

Dell'affinare l'oro e l'argento [*On the Refining of Gold and Silver*]

In Italian, manuscript on paper

Central Italy (Tuscany), c. 1520-1530

56 folios on paper (with watermark similar to Briquet, no. 3903, *Deux clefs*: Pisa, 1524-1528), contemporary foliation in dark brown ink in Arabic numerals, upper outer rectos, 151-200, and in upper inner rectos, [2], 3-29, modern foliation in pencil, lower rectos, 1-56 (collation i⁵⁶), ruled very faintly in hardpoint, with at least one full-length horizontal and vertical bounding lines (justification 250-262 x 172-180 mm.), written in dark brown ink in a clear and elegant cancelleresca hand with few abbreviations on thirty-two to forty long lines, textual divisions marked by initials set outside the text frame, some additions and corrections by the scribe, staining and fading from humidity leaving the text faint but legible on the last ten leaves, losses and wear to lower outer corner of some leaves with no loss of text, losses to upper margin of ff. 1-2, perhaps due to rodent bites, with slight loss of text, otherwise in very fine condition. Unbound and loose, with traces of sewing along the spine. Dimensions 293-297 x 215 mm.

An important and early witness to the codification of metallurgical practice in the Renaissance, this complete copy of a rare and very early treatise on the purification and working of metal (one of only seven known manuscripts) was likely copied shortly after the text was first written, perhaps with the supervision of the author. A well-used volume, it promises insights into metalworking methods in the fifteenth- and sixteenth-century workshops of Tuscany, including, perhaps, the State Mint of Florence. Possibly an important source for Vannoccio Biringuccio, father of the foundry industry, its contents may be traced in Biringuccio's *De la pirotechnia*.

PROVENANCE

1. Evidence of script and watermarks suggests that this book was produced in Tuscany, c. 1520-1530. The contemporary foliation of this single, large quire indicates that this once formed part of a larger volume, preceded by 150 folios, very likely comprising similar large quires presenting treatises on subjects of similar practical interest. This was a manuscript that was clearly made to be used, not to be admired at a remove, and the staining and rubbing evident on some of this manuscript's pages attest to its intensive handling and use by an early owner, quite possibly a metalworker, perhaps a student affiliated with the State Mint of Florence (see below, in Text).

TEXT

ff. 1-48, *Ricetta per*[?] *part*[...?] ... *mio*, incipit, "A voler partir ad acqua, Togli salnitro e allu[me di roccha per] far lacqua ... fa vno tristo sale che timpaccia molte boccie";

f. 48rv, incipit, "Bianchebbio prouato assaj buono togli el rame e purgalo ... In pratiche che In penissimo con queste ricette si puo acquistar e trarne frutto"; [ff. 49-56v, blank].

A rare, anonymous treatise on metallurgy, elsewhere titled *Dell'affinare l'oro e l'argento* [*On the Refining of Gold and Silver*], followed by eight additional metallurgical recipes, all but one unpublished (f. 48rv). A modern critical edition (Marini 2007) draws on the text in four other surviving copies, three in Florence (Biblioteca Nazionale Central, cod. Pal. 814, 923, and 929)

and one in Venice (Biblioteca Nazionale Marciana, MS Marciano it., IV, 48 = cod. 5365); the present manuscript goes unmentioned in any scholarship on the treatise and brings the total of known copies to seven. Texts like this one are also extremely rare on the market; according to the Schoenberg Database, only two other copies have been sold in the last century.

This treatise lays out the materials and techniques used to purify metals and to work them. The text of our manuscript follows that of the edition fairly closely for the most part, presenting all of its twenty-two chapters in full (though not always with chapter divisions clearly marked). The first chapter, and also the longest by far, addresses the making of *acqua forte* ("strong water"), an acid distilled from a solution of saltpeter (potassium nitrate) and alum to be used as a chemical agent to separate gold from silver. This is followed by chapters on materials – for example, the appropriate glassware to make and use the *acqua forte* (ch. 2) and the appropriate furnaces to use for reducing ores, recasting metals, and fashioning the silver and copper plates from which to mint coins, among other procedures (ch. 4-8) – and methods – for example, other techniques for extracting gold and silver (ch. 3, 9) and procedures for purifying gold (ch. 14-15), assaying metals (ch. 10-13), and producing a mercury sublimate to enhance the effects of *acqua forte* (ch. 16-17).

