

Shared Watermark Types in the Royal Collection Trust and the Codex Leicester: Fleur-de-lis or Lily

According to information found on the Royal Collection Trust website,¹ three sheets used in works by Leonardo da Vinci (RCIN 919099, RCIN 919105, and RCIN 912624) share the same fleur-de-lis/lily watermark type.² The website also notes that one sheet (Leicester Sheet 5 (ff. 5/32)) found in the Codex Leicester (Gates Collection) also contains a fleur-de-lis/lily watermark type.³

As the symbol of Florence, the fleur-de-lis was used by mills in Tuscany; the presence of a *filone supplementare*, to which the watermark wires are attached, strongly indicates a Fabriano manufacture.⁴

¹ <https://www.rct.uk/collection>. Accessed October 27, 2021

² RCIN 919099

Recto: A male torso showing genito-urinary system, liver, spleen, and stomach, etc. Verso: A sketch of the cervical spine, oesophagus, and trachea, with notes c. 1508-10

Pen and ink over traces of black chalk

26.3 x 18.9 cm

RCIN 919105

Notes and diagrams on geometry, and sketches of the male genito-urinary system c. 1508-10

Pen and ink, over traces of black chalk and stylus

27.4 x 20.9 cm

RCIN 912624

Recto: The vessels of the leg, and a monstrous head. Verso: The bone and vessels of the thigh c.1508-10

Pen and ink and black chalk

27.5 x 19.5 cm

³ Carlo Pedretti noted the shared fleur-de-lis watermarks of RCIN 919099 and Leicester Sheet 5 (ff. 5/32); see Carlo Pedretti, *The Codex Hammer of Leonardo da Vinci*, translated into English and annotated by Carlo Pedretti.

Florence: Giunti Barbèra, 1987, Figs. 62 and 63, pp. 168-169.

The dimensions of Leicester Sheet 5(ff. 5/32) are 29.3 x 44.2 cm. The Royal Collection drawings, which appear to be trimmed, are assumed to be one-half of the Codex Leicester's untrimmed *rezzuta* format sheets. The location of their watermarks in the sheets also supports this observation.

⁴ What at first appears to be a chain line supporting all four fleur-de-lis watermarks is, in fact, a *filone supplementare*. There are no shadows of accumulated pulp to either side of a *filone supplementare* because there is no wooden rib below it, which would inhibit the even distribution of pulp. I am grateful to paper historian Neil Harris for this information.

When comparing all four watermarks, two variants can be discerned:

- variant A has a slender, tapered, and evenly positioned central petal (RCIN 919099 and Leicester Sheet 5 (ff. 5/32)); see figures 1 and 2.
- variant B has a stubby, slightly off-center central petal (RCIN 919105 and RCIN 912624); see figures 3 and 4.

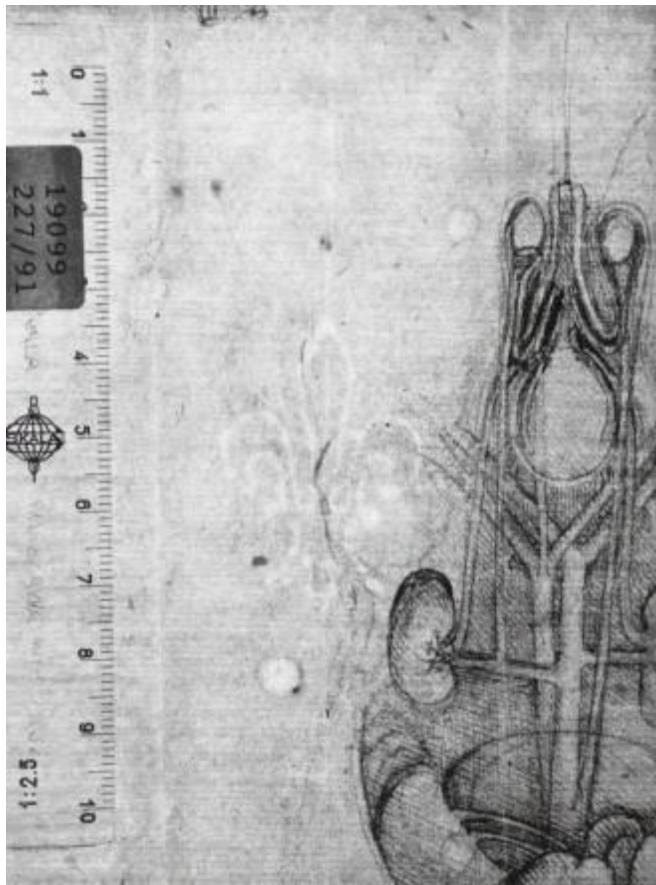


Figure 1. Fleur-de-lis/lily watermark variant A (RCIN 919099); transmitted light image <http://www.rct.uk/collection>

