

The palimpsest documents of Santa Sofia di Benevento (11th century) studied through the “Imaging multispectral”

Os documentos do palimpsesto de Santa Sofia di Benevento (século XI) estudados através da técnica de “imagem multispectral”

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Abstract

Although the palimpsests codes are not longer a rarity, the rescripti documents are still very rare. It was the practice of reusing parchments already written, then erased and subjected to a particular treatment, for the purpose of recycling for the preparation of a new document. The study in question examines the parchments of Santa Sofia di Benevento and the conspicuous dossier consisting of documents concerning the monastery of Sant’Angelo di Ariano. The membranes examined for this study are twenty-two (twenty-one have double palimpsests, while one is triple), for a total of forty-five documents, all relating to the eleventh century. The new multispectral imaging technique has allowed the identification of new occurrences relating to the sofiano parchment background, through the experimentation of multispectral digital photography and the digital manipulation of dissected images, able to bring out, in their clarity, the traces of the writings no longer visible either to the naked eye, or through the classic use of the Wood Lamp; this new photographic technique allows the isolation and separation of one or more levels of writing.

Keywords

Palimpsest, Imaging multispectral, Santa Sofia di Benevento, 11th century.

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Resumo

Embora os códices de palimpsestos já não sejam uma raridade, os documentos rescritos continuam a ser muito raros. Tratava-se da prática de reutilizar pergaminhos já escritos, depois apagados e submetidos a um tratamento particular, com o objetivo de os reciclar para a elaboração de um novo documento. O estudo em questão examina os pergaminhos de Santa Sofia di Benevento e o notável dossier constituído por documentos relativos ao mosteiro de Sant'Angelo di Ariano. As membranas examinadas para este estudo são vinte e duas (vinte e uma têm palimpsestos duplos, enquanto uma é tripla), num total de quarenta e cinco documentos, todos relativos ao século XI. A nova técnica de imagem multiespectral permitiu a identificação de novas ocorrências relativas ao fundo do pergaminho sofiano, por meio da experimentação da fotografia digital multiespectral e da manipulação digital de imagens dissecadas, capazes de trazer à tona, na sua clareza, os vestígios das escritas não mais visível a olho nu ou através do uso clássico da Lâmpada de Madeira; essa nova técnica fotográfica permite o isolamento e separação de um ou mais níveis de escrita.

Palavras-chave

Palimpsesto, imagem multiespectral, Santa Sofia di Benevento, século XI.

Palimpsest: definition, origin and evolution

Although the palimpsest codes are no longer a rarity, “if the expression refers to the number rather than to the intrinsic value”, as Alessandro Pratesi stated in the first half of the twentieth century¹, the documents *rescripti* are still very rare – documents subjected to the practice of reuse of parchments already written, then erased and subjected to a particular treatment, for the purpose of “recycling” for the preparation of a new document.

The etymology of the word ‘palimpsest’ derives from the Greek *πάλιν* and *ψηστός*, *pàlin psestòs* or *palímpsestos*, and means, in fact, ‘scraped again’. In the world of ancient book / documentary production, the term indicates the practice of removing a writing from a surface to make it rewritable. The technique consisted in eliminating the text written on the parchment to make it virgin, in order to be able to use it for a new writing.

¹ PRATESI, Alessandro (1956). *Chartae rescriptae*” del secolo XI provenienti da Ariano Irpino. *Bullettino dell'Istituto storico italiano per il medio evo e archivio muratoriano*, 68, p. 165-202.

The testimonies of the practice are manifold and range from Marziale, who in an epigram of the *Apophoreta* described this use², to an 11th century manuscript, preserved in the Bavarian monastery of Tegernsee, which contains some recipes that codify the best procedure for performing the operation³.

The ease or otherwise of the operation substantially depended on the type of ink used and its degree of penetration into the parchment⁴. The process consisted of scraping the membrane, usually with a pumice stone, after dipping it in milk for a whole night and covered with flour, in order to avoid wrinkling, and placing it under pressure until dry; after eliminating the *scriptio prior*, it was washed and again subjected to the lime bath (lime milk, that substance obtained from the mixing of lime and water, in which the parchment was immersed for the degreasing operation in the manufacturing process). Finally, it could also be trimmed on the margins in order to constitute a new membrane for the drafting and compilation of legal documents.

From historical sources we know that the technique of erasing a text in order to rewrite a new one was not alien to other writing media, such as wax tablets or papyrus⁵.

The reasons for the reuse of the membrane must certainly be sought, but not limited, to the economic question, although there are reasons of a deeper nature, such as the cancellation of a text per *damnatio memoriae*, of texts *damnatio memoriae*, heretical, amoral or of a text become obsolete and no longer useful. However, there is no doubt that the parchment, despite being the best writing medium ever invented by man, is certainly also the one with the highest cost, also in relation to its preparation. In the period of great economic crisis that characterized the early Middle Ages, together with the poverty of the monks and notaries and the request for parchment which in some periods had exceeded the offer, the practice of recycling spread, fueled by the ignorance of scribes, which had contributed over time to the spread of this practice⁶.

The practice of 'reuse' had already been introduced in France in the first half of the VI century, then spread to Italy and Greece, in various fields, especially in

² MARZIALE, *Epigrammaton liber XIV, VII Pugillares membranei*, which he described: "Esse puta ceras, licet haec membrana vocetur: delebis quotiens scripta novare voles".

³ München, Bayerische Staatsbibliothek, *Clm* 18628, f. 105v.

⁴ For the preparation of the inks and their ingredients, see for all *Atelier Deltòs. Restauro e Conservazione. Opere su carta*, [Online]. [Consult. 29 May 2021]. Available at [www:http://www.restaurocarta.it/2011/02/19/247/](http://www.restaurocarta.it/2011/02/19/247/).

⁵ UBERTI, Marisa (2019), *I palinsesti pergamenacei: dalle origini alle tecniche di Imaging Multispettrale*. Rovato: Corso di Avviamento alla Ricerca Storica, diretto dal prof. d. Giovanni Donni, p. 5.

⁶ FERRARIO, Luigi (1853), *Memoria intorno ai palinsesti*, Milano: Tipografia di Giuseppe Bernardoni, p. 9-10; UBERTI, *I palinsesti pergamenacei*, p. 4.

medieval *scriptoria*, where it was used in manuscript codices⁷. A large concentration of palimpsests was identified at the turn of the VIII and IX Centuries, when the practice of rewriting *codices rescripti* spread in Europe, containing classical, legal, liturgical and biblical texts that have fallen into disuse or were considered heterodox⁸.

Between the 11th and 15th centuries, numerous palimpsests were produced by reusing liturgical codes from the Romanesque period. The recycled material was not considered of a high level, therefore the abraded parchment was intended for book production mainly aimed at peripheral monastic centers and not intended for central ones, such as the centers of San Gallo, Bobbio and Luxeuil⁹. In this period, cases of parchment documents reused to rewrite other documentary acts, the so-called *chartae rescriptae*, are very rare. The practice of “recycling” peeped out in the world of notaries in some regions, until it was absolutely forbidden for notaries to use writing support material in the drafting of documents in the legal process that had already had its own use, and had been submitted to the “erasure” operation.

