Towards archaeological printmaking

Marta Bełkot, Rafaela Lima, Antònio da Silva, and Graciela Machado

ABSTRACT

With the advancement of the ink manufacturing industry and methods in the 19th century, it has been argued that artists lost intimacy with the raw materials used in almost all techniques. The composition of ingredients in even the most common drawing and printing inks, tusches, or crayons became a mystery. If, on one hand, the advancement of chemistry and industry allowed the improvement of paints and led artists to understand how to combine them, on the other hand, putting high-quality ready-to-use materials on the market pinpointed the beginning of the broken connection between artists, raw materials, and the process of their fabrication. The model of work in this research is posited in a more complex and desirable situation, such as working in situ as opposed to a well-provided printmaking workshop. To achieve a better understanding of local culture, this research aims to deepen the knowledge of the processes embodied in the use of print media and the construction of artists' tools. The local black slate, used as a matrix for lithographic printing, its colourful variation for coating papers, gum printing, inks, and crayons, extend the innovative experimental approaches and offer a variety of strategies to understand and read local collective memories and the history of communities. Reconstructing 19th-century materials used in commercial printing or looking at vernacular buildings makes us consider the use of hereditary methods and knowledge and the need to include traditional skills and craftsmanship. It prompts us to learn from a constructive culture that has been informed by the collective memory of knowledge and skills, both popular and erudite, and to acknowledge these repositories of knowledge as evidence of the dynamic connection between the past and future of humankind's adaptation to the environment, where printmaking in situ may have a role in negotiating culture and history.

WE HAVE CALLED THE MANUFACTURE OF INK AN ART:[1] A CASE STUDY ON THE APPROPRIATION OF 19TH-CENTURY LITHOGRAPHIC DRAWING-TOOL FORMULAS

Invented forty years apart, lithography and photography emerged from the same background, generated by industrialised multiplication and reproduction of images (Howe 1998). Both claimed capabilities beyond mere copying. Photography struggled to establish itself as distinct and superior

Figure 1

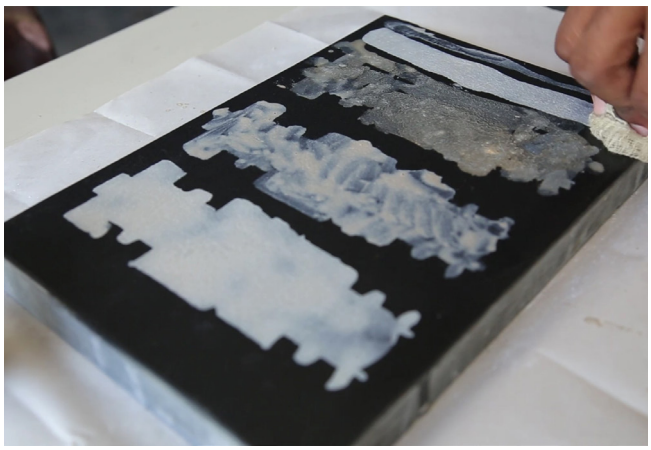

Figure 2

https://doi.org/10.54632/22.7.IMPJ12

Figure 1. The first stage of autographic ink research 2020/2021 (PURE PRINT/i2ADS).On the left side of the lithographic stone are produced inks nr. 1-5, on the right side the available brands:Charbonnel,Rohrer & Klingner, and Korn. On the bottom manufactures crayons, inks in the dry form and its commercial equivalent. Experiment conducted by Marta Bełkot and Rafaela Lima8.
Figure 2. The secondstage of autographic ink research, 2021(PURE PRINT/i2ADS). White inks numbers from 1 to 4, produced by Marta Bełkot. Experiment conducted by Marta Bełkot and Antonio daSilvaon black slate.

to lithography, seeking accuracy of representation. This history of the relationship between the two techniques is full of intersections and distinctions, but just as artists did almost two centuries ago in commercial printing, contemporary artists continue to merge the two processes.

The invention of photography also had a strong impact on the relationship between artists and scientists. The image produced by the camera was more accurate, faster, and, importantly, possible to make by scientists themselves (Daston & Galison, 2007)). However, scientific drawing survived even in the late 19th century, wherever photogravure or photo-lithography made it possible to reproduce images both cheaply and accurately. Although photography was the preferred medium for capturing and presenting controversial subjects, it nevertheless aroused mistrust. It was not only in the field of image-making that one could observe the loosening of ties between scientists and artists. The expansive development and fast-growing industry of the 19th century spurred the production of high-quality materials for artistic use. Up to that point, artists could easily purchase the required substances and recipes to create their own drawing or printing inks; by the 19th century, they no longer needed to study and understand the substances as they were all available on the market, and artists were encouraged to buy the materials rather than prepare them themselves[2] (Cumming, 1948).

"We have called the manufacture of ink an art. Many may smile at the designation, but we shall adhere to our nomenclature. It is not easy to make an ink fulfilling every requirement that may be demanded of it, especially as we are even now to a large extent in the dark as to the exact chemistry of ink manufacture, although distinguished chemists have not thought it unworthy of them to work at the subject." [3]

Lehner, 1902

1. PRINTMAKING AND DRAWING CUISINE

There is a need for tangible form and more subtle choices of papers and inks, to draw or to print, to bring us closer to the rich 19th-century printmaking processes and techniques that are almost forgotten today. Some of those, like *gillotage*, photo-engraving and photo-lithography, are based on the use of transfer papers and greasy lithographic transfer inks (Machado, Bełkot & Brás, 2022). With the first attempt to reconstruct such processes, we realised most of the necessary materials were no longer available on the market. This was the hint for us to recreate several types of inks, from the ones used in processing to the ones used for drawing. The initial scope of ink reconstruction included transfer inks, evolving to autographic inks, tusches, and crayons from original recipes taken from lithographic reference books and the Portuguese manuals, *Bibliotheca do Povo e da Escola* (1888) and *Mil Segredos de Oficinas* (1925).