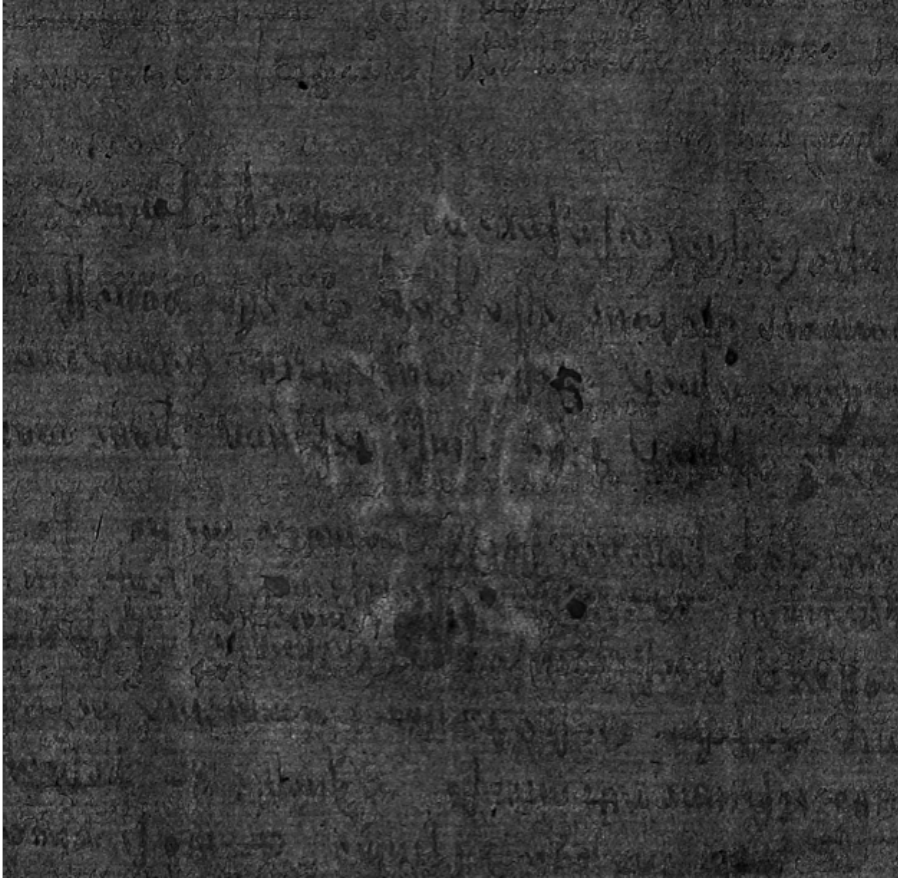


Figure 2. Fleur-de-lis/lily watermark variant A (Leicester Sheet 5(ff. 5/32), “de-noised” to reduce interference from surface marks. (image: W.A. Sethares)