The ban is witnessed indirectly and in a late period

In the Roman Ages, the practice of recycling was in force and Roman law recognized full value to the *chartae deleticiae* – a term used by the Romans to identify *rescriptae* parchments – if the current interpretation of a fragment of Ulpiano is considered reliable¹⁰.

The oldest prohibition dates back to the Frederick era and is expressed in the form of the *ordinationis notarii* attributed to Frederick II himself¹¹, in which this condition had become *sine qua non* for admission to the notary profession. However, it does not seem to be inspired by a constitution in force throughout the Empire. The restrictions of the subsequent period must also have, most likely, only territorial character, since the known testimonies are limited to some oaths of notaries in

⁷ The discovery of the schedules and the first studies carried out took place between the end of the seventeenth and the beginning of the nineteenth century, although in 1640 there are some hints in ALLATII, Leonis (1640), *Animadversiones in antiquitatum Etruscarum fragmenta ab Inghiramio edita*, Parisiis: apud Sebastianum Cramoisy typographum Regis ordinarium, via Iacobaea, sub Ciconijs. 1692 is, however, the date that marks the first attempt to read an erased text, for which further details are referred to UBERTI, *I palinsesti pergamenacei*, p. 7-16 and the extensive bibliography cited therein.

⁸ LOWE, Elias Avery (1964), *Codices rescripti. A List of the Oldest Latin Palimpsests with Stray Observations on their Origin*, in *Mélanges Eugène Tisserant, V: Archives Vaticanes. Histoire ecclésiastique*, Deuxième partie, Città del Vaticano (“Studi e testi”, 235), p. 67-81; LOWE, Elias Avery (1934-1972), *Codices Latini Antiquiores. A Palaeographical Guide to Latin Manuscripts Prior to the Ninth Century*, I-XII, Oxford: Clarendon press. The scholar has compiled a database and identified 120 Latin palimpsests.

⁹ UBERTI, *I palinsesti pergamenacei*, p. 5.

¹⁰ D. 37, II, editions by MOMMSEN, Theodor (1954), *Corpus iuris civilis*, I, *Digesta*, recognovit et retractavit KRUEGER, Paulus, 16, Berolini: ed. Stereotypa, p. 604.

¹¹ HUILLARD-BRÉHOLLES, Jean-Louis-Alphonse (1854), *Historia diplomatice Friderici secundi*, I-IV, Parisiis: Excudebat Henricus Plon, IV, I, p. 57 nt.

northern Italy during the XIV century¹². Even the Maurini fathers had expressed themselves on these provisions, excluding the existence of a real custom of reusing second-hand parchment writing support¹³. On the other hand, it was in the interest of the contracting parties that the legal act or the recipient of any benefit, donation or testamentary bequest did not have the deed that constituted in effect the document of proof of the legal transaction stipulated or of the benefit received destroyed, and that it was his care to keep even after the expiry of the contractual terms, since it constituted the value of *munimen*.

The sporadicity of the existence of *chartae rescriptae* is also conditioned by the difficulty presented by the complex operation that required the restoration of the parchment writing support for the new writing. As long as it was a question of carrying out the scraping work on entire manuscript codices¹⁴, evidently carried out in writing centers adequately equipped for use, it had its validity, but it became useless and wasteful when it was practiced on individual membranes and in a completely private way. Therefore, when the parchment was subjected to reuse, it was used for a completely different purpose. It is quite frequent the case of parchments used as reinforcement or as guard sheets in the bindings of manuscripts, *incunabula* or sixteenth century, thus acting as a cover; or the use of the membrane on its fur side, the *verso*, is known, in order not to destroy the writing on the *recto*, usually used for archival signatures or landed notations – useful for immediate recognition of the document – which in this case is used to the drafting of an entire legal act or for simple notes¹⁵.

¹² FUMAGALLI, Angelo (1802), *Delle istituzioni diplomatiche*, I-II, Milano: Stamperia e Fonderia del Genio Tipografico, I, p. 49; GIRY, Arthur (1894), *Manuel de diplomatique*, Paris: Librairie Felix Alcan, p. 497; WATTENBACH, Wilhelm (1896), *Das Schriftwesen in Mittelalter*, 3 Aufl., Leipzig: Verlag Von S. Hirzel, p. 316.

¹³ TOUSTAIN, Charles-François; PROSPER TASSIN, René (1765), *Nouveau traité de diplomatique où l'on examine les fondemens de cet art: on établit des regles sur le discernement des titres, et l'on expose historiquement les caracteres des bulles pontificales et des diplomes donnés en chaque siècle [...] par deux Religieux Bénédictins de la Congrégation de S. Maur.*, I, Paris: chez Guillaume Desprez, p. 481.

¹⁴ Here, and merely as an example, we recall some examples and findings in the codicological context, CRISCI, Edoardo (1990), *I palinsesti di Grottaferrata. Studio codicologico e paleografico*, Napoli: Edizione Scientifiche Italiane ("Collana dell'Università di Cassino", 2); ESCOBAR, Ángel (2006), *El palimpsesto grecolatino como fenómeno librario y textual*, presentación de Dieter Harlinger, Zaragoza: Institución "Fernando El Católico" (C.S.I.C.) Excma. Diputación de Zaragoza; AGATI, Maria Luisa (2009), *Il libro manoscritto da Oriente a Occidente. Per una codicologia comparata*, Roma: "L'Erma" di Bretschneider ("Studia archaeologica", 166), p. 75-79; RODRIGUEZ, Maria Teresa (2013), *Riflessioni sui palinsesti giuridici dell'area dello Stretto*, in *Vie per Bisanzio*. VII Congresso Nazionale dell'Associazione Italiana di Studi Bizantini (Venezia 25-28 novembre 2009), I-II, a cura di RIGO, Antonio; BADUIN, Andrea; TRIZIO, Michele, Bari: Edizioni di Pagina ("Due punti", 25), II, p. 625-645; RODRIGUEZ, Maria Teresa (2010), *Un "nuovo" palinsesto dei Basilici*, in *Nea Rhome*, 7, p. 73-97.

¹⁵ This is the case of the notarial formula found on the reverse of a parchment preserved in the cod. *Vat. lat.* 13491 parch. 57, and edits in MATERA, Vincenzo (1997), *Una formula notarile d'area beneventana del secolo XI*, in *Annali della scuola speciale per archivisti e bibliotecari*, XI, p. 71-77.

Palimpsests of the Archive of Santa Sofia

Despite the scraping and bleaching process to which the parchments have been subjected, the writing of the primitive text has not been lost and, fortunately, more than one trace has remained and is still visible in many membranes, which is why today we talk about palimpsests.

The non-intrusive cancellation allowed the recovery and reading of a conspicuous documentary dossier coming from the parchment fund of the abbey of Santa Sofia in Benevento, currently dispersed in three autonomous funds: the archive of Santa Sofia of Benevento at the Museo del Sannio (Benevento, Campania, hereafter BSS), the Aldobrandini Archive at the Villa Aldobrandini in Frascati (Rome, Lazio, hereafter AA), and the Vatican Apostolic Library (Vatican City, hereafter BAV)¹⁶.