From several available brands of lithographic drawing inks in

Figure 3

Figure 4

Figure 3. The second stage of autographic ink research, 2021(PURE PRINT/i2ADS). White inks numbers from 1 to 4, produced by Marta Bełkot. Experiment conducted by Marta Bełkot and Antonio daSilvaon black slate.
Figure 4. From the left: equipment needed to cut inks into pieces, in the middle drawing ink number 4, made with dragon blood, on the right side ink nr. 3 cut in pieces to be preserved.

the middle of the 20th century: *Vanhymbeeck, Lemecier, Stroeger, Charbonnel, Korn, and Rohrer & Klingner*, only the last three have survived to this day. The limited variety drives us to shed some light on printmaking and drawing cuisine. Profiting from previous experiences[4], using an accessible database, or by modifying recipes to obtain uncommon white ink suitable for drawing on the black slate for *Bienal da ardósia de Valongo*, Portugal, we have reached the desired effect. To validate our findings, comparative tests were conducted using the remaining inks[5] and manufactured ones on lithographic stone, Portuguese marble, black slate, and prepared and cured stone paper, also with the use of current drawing materials on paper. The recreation of lithographic drawing ink took place in two stages: the first stage, which was based on traditional lithography and involved following mainly Portuguese recipes, was dedicated to creating inks that are visible on light stones. The second stage focused on the production of white drawing inks visible on dark surfaces based on indications by lithographic masters and certain manipulations. In the second stage, we created crayons based on black slate colouration, which ranged from dark grey to earthy yellow. We also used the local black slate, with its colourful variation, as a matrix and pigment for coating papers following previous research (Machado & Bełkot 2019) and gum printing. The preparation for lithography in situ began at the Flash residency (2020) in Anadia, Bairrada, Portugal, where Graciela Machado, Marta Bełkot, and Kasia Harciarek collected and printed from uneven calcareous stones, indicating that the research path would focus on the construction of artists' tools[6]. Later, as an effect of the local Biennale of Black Slate in Valongo, with the usage of two models of portable lithographic presses constructed by Antònio da Silva and four kinds of white inks prepared by Marta Bełkot, the lithography in situ took place in the backyard of Empresa De Lousas De Valongo, S.A.[7]

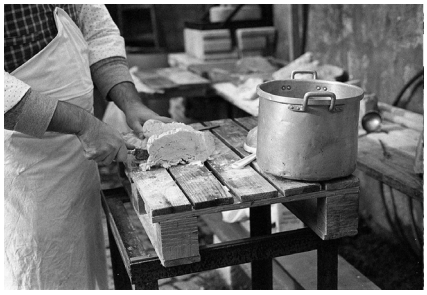

Figure 5

Figure 6

2. AUTOGRAPHIC INK PRODUCTION

Experimenting with inks and crayon formulas today involves putting a lot of energy into the manufacture of such items and consideration of their further use. First, one needs to analyse the advantages and limitations of reintroducing old materials to the lithography studio. Second, one needs access to a technical context that is no longer available. Third, such tailored production is based on a cooperative process by which drawing lithographic inks used in the traditional liquid form as tusche, or as solid crayons, are reconstructed at the printmaking workshop, allowing future practitioners to access a new set of distinct formulas today restricted to fewer options offered by the fine art suppliers industry. Finally, reusing old formulas, which were often used in the commercial lithographic industry, will no longer give us inks proved by their convenience and predictable, standardised behaviour. Drawing techniques allowing one to produce lines and wash must be considered in relation to the ink properties, both as a drawing tool and as material crafted to suit a reproductive technique. This means considering the most suitable tools and processes, and the nature of the images to be produced as lithography. In our context, we are emphasising the creation of a drawing ink rather than considering

Figure 5. Mutton fat cleaning and cooking with Gil Raro[14] collaboration.
Figure 6. On the top: Three different types of lithographic stone tested using the same system as in Fig.1. On the bottom: Stone paper, processed and printed, from the left; (1) matrix with all tested inks; (2) process of printing; (3) first proof; (4) second one; (5) third one; (6) and the forth one.

its exclusive use on stone or plate[9]. The links between ink production and the other stages of the lithographic process are also important. For example, the choices of ink based on its ingredients may be relevant to the project concept and help to define the colour in which to produce the printed image.

In short, rather than considering ink as a material that will disappear in processing, replaced by printing ink, production and reproduction techniques are making us aware of how the stages of production influence the appearance and the final printed product. Again, as we discuss all the stages and elements of the lithographic process, this essay will concentrate not only on the use of tailored black and white inks, tusches, and crayons but also on black slate as an alternative stone or pigment. For example, although printing efficiency has played an important role throughout the analysis of the process and in validating the use of materials, only some aspects related to the response to drawing and processing are discussed in detail and considered relevant to creative practice. This research offers an innovative experimental approach and helps to understand local collective memories and community.