The recipes that follow the treatise address similar procedures. The first three, for example, provide instruction for "whitening," namely for purifying silver alloys, a practice used in mints of the day in the production of silver coins. The first of these appears in cod. Pal. 929 as well (it is printed in full in Marini 2007, p. 107; the remaining recipes are unpublished), where it is accompanied by other added recipes. Further study of the present manuscript alongside cod. Pal. 929 may reveal other shared recipes and could perhaps add to our understanding of how these recipes were transmitted.

A Tuscan metalworker experienced in metallurgy was almost certainly the author of this pragmatic treatise, likely written very early in the sixteenth century. With its detailed recipes and rigorously laid out methodologies – even the most basic tasks are explained in detail – this manual bespeaks the author's well-established experience in metallurgy. The treatise's careful details may indicate that it was intended for the use of students in a workshop, perhaps associated with the State Mint of Florence, given the inclusion of more specialized recipes related to making coins. If so, this would have been used by students with some experience of metalworking, as the treatise does assume some basic familiarity with the methods, equipment, and safety precautions. With its detailed contents, this manual offers an opportunity to reconstruct one of the many environments in which metalworking took place in the fifteenth and sixteenth centuries.

On the Refining of Gold and Silver also bears witness to an important shift in preservation and presentation of metallurgical knowledge that took place during the Italian Renaissance. While it is possible to find discussions of various methods of metalworking in treatises of the eighth and tenth centuries, these tended to cover only specialized areas of knowledge, omitting, for example, preliminary processes for preparing the metals. Elsewhere, alchemical treatises intimate some of these processes, although they are often shrouded in cryptic language, while collections of recipes set down the knowledge of individual practitioners, spread orally or through written correspondence, often mixed in with medical, cosmetic, or even culinary recipes. Only in the fifteenth century did metallurgical materials and practices begin to receive

more extensive and codified coverage in manuals like this one, which furnishes an orderly and didactic presentation of a substantial corpus of metallurgical methods, recipes, and general knowledge.

As such, this text takes part in a trend of increasingly systematic and scientific works on mineralogy and metallurgy, among which Vannoccio Biringuccio's *De la Pirotechnia* (printed in Venice, 1540) and Georgius Agricola's *De re metallica* (published in 1556) are the best known works of the sixteenth century. Indeed, Biringuccio (c. 1480-c. 1539), active in the Sieneese mint and the mines of Boccheggiano (also in Tuscany), may well have drawn on *On the Refining of Gold and Silver* in producing his famous *Pirotechnia*, as the two texts are quite close in content. And this text would continue to exert an influence. Though outdated by the eighteenth century, treatises like this still held undeniable scholarly value to eighteenth-century students of metallurgy like Jacopo Nani (1725-1797), director of mining in Venice, who obtained the Venetian copy (cod. 5365) of this treatise.

LITERATURE

Marini, Chiara. *Due trattati di metallurgia della Biblioteca Marciana di Venezia: tecniche di estrazione e raffinamento dei metalli tra XV e XVI secolo*, Galatina, Congedo, 2007.

Smith, Cyril Stanley and Martha Teach Gnudi, trans. *The Pirotechnia of Vannoccio Biringuccio: The Classical Sixteenth-Century Treatise on Metals and Metallurgy*, New York: Dover, 1990.