This is undoubtedly an exceptional case of its kind, more unique than rare, which concerns in particular the documentation of the monastery of Sant'Angelo of Ariano, one of the dependencies of the Benevento abbey, located in Ariano Irpino, a town located in the province of Avellino, in Southern Italy.

The membranes examined for this study amounted to twenty-two. There are twenty-one double palimpsest documents, which present a more recent *scriptio superior*, written on a single, older, *scriptio inferior*, and a triple palimpsest document, which presents a *superior scriptio* written on two *scriptiones inferiores*. In total, therefore, forty-five notarial deeds are documented, all relating to the 11th century. The discovery is all the more extraordinary if we consider the number of palimpsests identified in such a short period of time: the oldest writing, which bears an uncertain date, dates back to the years 955-966 / 1025-1026, while the most recent document is dated March 1090¹⁷.

Their state of conservation is unfortunately very precarious and the restoration to which those which became part of the BAV patrimony were subjected, if in part halted the decomposition process, failed to eliminate the layer of mold, most of which it has been covered and which in some cases prevents the membrane from reaching the degree of fluorescence that gives the metallic residues of the ink of the *scriptio inferior* the prominence necessary to allow them to be read.

The abrasion practiced, in some cases, in a clumsy way, has deprived the parchments of their fatty substance, favoring rot due to the effect of humidity with the consequent loss of parts of text and lines of writing.

On the basis of the orientations of the *scriptiones superiores* and *inferiores*, it seems that the purpose of the cancellation was not to completely remove the previous writing,

¹⁶ For the history of the Sofia fund and its reconstruction, see the *Introduzione* in CUOZZO, Errico; ESPOSITO, Laura; MARTIN, Jean-Marie (2021), *Le pergamene del monastero di Santa Sofia di Benevento (762-1067)*, I, di prefazione di ZECCHINO, Ortensio, Roma: École française de Rome ("Sources et documents", 12/1; "Medievalia. Nuova serie", 11/1).

¹⁷ In this regard, see the table in the *Appendix* to this essay.

but only to free the surface in a way suitable to be able to write the new one. And it is evidently for this reason that notaries paid attention to orient the parchment 180 degrees (more rarely 90 degrees) before writing the upper text, between the lines of the lower text. In other cases, in drafting the new act, they used more subtle graphic elements on the parchment in order to differentiate the new handwriting, and thus avoid the overlapping of the two writings that would have made reading difficult. This trend has helped us to decipher the lower texts, although the two scripts often totally overlap and this is the most difficult obstacle to overcome, despite having the latest technologies available.

The phenomenon of Ariano's *chartae rescriptae*, which extends, as mentioned, for the entire 11th century, evidently denotes the difficulty of obtaining writing material from notaries; it is difficult to research the historical causes of this shortage, since the sources from which to draw information are very scarce.

The serious damage that the city of Ariano could have suffered as a result of the earthquake that struck it in October 989¹⁸, the continuous contrasts between the Lombards and the Byzantines which the town could have suffered economically¹⁹, some repercussions at a local level due to the presence on the territory of the Norman *Girardo* of Buonalbergo who around 1051, entering between Benevento and Ariano, deprived the latter of the possibility of communicating with the capital of the Principality²⁰. These are minor episodes, which, however, could not have a prolonged influence and were not such as to cause a serious economic crisis. On the other hand, the known and published documents of the Sofia collection show a state of well-being relative to the monastery of Sant'Angelo of Ariano that certainly reflected the more than prosperous economic conditions of the entire town.

Therefore, another factor must be considered.

From the papers it appears that the town of Ariano was not supposed to have a pastoral character, since the published documents describe plowed land, vineyards, olive groves, woods, houses, mills, but do not recall pastures and livestock is rarely mentioned.

The parchment, therefore, had to be imported material and for this reason very precious. And, probably that, for unidentifiable reasons, there arose a moment of temporary difficulty in communicating with the central structures that had prevented the supply of the writing support and had begun the practice of reusing the

¹⁸ BERTOLINI, Ottorino (1923), *Gli "Annales Beneventani"*, in *Bullettino dell'Istituto storico italiano*, 42, p. 101-163, cit. p. 127 (an. DCCCCLXXX). The date of 989 is the most reliable, even if historians oscillate between 986, 988 and 990, see DELLA VIPERA, Mario (1636), *Chronologia episcoporum et archiepiscoporum metropolitanae Ecclesiae Beneventanae quorum extat memoria*, Neapoli: tip. Montanari, p. 75; VITALE, Tommaso (1794), *Storia della regia città di Ariano e sua diocesi*, Roma, Nella Stamperia Salomoni, p. 51; WATTENBACH, Wilhelm (1846), *Leonis Marsicani et Petri diaconi chronica monasterii Casinensis*, in MGH, *Scriptores*, VII, Hannoverae, p. 636.

¹⁹ CHALANDON, Ferdinand (1907), *Histoire de la domination normande en Italie et en Sicilie*, I-II, Paris: A. Picard et fils, I, p. 58.

²⁰ CHALANDON, *Histoire de la domination*, I, p. 120, 125, 136, 268.

parchment; a practice, then, which had to be preserved for the economic advantage that involved buying an erased membrane, certainly less expensive than a new one.

It was local custom that the parchment for the drafting of the deed was provided by the parties to the legal action and not by the notary. This custom is not explicitly attested although it is also valid elsewhere and is probably at the basis of the *traditio ad scribendum*²¹. However, it had to limitedly concern private individuals to get rid of a document in the conservation of which they did not have an excessive interest, rather than entities, certainly equipped with their own archives for the conservation of the *chartae*.

In the forty-five palimpsests writings examined, ten notaries were identified with certainty: *Adelbertus* writes an act, *Godeprando* with one, *Laurentius* with one, *Risando* with twelve acts, *Birno* with two, *Iohannes [I]* and *Iohannes [III]* respectively with one act, while there appears an unidentifiable *Iohannes* with two acts, *Petrus [I]* with two acts and *Bernardus* with three. If the writing material had been provided by the notaries themselves, the *scriptio inferior* would have had to go back to the same notaries and would have concerned *chartae* drawn up by them and preserved with them. But the editor's correspondence between *scriptio superior* and *inferior* never occurs; what happens, rather, and that *scriptiones inferiores* are written by notaries who have written the *superiores* on other membranes: *Risando* draws up the *inferior* dated before June 1075 while *Iohannes* draws up two *inferiores* deeds between 1033 and 1039²².

It is quite evident that it was not the notaries who reuses membranes already written and in their possession for economy, but it was the contracting parties in the legal transaction that handed them over to the notaries for the drafting of documents.

And since no correspondence was found between the first and second documents in the contracting parties or in the subject of the transaction – except for the two palimpsests dated 1033 August 15-1034 June/July 14 and February 1064, concerning the monastery of Sant'Angelo²³ – it must be deduced that the sheets were found on the market, and that there was a local craft that collected the documents that the owners discarded, perhaps even for a fee in money²⁴.