This narrow focus is valid because it allows us to consider that using reproductive media today cannot be restrained by the consistency of edition: it is about entering into an arena where crafting an ink/crayon set determines a project's direction. The strategy used is to devise drawings, which, in their initial sampling will demonstrate the artistic potential of the media and their future uses. For example, although test drawings were made and processed using conventional processing techniques adopted at the printmaking studio, Antònio da Silva adopted alternative etches learned from the PURE PRINT manual[10] dedicated to the use of alternative stones.

Figure 7

Figure 8

3. HISTORY AND RECREATION OF LITHOGRAPHIC INKS AND CRAYONS FORMULAS

Alois Senefelder, the inventor of lithography, laid a good foundation for ink manufacturers. The same ingredients he had used two centuries ago are still in use today, carefully refined by years of experiments and chemical research to find the exact proportions. In Chapter 2 (*The Chemical Ink*) of his book: *A Complete Course on Lithography, Senefelder* (1819) makes a clear distinction between chemical inks: the one for drawing on stone is thicker and the one for transferring from paper to stone is more liquid. The common ingredients repeatedly used in different recipes and proportions are wax, shellac, tallow, soap, mastic, resin, turpentine, and lampblack. The yellow beeswax is an acid-resistant substance that provides smoothness and adhesiveness; the shellac in flakes gives hardness and elasticity to the ink; the mutton fat (tallow) gives the necessary greasiness and softness; the Marseille soap, made from soda, opens the porosity of the stone and helps the penetration of fat, providing a smooth or slippery quality and solubility in water; mastic in tears gives the ink fluidity, and resins impart

Figure 7. Top left; Marble stone with paint No 1-medium brown; paint No 2-dark brown; paint No 3-medium grey; paint No 4-red dragon; paint No 5-medium soft brown. Top right; two portable lithographic dispositive made by Antonio da Silva and tests made during technological residency, in Museum of Dias de Oliveira in Valongo. Bottom: print form the dry form of black recreated inks. Tests conducted by Antonio da Silva, photo credits: Antonio da Silva, 2021.
Figure 8. Lithography in situ, (2021) Empresa das Lousas de Valongo, Portugal II Bienal de Ardosia do Valongo (i2ADS, GroundLab). Professor Graciela Machado, Antonio da Silva (PhD) and Marta Bełkot (PhD) are testing black slate, produced white inks and two types of portable lithographic presses.

stickiness and solidity (Brégeaut, 1827; Lemercier, 1896).

The ingredients are heated together, burnt, and later formed into round shapes and preserved in a dry state to extend their lifespan. Despite the many descriptions some of these recipes are not as easy as they seem, and some are almost impossible. We noticed that among lithographers, keeping small secrets and tricks about ink-making was quite common. We can guess that the commercial sphere was responsible for that, and the popularity of patenting inventions. Using the common recipes for lithographic writing ink from Senefelder, Hulmandell, Knecht, and Lemercier, we could ascertain the proportions of the ingredients to create the necessary capabilities of being dissolved in water, combined with stone, transferable, and visible (Champour & Malepeyre, 1875). What distinguishes lithographic drawing ink from normal drawing ink is the resistance to withstand acid (Lehner, 1902). Different methods of using these inks can be applied not only to lithographic stone or transfer paper but also to drawing paper by hand dabbing, stripping, splashing, or spraying with an aerograph, and also by working up transfers with a photographic base. Each method has its own special benefits (Rhodes, 1914). Lithographic chalk or crayon has the same effect on stone as ink but it differs when adhering or penetrating. It is used in a form of drawing stick with varying degrees of softness, according to the wax and shellac composition (Senefelder, 1819). The process of lithography, simply outlined, consists of drawing or painting with thick crayons and inks on limestone. The stone is etched and when moistened with water, the traces of ink repel the water and remain dry. Oily inks applied with a roller adhere only to the drawing being repelled by the wet parts of the stone (Mayer, 1991).

Figure 9

Figure 10

4. THE PRODUCTION OF INKS

Lithographic crayons, inks, and tusches are always black or dark brown, regardless of the colour in which the proof is printed, because the drawing is judged according to the experience gained working with black. Lampblack[11] is the pigment used to make crayons and tusches because of its suitable texture and because it does not interfere with the functioning of the process. Lampblack is used to impart colour but it also contributes a little solidity and drag or resistance to the drawing quality (Mayer, 1991). To diversify autographic or drawing ink, Senefelder suggests in one of his recipes for Hard Ink of Borax to add the desired colour after boiling. Light-coloured lithographic inks have never been popular; even today in the commercial sphere there is no white option. In two different stages, we conducted some trials for crayons, tusches, and inks following the lithography masters and Portuguese manuals, one from the end of the 19th century and another from the beginning of the 20th century. We produced both dark and white inks by replacing shellac with wax and lampblack with titanium white or lead white. Whether making tusches or crayons, the process does not differ; the ingredients and steps are quite similar. To obtain dark-coloured ink, we chose the recipe from Villon (1932, p.47), in which the main ingredient is dragon blood. Compared to the ease of executing the recipes from little Portuguese manuals, this one

Figure 9. Graciela Machado and Marta Belkot, School, 2021. Picture credits: Marta Bełkot, 2021.
Figure 10. Marta Bełkot, Rota do pão, 2021. Metal mold, crayons, white string (project in process) Pictures credits: Marta Bełkot, 2021
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was very difficult. At the points of melting and mixing, the substances disintegrated. Once dry, the ink remains a little soluble in water, and its pieces seem unblended. Therefore, its colour is very attractive and, to our surprise, very light; it is also possible to process the ink on stone and print from it. To create white ink, we chose recipes from Senefelder and Hulmandel (Cumming, 1948, p.19), delicately modifying and colouring it with titanium white or white lead.

