RETOUCHING THE ARCHIVE

WOMEN'S CONTRIBUTIONS TO EARLY PHOTOGRAPHY IN SCOTLAND

PART A

PhD Candidate, Caroline Douglas
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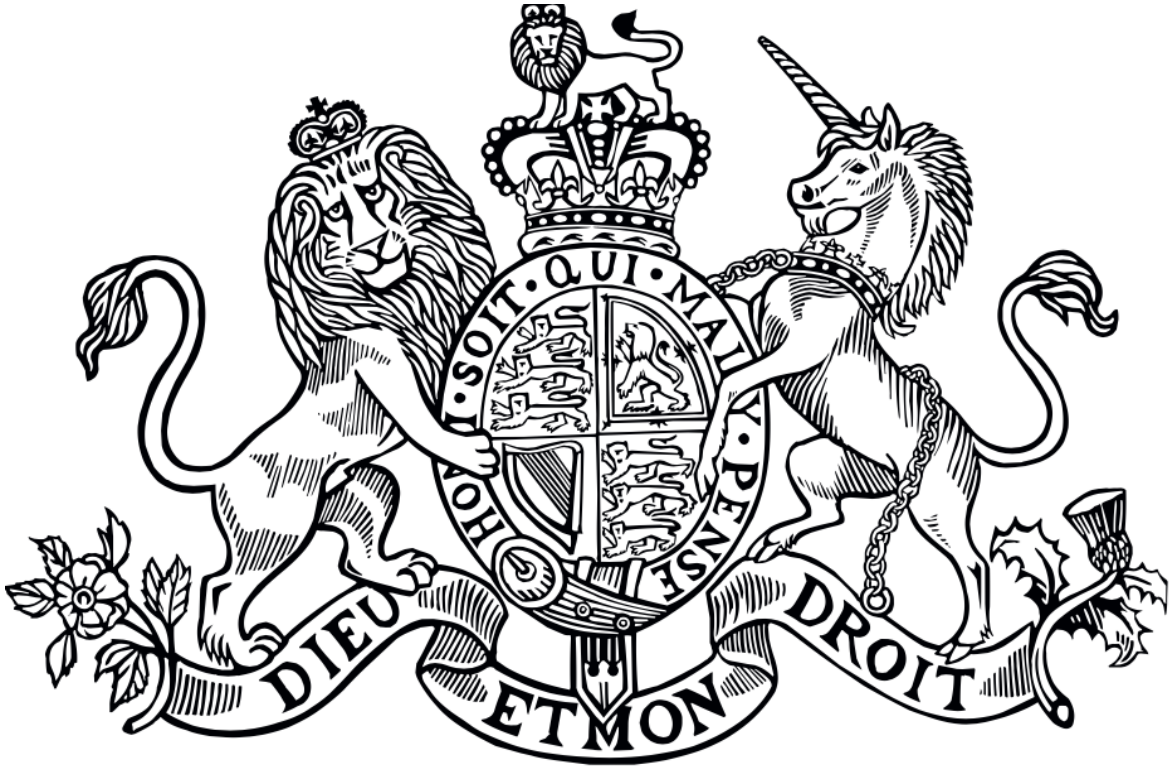

Retouching the Archive
Women's Contribution to Early Photography in Scotland

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Declaration

This thesis represents partial submission for the degree of Doctor of Philosophy at the Royal College of Art. I confirm that the work presented here is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

During the period of registered study in which this thesis was prepared the author has not been registered for any other academic award or qualification. The material included in this thesis has not been submitted wholly or in part for any academic award or qualification other than that for which it is now submitted.

Caroline Douglas

June 17 2024

Abstract

'Retouching the Archive' is a practice-based research project located between the archive, darkroom and studio that explores the role of women in early photography in Scotland between 1780 and 1847. In the late eighteenth and early nineteenth centuries, women were at the centre of the scientific breakthroughs that would later become known as photography. This project focusses on the contributions of three women who lived and worked in Scotland: Elizabeth Fulhame, Mary Somerville and Elizabeth Johnston Hall. Through archival research and contemporary art practice, it examines their lives and works as they intersect with histories of photography. The project's contribution lies in its retrieval of their work and its repair of the subsequent, canonical narrative which marginalised their vital contributions to an 'invention' of photography dated to 1839. More than this, its significance is in the creative methods of reenactment and retouching, demonstrating how a fine art practice can deepen our understanding of women's contributions to early photography.

Following Lütticken's theorisation of reenactment as activating 'a potential waiting' (Lütticken 2005), the project reenacts the published technical workings of women's chemical and optical experiments undertaken before and after 1839. Its method of reenactment provides a haptic encounter with the materiality of historical photochemical processes, enabling me to experience, at a distance of over 200 years, these women's still-thrilling pre-photographic moments of discovery. Reenactment also undertakes a reparative action that allows me to make the invisible labour of these women's production visible once again. When the limits of the archival case files are breached (Hartman 2019b), I advance a feminist research method called *retouching* in which non-verbal, non-visible and non-dominant narratives are reactivated, and new knowledge produced. Ultimately, the art practice and archival research presented here attempts to create a space for women's contributions to early photography to become known again so that a history of photography can be learned anew.

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PhDs involve many hands. In this project, I have thought a lot about care work and invisible labour. I too have been a beneficiary of many invisible hands. I would like to extend my thanks to a few who have helped me along the way.

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This is for you, Ezra and Samuel.

Contents

How to read this project

This project comprises **Part A** (thesis) and **Part B** (visual essay).

Part A and Part B are organised by the format of Introduction, Chapters I, II and III and Conclusion. Part A consists of the written element of the project with examples of my artworks and archival imagery woven throughout. Part B takes the form of a visual essay comprising art practice and imagery drawn from the archival research. Titles, captions and collections in Part B are located in a Glossary at the end of the essay.

Parts A and B two are to be read together in tandem. Throughout the text in Part A, directives are given to the reader to consult corresponding visual images in Part B. These appear in the following format in Part A: '(**B:X**)'. The reader can also consult Part A and Part B independently at will.

Part A comprises the written element of the project, which is based on archival and practice-led research. My art practice is discussed in Part A in a creative critical mode of writing, where the register shifts to the present tense and the first person 'I' is deployed. These sections, denoted by the symbol ***, appear in each of the three main chapters of Part A. Here, practice-led findings are presented alongside the archival research; they respond to and inform each other.

The visual component of this project is located in the visual essay which comprises Part B.

Prologue

Mythical Pictures: The Conception of Photography

Geneva 1834. British Scientist William Henry Fox Talbot is experimenting with silver chloride and light. At long last, he succeeds in his pursuit of capturing the scene before him, and admires the beauty of his new phenomenon.

> *It was eight o'clock when we landed; we walked for a short time on the shore, enjoying the transitory light, and then retired to the inn and contemplated the lovely scene of waters, woods, and mountains, obscured in darkness, yet still displaying their black outlines.*

A year earlier he had tried to sketch the scenery by Lake Como. His drawing instrument – the camera lucida – was of no help. A decade prior, he had attempted a sketch of the same scene using another artist's tool – the camera obscura – but it too, had left him dissatisfied.

> *I sat one evening in my laboratory; the sun had set, and the moon was just rising from the sea; I had not sufficient light for my employment, and I remained idle, in a pause of consideration of whether I should leave my labour for the night or hasten its conclusion by an unremitting attention to it. As I sat, a train of reflection occurred to me which led me to consider the effects of what I was now doing.*

Frustrated by pencil outlines, Talbot turned his attention to the effect created by the glass prism when brought into focus on his paper. As he would later recount in *The Pencil of Nature*, these momentary creations appeared like 'mythical pictures' which he knew would fade away to a shadow. The challenge he now set himself was to somehow make a durable imprint of these 'images'.

> *If I looked up, I saw scenes which were familiar to me in my happier time and which I had contemplated but the day before in the company of her who was now but a shadow and a recollection.*

He decided that on his return to England he would charge paper and exert action upon it. He experimented by coating paper with various proportions of salt and silver. By spring 1834, he had succeeded in capturing images of leaves, lace and other flat, opaque objects by placing them on light-sensitive paper underneath the sun's rays. His chemical formula would 'blacken' when exposed to light, but the results were limited and unsatisfactory. Talbot also experimented with a chloride of silver, but these results turned to a shade of dark violet when exposed to sunlight. In the face of such difficulties, he resolved to find a way of defending the image against further action of light.

> *Summer passed away in these occupations, and my return to Geneva was fixed for the latter end of autumn.*

That autumn in Geneva he made a breakthrough discovery: a picture made with chloride would stabilize when dipped in a bath of alkaline iodide. The chemical process to make images permanent was conceived; the concept of photography was born.[1]

[1] Note to reader: the italicised text above is from Mary Shelley's *Frankenstein*, first published in 1818 (Shelley 2018). The non-italicised sections are my descriptions of William Henry Fox Talbot's account of his invention of photography as set out in *The Pencil of Nature*, first published in 1844 (Talbot 1844).

Introduction

Sublime and Fatal Creation: Women in Early Photography

Photography, we could say, was born from painful labour. William Henry Fox Talbot (1800-1877) recounts his invention in *The Pencil of Nature* (Talbot 1844). His origin story begins with frustration at his 'irredeemably talentless' drawings of Lake Como (**B:14-16**) and the superiority of the women in his company – principal among them, his wife, Constance Mundy (1811-1880). Talbot's discovery of photography was driven by gendered anxiety; an attempt to re-masculinize the tradition of sketching. With one eye pressed against the camera lucida, (**B:19**) Talbot failed to capture the beauty of the shore refracted on the pages of his sketchbook. The failure of his 'faithless pencil' led him to consider how images could 'imprint themselves durably, and remain fixed on the paper' (Talbot 1844).