ONLINE RESOURCES

Biringuccio, Vannoccio. *De la Pirotechnia: libri .x. dove ampiamente si tratta non solo di ogni sorte ...*, Venice, 1540

<https://books.google.com/books?id=IUNXAAAACAAJ&printsec=frontcover#v=onepage&q&f=false>

TM 897

Dell'affinare l'oro e l'argento [On the Refining of Gold and Silver]

In Italian, manuscript on paper

Central Italy (Tuscany), c. 1520-1530

56 folios on paper (with watermark similar to Briquet, no. 3903, *Deux clefs*: Pisa, 1521-1528), contemporary foliation in dark brown ink in Arabic numerals, upper outer rectos, 151-200, and in upper inner rectos, [2], 3-29, modern foliation in pencil, lower rectos, 1-56 (collation i⁵⁶), ruled very faintly in hardpoint, with at least one full-length horizontal and vertical bounding lines (justification 250-262 x 172-180 mm.), written in dark brown ink in a clear and elegant cancelleresca hand with few abbreviations on thirty-two to forty long lines, textual divisions marked by initials set outside the text frame, some additions and corrections by the scribe, staining and fading from humidity leaving the text faint but legible on the last ten leaves, losses and wear to lower outer corner of some leaves with no loss of text, losses to upper margin of ff. 1-2, perhaps due to rodent bites, with slight loss of text, otherwise in very fine condition. Unbound and loose, with traces of sewing along the spine. Dimensions 293-297 x 215 mm.

An important and early witness to the codification of metallurgical practice in the Renaissance, this complete copy of a rare and very early treatise on the purification and working of metal (one of only seven known manuscripts) was likely copied shortly after the text was first written, perhaps with the supervision of the author. A well-used volume, it promises insights into

metalworking methods in the fifteenth- and sixteenth-century workshops of Tuscany, including, perhaps, the State Mint of Florence. Possibly an important source for Vannoccio Biringuccio, father of the foundry industry, its contents may be traced in Biringuccio's *De la pirotechnia*.

PROVENANCE

1. Evidence of script and watermarks suggests that this book was produced in Tuscany, c. 1520-1530. The contemporary foliation of this single, large quire indicates that this once formed part of a larger volume, preceded by 150 folios, very likely comprising similar large quires presenting treatises on subjects of similar practical interest. This was a manuscript that was clearly made to be used, not to be admired at a remove, and the staining and rubbing evident on some of this manuscript's pages attest to its intensive handling and use by an early owner, quite possibly a metalworker, perhaps a student affiliated with the State Mint of Florence (see below, in Text).

TEXT

ff. 1-48, *Ricetta per[?] part[...?] ... mio*, incipit, "A voler partir ad acqua, Togli salnitro e allu[me di roccha per] far lacqua ... fa vno tristo sale che timpaccia molte boccie";

f. 48rv, incipit, "Bianchebbio prouato assaj buono togli el rame e purgalo ... In pratiche che In penissimo con queste ricette si puo acquistar e trarne frutto"; [ff. 49-56v, blank].

A rare, anonymous treatise on metallurgy, elsewhere titled *Dell'affinare l'oro e l'argento* [*On the Refining of Gold and Silver*], followed by eight additional metallurgical recipes, all but one unpublished (f. 48rv). A modern critical edition (Marini 2007) draws on the text in four other surviving copies, three in Florence (Biblioteca Nazionale Central, cod. Pal. 814, 923, and 929) and one in Venice (Biblioteca Nazionale Marciana, MS Marciano it., IV, 48 = cod. 5365); the present manuscript goes unmentioned in any scholarship on the treatise and brings the total of known copies to seven. Texts like this one are also extremely rare on the market; according to the Schoenberg Database, only two other copies have been sold in the last century.

This treatise lays out the materials and techniques used to purify metals and to work them. The text of our manuscript follows that of the edition fairly closely for the most part, presenting all of its twenty-two chapters in full (though not always with chapter divisions clearly marked). The first chapter, and also the longest by far, addresses the making of *acqua forte* ("strong water"), an acid distilled from a solution of saltpeter (potassium nitrate) and alum to be used as a chemical agent to separate gold from silver. This is followed by chapters on materials – for example, the appropriate glassware to make and use the *acqua forte* (ch. 2) and the appropriate furnaces to use for reducing ores, recasting metals, and fashioning the silver and copper plates from which to mint coins, among other procedures (ch. 4-8) – and methods – for example, other techniques for extracting gold and silver (ch. 3, 9) and procedures for purifying gold (ch. 14-15), assaying metals (ch. 10-13), and producing a mercury sublimate to enhance the effects of *acqua forte* (ch. 16-17).