5. FIRST PHASE OF DRAWING INK PRODUCTION: REVISIONS OF PORTUGUESE FORMULAS FOR DARK TONES

The curious aspect of the reconstitution of these recipes was understanding how the formulas were developed through time via different publications. In the 19th century, Portugal was strongly marked by the presence and influence of French culture in our libraries and bookshops, with greater sales of books in French than in Portuguese (Loureiro, 2001). At the same time, technological knowledge proliferated through popular periodical manuals, which contained a variable number of recipes taken from the international books that circulated in the country. When analysing both *Bibliotheca do Povo e da Escola* (1888) and *Mil Segredos de Oficinas* (1925) in comparison with international recipes, we came to understand the formula and portion adjustments over the years; the first recipe contains only four ingredients: wax, white soap, shellac, and lampblack, but the second and most recent recipe resembles Senefelder's autographic ink formula containing white soap, white wax (beeswax), shellac, mutton fat, bitumen, and soot. If, in the first instance, we used lampblack in the production of the lithographic crayons and the *Bibliotheca do Povo e da Escola ink*; in the *Mil Segredos de Oficinas* formula, the lampblack that gives the ink its pigmentation is replaced by soot[12]. The Portuguese were aware that because of its specific nature as an autographic ink, they only needed to see what they were drawing at the moment of drawing; since the graphic image would be printed later with lithographic ink using only ink pigmentation, it would not be necessary to use an excellent pigment, and one could opt for a collectable pigment at home. In the production of this recipe as part of an artist book project, Rafaela Lima collected various pigments extracted from different fireplaces and ovens to search for the finest and blackest powder, opting for a pigment taken from a wood oven; the burnt material and the chimney place from which the pigment is taken are important factors in defining the quality and consistency of the pigment (Cruz, 2009)[13]. As with the other recipes, the mutton fat ingredient was one of the most difficult ingredients to procure since Porto is not a typical sheep-breeding area; the preference for this specific animal for lithographic ink production is explained by the high concentration of olein in the mutton fat constitution, which is essential to fix the painted image on stone (Béguin, 1977). Besides the struggle to obtain this ingredient, fewer and fewer people know how to treat animal tallow, and more people are opting to purchase grease and industrialised inks. The mutton fat needs to be cleaned before being cooked by removing all the blood and flesh, after which it is preserved in a solid state and has a soap-like consistency.

Five different inks were produced: two variations of the same *Mil Segredos de Oficinas* formula (changing only the wax type), a second recipe from the same manual (varying the portions and adding sulphur flour and gum copal), and the *Bibliotheca do Povo e da Escola and Villon's* recipes. All the inks were preserved in a solid state, as seen with the Senefelder, Hulmandell, Knecht, and Lemercier recipes, and when tested on lithographic stones and prepared stone papers, alongside five industrialised inks — Charbonnel zincographic and lithographic ink, Rohrer & Klingner autographic tint and lithographic tusche, and Korn's lithographic tusche — all achieved distinct results. The two variations of the same *Mil Segredos de Oficinas* formula had a consistency and fluidity similar to all the industrialised inks except for Korn's lithographic tusche, which was more fluid and transparent, like the other three inks we produced. When printed, the first two inks showed better results by having a uniform stain and showing a deeper intensity in paper penetration. We also tested its dry form, which was very similar to the use of a crayon, surprisingly easy to besmear on all stones and stone-paper surfaces, resistant while processing, and stable while printing.

6. SECOND PHASE OF LITHOGRAPHIC DRAWING INK REPRODUCTION, STARTING WITH A WHITE CRAYON, THROUGH THE PRODUCTION OF WHITE INKS AND THE USE OF BLACK SLATE AS A PIGMENT

White inks or crayons were never common in the sphere of drawing on stone. While experimenting with lithographic processes on alternative stones, we were inspired to make a white lithographic crayon to be used on black slate. When perusing old manuals on lithography and the manufacture of ink, we could not find any reference to the use of lithographic crayons in any other colour than black.

Crayons for drawing on paper ranged in colour, as mentioned by Robert Dossie in his 1796 book: *The Handmaid to the Arts*, and they consisted of different binders like ale (beer), gum tragacanth, gum arabic, size (any crayons of various glutinous materials), milk or oat milk, sugar, olive oil, or linseed oil. Senefelder conducted experiments to discover the composition of what he called chemical ink, which is used to draw on stone, strongly adheres, is acid resistant, and makes it possible to take a considerable number of proofs from a drawing. Chemical ink works sympathetically: it contains a correct blend of materials to deposit the necessary grease-receptive water-repellent printing areas (Mayer, 1991). We conducted some trials to create white and black crayons by following Senefelder's and Lemercier's recipes[15]. Lemercier in *La Lithographie Française* (1896) gives a complete description of the process of the crayons' creation; we have focused on number four, which he describes as a crayon with a consistency that allows easy use. This recipe composition consists of a mixture of wax, tallow, soap, potassium nitrate, water, and, as a pigment, lampblack, which we substituted for the white version

with titanium white. The crayons that were produced worked to a high standard.