We have already mentioned the narrow temporal gap that exists in the 45 palimpsests between the drafting of the *scriptiones inferiores* and *superiores*, which goes from a minimum of 2/3 years to a maximum of 34 years²⁵, a decidedly remarkable circumstance for this dossier of documents, which it becomes even more so if

²¹ RASI, Piero (1946), *Il documento e la "traditio cartae" nel periodo longobardo*, in *Pubblicazioni dell'Università di Pavia. Studi nelle scienze giuridiche e sociali*, 99, p. 237-283.

²² Respectively, BAV, cod. *Vat. lat.* 13490, parch. 18, 13; AA, parch. I, 19.

²³ BAV, cod. *Vat. lat.* 13490, parch. 13.

²⁴ PRATESI, "*Chartae rescriptae*", p. 187.

²⁵ Respectively, BAV, cod. *Vat. lat.* 13490 parch. 18 and AA, parch. I, 17.

one takes into account the fact that in most cases the oldest writing refers to bonds with an expiry date that had not yet been exceeded by the date of the drafting of the most recent writing.

In the appendix there is an illustrative table of the forty-five palimpsest writings. They are listed in chronological order, with the indication of the place of writing (topical date), of the type of *scriptio*, if *inferior* or *superior*, the archival signature of the current place of conservation (referring to one of the three cited parchment funds), and to the univocal progressive number for each act that corresponds to that present in the two volumes of the four of the collection, of which the first has already been published²⁶, of the entire Sofia parchment fund. Finally, there is the report of the new palimpsest findings, subsequent to those identified by Pratesi at the beginning of the second half of the twentieth century.

Digital photography and the “multispectral imaging” technique

Before explaining the criterion that underlies this new digital technology, without however going too far into the details technical, we will briefly give some hints on the technologies used in the past for the recovery of the palimpsest texts.

Bringing an erased text back to the surface depended above all of the type of ink with which it was written, as well as the razor’s skill at eliminating it. Carbon-based inks, for example, once eliminated were very difficult to recover and the attempts were mostly unsuccessful (at least until the advent of modern technologies), while for the metal-gallic ones the results were surprising.

The first attempts at reading ‘hidden texts’ were carried out in a pioneering way between the second half of the 17th and the first half of the 18th century, on Greek biblical texts of the 5th century AD²⁷ and a first scientific methodology of approach to the analysis of the palimpsests took place in the middle of the 18th century²⁸.

Between the XVIII and XIX centuries, the study of palimpsests did not experience a solution of continuity. Prominent figures of the scholarly community such as Barthold Georg Niebuhr, Theodor Mommsen, Angelo Mai, Amedeo Peyron, Friedrich Ritschl, Wilhelm Studemund, Charles Graux, Wilhelm Wattenbach and Elias Avery Lowe took turns in the challenge of recovering the invisible.

The technique used was invasive and consisted of two main methods, one based on plant and the other based on chemical reagents. The two different approaches reflect

²⁶ CUOZZO; ESPOSITO; MARTIN, *Le pergamene del monastero di Santa Sofia*.

²⁷ It is one of the most important Greek biblical codes, the *Codex Ephraemi Rescriptus* (5th century AD), which together with the Sinaitic, Alexandrian and Vatican Codes, constitutes the group of the four great uncial codes containing the entire text of the Greek Bible (Old and New Testament).

²⁸ UBERTI, *I palinsesti pergamenei*, p. 6.

two different cultures and traditions. The first more traditionalist was linked to forms of practical experimentation: it used a sponge soaked in gallic acid, extracted from gall nuts (which was also the basis for the preparation of metal-gall inks), pulverized and moistened, which passed on the sheet of parchment made visible the faded ink of the deleted text and brought to light the lost testimony. The second method, on the other hand, opened up to the progress of chemical science through the use of chemical reagents, the so-called “Giobert’s mixture”, a compound of water, muriatic acid and potassium ferrocyanide, developed towards the end of the 18th century²⁹. With either method, however, the parchment could dramatically change in color and become illegible. The gall nut produced dark spots and browning of the parchment, especially if the user was not very experienced, and the chemical methods did not safeguard the conditions of the writing support, and the “Gioberti dye” produced a blue color on the treated sheets.

Towards the end of the XIX century there was a greater sensitivity on damaged writing media; on the one hand, new non-invasive techniques were being discovered such as photography, ultraviolet radiation and radiography, thus decreeing the end of the era of reagents, on the other hand it was understood the need to preserve the parchment, to protect its integrity and to recover it, obviating the damage suffered.

In 1903 the American Robert Williams Wood developed a decidedly revolutionary optical instrument for those times, which supplanted the techniques used up to that moment – these had turned out to be too invasive, since the acids used for reading the palimpsests produced irreversible damage to the manuscript, even continuously over time, due to the oxidation process produced by the gallic acid itself³⁰, permanently damaged the texts. The inventor had developed a luminous instrument that emitted electromagnetic (EM) radiation mainly in the ultraviolet (UV) range and, to a lesser extent, in the visible light field, that is natural light (RGB). It based its principle on fluorescent and phosphorescent pigments present on fabrics, paper, bacteria, minerals, banknotes and so on. In 1934, ultraviolet fluorescence unequivocally became the preferred analysis tool in the various stages of the restoration operations, until the advent of digital technology revolutionized the very concept of photography.

The innovation, however, took place during the seventies of the XX century, when photographic technology used for space missions was applied to palimpsest. The project was carried out by the *California Institute of Technology* with the

²⁹ UBERTI, *I palinsesti pergamenei*, p. 19.

³⁰ In this regard, see the results presented in the International Meeting held in Rome in 2009, *Conservation and preservation of library material in a cultural-heritage oriented context, Vatican Library Conservation Workshop*, tenutosi a Roma il 31 Agosto-1 Settembre 2009, organized by Icpal (Istituto Centrale per il restauro e la conservazione del patrimonio archivistico e librario) and by IFLA (International Federation of Library Associations and Institution), [Online], Città del Vaticano [Consult. 2 June 2021]. Available at [www: https://www.ifla.org/files/assets/pac/Satellite_Meeting_Rome_2009/Nu%C3%B1ez%20Gaitan.pdf](https://www.ifla.org/files/assets/pac/Satellite_Meeting_Rome_2009/Nu%C3%B1ez%20Gaitan.pdf)].

support of NASA and the *Jet Propulsion Laboratory* in Pasadena. The conclusions of that experiment were produced between 1978 and 1981 by John Benton, Alan R. Gillespie and James Soha³¹. At present, in the paleographic-diplomatic-codicological field, it is the most promising system, which has produced very satisfactory results, especially in terms of safeguarding and respecting the written support examined.

By digital photography we mean a process for acquiring static images, projected on an electronic device (sensor) sensitive to light, by means of an optical system, with subsequent conversion into digital format and storage on a memory support. To achieve this, the most direct method is to shoot with a digital camera, or you can scan a previously printed image, in the form of a negative or slide, with an image scanner³².

The first prototype of a digital camera occurred in 1975 by a Kodak engineer, Steven Sasson, the official presentation of a digital camera took place in 1981 with the Sony Mavica, while for a fully digital camera it had to wait until 1988, the model from Fuji.