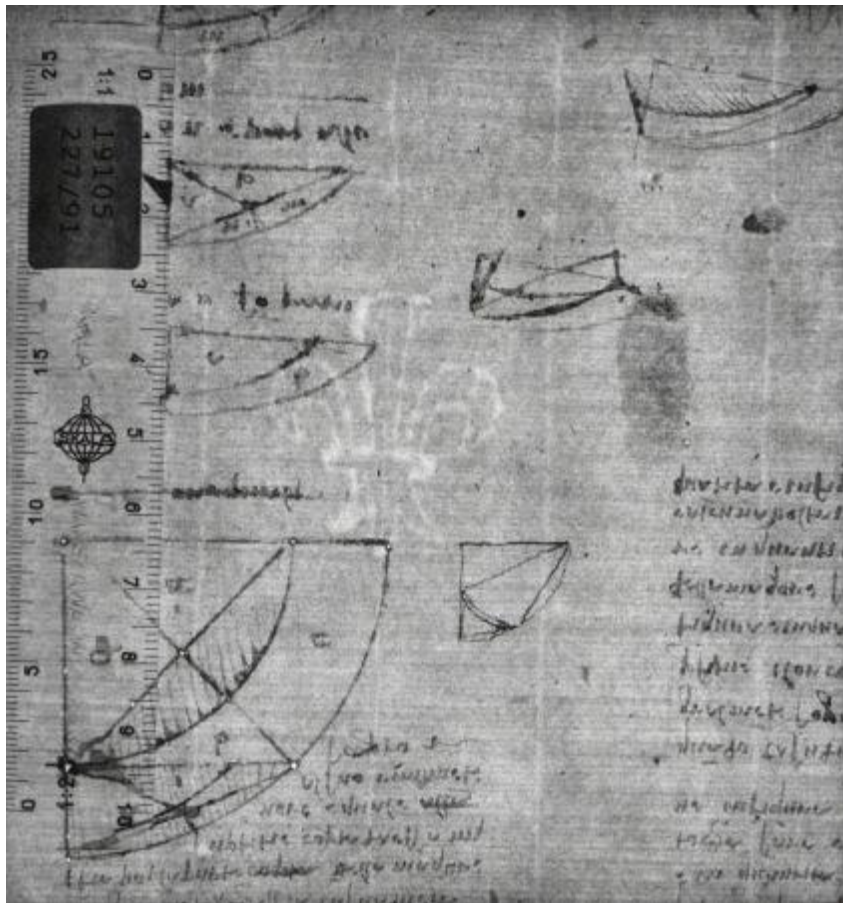


Figure 3. Fleur-de-lis/lily variant B (RCIN 919105); transmitted light image
<http://www.rct.uk/collection>

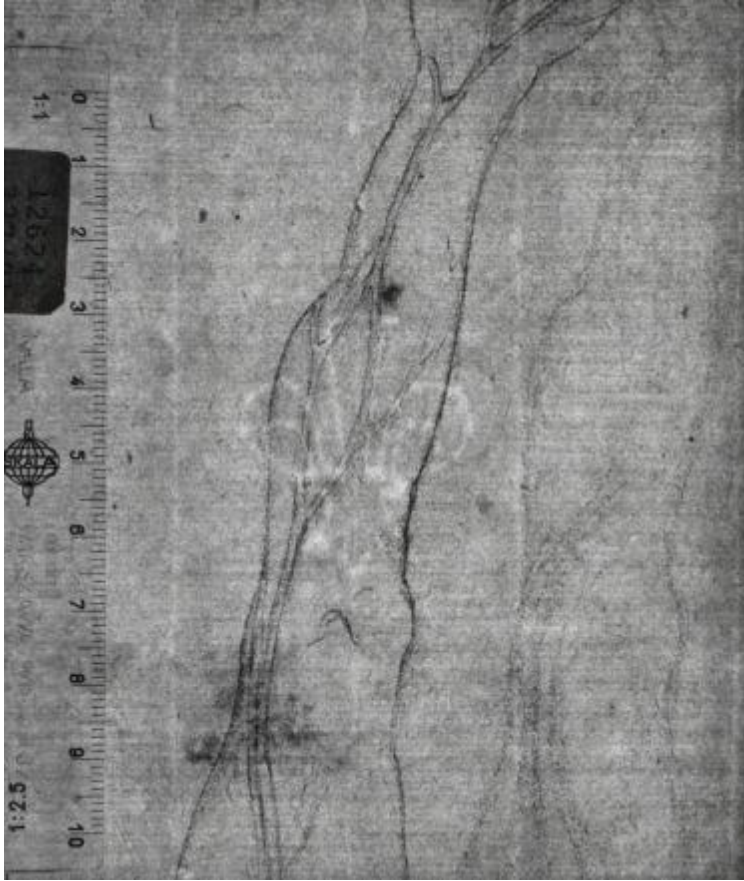


Figure 4. Fleur-de-lis watermark/lily variant B (RCIN 912624); transmitted light image <http://www.rct.uk/collection>

Leicester Sheet 5 (ff. 5/32) is the only bi-folio having a fleur-de-lis watermark out of 18 total sheets. As seen in the Codex Leicester's collation diagram (figure 5), the watermark (called "lily" here) is found inserted between two sequences of computationally confirmed moldmates; moldmates are identical sheets formed from the same papermaking mold. Codicologically, Leicester Sheet 5 (ff. 5/32) is an outlier.⁵