The recreation initiated by the *II Biennal da Ardosia de Valongo* resulted in four slightly different white inks, following Senefelder's and Hulmandel's formulas (Cumming, 1948)[16]. The ingredients were wax, shellac, soap, titanium white, or lead white. Numbers 1 and 4 contained some particles that were not well dissolved and it seemed necessary to heat them before use. We tried to replace shellac with wax or tallow[17]. The produced inks in their dry form can be used for drawing as crayons. We recreated the lithographic crayon *number seven* by Senefelder (1819) and the first crayon composition from page 11, *Nouveau Manuel Complet de Imprimeur Lithographe*, written in 1850 by Brégeaut, using black slate as a pigment to create three different shades of earthy black, red and yellow. We also continued the research on prepared surface papers and gum printing using the same stone as a pigment, resulting in artistic creation. In the final stage of this production, we used prepared inks in situ, testing their capacity outside the common printmaking workshop and inserting ourselves into the local landscape and culture.

7. EXPERIENCES THAT INFLUENCE ARTISTIC CREATION

In the all processes of ink/crayon/tusches recreation or prepared surface papers, as well as in the residence settings of the *II Bienal de Ardosia do Valongo* (i2ADS, GroundLab), we had to extend the innovative experimental approaches to the study of multi-layered methods of creating an image. Through collaborative approaches to procuring organic raw materials encountered in local settings or purchased from local stores and by following old historical manuals and books, we had a unique experience that enabled us to recognise the potential of a more complex and often industrial past. Through technological research on black slate as a substrate, materials, and matrices, we could study the possibilities of (1) black slate's use as a pigment for crayon and ink production, (2) drawing and printing from portable devices, and (3) alternatives to prepared surface papers, including stone paper and gum printing. In this way, we accessed the local technologies, collective memory, and the history of the communities. By bringing together original forms of crayons, inks, matrices, paper, and still image transfer, the essential content of traditional printmaking and recognition of the black slate region are thriving. As a result of lithography in situ and with the use of portable printmaking instruments in common workshop settings, we found an excellent alternative to working with organic materials in natural settings. The authors of the text, Marta Bełkot and Graciela Machado, were delighted to come across an abandoned school near the factory where lithography in situ was taking place in Valongo. Inspired by its vernacular architecture made out of cement, wood, and black slate, the authors created an installation entitled *School*. This work is based on surface papers prepared from black slate, with the paper having a very specific shape referencing stone commonly used in Portuguese architecture.

This project not only focuses on the common use of the silhouette of *ardósia* (black slate) in the past but also on the local history of famous bread production, resulting in the use of flour as a colloid.

Crayons produced by Marta Bełkot (*Rota do pão*, 2021) hanging on the wall in an uneven line represent the walking distance from Valongo to Porto (13 km). In Valongo history, people walked this distance repeatedly to sell bread. Using the same idea, Marta intends to draw an inconspicuous line symbolising what was underground, highlighting the difficulties and dangers faced by people working in the mines.

Marta was inspired by the complex procedure of creating the crayons, as well as by the strong smell and smoke and the need to work outdoors. Judging by sight, feeling, and experience of the right consistency made her adept at crafting the crayons. Working with black slate as a pigment made this process a lot more difficult; lampblack and titanium white are more predictable. Great amounts of greasy substances influence the trace that is drawn, which is very subtle and unobtrusive. The colouration differs from dark grey to earthy yellow. It was important to use the produced round shape in the frame of the drawing structure while walking (performance), and for the preparation to be able to produce a metre. To allow the repeated fabrication of the crayon in a similar shape, a simple metal mould was constructed.

8. DISCUSSION AND CONCLUSIONS

Lithographic ink recreation allowed us to test a new set of drawing options by using the technical innovations of the past in various formulas of crayon and tusche. These inks display the highly complex art form lithography may become, and allow an understanding of how important it may be to reconstruct parts of this technical past to create other expressive options. Through experience, one can retain the subtleness that can be achieved by using something as simple as drawing ink. Generally, drawing and print-based practices do not consider the making of materials as part of the process. Recent research conducted by PURE PRINT/i2ADS/GroundLab, FBAUP[18] focused on learning how practice may change when artists are given the time and opportunity to collaborate and experiment with inks, surfaces, and with what has often been confused with mere craft. In printmaking, there is an awareness of the importance of retaining the knowledge of how to make the materials, especially in light of the recent printmaking intersection with digital media. Fast access to information and the risk of obsolescence has promoted a renewed instinct to gain control over printmaking and to use this knowledge in other related practices. Within the larger context of art, there is a conscious consideration of what may be the essence of each medium, where the maker may aspire to make decisions based on a richer and more precise conception of the drawing materials. Manufacturing inks may be a way to familiarise ourselves with the properties of local materials and their relation to the material culture, as in the case of collecting lampblack from family ovens and chimneys, learning what kind of wood is being used, and listening to family narratives about local resources.