Digital photography, placed at the service of Paleography, Diplomatics and Codicology and, in this case of palimpsest, improves their reading without causing damage, using non-invasive methods. The commonly adopted term is *Imaging multispectral*, an optical investigation technique that allows you to extract information from digital images acquired in different bands of the electromagnetic spectrum, depending on the potential of the tools used³³.

In the field of book and documentary heritage, as some studies and conferences on the subject have shown³⁴, this technique allows you to acquire information on the composition and degradation of documents without having to take samples and damage the artefact. You can highlight erased palimpsests, analyze hidden text, improve readability and virtually erase smudges, defining the difference between faded inks and surrounding areas.

³¹ BENTON, John F.; GILLESPIE, Alan R.; SOHA, James M. (1979), *Digital Image-Processing Applied to the Photography of manuscripts, with Examples Drawn from the Pincus MS of Arnald of Villanova*, in *Scriptorium*, 33, pp. 40-55, [Online]. [Consult. 8 June 2021]. Available at [www.<https://www.persee.fr/doc/scrip_0036-9772_1979_num_33_1_1119>](https://www.persee.fr/doc/scrip_0036-9772_1979_num_33_1_1119).

³² UBERTI, *I palinsesti pergamenei*, p. 34.

³³ SCHULER, Irmgard; FONTANA, Carola; FALCIONI, Eugenio (2017), *Oltre il visibile: tecniche fotografiche multispettrali per il recupero di materiale manoscritto*, in *Miscellanea Bibliothecae Apostolicae Vaticanae*, 23 ("Studi e testi", 516), p. 569-609.

³⁴ FARAGGIANA DI SARZANA, Chiara (2007), *Leggere manoscritti palinsesti nell'era digitale: nuove prospettive di ricerca e vecchi problemi*, in *Papers on Grammar*, IX, 3: *From Manuscript to Digital Text. Problems of interpretation and markup*, edited by CITTI, Francesco; DEL VECCHIO, Tommaso, Roma: Herder ("Università degli studi di Bologna, Dipartimento di filologia classica e medioevale, Centro di studi retorici e grammaticali"), p. 35-60; LUCÀ, Santo (2008), *Libri palinsesti greci: conservazione, restauro digitale, studio*. Atti del Convegno internazionale (Villa Mondragone-Monte Porzio Catone-Università di Roma "Tor Vergata" – Biblioteca del Monumento Nazionale di Grottaferrata, 21-24 aprile 2004), *Indici* a cura di ALETTA, Alessia Adriana; RODRIQUEZ, Maria Teresa, Roma: Comitato nazionale per le celebrazioni del millenario della fondazione dell'Abbazia di S. Nilo a Grottaferrata.

The technique uses a multiple number of images on the same page that are captured in the identical position while it is illuminated by a preset succession of fixed wavelengths of light (various waves of natural, ultraviolet, infrared, and other types of light). These images fix the different reactions of the parchment generated by the different light waves and can be profitably compared; the process manipulates mathematical algorithms in such a way as to bring these differences from the invisible spectrum to the spectrum visible to human eyes³⁵.

The results of *Imaging multispectral* depend on several factors, such as the type of ink used, the quality of the *vellum* support, the level of abrasion, the degree of overlap of the upper writing, the presence of stains or alterations and as well as the *Imaging* systems employees. Furthermore, the acquisition time of the multispectral image is generally very long and is a function of the number of bands or filters used, the size of the surface examined and the type of instrumentation, which is rather heavy and generally not portable.

Imaging Multispectral produces data that cannot be consulted directly by end users, text scholars or conservators³⁶. Various photo projects on palimpsests that use this principle try to publish the data together with a more or less readable version that can be rendered with their own standards³⁷.

The digital recovery of the removed texts has many advantages: first of all, it is a non-invasive method and does not imply a long exposure to UV or infrared lights; secondly, the results can be manipulated without the risk of damaging the starting images to which it is always possible to return. Finally, it is evident how easy it is to distribute and circulate these images and their elaborate variants among scholars, even in multiple identical copies³⁸.

The *Imaging multispectral* technique has allowed the identification of new occurrences relating to the sofiano parchments background, through the experimentation of multispectral digital photography and the digital manipulation of the sectioned images, able to bring out, in their clarity, the traces of the unspoken writings, more

³⁵ EASTON, Roger L.; KELBE, David (2014), *Statistical Processing of Spectral Imagery to Recover Writings from Erased or Damaged Manuscripts*, in *Manuscript Cultures*, 7, p. 35-46.

³⁶ And this is where Mirador comes into play, a software developed as an open source project capable of managing multiple based on images, allowing structural navigation and synchronization of visual content; see the dedicated page with the link available and usable on the website of the Biblioteca Apostolica Vaticana, see [Online]. [Consult. 20 June 2021]. Available at <http://www.https://spotlight.vatlib.it/palimpsests/feature/recupero-digitale-dei-testi-rimossi>; www.https://jubilees.stmarytx.edu/mirador/index.html?manifest=MilanWinter2017&canvas=Narrowband.

³⁷ The best known projects with the most reliable and documented results are essentially four: *The Archimede Palimpsest*, [Online]. [Consult. 20 June 2021]. Available at www.http://archimedespalimpsest.org; *Palimpsest. The Jubilees Palimpsest Project*, [Online]. [Consult. 20 June 2021]. Available at <http://www.https://jubilees.stmarytx.edu>; *Rinascimento Virtuale*, [Online]. [Consult. 20 June 2021]. Available at <http://www.http://www.rinascimentovirtuale.eu/online.html>; *The Sinai Palimpsest Project*, [Online]. [Consult. 20 June 2021]. Available at <http://www.http://sinaipalimpsests.org>.

³⁸ The Biblioteca Apostolica Vaticana normally publishes two versions for each page of the palimpsest, one taken in natural light, the other with UV fluorescence. Both can be consulted one at a time without being combined with the other, while the image enhancement tools allow scholars to manipulate these images to suit individual research programs.

visible, neither to the naked eye, nor through the classic use of the Wood Lamp. This new photographic technique, which has allowed the isolation and separation of one or more levels of writing, has allowed at present in a few cases the recovery and reading of an entire document – such as the writing preserved in parchment AA, parch. I, 19, whose example we will see below – in some cases, the recovery of parts of documents, in still other cases the reading of only scattered letters.

The work, however, continues briskly in the hope of being able to find other lost documents.

The case of the hidden document

In April 1077³⁹, in a legal dispute, the monastery of Sant'Angelo di Ariano, a dependency of Santa Sofia, obtained a sentence in its favor, to the detriment of an inhabitant of Ariano, which today we can prove to be the result of a deception.

The *prepositus* Orso [II] of the Arianese monastery was accused by a certain *Maraldus*, son of *Guisenolfus*, of holding in bad order and above all *contra legem* a land in Laturano.

Maraldus claimed possession of the land, stating that it was owned by him by his father's inheritance, and that his father, now deceased, had, in turn, received it from the bishop of Ariano. This claim, however, is not supported by any documents or evidence of testimony proving the claimed possession. On the other hand, the *prepositus* Orso declares to have full possession of the land in question.