⁵ It has been advanced that Leonardo combined two sets of independently produced notes and observations that now constitute the final notebook; Leicester Sheet 5 (ff. 5/32) has been included in the "outer set." The dating of the two sets is discussed in Domenico Laurenza and Martin Kemp, eds., *Leonardo da Vinci. A New Edition of the Codex Leicester of Leonardo da Vinci*, (Oxford and New York: Oxford University Press, 2019/2020), vol. 2, pp. 15-16. <https://www.oxfordscholarlyeditions.com/view/10.1093/actrade/9780198832874.book.1/actrade-9780198832874-book-1?rskey=GyM68k&result=1.bbb>

Also, Domenico Laurenza, *The compilation of the Codex Leicester. An insight into Leonardo's research style*, in P. Galluzzi, A. Nova (eds.), *Decoding Leonardo's Codices*, Atti del convegno internazionale di studi, Kunsthistorisches Institut in Florenz, 10-12 ottobre 2019, Marsilio, Venezia, forthcoming.

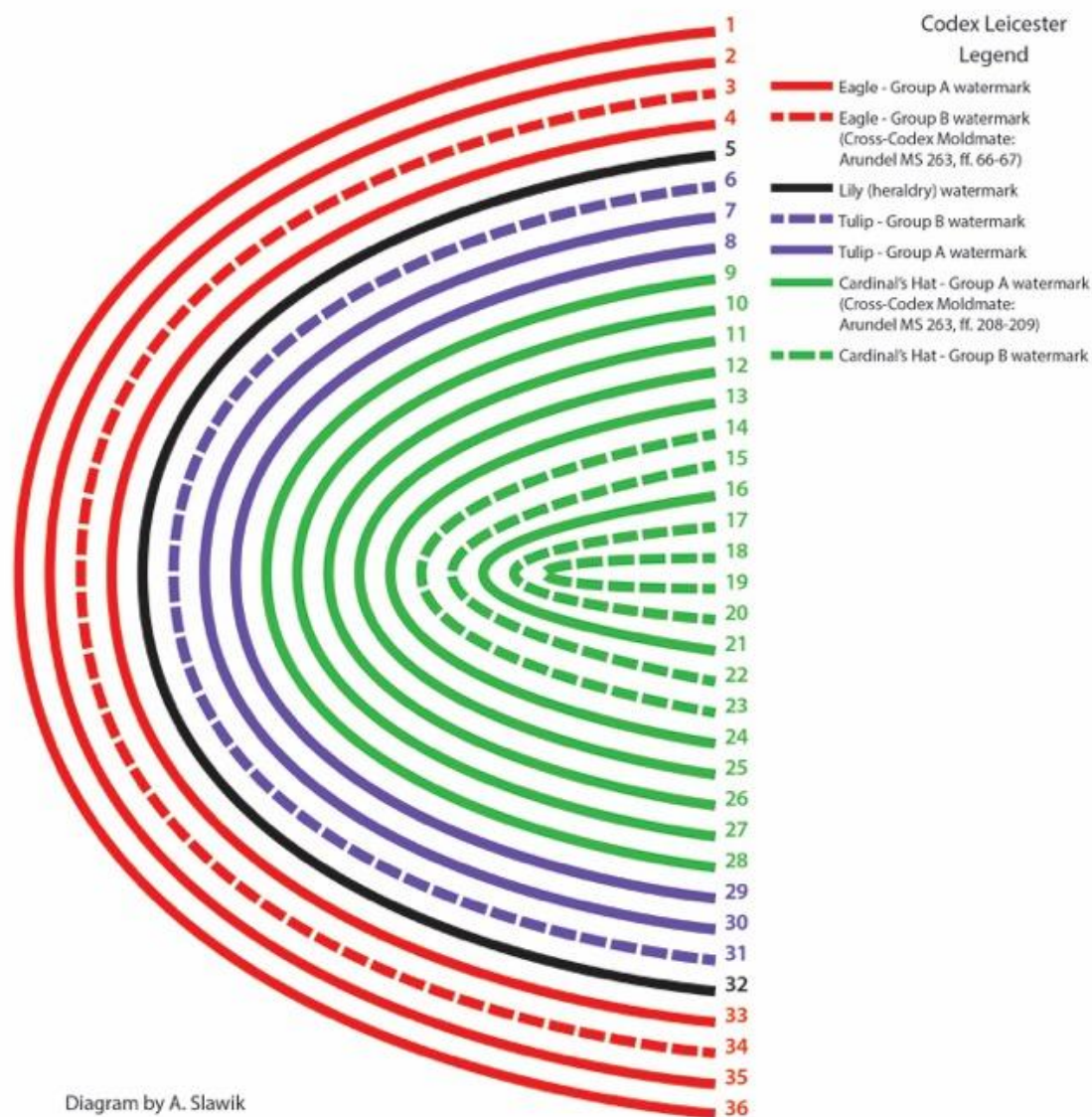


Figure 5. The Codex Leicester with moldmates (solid lines) and probable twins⁶ (dashed lines) indicated by color; the current collation of the Codex Leicester is depicted. Sheet 5(ff. 5/32), having a fleur-de-lis/lily watermark, is solid black. (Diagram by A. Slawik)

Because of the fleur-de-lis/lily watermark's unexpected insertion in the "outer set" of the Codex Leicester and its striking similarity to RCIN 919099, the two papers were compared. The application of image processing software,⁷ designed to computationally "code" manufactured patterns inherent to paper (specific watermark features, chain line intervals, and laid line