> *The astonishment which I had at first experienced on this discovery soon gave place to delight and rapture. After so much time spent in painful labour, to arrive at once at the summit of my desires was the most gratifying consummation of my toils. But this discovery was so great and overwhelming that all the steps by which I had been progressively led to it were obliterated, and I beheld only the result. What had been the study and desire of the wisest men since the creation of the world, was now within my grasp.*

The words in italics quoted above are not Talbot's but those of another inventor, Mary Shelley (1797-1851). In this passage, Shelley voices the experience of the monster's maker, the fictional scientist Dr Frankenstein (Shelley 2018b). When I set out to begin my enquiry into early photography in Scotland, I was struck by the way conventional histories present, with various modifications, a more or less singular account of male accomplishment. The contributions of women in early photography were absent from this origin story. In the face of this relative silence, I turned to Shelley. At first, this was driven by a search for an eighteenth-century woman's voice narrating the experience of discovery and invention. Shelley's words felt more generative than those penned by Talbot himself, offering a way to rewrite the representation of photography's beginnings which placed women at its newly beating heart: 'What had been the study and desire of the wisest men since the creation of the world, was now within my grasp' (Shelley 2010, 42).[2] As an artist and practice-based researcher experimenting in the here and now, Shelley's words helped me to imagine a relation between photography's past, present and future. Unexpectedly, my turn to science-fiction proved generative as I commenced this project.

Talbot and Shelley generated their thoughts on the shores of Lake Geneva. In 1834, Talbot first articulated the idea that images could be 'fixed' by stabilising prints with potassium iodide.[3] But Shelley was 'first'; her monster creation in the shape of Frankenstein was conjured in 1816, nineteen years prior. In the introduction to the 1831 edition of her book, Shelley reflects on her own origin story, recounting a question

[2] Steve Edwards has also written on the usefulness of bringing Shelley into dialogue with Talbot. See Edwards (2006, 114).

[3] Though 'fixing' and 'stabilising' are fundamentally two different process for preserving prints, confusingly, Talbot uses of the term 'fixing' as early as 1834, see Schaaf (1992a, 51–52). Talbot is in fact referring to 'salt fixing', i.e. stabilising prints. Schaaf lays out the etymological confusion as 'Herschel's hypo became commonly known as 'fixer', even though his original label of it as a 'washing out' agent more accurately describes its true function see Schaaf (1992a, 54). See also Schaaf (1992a, 168 fn 33, 34 and 35).

'so very frequently asked me - 'how I, when a young girl, came to think of, and to dilate upon, so very hideous an idea?". Part of the answer, she tells us, can be traced to Scotland:

> I lived principally in the country as a girl, and passed a considerable time in Scotland. I made occasional visits to the more picturesque parts; but my habitual residence was on the blank and dreary northern shores of the Tay, near Dundee. Blank and dreary on retrospection I call them; they were not so to me then. They were the eyry of freedom, and the pleasant region where unheeded I could commune with the creatures of my fancy. I wrote then—but in a most common-place style. It was beneath the trees of the grounds belonging to our house, or on the bleak sides of the woodless mountains near, that my true compositions of the airy flights of my imagination, were born and fostered.' (Shelley 1831).

Though Shelley is a not a figure of further study in this project, her encounter with science and invention resonates with this inquiry into the role of women in early photography in Scotland. The women in my study did not lay claim to the invention of photography. Nevertheless, through practice-led and archival research, this project positions them as overlooked thinkers, participants and experimentalists that were, in fact, central to its emergence. The invention of photography, I want to suggest, was conceived through collective labour, through networks of thinkers, teachers, experimentalists and assistants in which women were present and active. Through this detour of Shelley, my feminist reading of early photography takes form. It leads me to a provocation, namely, that photography was in fact invented by women:

> by Mary Shelley on Lake Como in 1816;
> by Elizabeth Fulhame in her 1780s Edinburgh home;
> by Mary Somerville in her garden in 1835;
> by Elizabeth Johnston Hall in 1840s Newhaven;
> and by others whom we are yet to meet.

On Women and Early Photography

This project considers the role of women in early photography; their hands and thinking that shaped the medium in its formative period. From unknown 'assistants' to unnamed sitters, women were witness to the invention of photography and participated in it. In *Burning With Desire*, Geoffrey Batchen suggests the declaration of the invention of photography in 1839 was preceded by at least four decades of experimentation involving as many as twenty individuals from seven different countries – Brazil, Britain, France, Germany, Spain, Switzerland and United States (Batchen 1999). These protophotographers all shared, he suggests, a pursuit of a photographic process of one kind or another (Batchen 2008, 668). My project sets out to build on and expand this history by focussing on women's protophotographic thinking and practice in Scotland from 1780 through to 1847. It does so by bringing together contemporary art practice and archival research to go in search of three historical subjects: Elizabeth Fulhame (1765-ca.1798-

1802) (Chapter I), Mary Somerville (1780-1872) (Chapter II), and Elizabeth Johnston Hall (1822-1901) (Chapter III).

It is well known that the invention of photography as a process was formally declared on January 7 1839 by François Arago (1786-1853) in the French Académie des Sciences in Paris. It is a moment closely associated with two men – Louis Jacques Mandé Daguerre (1787-1851) and William Henry Fox Talbot (1800-1877) – who discerned a method for making photographic images permanent within two weeks of one another. What often goes unmentioned, however, is that their work rested on the results of chemical experimentations carried out by many before them. Talbot and Daguerre were preceded by at least half a century of protophotographic experimentation in which women played a central role.[4]

In a definitive volume, first published in 1984, Naomi Rosenblum offered a substantial survey of women photographers from the daguerreotype through to the contemporary period (the book is now in its fourth, updated edition: Rosenblum 1984, 2015). In addition to bringing unknown women into the spotlight, Rosenblum offered a series of biographical sketches that revealed important, fragmentary aspects of these women's lives as well as their outputs. Following Rosenblum, other authors have since expanded the field. Principal among them is Val Williams, whose two key volumes are *Women Photographers: The Other Observers 1900 to the Present* (1986) and her co-edited book with Liz Heron *Illuminations: Women Writing on Photography: From the 1850s to the Present* (Heron and Williams 1996). In the first of these, Williams declared that "the history of nineteenth-century women's photography has yet to be written" (Williams 1986, 10). Four decades on, where do we stand? Without doubt, a burgeoning literature has begun to appear, particularly since the turn of the century (Mavor 1999; Di Bello 2005; 2007; Hudson 2012; Galifot 2015; Riches 2015; Weiss 2015; Greaney 2015; James 2015; Teanby 2018; French 2019; Pritchard 2019; Langford 2019; Chambers 2019; Hudgins 2020). Nevertheless, there remain significant gaps in our understanding. As we approach forty years since Williams' declaration, the history of women in early photography in Scotland remains unwritten. This project addresses that lacuna in the literature through practice-led research.

Like any discipline, the history of photography contains a tale of repeated, selective myths, retold and moulded into a 'canon' built on the exclusion of others; a gendered narrative of individual scientific genius and discovery.[5] In pushing against this tired account of photography, this project goes in search of the invisible and often painful labour associated with its invention, the networks that made possible the emergence of photography, and the emotional and lived accounts that accompanied it. The notion of the great individual has long presented an obstacle to our understanding of the discipline. Moving beyond the

[4] The very origins of the word 'photography' are fraught (Goldberg 1992; Batchen 1993a). In Greek, φωτὸς (phōtos) is a genitive of φῶς (phōs), 'light' and γραφή (graphé) 'representation by means of lines' or 'drawing'. Until recently, it had long been assumed that the term could be traced back to 1839, and to Herschel (Gernsheim and Gernsheim 1969, 98; Schaaf 1979; Newhall 1984, 35). More recent counterclaims, however, trace the etymology back further still, to a figure (and protophotographer) by the name of Hércules Florence (1804-1879), who in Brazil in 1832 made the first photocopy and used the word 'photographie' (Brizuela 2014; Hercule Florence: Le Nouveau Robinson 2017). Meanwhile, Rosamund Moon's (2000) etymological study of photographic words also locates the usage of 'photographie' in Germany around the same time.

[5] The literature on the history of photography is vast. See, for example, Gasser (1992); Blank (1994); McCauley (1997); Bertrand (1997); Nickel (2001); Kusnerz (2001).

figure of the author-inventor, Silverman invites us to consider photography as 'authorless' and 'untranscendable' (Silverman 2015, 11). In a similar vein, Sheehan and Zervigon ask why origin stories matter in photographic invention, and probe who constructs these narratives and what kind of work these stories do (Sheehan and Zervigon 2014). Instead of asking who invented photography, their edited collection interrogates the writing of these genesis narratives (Sheehan and Zervigon 2014). In her contribution, Wilder asks us to recognise that '[I]ts history has a history' (Wilder 2014, 208). At a recent an event, I closed my paper on women's creative legacies in early photography, asking 'why do first matter so much to me anyway?' (Douglas 2023). Throughout this thesis I go in search of firsts aware of the inherent problem they present. The search for firsts can also be disruptive in a generative way when they bring into view occluded histories of photography. More recently, Azoulay et al have advanced a potential history of photography as one of 'collaboration' to challenge dominant narratives around photographic history and authorship (Azoulay et al. 2024).