Judge *Magelpoto* intervenes to resolve the dispute, who set a date on which he made the two parties commit to *wadia* – this is any object that symbolically testified to the authority that the creditor acquired over the person and assets of the debtor who handed over to him – and with the presence of the *fideiussores* – well-known and trusted people usually chosen from relatives, who at a later time redeemed the *wadia* from the hands of the creditor – so that they would appear in court to swear an oath on the Gospels on the veracity of their statements.

On the day set for the meeting, the two parties gathered before the judge to be heard: the *prepositus* Orso presented himself with his lawyer *Iohannes*, while *Maraldus* presented himself alone.

Orso swore that he had never entrusted or given in custody any movable or immovable property to *Guisenolfus*, father of *Maraldus*, and denied being aware of any concessions made by his predecessors; moreover, his *sacramentales* – a certain number of acquaintances who confirmed the credibility of the party called to swear

³⁹ CUOZZO, Errico; ESPOSITO, Laura; MARTIN, Jean-Marie (2017), *I più antichi documenti di Ariano. Dai Longobardi agli Svevi (777-1264)*, prefazione di ZECCHINO, Ortensio, Ariano Irpino: CESN ("Medievalia. Nuova serie", 6), p. 147-150 doc. 36.

– swore *de credulitate* – therefore on the reliability of the person and not *de veritate*, on the reliability of the facts.

Maraldus entered the trial without the papers that could have supported and corroborated his case, not because he was in bad faith, but simply because he did not possess them. The judge, having no papers to refute, could only deliberate and issue a judgment in favor of the monastery and the *prepositus* Orso.

Today we know without any doubt that the *prepositus* Orso lied in disavowing the reasons of *Maraldus*, who was in good faith when he claims that the land was his property, that they were once his father's. And why do we know? Because we have the deed of concession with which *Guisenulfus*, father of *Maraldus*, had received the property contested by the Bishop.

The *Chartula concessionis* dated August 1039⁴⁰ and issued by Bishop Bonifacio was found in the private archive of the Aldobrandini princes in Frascati, with which the Arianese prelate had granted the land located in Laturano to *Guisenulfus*.

The parchment that contained the Bishop's concession, for reasons unknown to us, had been subjected to the usual operation used for the palimpsests, losing its primary writing of 1039, to be reused for the drafting of another deed, that of March 1063, whose content had nothing to do with that of the deleted document.

The membrane had been erased 'badly', subjected to a lime bath and trimmed on the lower edge, with the removal of all the *escatocollo*, including the signatures of the witnesses. Some of these are still visible and were recovered first through reading with the ultraviolet light lamp (also called Wood's Lamp) and, subsequently, with the use of the *Imaging multispectral* technique; the examination allowed the identification of the name of the notary *Iohannes* and that of judge *Alerissi*, both now almost certainly dead at the time of the lawsuit with the monastery of Sant'Angelo, so they were no longer able to testify on the nature of the erased act.

The new membrane had been used by the notary *Risando* for the drafting of the new document containing a donation in favor of the Arianese monastery. However, some questions remain about the work of the monastery, why the notary *Risando*, a trusted man of the monastery, used a parchment guaranteeing the bishop's concession that still exists; whether the notary acted with the knowledge or not of the damage that he would have caused to the counterparty of the legal transaction (*Guisenolfus*), eliminating the only existing evidence; whether the work of *Risando* is prior or subsequent to the abuse committed by the monastery of Sant'Angelo and whether or not it is to be connected with the illegitimate possession of the disputed property.

The palimpsest parchment, therefore, contains two documents: the first dated 1039, which constitutes the *scriptio inferior*, and the second, dated March 1063, which constitutes the *scriptio superior*.

⁴⁰ The palimpsest parchment, with signature AA, parch. I, 19, together with its two documents, it is published in CUOZ-ZO-ESPOSITO-MARTIN, *I più antichi documenti di Ariano*, p. 62-65 doc. 14 (y. 1039), p. 107-111 doc. 25 (y. 1063).

The concession of Bishop Bonifacio constitutes today the *scriptio inferior* of a *charta rescripta*. Therefore, *Maraldus* in the case of 1077 could never have refuted the statements of the *prepositus* Orso, since he was no longer in physical possession of the document to be presented to Judge *Magelpoto*. And that's why he lost the case.

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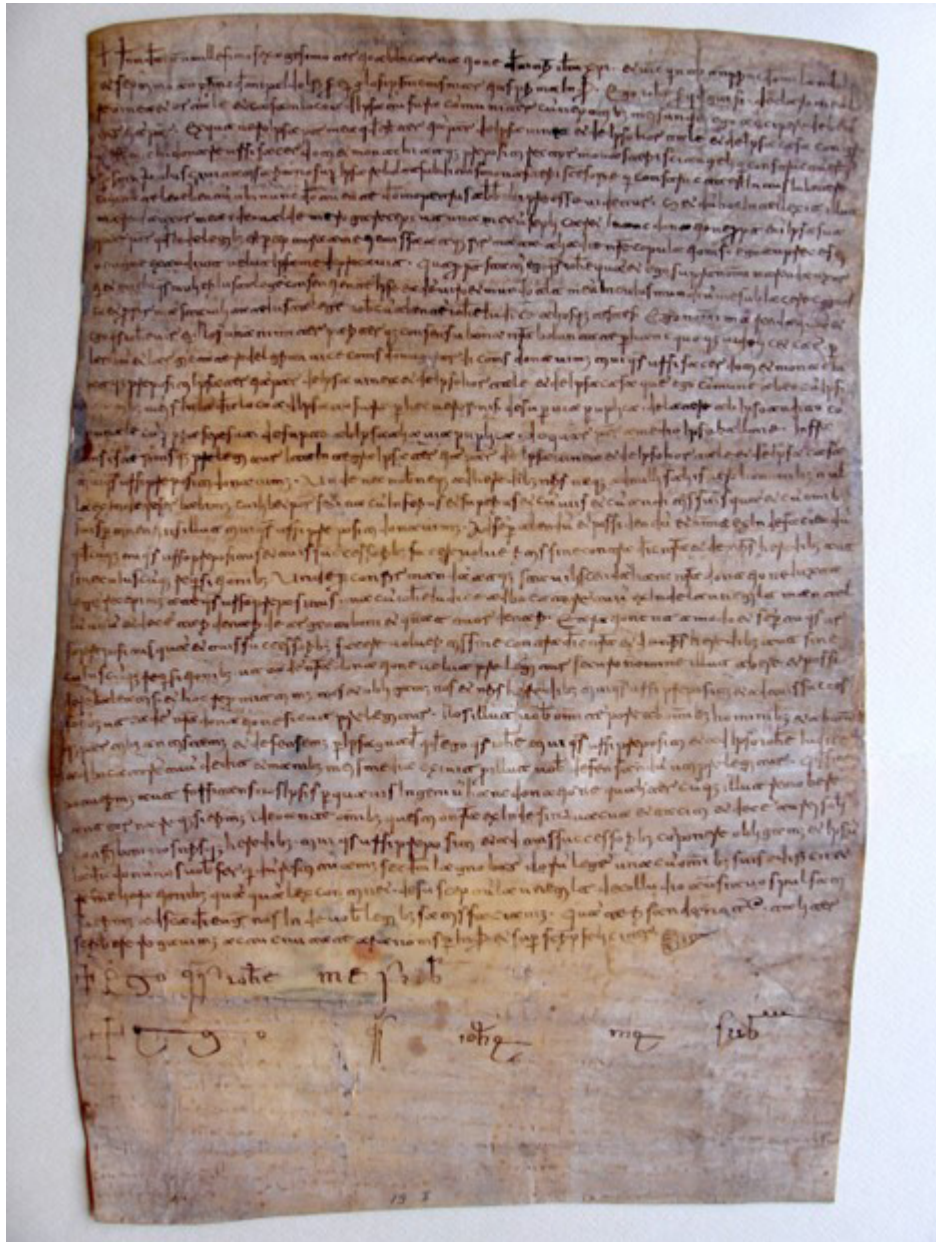
APPENDIX