⁶ A "twin" is one of two alternating molds used to form sheets of paper. Papers formed from the two molds may have similar, but not identical, watermarks.

⁷ The development of programs designed to computationally characterize paper structure was made possible by funding provided by the Getty Foundation and the Gates Collection.

density), revealed that RCIN 919099 and Leicester Sheet 5 (ff. 5/32) are not only similar, but appear to be identical paper moldmates. An animated overlay (figure 6) of transmitted light images of RCIN 919099 and an enhanced image of Leicester Sheet 5 (ff. 5/32) confirms that their internal characteristics – watermark features, chain line intervals, and laid line densities – align exactly.⁸

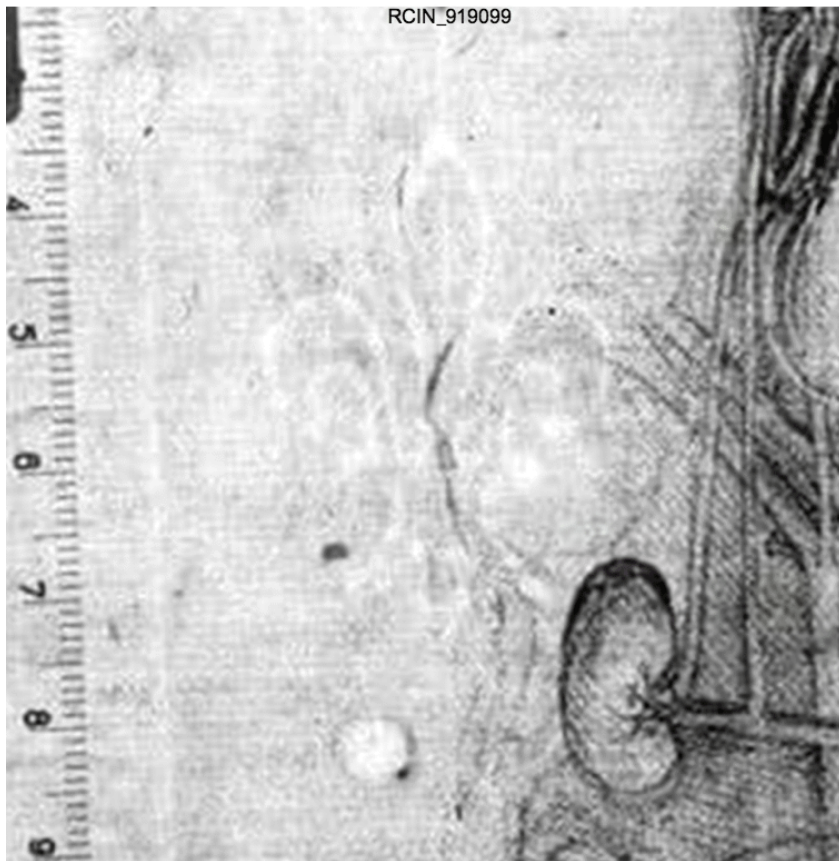


Figure 6. Animated overlay of RCIN 919099 and Leicester Sheet 5 (ff. 5/32) (video produced by A. Slawik)

Turning to the stubby variant B of the fleur-de-lis/lily as seen in RCIN 919105 and RCIN 912624, an animated video strongly indicates that they, too, are moldmates (figure 7).⁹

⁸ While a compelling case can be made that these two papers were formed from the same mold, absolute confirmation is tempered by the low-resolution image downloaded from the Royal Collection Trust website. Computational coding of the unique chain line intervals found in RCIN 919099 would confirm their moldmate status; an image that includes the chain lines across the entire sheet of RCIN 919099 would be ideal, since one already exists for Leicester Sheet 5 (ff. 5/32).