In uncovering these neglected histories, the project does not set out to rewrite the 'canon'. As art historian Maura Reilly notes, 'revising the canon to address the neglect of women and/or minority artists is fundamentally an impossible project because such revision does not grapple with the terms that created that neglect in the first place' (Reilly 2019). Taking Reilly's position, this project looks at the terms of neglect leading to women's occlusion and dismissal in early photography in Scotland. In doing so, it further sets out to question and interrogate the very notion of the solitary figure – so often gendered – who is held responsible for 'discovering' the medium. Following the insistence that we consider the 'various relationships, exchanges and interactions that occur between all participants in the making of any photograph' (Azoulay et al. 2024), this project locates its three individual historical subjects (Fulhame, Somerville and Johnston Hall) within the networks in which they moved and relations in which they were entangled.[6] It explores what happens to the discipline of photography when we start to identify the contributions of women through contemporary art practice and archival research. In doing so it asks three core research questions. First, what role did women's thinking and practice play in the making of photography in Scotland between 1780 and 1847? Second, how can contemporary photographic art practice deepen our understanding of women's contributions to early photography in Scotland? And third, how can our understanding of women's contributions to early photography in Scotland be enhanced by turning to the sitter and her subjectivity in 1840s calotype portraiture?

In addressing these questions, the project reinhabits and reimagines the protophotographic activities of women using feminist creative research methods and art practice to recover a significant yet marginalised history. The thesis begins in the 'protophotographic' moment of the 1780s, focusing on Elizabeth Fulhame (Chapter I) before moving to a study of Mary Somerville's understudied photochemical experimentations between 1826 and 1845 (Chapter II). Chapter III turns to the photographic image and the subjectivity of the sitter through the case study of the fisherwoman Elizabeth Johnston Hall in 1840s Edinburgh.

[6] On the importance of networks and early photography, see Ryan (2017), Siegel (2017) and Gartlan (2022).

I work with an expanded conception of photography, one that stretches from the recognisably photographic 1840s calotype negative (Chapter III), to no longer extant cuttings of silk that were once coated with protophotographic chemicals in 1780s Edinburgh (Chapter I), to strips of paper, now faded, that once held vegetable extracts juices in a woman's back garden in the mid-1830s (Chapter II). As Edwards and Hart put it: 'photographs exist materially in the world, as chemical deposits on paper, as images mounted on a multitude of different sized, shaped, coloured and decorated cards, as subject to additions to their surface or as drawing their meanings from presentational forms such as frames and albums' (E. Edwards and Hart 2004, 1).

I position two of my three historical subjects – Elizabeth Fulhame and Mary Somerville – as deeply embedded in protophotographic activity, in fact, as two of the many inventors of photography. Yet as Patterson notes, 'neither she [Somerville] nor her contemporaries recognised that she was in fact employing a kind of primitive photography' (Patterson 1983, 173). Despite living to witness its formal declaration in 1839, Somerville did not stake any claim for the invention of photography, and nor did she name herself as a 'photographer' after such term came into circulation. Unlike her male contemporaries who made competing claims for the title of 'first', Mary's interests lay elsewhere, in astronomy, mathematics and scientific writing. But by expanding our conception of photography, I argue that both Fulhame and Somerville be repositioned as key figures in the emergence of the medium.

On Scotland and Biography

Scotland's central role in early photography is long-established. Much of the ground for the science and art of photography was laid during the Scottish Enlightenment (Stevenson and Morrison-Low 2015, xi). What has been less-well explored, however, are the entanglements of the invention of photography in Scotland with empire, race and gender. Recent work by Luke Gartlan has challenged the notion of Talbot's calotype arriving to a sleepy-backwater of 1840s St Andrews. Instead, he positions St Andrews as a place of colonial activity and industrial enterprise (Gartlan 2022). In my own work I have explored themes of empire and race in early photography in Scotland, focussing on Frederick Douglass and the intersection of abolition and invention (Douglas 2021c; 2021b). Elsewhere, I have surveyed the colonial dimensions of Anna Atkins's early photographic works.[7] This thesis, however, addresses the more specific question of gender and the role of women during this period. Put simply: we know relatively little about the role of women in the making of photography in Scotland. The cultural climate of enlightenment Edinburgh remains an understudied yet research-productive area of photographic history. This project will trace the emerging protophotographic networks of the late eighteenth and early nineteenth centuries in Scotland, showing how they offer a rich and underexplored resource for examining women's contribution to photographic invention.

[7] See https://www.carolinedouglasphotography.co.uk/unanchoredseaweeds

The study of my three historical subjects is pursued in part through the biographical form. In my archival research, I piece together the biographies of Fulhame, Somerville and Johnston Hall to more fully appreciate their photographic contributions. In doing so I explore their experiences of obtaining access to education and scientific networks; their labouring lives; the sharing and reciprocity of ideas; publishing; domestic servitude; optical looking; and photographic representation. I work across different registers, seeking to understand the personal dimensions of photographic invention, leaning into the subjective as an overlooked form of knowledge production[8] for early photography in Scotland. This biographical form provides a proximity to early photography and enables a re-evaluation of familiar sources.

My own biography forms part of the story to this project. My role as a carer for two small children born in the course of this study has shaped both the method and my findings.[9] While pregnant, I could not work with certain chemicals in the darkrooms. These boundaries, along with covid-19 pandemic, led me to sit longer with the source materials in libraries and at my kitchen table. This sitting while caring, feeding, watching over, thinking and reading enabled a different kind of encounter with text and image. It led me to experience (rather than simply know) that the personal and political are always intersecting. From then on, it was all I could see, including among the source materials. In the historical lives I was researching, I began to identify maternal interruptions, for example, in Somerville's career, discussed in Chapter II. While the theme of the maternal is not centred in the final version of this project, it figured throughout the writing, research and art practice. I drew inspiration, for example, from Kate Davis' (2021) neglect of domestic labour as a feminist approach to making work, from Roland Barthes's maternal musings in *Camera Lucida* (Barthes 1981) and Doireann Ní Ghríofa's (2020) exploration, through creative fiction, of the tensions between maternal care and care for our historical subjects.

On Method

To understand women's role in early photography, this project combines archival research and art practice. My route to this project was paved through decades of art practice, working in darkrooms while also teaching photography in Edinburgh. Through this work I developed a certainty – even more than a scientifically formed hypothesis – that women were present at the birth of photography and that they were active participants in it. I came to this view, or rather, this sensibility, through the experience of being an artist working with photography, of encountering, through touch, the materiality of making of a photographic artwork.[10] From this embodied knowledge, I knew that women's contributions were there; it was a matter of finding them: in the archives, in the literature and in my practice. It gave me a certainty, a way of finding, that I might not have had without my practice to draw on. My feminist art practice, then, is in close proximity to the sources in the archives and is central to the findings this project presents. In *Living A Feminist Life*, Sara Ahmed offers a framing of feminism that speaks to my own pathways to this project:

[8] On the significance of the subjective as a form of knowledge production, see Teichmann (2011, 13).
[9] See 'Postpartum: Unlearning Conception and Photography' (Douglas 2021d).
[10] On materiality and the photographic, see Edwards and Hart (2004); Edwards (2014); Batchen (2006); Wilder (2023).

> Over time, with experience, you sense that something is wrong or you have a feeling of being wronged. You sense an injustice. You might not have used that word for it; you might not have the words for it; you might not be able to put your finger on it. Feminism can begin with a body, a body in touch with a world, a body that is not at ease in a world; a body that fidgets and moves around. Things don't seem right (Ahmed 2017, 22).

Women's contributions to early photography are there and they have always been there – in the archives, in literature, in glass prisms, in light, on paper, in silver chloride, with thoughts conceived on Lake Geneva. What I once went looking for in Shelley's science-fiction I found materially in this project across a range of archives and practices that traverse the historical divide of 1839.

Trained as an artist, not an historian or chemist, I have had to borrow, trust and distrust secondary literatures in the field of science to conduct this research. In the archive – another space that was new to me – I went in search of women's contributions to the making of photography in census returns, parish records, post office directories, chemical treatises, epistolary forms of address, and in the materiality of the photographic image. In both the archive and the literature, I always searched for my historical subjects' names. Just in case. Without realising it, *just-in-case* became an archival habit; an element of my method; a way of familiarising myself with silences and occlusions of the primary and secondary sources, of getting to know my historical subjects in their absences, of recognising their trails. Each time I entered the archive or picked up a text from the secondary literature, I would scan not only for their surnames, but for any traces of protophotography, *just in case:* silver, blackening, lens, solar rays, anything resembling protophotography. In becoming intimate with Fulhame, Somerville and Johnston Hall in their archival state, the historical distance (E. Edwards 2016, 309) between then and now began to shift, and a new way of relating to the topic emerged.

On Retouching

I offer as one of my original contributions to knowledge the methodology of *retouching*. Touch has a long history in photography (Olin 2012). For Batchen, it sits at the heart of the medium: 'what photography gave to modernity was not vision, but touch' (Batchen 2001, 21). Historically, retouching is associated with the physical correction of a photographic print, an act of post-production. Using brush and ink, clusters of tiny 'spots' are applied to the surface of prints to correct the white marks where dust resides on the negative or a scratch has left its mark. In the digital age, photographic techniques of manipulation have migrated from the darkroom to computer screens with editing software (the touch is transferred to the trackpad, the mouse, the pen tablet and the touch screen with automated filters to retouch). Though fundamentally different physical acts, the visual effects are similar, and the terms of production and postproduction are retained; spotting, dodging, burning, cropping, masking. Retouching in a digital age brings with it all sorts of anxieties, most communally understood in terms of falsehood, manipulation, distrust and the removal of 'impurities'. But it is a mistake to think of these practices as contemporary. Since photography's

inception, retouching has played a central role.[11] As Chapter III shows, Adamson and Hill's calotypes hold marks of some of the earliest examples of this act.