N.	PLACE	DATE	SC. INFER.	SC. SUPER.	NR. DOC.	SIGNATURE	PRATESI
1	...	<i>ante</i> [995-996/1025-1026]	1		I, 20	AA II, 52	no
2	<i>Rediri</i>	[995-996/1025-1026]		1	I, 20	AA II, 52	no
3	...	<i>ante</i> [1003] December	1		I, 27	SS XXXVI, 1	no
4	Lucera	[1003] December		1	I, 27	SS XXXVI, 1	no
5	...	<i>ante</i> [1013] March	1		I, 33	BAV 13490, 4	no
6	Ariano	[1013] March		1	I, 33	BAV 13490, 4	no
7	...	<i>ante</i> [1024] December	1		I, 39	BAV 13490, 6	no
8	Ariano	[1024] December		1	I, 39	BAV 13490, 6	no
9	...	<i>ante</i> [1028?] May	2		I, 42	AA I, 17	yes
10	Ariano	[1028?] May		1	I, 42	AA I, 17	yes
11	...	<i>ante</i> [1028] August	1		I, 43	BAV 13490, 8	yes
12	Ariano	[1028] August		1	I, 43	BAV 13490, 8	yes
13	Ariano	[1033 Aug. 15-1034 Jun./Jul. 14]	1		I, 47	BAV 13490, 13	yes
14	[Ariano]	[1039] August	1		I, 52	AA I, 19	yes
15	...	<i>ante</i> [1043] April	1		I, 55	AA I, 34	yes
16	Ariano	[1043] April		1	I, 55	AA I, 34	yes
17	...	<i>ante</i> [1050] November	1		I, 62	AA I, 52	no
18	Ariano	[1050] November		1	I, 62	AA I, 52	no
19	...	<i>ante</i> [1052] March	1		I, 63	BAV 13490, 9	yes
20	Ariano	[1052] March		1	I, 63	BAV 13490, 9	yes
21	Ariano	1062 April		1	I, 93	AA I, 17	yes
22	...	<i>ante</i> 1062 May	1		I, 94	BAV 13490, 12	yes

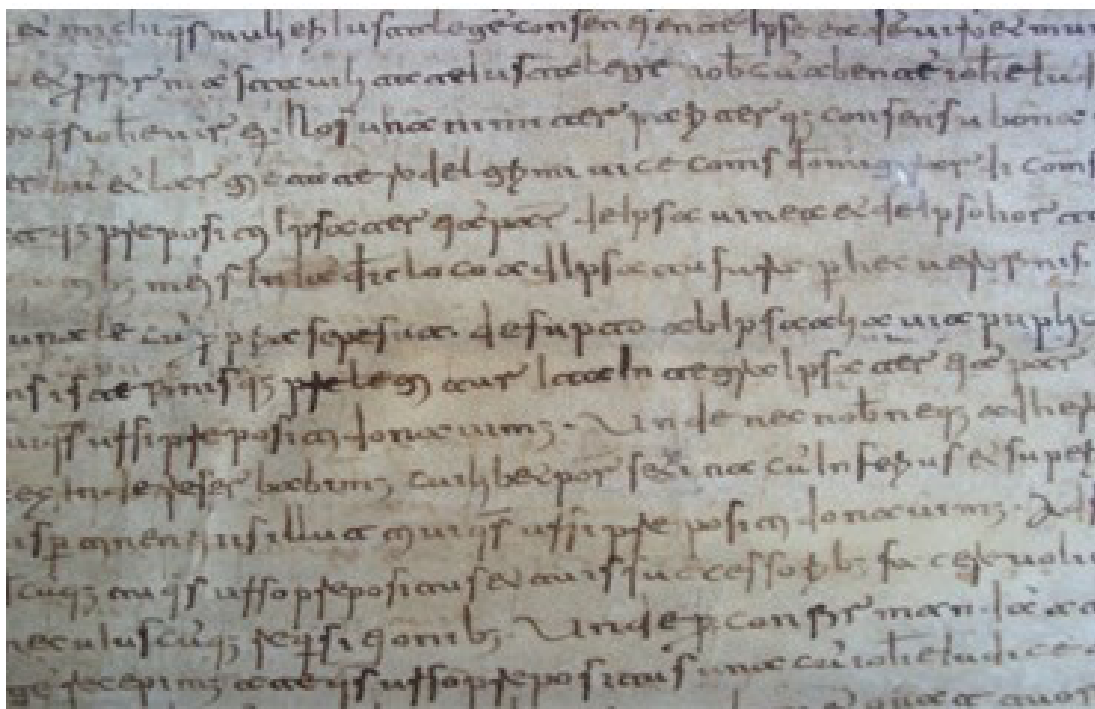
APPENDIX

N.	PLACE	DATE	SC. INFER.	SC. SUPER.	NR. DOC.	SIGNATURE	PRATESI
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24	Ariano	1063 March		1	I, 100	AA I, 19	yes
25	...	<i>ante</i> 1063 May	1		I, 101	SS XXVIII, 4	no
26	...	1063 May		1	I, 101	SS XXVIII, 4	no
27	Ariano	1064 February		1	I, 103	BAV 13490, 13	yes
28	...	<i>ante</i> 1064 March	1		I, 104	BAV 13490, 14	yes
29	Ariano	1064 March		1	I, 104	BAV 13490, 14	yes
30	...	<i>ante</i> 1064 May	1		I, 105	AA I, 16	yes
31	Ariano	1064 May		1	I, 105	AA I, 16	yes
32	...	<i>ante</i> 1067 October	1		I, 110	AA I, 13	yes
33	Ariano	1067 October		1	I, 110	AA I, 13	yes
34	...	<i>ante</i> 1072 March	1		II, 9	BAV 13490, 17	yes
35	Ariano	1072 March		1	II, 9	BAV 13490, 17	yes
36	...	[1062/1063 Aug.-1072/1073 Aug.]	1		II, 12	BAV 13490, 18	yes
37	Ariano	[10]75 June		1	II, 12	BAV 13490, 18	yes
38	...	<i>ante</i> 1077 April	1		II, 14	BAV 13490, 19	yes
39	Ariano	1077 April		1	II, 14	BAV 13490, 19	yes
40	...	<i>ante</i> 1077 May	1		II, 15	BAV 13490, 20	yes
41	Ariano	1077 May		1	II, 15	BAV 13490, 20	yes
42	...	<i>ante</i> 1081 February	1		II, 26	BAV 13490, 21	yes
43	Ariano	1081 February		1	II, 26	BAV 13490, 21	yes
44	...	<i>ante</i> 1090 March	1		II, 34	BAV 13490, 23	yes
45	Ariano	1090 March		1	II, 34	BAV 13490, 23	yes