At this point, working in situ provides a foundation from which to observe and question a field of endlessly available technologies. When ink is prepared in liquid form, from the time of heating, it is highly effective, although Senefelder (1819) mentions that after dissolution in distilled water, rain, or river water, the ink is useful for only a week. In our case, inks that have been closed in jars for more than a year still produce great results. Liquid formed from the development of a tonal wash, when applied with a brush, feather, nip pen, autograph, or even a dabber, produces a distinct tonal range. In crayon form, it moves easily across the stone and simplifies the development of even grey tones. Tones can be settled rapidly with the side of the crayon, without the risk of the characteristic irregularities caused by the building up of ink, as seen using the *Korn's* brand. Working with raw, organic materials, producing our own inks, tusches, and crayons, studying the first recipes, the more advanced ones, and the ones from Portuguese manuals; *Bibliotheca do Povo e da Escola* and *Mil Segredos de Oficinas*, bring us closer to 19th and 20th-century inventions. Lithographic ink recreation, with a more specific focus on autographic ink, allowed us to test a new set of drawing options by using the technical innovations of the past, in various formulas of crayon and tusche. At first, these display the highly complex art form lithography may become, and allow for an understanding of how important it may be to reconstruct parts of this technical past to create other expressive options. Through experience, one can retain the subtleness that can be achieved by using something as simple as drawing ink. Considering ink just as a processing material is not relevant for us: the use of tailored ink raises the question of ink choice being based on mere processing efficiency. Extreme situations are still to be tested, such as the possibility of drawing in the rain[19]. Barker's crayon, for example, was water resistant, did not contain soap, and was used on stone based on a different process than acidulation (Netsky, 1982). Such advantages and the procedure for easy processing and printing in situ are being considered for future production and uses. Also, it is possible, within reason, to make additions, with or without counter etching[20].

FOOTNOTES

[1]Quotation from: Lehner, S. (1902). Ink manufacture including writing, copying, lithographic, marking, stamping and laundry inks. Scott Greenwood and Co., London. (p.4)

[2] We would like to point out that, though the composition and the general methods of preparing the various transfer inks are given, it is not advisable that private individuals should attempt to make them, except in the way of experiment. They may all be bought from manufacturers who make these inks as a special line of business, and are therefore better able to give a reliable and more equal quality than could be obtained by an amateur, however careful he might be. Experiment we heartily recommend in the making of ink as well as in every other department of the business. Quotation from the book: Cumming, D. (1948) Handbook of Lithography. A&C Black, LTD. London (p.20)

[3] Quotation from: Lehner, S. (1902). Ink manufacture including writing, copying, lithographic, marking, stamping and laundry inks. Scott, Grenwood, and Co., London (p.4)

[4] In 2020, Sandra Costa Brás and Marta Bełkot created a white lithographic crayon to draw on black slate (FBAUP, Pure Print, i2ADS).

[5] For example, the transfer ink brands were sold with their original labels on Joop Stoop and Polymetal.

[6] For a manual and article on making a dabber under construction, please go to: https://gravura.fba.up.pt/home/investigacao/

[7] See the video: https://gravura.fba.up.pt/home/investigacao/ and scroll down to: Projeto experimental GroundLAB (fbaup/i2ads) residências tecnológicas a decorrerem na Casa museu Dias Oliveira (Bienal da Ardósia 2021)

[8] Inks were also tested on transparent polyester and paper to compare the use of black Pelican drawing ink, red china ink, blue Ecoline, black acryl, and black gouache.

[9] Other issues include the need to consider the dangers to health that invalidate making available materials essential to hand lithography. Strong competition takes place between the existing commercial printing materials, specialised fine art print materials, and faster versions where basic materials may be used.

[10] Accessed online on 10.03.2022: https://gravura.fba.up.pt/wp-content/uploads/2020/11/19-Litografia-sobre-pedras-alternativas-2-Novembro-2020.pdf

[11] Lampblack, the oldest known black pigment, is produced by burning oil, usually coal-tar creosote, in shallow pans in a furnace with the draft regulated to give a heavy smoke cloud. Sources: https://www.britannica.com/

[12] A black or brownish pigment produced by wood combustion, which rises when the fire is stirred and is deposited on the chimneys walls.

[13] As much as family narratives referring to a still over present rural past.

[14] Gil Sousa Pinho, MA student from FBAUP.

[15] This initial scope of transfer ink and crayon reconstruction was conducted by students Marta Bełkot (PhD) and Sandra costa Bras (PhD) FBAUP, Pure Print, i2ADS (2019/2020).

[16] Reconstruction of white inks and crayons with black slate made by Marta Bełkot took place at the Casa Museum Dias de Oliveira, for the second Biennal da Ardosia do Valongo, Portugal. (i2ADS, GroundLab)

[17] We received this component courtesy of Rafaela Lima (MA) and Gil Sousa Pinho, MA students from FBAUP. Publication: Secrets of Reality, accessed online: 19.05.2022 p.40–41. https://issuu.com/secretsofreality1/docs/binder2

[18] Research conducted by two PhD students, Sandra Costa Brás and Marta Bełkot, and, later, Rafalela Lima (BA student) proposing to recreate a Portuguese autographic ink formula disseminated by Bibliotheca do Povo e da Escola (1888) and Mil segredos de Oficinas (1925). The research was later continued by Marta Bełkot, who focused on white inks, under GroundLab, II Bienal de Ardosia do Valongo.

[19] Formulas may contain soap, making inks soluble in water.