In this project, my method of retouching carries four distinct meanings and applications. First, and as alluded to above, I trace the historical retouchings inscribed in eighteenth and nineteenth century image making practices. For example, I locate the retouching hand of David Octavius Hill, carefully editing the calotype negative in his studio in 1840s Edinburgh. Or, the technical notations of his collaborator Robert Adamson on the very same calotype surfaces (see Chapter III). These retouchings are not by my hand, but I trace them in the historical archive and bring them into view. Second, in my art practice retouching takes the form of coating silver nitrate onto cuttings of silk cloth (Chapter I) and applying vegetable juice extract to strips of platine paper (Chapter II). What makes these *re*touchings rather than generic touch is that they take the form of reenactment. In making these works the prefix of *re* takes on a significance: I am repeating, reenacting, retouching. I am doing something that was done once before. Third, through a haptic engagement with the materiality of the archive, I retouch historical documents (**B:25**). The closeness of my archival encounter requires a handling, a proximity, a relationship to the documents and the biographies they represent (and occlude). Seeing, holding, handling and retouching these materials becomes as important as the practice of reading. In holding and caring for these items, I touch them anew, conscious of the many hands that touched before me, aware that these early photographic sources can fade and be damaged by inattentive touch. At times, this entails retouching a photograph that depicts touch – women touching women (Chapter III). This mode of retouching facilitates an appreciation of women's labour in the early history of photography. Fourth, in the Victoria and Albert Museum photography collection retouching takes on a new meaning through the altering of collection management systems as I digitally retouch the archival inventories in the Adamson and Hill collection to 'redress', what Hartman has described as the 'absences and silences of the archive' (Hartman 2021). This entails naming historical subjects that are depicted in the Adamson and Hill collection and altering the language that is used to describe them. As I undertake this retouching work, I draw inspiration from *Black Models: from Géricault to Matisse*, shown at the Musée d'Orsay in 2019, which explores neglected Black contributions to art history and attempts to 'reinstate their names, reveal their stories and restore them a visibility' (Musée d'Orsay 2019). My own iteration of this mode of retouching provides a method to correct the gendered discourse through which we have come to know some of the early photographic works that sit at the centre of my research. Taken together, these four meanings of retouching comprise a feminist research method that enables a new understanding of women's contributions to early photography.

[11] This is a theme explored in numerous exhibitions on early photography, particularly those featuring Julia Margaret Cameron (1815 – 1879) and Oscar Gustave Rejlander (1813-1875). Exhibitions where these conversations were brought to the fore at the beginning of my studies in 2017 include; *Victorian Giants: The Birth of Art Photography*, National Portrait Gallery, 2018, *Julia Margaret Cameron: Influence and Intimacy*, Media Space, Science Museum, London, 2015-16, *A Perfect Chemistry*, Scottish National Portrait Gallery, 2017 and *Salt and Silver: Early Photography 1840-1860*, Tate Britain, 2015.

In the course of my research the limits of the archive are reached time and again. The research runs to ground amid absences and silences in the historical record. When the coloured silks and fibres of paper no longer exist, when the photochemical colours of my historical subjects can only be imagined not seen, the project turns to art practice and specifically, to reenactment. In reenacting chemical and optical protophotographic experiments and early photographic portrait encounters, I shed light on a counter history of photography. Reenactment in the form of art practice becomes a feminist method for critical inquiry. To quote Lütticken, reenactment serves as a 'challenge to the present' (Lütticken 2005, 19). Through an expanded understanding of photographic reenactment, my art practice becomes what Catherine Grant refers to as a feminist 'space of learning' (Grant 2017) as I go in search of the historical subjectivities of photographic invention. My reenactments are inexact: I do not seek a faithful repetition, but instead play with historical materials, processes and memory. What Thompson calls the 'artists' creative, playful irreverence towards source material' (Thompson 2023, 598) becomes an enabling resource. This approach to reenactment is woven through each chapter of this project. In my art practice, I also undertake what Robinson refers to as 'silent thinking'. He writes: 'silent thinking is often accompanied by subvocal sayings to ourselves, imagery, emotional feelings, and non-sensory experiences such as familiarity, rightness, and confidence that we can go on in certain ways' (Robinson 2005, 534). This captures an important part of the process in my practice. In reenacting Fulhame and Somerville's photochemical experiments (Chapters I and II) and Johnston Hall's calotype portrait (Chapter III), I engage in lengthy, haptic encounters which move the project beyond the absences of the archive, generating practice-led findings that answer my research questions and prompt new ones.

This project is the product of seven years of study. It stretches and expands the understanding of photography and the photographic to include figures and forms that have been occluded. It is a project that has been a painful labour in itself that has involved a study of failures, invisible labour, archival silences and absences, disappointments, dead-ends, understudied and undocumented lives, much of which cannot be known. If we consider how the magic scene of invention does not lie with what Shelley described as 'the wisest men', but instead, in the hands of women, another history might emerge, one that is within my grasp.

Chapter I

Spectre of a Woman: Reenacting Elizabeth Fulhame

Published

1794 *An Essay on Combustion with a view to a new art of Dying [sic] and Painting wherein the Phlogistic and Antiphlogistic Hypotheses are Proved Erroneous*, London (Fulhame 1794)

1798 *Versuche über die Wiederherstellung der Metalle durch Wasserstoffgas* (Fulhame 1798), translated by Augustin Gottfried Ludwig Lentin, German Edition (Fulhame 1798)

1810 *An Essay on Combustion with a view to a new art of Dying [sic] and Painting wherein the Phlogistic and Antiphlogistic Hypotheses are Proved Erroneous*, American Edition (Fulhame 1810)

Women are every where in this deplorable state; for, in order to preserve their innocence, as ignorance is courteously termed, truth is hidden from them, and they are made to assume an artificial character before their faculties have acquired any strength. Taught from their infancy, that beauty is woman's sceptre, the mind shapes itself to the body, and, roaming round its gilt cage, only seeks to adorn its prison. Men have various employments and pursuits which engage their attention, and give a character to the opening mind; but women, confined to one, and having their thoughts constantly directed to the most insignificant part of themselves, seldom extend their views beyond the triumph of the hour.

— *A Vindication of the Rights of Woman*, Mary (Wollstonecraft 1792)

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It may appear presuming to some that I should engage in pursuits of this nature,…and censure is perhaps inevitable; for some are so ignorant that they grow sullen and silent and are chilled with horror at the sight of any thing that bears the semblance of learning, in whatever shape it may appear; and should the spectre appear in the shape of woman, the pangs which they suffer are truly dismal.

— *An Essay on Combustion*… Elizabeth (Fulhame 1794, iv) (**B:33**).

(b. place of birth unknown, 1765; d. South of France, ca. 1798-1802 (after Feb 1798, by Sep 1802))

In the shadows of St Paul's Cathedral in 1790s London, a bookseller by the name of Joseph Johnson (1738 – 1809) provided a hub for dissenters and radicals (Bugg 2016, xix). Readers in the shop would find books on abolition, prison reform and education among other topics. They would also encounter books written by women. In 1792, one of the most important protofeminist texts of the eighteenth century was sold there: Mary Wollstonecraft's (1759-1797) *A Vindication of the Rights of Woman* (**B:34**). This was not the only pathbreaking text sold by Johnson. Two years later, in 1794, Elizabeth Fulhame's (fl. 1794) *An Essay on Combustion...*[12] arrived (**B:35-37**). Protofeminist in its own right, the book was more substantially an act of protophotography, a landmark moment in the development of an emergent field. As a woman publishing in chemistry, the boundary-crossing Fulhame traversed the gendered distinction between 'handcraft' and 'science'. On account of her gender, she was prevented from joining the learned societies of Edinburgh and London. It was in the domestic setting, therefore, that her protophotographic experiments with fabrics, silks, light and chemistry were enacted. The breakthroughs that flowed from these experimentations predate those of Daguerre and Talbot by half a century, and make her a generative case study for the analysis of the role of women in early photography.

Fulhame's contributions were widely recognised in the earliest accounts of photography. On March 14th 1839, John Herschel delivered an address to the Royal Society entitled *Note on the art of Photography* (J. Herschel 1839). This paper, coming just weeks after the formal declaration of the invention of the medium, was Herschel's first address on photography, and indeed 'one of the first by anyone' (Schaaf 1979, 49). In this landmark moment, he mentioned Fulhame by name in his opening paragraphs (**B:38-41**). Fulhame was again cited in Robert Hunt's 1841 *A Popular Treatise on the Art of Photography*, the first English-language manual of photography, where he described her experiments with gold and silver as 'very interesting and 'beautiful and unexpected' (Hunt 1841, 74). Perhaps more substantially, Snelling's 1849 *History and Practice of the Art of Photography* described her contribution as 'the first steps towards the discovery of the Photogenic art' (Snelling 1970, 5). Despite this early flurry of recognition, Fulhame's contributions were then forgotten as the dominance of Talbot and Daguerre came to prevail. Other than a singular citation in 1945 by Josef Eder, who recognised her work as 'original and important' (Eder 1945, 117), Fulhame's contribution to photography was ignored from the mid-nineteenth century right through until the close of the twentieth century.[13]

[12] *An Essay on Combustion with a view to a new art of Dying [sic] and Painting wherein the Phlogistic and Antiphlogistic Hypotheses are Proved Erroneous* (Fulhame 1794). I will use the short title going forward.

[13] Fulhame's contributions to chemistry are well established: she is understood as one of, if not the first, solo woman researcher of chemistry (Rayner-Canham and Rayner-Canham 2020, 10), and the first to publish on what later became known as 'catalysis', positioning her work 'a century ahead of its time' (Laidler 1986). Several historians of chemistry have noted her pioneering work in this area (Wheeler and Partington 1960; Alic 1986; Ogilvie 1986; Davenport and Ireland 1989; Laidler and Cornish-Bowden 1997; Davenport 2004; Neeley and Bashore 2005; Palmer 2008; Linker 2015; Steinmark 2017; Shah 2019; Booth 2020; Jarvis 2020; Rayner-Canham and Rayner-Canham 2020; O. Campbell 2021; Brazil 2022; MacPherson 2023).