⁹ While a compelling case can be made that these two papers were formed from the same mold, absolute confirmation is tempered by the low-resolution images downloaded from the Royal Collection Trust website. Computational coding of the unique chain line intervals found in RCIN 919105 and RCIN 912624 would absolutely confirm their moldmate status; images of RCIN 919105 and RCIN 912624 that include the chain lines spanning the entire sheets would be required.

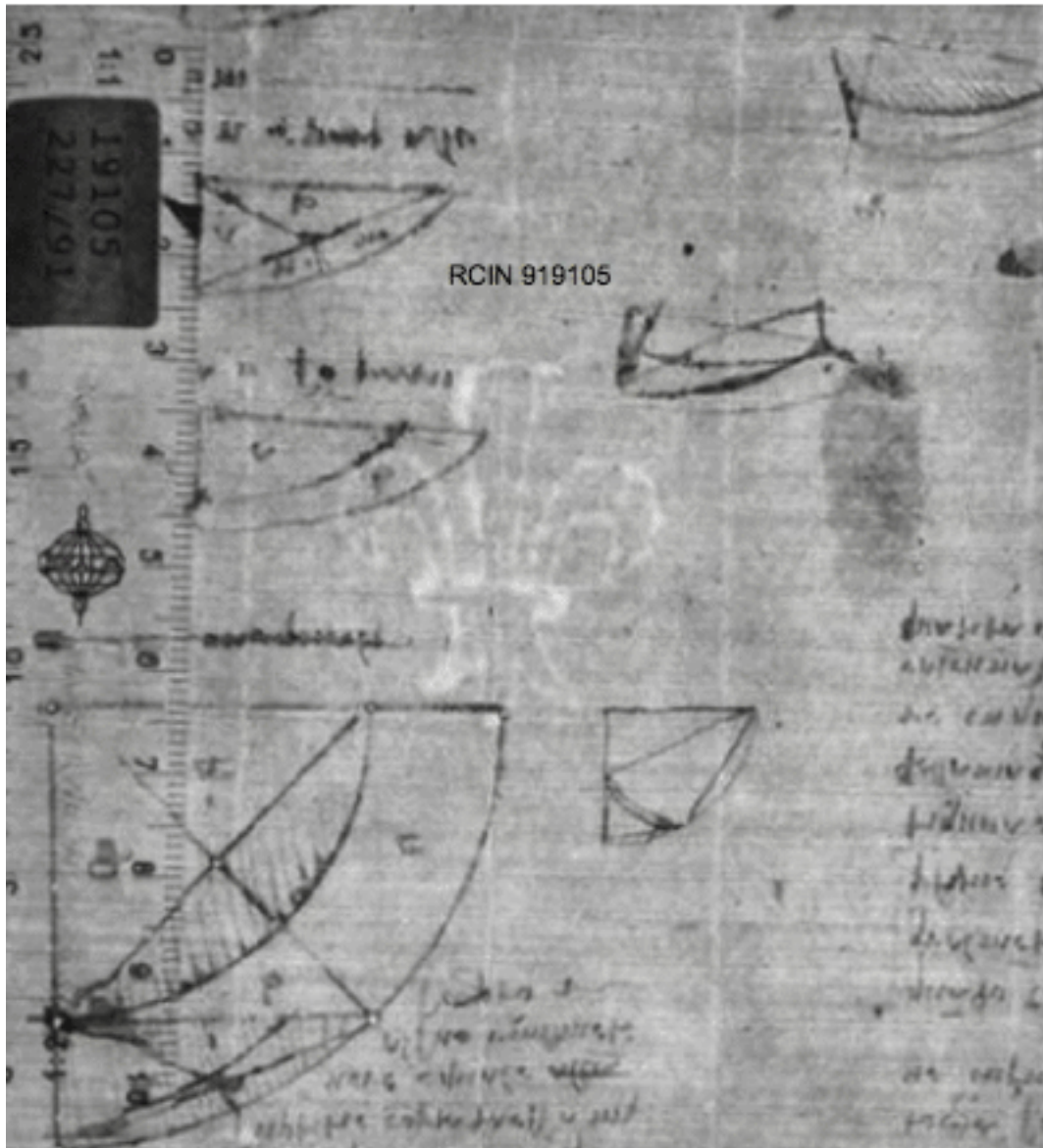


Figure 7. Animated overlay of RCIN 919105 and RCIN 912624 (video produced by A. Slawik)