[20] Drawing and printing in situ proposes such flexibility of use. With the scope of this research, editing as much as using printing media to produce variable prints is considered. In such a way, a stone may be inked, printed, and have some added lines and tones, just enough to have them visible in the next print. Such direction may be insisted upon to achieve a changeable print as the desired result.

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AUTHORS

Marta Belkot
FBAUP Faculty of Fine Art, Porto, Portugal
i2ADS/VICARTE
bbelkot@gmail.com

António da Silva
Artist, PhD student at the Faculty of Fine Arts, University of Porto.
ntndasilva@yahoo.com

Rafaela Lima
Artist, Master's student at the Faculty of Fine Arts, University of Porto.
rafaelalima1758@gmail.com

Graciela Machado
Faculty of Fine Art, University of Porto, Portugal
i2ADS/VICARTE
gracielamachado@outlook.pt

IMAGE GALLERY

Figure 1. The first stage of autographic ink research 2020/2021(PURE PRINT/i2ADS). On the left side of the lithographic stone are produced inks nr. 1-5, on the right side the available brands: Charbonnel, Rohrer & Klingner, and Korn. On the bottom manufactures crayons, inks in the dry form and its commercial equivalent. Experiment conducted by Marta Bełkot and Rafaela Lima[8].

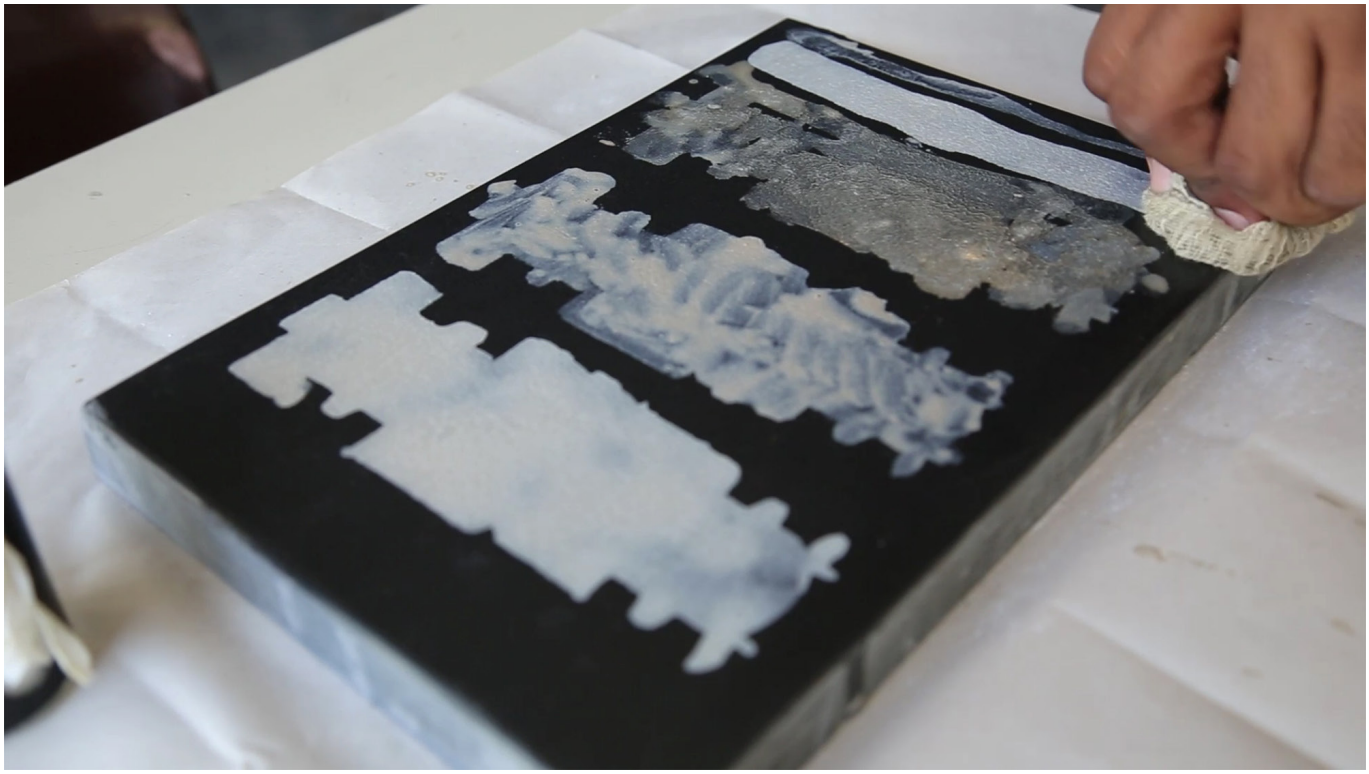

Figure 2. The second stage of autographic ink research, 2021(PURE PRINT/i2ADS). White inks numbers from 1 to 4, produced by Marta Bełkot. Experiment conducted by Marta Bełkot and Antonio da Silva on black slate.

Figure 3. From the left side: cooking pod, on the right side the same pod put on fire in order to activate melting shellac with greasy substances as in moderate heat shellac does not dissolve in any animal grease. The experiences were made mostly outdoors, because the smoke emanated adheres to the throat and causes violent coughing.

Figure 4. From the top to bottom: equipment needed to cut inks into pieces, in the middle drawing ink number 4, made with dragon blood, on the right side ink nr. 3 cut in pieces to be preserved

Figure 5. Mutton fat cleaning and cooking with Gil Raro13 collaboration.