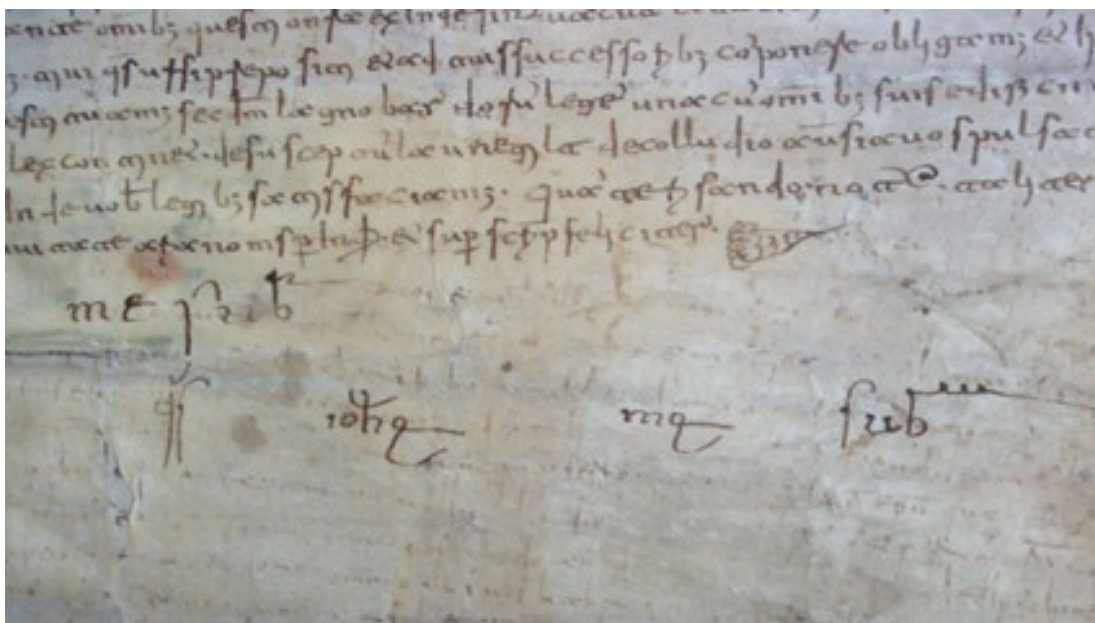
TAVOLE



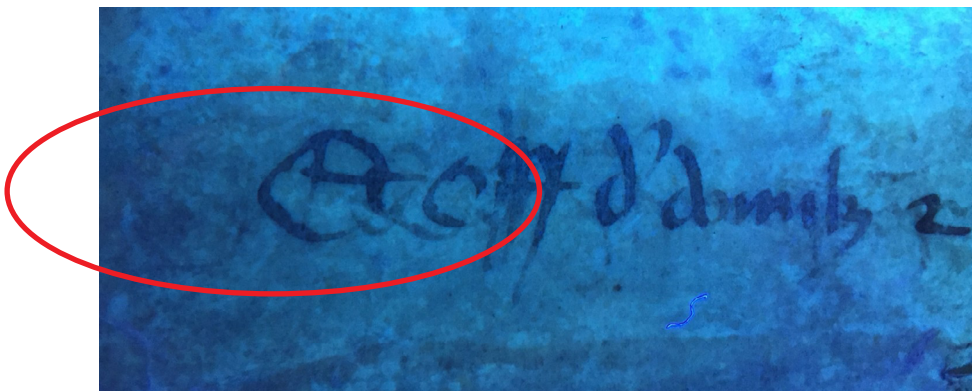
TAV. 1. Frascati, Archivio Aldobrandini, Documenti Storici, Abbade, parch. I, 19.



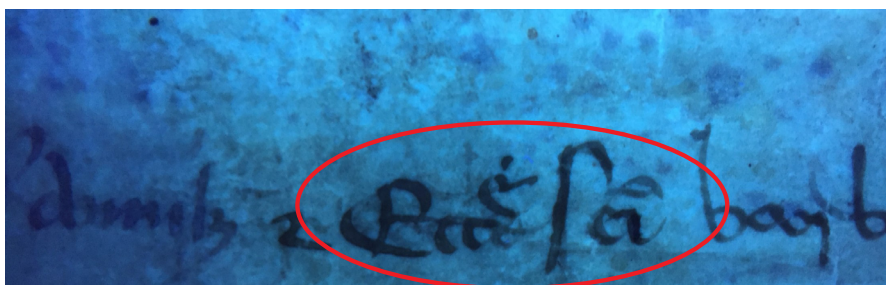
TAV. 2. Frascati, Archivio Aldobrandini, Documenti Storici, Abbadie, parch. I, 19, particular.



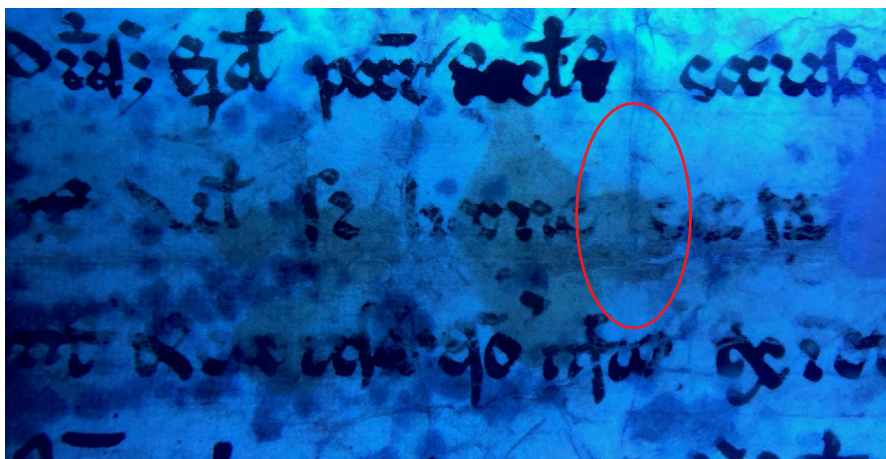
TAV. 3. Frascati, Archivio Aldobrandini, Documenti Storici, Abbadie, parch. I, 19, particular.



TAV. 4. Frascati, Archivio Aldobrandini, Documenti Storici, Abbade, parch. II, 52v, particular.



TAV. 5. Frascati, Archivio Aldobrandini, Documenti Storici, Abbade, parch. II, 52v, particular.



TAV. 6. Frascati, Archivio Aldobrandini, Documenti Storici, Abbade, parch. II, 52r, particular.