The recipes that follow the treatise address similar procedures. The first three, for example, provide instruction for "whitening," namely for purifying silver alloys, a practice used in mints of the day in the production of silver coins. The first of these appears in cod. Pal. 929 as well (it is printed in full in Marini 2007, p. 107; the remaining recipes are unpublished), where it is

accompanied by other added recipes. Further study of the present manuscript alongside cod. Pal. 929 may reveal other shared recipes and could perhaps add to our understanding of how these recipes were transmitted.

A Tuscan metalworker experienced in metallurgy was almost certainly the author of this pragmatic treatise, likely written very early in the sixteenth century. With its detailed recipes and rigorously laid out methodologies – even the most basic tasks are explained in detail – this manual bespeaks the author's well-established experience in metallurgy. The treatise's careful details may indicate that it was intended for the use of students in a workshop, perhaps associated with the State Mint of Florence, given the inclusion of more specialized recipes related to making coins. If so, this would have been used by students with some experience of metalworking, as the treatise does assume some basic familiarity with the methods, equipment, and safety precautions. With its detailed contents, this manual offers an opportunity to reconstruct one of the many environments in which metalworking took place in the fifteenth and sixteenth centuries.

On the Refining of Gold and Silver also bears witness to an important shift in preservation and presentation of metallurgical knowledge that took place during the Italian Renaissance. While it is possible to find discussions of various methods of metalworking in treatises of the eighth and tenth centuries, these tended to cover only specialized areas of knowledge, omitting, for example, preliminary processes for preparing the metals. Elsewhere, alchemical treatises intimate some of these processes, although they are often shrouded in cryptic language, while collections of recipes set down the knowledge of individual practitioners, spread orally or through written correspondence, often mixed in with medical, cosmetic, or even culinary recipes. Only in the fifteenth century did metallurgical materials and practices begin to receive more extensive and codified coverage in manuals like this one, which furnishes an orderly and didactic presentation of a substantial corpus of metallurgical methods, recipes, and general knowledge.

As such, this text takes part in a trend of increasingly systematic and scientific works on mineralogy and metallurgy, among which Vannoccio Biringuccio's *De la Pirotechnia* (printed in Venice, 1540) and Georgius Agricola's *De re metallica* (published in 1556) are the best known works of the sixteenth century. Indeed, Biringuccio (c. 1480-c. 1539), active in the Sienese mint and the mines of Boccheggiano (also in Tuscany), may well have drawn on *On the Refining of Gold and Silver* in producing his famous *Pirotechnia*, as the two texts are quite close in content. And this text would continue to exert an influence. Though outdated by the eighteenth century, treatises like this still held undeniable scholarly value to eighteenth-century students of metallurgy like Jacopo Nani (1725-1797), director of mining in Venice, who obtained the Venetian copy (cod. 5365) of this treatise.

LITERATURE

Marini, Chiara. *Due trattati di metallurgia della Biblioteca Marciana di Venezia: tecniche di estrazione e raffinamento dei metalli tra XV e XVI secolo*, Galatina, Congedo, 2007.

Smith, Cyril Stanley and Martha Teach Gnudi, trans. *The Pirotechnia of Vannoccio Biringuccio: The Classical Sixteenth-Century Treatise on Metals and Metallurgy*, New York: Dover, 1990.

ONLINE RESOURCES

Biringuccio, Vannoccio. *De la Pirotechnia: libri .x. dove ampiamente si tratta non solo di ogni sorte ...*, Venice, 1540

<https://books.google.com/books?id=IUNXAAAACAAJ&printsec=frontcover#v=onepage&q&f=false>

TM 897