of the wonderful age, in which the younger WINTHROP lived, without a proper understanding of this influence which, however baneful it may have been in some of its manifestations, gave a stamp of dignity and purpose to all that was accomplished.

The younger WINTHROP was one of those who transplanted science from the Old World to the New. He corresponded with most of the eminent personages of his time including such men as BOYLE, CLARENDON, CROMWELL, DIGBY, GLAUBER, HARTLIEB, HELMONT, KEPLER, KEFFLER, MILTON, NEWTON, OLDENBURG, Prince RUPERT, STARKEY, WREN and scores of others. It would be of interest, if space permitted, to discuss his connection with the Royal Society and his extensive correspondence with its various members, much of which has fortunately been preserved and all of which is of the greatest scientific interest. The letters treat of such topics as the tides, the refining of gold, the making of pitch and tar, the manufacture of potash and salt, the malting of maize, deep-sea sounding, curious flights of insects, meteors, and countless other subjects. WINTHROP's life was remarkably rich in experiences and contacts; his long career of public service prevented him from giving as much attention to science as he would have liked and yet there was very little of the science of his time with which he was not familiar. His books and correspondence are an invaluable aid to those who would seek out the origins of science in America.

(*U. S. Department of Agriculture, Washington, D. C.*)

C. A. BROWNE.

APPENDIX

GENEALOGY OF SOME BRANCHES OF THE WINTHROP FAMILY

ADAM WINTHROP (1498-1562)
|
ADAM WINTHROP (1548-1623)
|
JOHN WINTHROP (1587-1649)
(Founder of Boston, Governor of Massachusetts Colony.)
|

JOHN WINTHROP, JR., F. R. S. (1606-1676)
(Founder of New London, Governor of Connecticut Colony).
|

FITZ-JOHN WINTHROP (1638-1707) (Governor of Connecticut Colony)

WAIT WINTHROP (1642-1717)
|
JOHN WINTHROP, F.R.S. (1681-1747), (Harvard College, 1700).
|
JOHN STILL WINTHROP (1720-1776), (Yale College, 1737).
|

FRANCIS B. WINTHROP (1754-1817), (Donor of JOHN WINTHROP, Jr.'s books to Society Library of New York.)

ADAM WINTHROP (1620-1652)
|
ADAM WINTHROP (1647-1700)
(Harvard College, 1668).
|
ADAM WINTHROP (1676-1743)
(Harvard College, 1694).
|
JOHN WINTHROP, L.L.D., F. R. S., (1714-1779).
(Harvard College, 1732; Hollis Professor of Mathematics and Natural Philosophy.)
|

THOMAS L. WINTHROP (1760-1841)
|
HON. ROBERT C. WINTHROP (1809-1894), (Donor of WINTHROP Papers to Massachusetts Historical Society).