That changed with the pioneering scholarship of Larry Schaaf, who was the first to undertake a detailed analysis of her chemical contribution to early photography (Schaaf 1979; 1985; 1990; 1992a; 2018). Building on Schaaf, a more recent literature on Fulhame's protophotography has emerged that continues to grow at a steady pace (Stevenson and Morrison-Low 1995; Batchen 1999; Kraus and Schaaf 2002; Batchen 2008; Fitzpatrick 2008; K. Wilder 2008; Stevenson and Morrison-Low 2015, 2018; Jaskot-Gill 2016; Morrison-Low 2018; Teanby 2018; Smith 2019; Hudgins 2020). Vital though these studies are (and I draw on them in this chapter), these authors have had to rely on fragments of her biography. Driven by both new archival and practice-led research, this project builds on these existing works and presents new findings. It is not the only work to push the conversation on Fulhame in new directions. Recent scholarship, such as that of Smith, makes the case to consider Fulhame's work in relation to colour. She argues: 'Fulhame allows us to reassess the evolution of photography as a distinctly colored phenomenon' (Lindsay Smith 2019, 15–16). Teanby and Montell-Boyd, meanwhile, are set to offer new and important contributions (Teanby 2023; Montell-Boyd 2023).

What has not yet been undertaken, however, is a practice-led, archivally driven analysis of her significance for early photography in Scotland. Specifically, this chapter locates and recovers Fulhame in the making of photography by exploring i) the significance of eighteenth-century Edinburgh as the site of her works' making; ii) the scientific networks to which Fulhame contributed; iii) the protofeminist current that runs through her protophotographic text; iv) the influence she had on her contemporaries and those who drew on her work following her death; and v) the role of art practice and reenactment as method to better understand her contribution to early photography. This last element becomes especially important in the course of the chapter: as an artist, I foreground a research process that combines archival research with art practice and reenactment to enter into a dialogue with the past.

Such a dialogue becomes important when confronted with the fact that no physical 'photographic' works of Fulhame's remain. When the coloured silks and fibres of paper no longer exist, when the photochemical colours can only be imagined, the chapter uses reenactment as a method for critical inquiry. Specifically, I ask: how can contemporary photographic reenactment assist our understanding of Fulhame's contribution to early photography? I find that the making of photographic, chemical works proves to be instrumental in deepening my engagement with and understanding of Fulhame's output. The decision to present these practice-led findings alongside those from the archive is intentional: the two are in conversation. A driving force behind this work is to question what happens to photography, to the discipline, when we start to identify and make visual individuals such as Fulhame through contemporary photographic practice. The decision to 'make visual' – in this case, to produce abstract contemporary photographic artworks through reenactment – arises from a research encounter that contends with the invisibility of Fulhame's chemical experiments. The reenactments presented in this chapter do not constitute replications of Fulhame's exact method. Winterson writes about art not as 'imitation' but one where we make visible the world in our heads. It is 'a chance at touching or glimpsing what might be the substance, and not the shadow' (Winterson 2022). The placement of this work alongside this counter-history of early photography is not an act of fictioning,

but instead a method that re-centres and re-creates the visual. In reenacting Fulhame's work, the light that once displayed its full colour spectrum to early pioneers of photography can represent itself once more.

In my art practice, I work with an expanded idea of photography, one in which the traces of women's creative labour in the archives are presented through exposure to sunlight; from white silk to peach, to pink through reddish brown to black, grey, (sometimes blue), to shimmers of silver. Practice gives form to something no longer visible. This method also carries historical resonance, for Fulhame's work itself was an invitation for reenactment. She informs her readers in the preface to her landmark (and only) text *An Essay on Combustion*: 'most of the experiments may be performed in the open air' (Fulhame 1794, xviii). This call did not go unheeded. As this chapter shows, it was through the reenactments of her contemporaries that her work was brought to a wider audience, and eventually to the attention of Herschel. By reenacting her chemical protophotographic experiments once more, this chapter demonstrates how new insights can be yielded not only about Fulhame, but the role of women in early photography in Scotland (**B:42-49**).

Fulhame's key photographic contributions were in the domain of photochemical imaging. Her work followed the discovery that silver salts would blacken under the influence of light (Partington 1970). As early as 1556 it had been established that a combination of chloride and silver ('horned silver') was blackened by the sun's rays (Snelling 1970, 5). In 1780, Fulhame initially explored the reduction of metals by light and the consequent formation of images. Her major breakthrough was to establish this in the form of a rudimentary image on dyed materials using the effect of light on photochemical solutions of gold and silver. She was seemingly the first to do so (Schaaf 1992a).

Fulhame's *An Essay on Combustion* was published in 1794. As Wilder notes, the work rapidly became known in chemical circles in her lifetime (Wilder 2008). She donated a copy to the Royal Society Library in 1795[14] and to the Royal Irish Academy. In Britain, her first review was published in *The Gentleman's Magazine*. Its byline reads: 'An essay on combustion, by a lady!" Thought we, could proceed from no other pen than that of Miss Williams or Mrs. Wollstoncroft [sic], and must be a political disquisition disguised' (Anonymous 1795, 501). From the very moment of its publication, then, Fulhame's text was understood not just as a work on chemistry, but a transgression of the gendered boundaries of science and scholarship. The next review was in the July 1796 edition of *The Monthly Review*,[15] a critical literary publication founded by Ralph Griffiths known for 'improving the status of female poets and novelists'. The review was favourable, citing Fulhame's 'singular discovery' and 'accurate and ingenious chemical investigation[s]' (Anonymous 1796, 301). It also recognised Fulhame's lack of apparatus and 'sincerely sympathise[d] with her on account of that disabling and discouraging narrowness of her circumstances' (Anonymous 1796, 304) (B). Fulhame's book was also reviewed in a Genevan journal in 1797 (*Bibliothèque Britannique* 1797). The following year, 1798, would prove to be a significant one for Fulhame: her work was given a lengthy review in French (Coindet 1798), she was made a corresponding member of the Chemical Society of Philadelphia (Miles

[14] Fulhame deposited her text at the Royal Society on January 8th 1795. See *The Journal Book*, the Royal Society, 1795 p594. A copy was donated 'by the author' to the American Philosophical Society in Philadelphia in 1795 (call number 667.2 F95e) and to the Royal Irish Academy (call number MR/29/G/18 though this was undated).

[15] Another review of Fulhame's text followed in the same publication the year after. See Peart (1797).

1950), her book was translated and re-published in German,[16] and then reenacted and presented to the Royal Society. In 1810 an American edition was issued.

A key element of Fulhame's work was the production of maps with rivers formed of silver by the action of light (Fulhame 1794, x; Schaaf 1992a; Wilder 2008). To date, it has been assumed no physical records of these maps remain extant. However, this chapter will tentatively advance the idea that such records may indeed exist. At the time of writing, I have not been able to access these records which I believe may be held in Geneva. Should they be found, these documents would point to one of the earliest photographic images known, and perhaps the earliest made by a woman. More substantively, they would provide yet more depth and understanding of the role women played in the emergence of photography. I explore these possibilities later in this chapter.

A Potential Portrait

The existing scholarship on Fulhame is characterised by its cautious, uncertain and inconclusive tone. Terms such as 'probably', 'presumably', 'likely' and 'appears to be' are regularly used to describe her in the secondary materials.[17] And for good reason: key elements of Fulhame's biography remain fragmented, untraceable and unknown. This project attempts to move beyond these uncertainties through archival and practice-led research. But first, I begin by turning to the elements of her biography that can be assembled. Until now, there has been no known record of Fulhame's date or place of birth. She left no memoir, and nor is there any record of her letters, though we know she certainly corresponded with her contemporaries. The only place her words can be read are in her aforementioned published text (Fulhame 1794). Known for more than a century as 'Mrs Fulhame', her forename Elizabeth was not included in the literature until 1960, when fragments of her biography were first published (Wheeler and Partington 1960, 121).

If the secondary literature presents challenges, so too do state archives, where filing procedures are highly gendered and largely reflect dominant histories of men. Where women are included in the eighteenth-century archives consulted, they tend to be in positions of power within male dominated fields of research (for example in records of political and military history). This chapter, more than any other in this thesis, has been hampered by such archival challenges. Further, where sources have been identified, they have often proven difficult and in some instances impossible to access. For example, there are relevant documents stored in collections in France that required a genealogist to navigate; key letters held in a vault in Geneva where the ancestral gatekeepers were unable or unwilling to share access; historical societies of persons of note kept in private family archives in Scotland. Further, as is so often the case, the everyday

[16] The work was translated to German by Augustin Gottfried Ludwig Lentin who also translated works by the Edinburgh chemist James Keir. Keir was an assistant to Joseph Priestley and met with Humphry Davy in 1800. Both Priestley and Davy appear as central figures in the argument that follows in this chapter.

[17] To illustrate the uncertainty within which Fulhame is discussed in the literature: she is presented as someone who 'appears to be' (Laidler and Cornish-Bowden 1997); as a 'probably' (Laidler 1993); 'a 'most probably' and as someone who 'seems likely to be' (Batchen 1993a).

lives of women, so often contained to the social and cultural sphere of the domestic, are even harder to locate.

Given the limited nature and at times complete absence of source material, my feminist art practice takes centre stage. Saidiya Hartman writes how she came to her method of critical fabulation when writing from 'nowhere' in the face of the power and authority of the archive (Hartman 2019b). Like Hartman, I have 'pressed at the limits of case files and documents, speculated about what might have been, imagined the things whispered in dark bedrooms, and amplified moments of withholding, escape and possibility' (Hartman 2019a). My feminist art practice becomes a method to explore the possibilities of making and writing a history of Fulhame's contributions to photography. But for now, I remain at the limits of the archive and in search of her biography.