Figure 6. On the top: Three different types of lithographic stone tested using the same system as in Fig.1. On the bottom: Stone paper, processed and printed, from the left; (1)matrix with all tested inks; (2)process of printing; (3)first proof; (4)second one; (5)third one; (6)and the forth one.

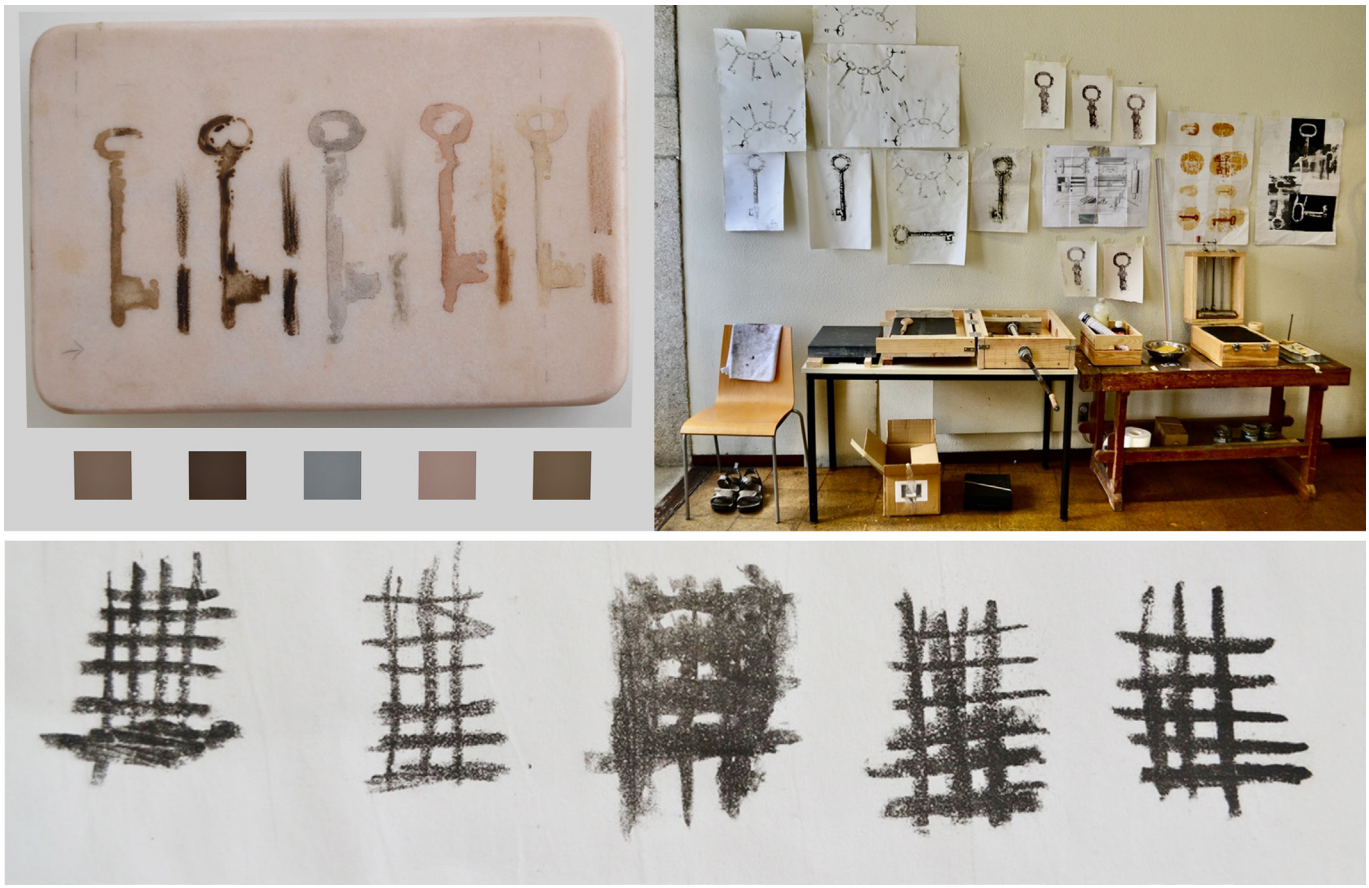

Figure 7. Top left; Marble stone with paint No 1-medium brown; paint No 2-dark brown; paint No 3-medium grey; paint No 4-red dragon; paint No 5-medium soft brown. Top right; two portable lithographic dispositive made by Antonio da Silva and tests made during technological residency, in Museum of Dias de Oliveira in Valongo. Bottom: print form the dry form of black recreated inks. Tests conducted by Antonio da Silva, photo credits: Antonio da Silva, 2021.

Figure 8. Lithography in situ, (2021) Empresa das Lousas de Valongo, Portugal II Bienal de Ardosia do Valongo (i2ADS, GroundLab). Professor Graciela Machado, Antonio da Silva (PhD) and Marta Bełkot (PhD) are testing black slate, produced white inks and two types of portable lithographic presses.

Figure 9. From the top, reference picture from abandoned school. Bottom picture: Graciela Machado and Marta Belkot, School, 2021. Picture credits: Marta Bełkot, 2021.

Figure 10. Marta Bełkot, Rota do pão, 2021. Metal mold, crayons, white string (project in process) Pictures credits: Marta Bełkot, 2021