The three Royal Collection drawings are dated as c. 1508-10.¹⁰ The most recent dating of the compilation of the Codex Leicester ranges from 1505-8 to 1512.^{11,12} The identification of moldmates can significantly narrow speculation regarding the date and place of origin of RCIN 919099/Leicester Sheet 5 (ff. 5/32) and RCIN 919105/RCIN 912624.

The designation of two sheets of paper as moldmates suggests a common place of origin and a narrow period of production: either from the same production run (days to weeks), or sometime during the lifetime of that one mold (nine months to two years for a popular size).¹³ Because all four drawings are now found out of any sequence that might suggest that they came from the same ream of paper, only the broader time span can be considered.

While watermark types can be used for decades, or even centuries, and across broad geographic regions, moldmates can suggest interconnections of time and place between specific sheets. The location and orientation of the watermark in Leicester Sheet 5 (ff. 5/32), having a bi-folio format, suggests that the paper conforms to the popular *rezzuta* dimension, also called *fogli comuni*, of approximately 30 x 40 cm. The mold would have been used continuously and, thus, have had a shorter functional life.

Because RCIN 919099, RCIN 919105, and RCIN 912624 are assumed to be half *rezzuta* format sheets, this raises the tantalizing possibility that the other, un-watermarked half sheets can be found among the Royal Collection Trust Leonardo drawings. This could be confirmed using chain line interval matching or, conceivably, laid line density mapping.

That these four now-separated drawings by Leonardo were created on papers made from the same papermaking mold invites investigation into possible historical connections between them. Furthermore, the affinity between RCIN 919099 and Leicester Sheet 5 (ff. 5/32) might contribute to the ongoing research regarding the compilation dates of the “inner” and “outer” sets of the Codex Leicester.

¹⁰ <https://www.rct.uk/collection>

Accessed September 8, 2021

¹¹ Gerolamo Calvi dated the beginning of the compilation of the Codex Leicester to the years of Leonardo's second stay in Florence. *Il codice di Leonardo da Vinci (idraulica e cosmografia) della biblioteca di Lord Leicester in Holkham Hall, pubblicato sotto gli auspici del Reale Istituto Lombardo di Scienze e Lettere, Milan, Premio Tomasoni* (Milan: L.F. Cogliati, 1909) vii-xviii. Among more recent dating proposals are those of Domenico Laurenza and Martin Kemp, who suggest that some of the material may date as early as 1505 and that Leonardo “was still making additions after 1509, but not after 1512,” *Leonardo da Vinci's Codex Leicester: A New Edition*: Domenico Laurenza and Martin Kemp, eds., (Oxford and New York: Oxford University Press, 2019-2020) vol. 2, pp. 38-39. See also, Pedretti, *The Codex Hammer of Leonardo da Vinci*, 1987, and Carmen Bambach, *Leonardo da Vinci Rediscovered* (New Haven and London: Yale University Press, 2019), vol. 3, pp. 273-274; also vol. 4, 292, note 438 and vol. 4, p. 352, note 557.

¹² Juliana Barone suggests dates c. 1506 to 1510. See British Library. *Leonardo da Vinci: A Mind in Motion*. Ed. Juliana Barone. (London: British Library, 2019), p. 11.

¹³ The lifetime of a papermaking mold is dependent upon its dimensions, with popular sizes being more short-lived since they were used most heavily. Based on estimates found in the literature, paper historian Neil Harris has suggested one to two years, with the caveat that older molds continued to be used as they were phased out (personal communications, March 5, 2020, and January 6, 2021; also, Harris, *Paper and Watermarks*, 46, 76-77). Additionally, molds could be sold as material assets and change their place of origin. That is why the position of one watermarked sheet relative to its moldmates within a manuscript is critical.