In the Preface to her 1794 work, Fulhame leaves traces that enable us to assemble important details of her work and life. She writes:

> The possibility of making cloths of gold, silver, and other metals, by chymical [sic] processes, occurred to me in the year 1780; the project being mentioned to Doctor Fulhame and some friends, was deemed improbable. However, after some time, I had the satisfaction of realizing the idea, in some degree, by experiment'. Though I was, after some considerable time, able to make small bits of cloth of silver and gold, yet I did not think them worthy of publish attention; but by persevering, I at length succeeded in making pieces of gold cloth, as large as my finances would admit (Fulhame 1794, ix) (**B:50**).

This passage is important in at least three ways. First, despite a network of men around her doubting the validity of her ideas, she persisted, and did so with 'satisfaction'. This points to the protofeminist current of her work. Second, it exhibits Fulhame's indirect access to chemical thinking and teaching despite her exclusion from learned societies. Third, it places 'Dr Fulhame' – her husband[18] – and his surrounding networks as a key component in the development of her ideas. By working with Dr Thomas Fulhame and that network I can begin to assemble a potential portrait of Elizabeth.

Thomas Fulham(e) first attended the University of Edinburgh in 1779. Matriculation rolls confirm he graduated as a Medical Doctor in 1784.[19] Crucially, for this project, records indicate that he enrolled in a chemistry class in his first year of 1779-80 and was taught by Joseph Black (a point of significance I will shortly return to). The Scottish Post Office Directories can be useful for building a picture of domestic lives, but the search is limited. Results do not give returns until 1784, where Fulhame (and we must presume,

[18] Confirmation that Thomas was indeed married to Fulhame can be found in a letter written by John Mawe to Lord Thomas Pelham in 1802, where Mawe refers to Elizabeth and Thomas as wife and husband. See British Library Manuscripts: John Mawe to Lord Thomas Pelham, July 7 1802 MS 33109 f278. I thank Rose Teanby for kindly sharing this information with me.

[19] Edinburgh University Library Special Collections: EUA IN1/ADS/STA/2: Students of Medicine, 1762-1826: Individual record for Fulham, Thomas. Year of study 4. First year 1779, Second year 1781, Third year 1782, Forth Year 1783. MD (Edin) 1784. http://www.archives.lib.ed.ac.uk/alumni/search.php?view=individual1&id=5362

Elizabeth) is located at a Bristo Street address.[20] In Scottish state records, only the heads of a household are recorded and women's names rarely feature in this period. If Elizabeth and Thomas were living together, potentially married, these records would not note her by name as he would be considered the principal inhabitant.[21] Scotland's Places Survey of Servants Tax Records also hold an entry for Dr Fulhame in Midlothian for the years of 1790-91.[22] Again, there is no mention of Elizabeth but the record does document the life of a woman, a single female servant, Peggy McPherson (**B:51**). If Davenport and Ireland's interpretation of Fulhame's 'intermittent' labours of 14 years are correct (Davenport and Ireland 1989, 37), then the possibility of McPherson being witness or even assistant to protophotographic experiments is within the realms of the possible. However, while challenges abound in locating Elizabeth, the prospect of recovering any history of Peggy are even more remote. Quite simply, working class servants are omitted in the archival records, their biographical data reduced to the rate of pay for their labour.

University of Edinburgh records show Thomas' birthplace as Ireland (**B:53**).[23] There is no real clarity on Elizabeth, however. She is most often cited as Scottish in the existing secondary literature, but also Irish, British, and less often, English. If both Elizabeth and Thomas Fulhame were of Irish Catholic descent, the absence of a marriage certificate could be due to laws against Catholics during the late eighteenth and early nineteenth centuries, meaning records were not kept in this period. Until her death or marriage certificates are located, her nationality cannot be firmly established. While Scottish Post Office Directories indicate that Thomas and (again, we must assume) Elizabeth were based in Edinburgh between the years 1784 and 1801,[24] other sources show them in London for a period of time. For example, in *An Essay on Combustion,* she writes of her meeting with the scientist Joseph Priestley in London in 1793 (her connections with Priestley are explored in detail below). More substantively, in the course of my research I came across the first and only recorded document written to her: a letter from Marc-Auguste Pictet to Fulhame dated 1798 indicating that she was alive and living in London at that time.[25] This source has not yet been discussed or noted in the photographic literature on Fulhame and represents a new finding on her biography. At the end of this chapter, I will return to the significance of this letter for my analysis of Fulhame's contribution to

[20] For the year 1784-95, sources at the Scottish Post Office Directories locate Fulhame at a Bristo Street address: https://digital.nls.uk/directories/browse/archive/83084788.

[21] Scottish Post Office (SPO) records indicate that people usually had a small fee to pay to be included in these directories meaning that those on lower income and the poor were often omitted altogether.

[22] (Servant Tax Records and National Records of Scotland 1790).

[23] Matriculation albums at the University of Edinburgh do not show his full name and birthplace since these were only recorded from the year 1869/70 onwards. Fortunately, we can glean his place of birth from his dissertation title: 'Puerperal Fever 'Hibernus'…subject to the examination of learned Thomas Fulhame, Irish, Societ. Phys. Edin. Soc. Hon. and the President of the Year.' Though born in Ireland, Thomas referred to his 'native Britain'. University of Edinburgh Library Centre for Research Collections, Thomas Fulham University of Edinburgh, Volume: Matriculation 1762 1785, ESTC T11877

[24] Dr Thomas Fulham(e) appears in various Edinburgh directories from 1784-5 to 1800-1. I could not locate him in any Edinburgh directories after 1801. For the year 1794-95, sources at the Scottish Post Office Directories locate Fulhame at a Bristo Street address http://digital.nls.uk/directories/browse/pageturner.cfm?id=83987510. See also Aitchison (1794b). In the years 1799-1800 the same sources locate him at 'No. 9 Society' and the following year at 'Brown's Square'. See: http://digital.nls.uk/directories/browse/pageturner.cfm?id=82855911.

[25] The letter appears in *Correspondence De Marc-Auguste Pictet (1752-1825), Tome III, Les Correspondants Britanniques*, (Pictet 2015, Tome III: Les Correspondants Britanniques:213). Marc Auguste Pictet to Elizabeth Fulhame, 22 February 1798, (PR: j. corr. I/5, 1795-97). I thank Anne Morddel and the network of the *Women's Studies Group: 1558-1837* for leading me to this source. I also thank the author, David Bickerton, for his assistance in contextualising the Genevan networks and sharing key documents with me.

photography. This is not the only new finding on Fulhame to emerge from my ongoing research. Recent scholarship by historian Rose Teanby has confirmed Fulhame's death from tuberculosis in the South of France at some point between the years 1798 and 1802.[26] Together, these findings provide an indication of Fulhame's age when she conducted her experiments, and confirm that she lived to see her publication in 1794 and its German translation two years later. Further, they show Fulhame was aware of her work's early reception.

Edinburgh Networks of Protophotography

> Here I stand at what is called the Cross of Edinburgh and can in a few minutes take fifty men of genius and learning by the hand.[27]

Of the twenty protophotographers identified by Batchen (2008, 668), three have firm connections to Edinburgh: Elizabeth Fulhame, Henry Brougham (fl. 1794), and Tom Wedgwood (fl. 1799-1802). By locating Fulhame in this network of Edinburgh-based protophotography and expanding upon it in new ways, we can we can uncover insights about both Fulhame and the role of women in early photography. This network can first and foremost be located within the University of Edinburgh at the close of the eighteenth century.

1780s Edinburgh was a pole of attraction for students from England, Ireland and beyond. In chemistry in particular, Edinburgh was at the forefront of a new and experimental approach which would soon come to dominate not just domestically but in the United States also (Beer 1976, 406; Perrin 1982, 169). Enrolment in chemistry at Edinburgh was booming during this period, with student numbers rising from around 400 young men at the start of the eighteenth-century to more than double by 1780 (doubling again by 1815).[28] Two men in particular were synonymous with this teaching: William Cullen (1710-1790) and Joseph Black (1728-1799). The latter would play a crucial and to date underappreciated role in the life and work of Fulhame. According to Smout:

> William Cullen and Joseph Black…filled the chair of Chemistry from 1755 to 1795: their combined labours transformed the sciences of chemistry and physics…It was a characteristic of these men that [they] were as brilliant at teaching as they were at scholarship….they had a great reputation as lecturers (T. C Smout 1969, 353).

Studying under Black from 1779 onwards, Thomas Fulhame was exposed to his teachings on the chemical properties of metals and their salts (Brazil 2022), insights that were key to Elizabeth Fulhame's protophotographic experiments in the 1780s. When Thomas Fulhame graduated from the university, he

[26] The source for this information is the previously mentioned letter confirming her marriage to Thomas, British Library Manuscripts: John Mawe to Lord Thomas Pelham, July 7 1802 MS 33109 f278. I again thank Rose Teanby for kindly sharing this reference with me.

[27] These are the words of the King George IIIs chemist, who studied medicine in Edinburgh between 1778-1780 (Atiyah 2006; R G W Anderson and Jones 2012).

[28] It would not be until the 1840s, some sixty years after Fulhame's text was published in 1794, that women could attend lectures in chemistry at Edinburgh.

remained in Edinburgh and in 1786, now a physician, found himself living on Bristo(w) Street, close to his alma mater (**B:54-55**).[29] A few hundred metres away was the home of his former chemistry tutor, Joseph Black.[30] As both a chemist and physician, Black's academic career included professorships in anatomy and chemistry at the University of Glasgow, as well as in medicine and chemistry at Edinburgh. His discovery of specific and latent heat would greatly influence his students, several of whom would in turn become key figures in the sciences, including in protophotography. Among his pupils include John Maclean, John Morgan, John Redman Coxe and Benjamin Rush who would establish chemical courses in the United States (Perrin 1982). Others include his successor at Edinburgh, Thomas Charles Hope, the founder of the Mechanics Institute George Birkbeck, and the Scottish engineer James Watt, who was mentored by Black in his early years at the University of Glasgow, the two becoming longstanding friends and correspondents. Black's lectures were attended not only by university students, but by intellectuals and practitioners from across Edinburgh more broadly (Ramsay 1918, 110).

Black's students founded the world's first Chemical Society in 1785 (Kendall 1935, 565; Black 2012, 794). Though it was short-lived, lasting only until 1788, the Society carries significance for the history of photography. Located in The University of Edinburgh Joseph Black Papers is a list of names of the Society's members, dated 1785 and written in Black's hand (**B:56-59**).[31] Of the sixty names that appear on that page, all but one were students of his at Edinburgh between 1780 and 1788. Fulhame, as a woman, is not among them. I want to propose, however, that through a closer examination of the network around Black we can indeed locate Fulhame, and in turn, produce a better appreciation of her contributions to protophotography.

Specifically, through Black, several figures can be reached who open up the world of Elizabeth Fulhame. First is her husband, Thomas Fulhame, who enrolled in Black's chemistry class in his first year of his studies in 1779-80 (The University of Edinburgh 1779). Then there is Thomas Wedgwood (1786-1791), Henry Brougham (1792-1796) and Thomas Beddoes (1760-1808). To this list we can add Black's aforementioned friend and closest correspondent, James Watt (1736-1819. These figures – Brougham, Wedgwood, Beddoes, Watt and T. Fulhame – are key to the story of protophotography in Edinburgh, and it is Black who is the unifying figure. I want to propose that Elizabeth Fulhame be located in this milieu, that an analysis of this circle can, in turn, augment our understanding of her. This chapter now moves towards a consideration of each of these figures as a way of better appreciating Fulhame's own work and life, and her contribution to early photography.

In the autumn of 1786, 15-year-old Thomas Wedgwood joined his older brother Josiah in Edinburgh. Their father, the industrialist and potter Josiah Wedgwood, wrote at the time: 'I have sent my youngest boy for

[29] Only part of this street is still standing. Files at the Scottish Post Office Directories locate Fulhame at this address for the year 1784-85 (National Library of Scotland 1784; Aitchison 1794b).

[30] Scottish Post Office Directories indicate Black lived at several addresses in and around the university. See (R G W Anderson and Jones 2012, 49).

[31] The paper is now refiled in Black Correspondence Gen 875 F (oversized), previously GEN 875 Vol II-246-7 53.

the present, at his own request, to the University of Edinburgh, where he has already been one winter'.[32] Tom and his brother lived on West Nicholson Street, just metres from the Fulhames, who were located on the same stretch of road known as Bristo(w) Street.[33] Just as Wedgwood was settling into life in Edinburgh, Elizabeth Fulhame was undertaking her own experiments in close walking distance. This striking proximity between Fulhame and Wedgwood has not yet been identified in the literature to date. A small entry ticket bearing the inscription 'lectures on chemistry' from the Wedgwood Collection at the V&A, provides a material trace of Tom's participation in Black's lectures, something that could never exist for Fulhame (**B:60**).[34]

Soon after his arrival in Edinburgh, Tom's tutor Alexander Chisholm wrote from his family home in Etruria, England: 'The classes & chemistry will in my opinion employ all your time…I hope Dr Black speak to the eye, as well as to the ear, though even that is not so good as doing a thing with ones [sic] own hand…Your laboratory shall be taken care of'.[35] *One's own hand.* In these eighteenth-century sources (**B:61**), the significance of learning through making is clear.

Despite Fulhame's experiments predating Wedgwood's, he is widely recognised as the pioneering figure in protophotography, his landmark moment coming in June 1802 when his experiments were presented by Humphry Davy to the Royal Institution (T. Wedgwood and Davy 1802). In *Partington's A History of Chemistry,* the case is categorical: 'the first true photographs were made by Thomas Wedgwood' . Newhall makes a similarly authoritative statement: 'The first person to attempt to record the camera image by means of the action of light was Thomas Wedgwood' (Newhall 1984, 13). For Batchen, these experiments are 'usually regarded as the first to have photography as their principal object' (Batchen 1991, 31). Wedgwood's significance is beyond doubt, not just for coating white paper and white leather with light-sensitive chemicals (silver chloride) to capture silhouette images, but also for undertaking the first attempt to photograph using a camera obscura.

A young Wedgwood, then, could have been conceptualising the beginnings of early protophotographic experiments, while Fulhame, in her domestic setting, was working with silver salts and silk – all on a continuous street a few hundred meters apart in the same city. Though a capital city, Edinburgh was compact, and its intellectual networks even more tightly entwined: 'everyone in cultivated circles knew everyone else' (Atiyah 2006, 596). The significance of Edinburgh in Wedgwood's protophotography remains

[32] Josiah Wedgwood to Marc-Auguste Pictet, 28 November 1787, Etruria, (Pictet 2015, Tome III: Les Correspondants Britanniques:514). Confirmation of Wedgwood's enrolment at Edinburgh in 1786 can be found at (The University of Edinburgh 1786).

[33] Thomas Wedgwood and his brother Josiah stayed with the influential figure Thomas Blacklock, a blind poet and Doctor in Divinity. Blacklock's house still stands today and is known as 'The Blind Poet' pub. Blacklock is best known for his friendship to Robert Burns, whom he dissuaded from going to the West Indies in 1789. This not only saved Burns' life (the ship Burns was due to sail on later sank) it also prevented him from becoming entangled directly in the transatlantic slave trade. For more on Burns and his aborted trip to Jamaica, see Mullen (2022, 147–48) and two Scottish artists Graham Fagen's *A Slave Lament* (Fagen 2015) and Douglas Gordon *Black Burns* (Gordon 2017).

[34] V&A Wedgwood Collection: E11-30037. I thank archivist Lucy Lead at the V&A Wedgwood Collection for taking this photograph for me. Note: Wedgwood is spelled incorrectly, something Lead notes was common.

[35] V&A Wedgwood Collection: (E44-28903 (2), December 23 1786).

neglected. The possibility that Fulhame and Wedgwood knew each other, were in touch, or moved in same protophotographic circles has similarly not yet been explored.[36] It is important to note that during this period, domestic practice was not strictly gendered, but was a matter of practicality. Werrett explains that scientific experiments in the seventeenth and eighteenth century were conducted in an 'age of thrift' in which rudimentary objects were used and the home served as the laboratory (Werrett 2018). This culture of experimentation was profoundly domestic.

To date, no known experimental outputs from Wedgwood and Fulhame have survived. Since Wedgwood had no way of making his images permanent (not until 1819 would this be possible), there is no extant record of these works today.[37] However, Schaaf notes, tantalisingly, that some of Wedgwood experiments with chloride of silver 'survived for a long time'. Viewed under candle light, they were apparently still readable in the mid-1880s, a near century after they were made (Schaaf 1990, 13). The visual histories produced by Wedgwood and Fulhame would have been time-limited from the moment of their creation, becoming less and less apparent to the human eye, eventually disappearing from sight. Interrupting this excursion in biography and networks in 1780s Edinburgh, I turn now to art practice to conjure what has been lost as a way of exploring Fulhame's contribution to early photography.

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Fulhame was a chemist. She combined a rigorous commitment to the scientific method with a theoretical explanation of her observations (Ogilvie 1986; Brazil 2022). I am an artist and PhD candidate employing a methodology to explore women's creative contributions in this earliest of periods of photography's history. The absence of Fulhame's creative and experimental output acts as my invitation. Following Lütticken's theorisation of reenactment as activating 'a potential waiting' (2005), I study Fulhame's experiments in light with silver and set out to remake her colour experiments *to see what she saw*. It requires a material understanding of the properties I am working with – silver, silk and the sun. Were it photographic paper and darkroom chemistry, I could draw on my training and experience. But I am in new territory, this is Fulhame's terrain. I source the silk fabrics from a local store in east London, where I live. Through forefinger and thumb, retouching, I run the material against my skin, making my selection carefully: it has to be a silk without chemical impurities (**B:63**). I wish I had inherited my grandmother's knowledge of fabric.

Each step is a touch. I cut samples from the fabric under the safelights of the darkroom at the Royal College of Art. I coat small squares of white silk – about four by five inches – with liquid silver nitrate. The silver nitrate is sold in a gel form and needs to be heated up to be applied. I apply the emulsion in its liquid state using a wide hake brush. Touching, retouching (**B:64-65**). Once coated, the strips of silk become light-

[36] An exception to this rule is the work of Fionn Montell-Boyd, a doctoral candidate at the University of Oxford, who in a recent (as yet unpublished) talk explored the industrial connections between Fulhame and Wedgwood (Montell-Boyd 2023).

[37] For more on the invention of fixer and photographic permanency, see Schaaf (1992, 26) and Chapter II of this project.

sensitive. I carefully place them into a black safety bag. Carrying these strips of silk home in their light-tight state on public transport, the pungent metallic scents of the darkroom travel with me.

Fulhame used both gold and silver chloride to dye fabrics by exposure to light. She worked between a dark closet and a window chamber. The domestic setting of her labour was not untypical: like her contemporaries, the equipment needed to employ her experimentation was basic and satisfactory.[38] In the age of thrift outlined by Werrett (2018), historical acts of *re*cycling, *re*purposing, *re*pairing and *re*using were used by many. My act of retouching feels within reach. In her chapter on the reduction of metals by light she writes:

> On the 24th of July a piece of silk was immersed in a solution of nitro-muriate of gold in water, and dried by a gentle heat; it was then suspended in a window, exposed to the sunbeams, as much as possible: no change was perceived on it until the 26th, when the margin of the silk began to assume a purple tinge, which increased gradually, and on the 29th exhibited a few obscure specks of reduced gold on the side of the silk opposed to the light. The purple tinge continued to increase… (Fulhame 1794, 202).

In art practice, I too conduct my experiments with light at home. I unpack my Sekonic light meter and take readings around my flat. I select the windowsill that best invites the early summer afternoon daylight. This happens to be in the kitchen. I unveil the tests, resting some of them on an unused radiator in June. The others I suspend in the rays of the sun attaching them to the cord of the window blind with clothes pegs. I have grown fond of the darkroom scents that insist on accompanying me everywhere I go, but it is not something you want brought into the home. I take care not to allow my cats to walk over the fabric tests. I keep the baby's weening hands out of reach. I 'abandon housework to make artwork', as the artist Kate Davis puts it (Davis 2021).

When placed into direct sunlight, the reaction of the silver is immediate. As the sun rays accelerate the discoloration of the coated fabric, the material starts to react. I turn back to Fulhame's text, held in one hand as a printed copy (a manual), while the other tends to the chemical process unfolding in front of me. She writes (I read): 'I was so struck with its beauty, that I attempted to imitate it on a small bit of white silk; and succeeded, having produced a beautiful purple colour, with gold beaming through it' (Fulhame 1794, xi). The silk starts to perform, and the experience is in full colour. The photochemical colours previously only imagined by word on the page now come into my view. The silk moves through white, to peach, to pink, darkening to a lilac-grey. Once dry, it shimmers and reflects flecks of silver. In reenactment, an

[38] 'My apparatus consisted chiefly of a few glass vessels for the solution of metals, and the formation of such elastic fluids as I used. The cheapest and the most simple of those described by Dr. Priestley answered my purpose.' (Fulhame 1794, xv). In Priestley's famous discovery of airs (including oxygen), household utensils were used as part of his chemical apparatus (Werrett 2018, 69). Davy, a key protophotographic figure discussed later in this chapter, encouraged his audiences at the Royal Institute to reenact his experiments at home (Science Museum Group Collection, n.d.). Some of Black's laboratory glassware is held in the Playfair Collection at National Museum of Scotland. As Morrison-Low notes, there is a need for more research on the material culture of Edinburgh chemistry (see (Verwaal 2016).

engagement is activated. Through retouching and at a distance of over 200 years, pre-photographic moments of chemical discovery become tangible, visually, experientially. And it is thrilling. I have a Fulhame fabric of my own – my own 'silver stuff'. It is an act of reversal. Fulhame's work, long since faded from view, is reactivated through art practice, made material, made visual. But it is also temporary and unfixed. My work too will fade, and it does. Blackshaw (writing on Fortnum) asks whether an art work can 'create a living, breathing historical subject, something more than a copy…?'. In reenacting the historical subject, she suggests the viewer can 'become this subject for a moment in time' (Blackshaw in Fortnum 2020, 19, emphasis added). As the artist (not the viewer), and one whose chemistry represents an inexact reenactment, I have not become Fulhame. But I have enacted a closing of historical distance for a 'moment'. I am speaking not for Fulhame but with her (Fraser et al. 2019). I consider the potential commonalities across time and space of a chemical, haptic pursuit. Following artist Nadia Hebson, it is 'a relationship established between two or more women, who do not necessarily live in the same place or period of time', an attempt to 'understand as a form of subjective, empathetic enquiry or a mode' (Hebson 2019). This has resonance as I reenact Fulhame. In the archive I had to undertake an imaginative leap to consider the range of photochemical colours Fulhame's experiments produced. Now, through reenactment and retouching, and a haptic engagement with her protophotographic experiments, I can experience them.

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Fulhame's studies on light-sensitive substances between 1780 and 1794 were similar to Wedgwood's. In 1849, Snelling, in one of the earliest histories of photography, held Fulhame in a higher regard, arguing 'Mr. Wedgwood's experiments can scarcely be said to be any improvement on them [Fulhame's work] since he failed to bring them to practical usefulness' (Snelling 1970, 5). But there were important differences. Fulhame never attempted to make shadow-prints on her silks and fabrics in the way Wedgwood did on his papers. Unlike Wedgwood, her project was not driven by an optical ambition; there was no lens or any stated interest in capturing an image. But through my practice-led inquiry, I now know that the results of her quest to reproduce 'cloths of gold, silver' were no less visual.

The distinguishing feature of Wedgwood's experiments was the employment of a camera obscura, making him 'the first to record contact images using silver nitrate coated on paper' (Ware 2019, 29). There is clear photographic intent. Fulhame does not fit so neatly into this standardised photographic category. Her aims were in 'making pieces of gold cloth, as large as my finances would admit' and in making maps and to 'facilitate the study of geography' (Fulhame 1794, x). But I want to insist, following others, that we stretch the category of the photographic to include Fulhame.

My quest for the presence of *something from the past* to materialise for Fulhame persists. Schaaf, the photography historian who played such a key role in contextualising Fulhame's protophotographic contributions, asked thirty five years ago: 'will enigmatically patterned eighteenth century fabrics of a

characteristic purple colour surface in the auction houses some day?' (Schaaf 1989, 12).[39] While this question remains unanswered, I turn back to my practice to appreciate the visual and physical form of Fulhame's work in my attempt to understand her contribution to photography on new terms.

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With the remaining metres of white silk, I scale up the fabric to create a new work. The plan is to again perform a chemical reaction of silver nitrate and sunlight. This time, however, the ambition is a larger, temporal work for exhibition. I plan to make the work before an audience at the School of Arts & Humanities annual postgraduate research show in Peckham (Douglas 2018). I visit the site to check the available daylight in the space. I travel with my 18-month-old son. Together we watch shafts of light dancing on the concrete floor as I could visualise where I could make my temporary monument (Wade 2022). Writing in her diary in 1971, almost 200 years after Fulhame, artist Rosemary Mayer suggests beauty 'is in the nature of materials as equally as it is in thoughts, process, structures, activities, reactions'. Her interest is in 'what materials do... & what I can do to them' (Mayer in Wade 2022). I am working with the unknown.

I return to the darkroom to prepare the silk for the exhibition. Where Fulhame worked in a 'dark closet to prevent the action of light' (Fulhame 1794, 200), I coat the liquid silver nitrate over silk under the red-light conditions of the darkroom. This reenactment is not scientific, it is instead an inexact contemporary photographic artwork that follows but does not repeat. At this scale, the physicality of the work is more demanding than I had anticipated, the folds and drapery of the fabric are a challenge to control in its wet state (I try to disguise this effort in the video documentation). I now have a bodily relationship with the materials that have chosen me. I give scale to the work. I have prepared a metallic stand to hold the weighted, chemically saturated cloth. Made in the RCA metal workshop with reproposed chemistry equipment, it inadvertently resembles a nineteenth century headstand (like those used by Adamson and Hill, and later retouched out of view: see Chapter III).

In the making of this work, I want to create both a physical and temporal space that can hold the chemical performance reacting in daylight. In each act of enquiry, I feel more committed to these materials, chosen by Fulhame and modified by me. In an article in *MAP Magazine*, I read art critic Barry Schwabsky's take on Karla Black's sculptural works:

> …this work accepts illusion, the impression it gives of being fragile, provisional, makeshift is not illusory. To reinstall one of these pieces would to a great extent mean to remake it—therefore to reinterpret it. And furthermore, since the materials are in themselves volatile, unstable, one might

[39] Fulhame presents an interesting opportunity to explore the intersections between photography and dress. She writes about being inspired to conduct her work after viewing a piece of 'gold stuff made for the late King of Spain' (Fulhame 1794, xii). But this line of enquiry presents challenges: if the category of the photographic is fluid and uncertain, so too is the language of dress. As Nicklas and Pollen note, 'terminology is a perpetual difficulty in the study of dress history: how should 'dress', fashion', 'clothing' or 'clothes' and 'costume' be defined and distinguished from each other?...How do 'dress history', 'fashion history' and 'fashion studies' differ?' (Nicklas and Pollen 2015, 1).

> say that the sculpture is always in the process of remaking and reinterpreting itself (Schwabsky 2007).

Black's sculptural practice cannot not easily be accessed, they are temporal and exist only in exhibition display. But her materials are familiar to me; Vaseline, paint, chalk, soap, sugar paper, creams, lipstick, cement, fake tan, toothpaste, cling, carboard, paint, polythene. The National Galleries of Scotland explain her concern is 'with the physical merits of matter: its tactile, aesthetic appeal, rather than its cultural connotations' (National Galleries of Scotland, n.d.). I too share in the celebration of matter. Though instead of being led by the unconscious, like Black, I have chosen to be bound by the materials chosen for me, through the archive, by Fulhame. Beyond Black's impressive material forms and pastel hues, her practice speaks to me in the way she embraces the decay that follows the work's making. Once installed, Black's work begins to be destroyed, leaving the viewers with only a memory (and documentation).[40]

In truth, the scale of Fulhame's work would have been closer to Joseph Black than Karla Black. The University of Edinburgh Special Collections holds samples of his study of indigo.[41] They show small, carefully examined strips of cotton tape (**B:66**). Yet Karla Black's larger format has a resonance with my reenactment of Fulhame. I have committed to this sculptural form. With no real physical sense of Fulhame's experiments I can dream them on a canvas of my own, in a scale that could invite the form of a person – *the spectre of a woman*.[42]

Once fully coated with light-sensitive emulsion, I wrap up the metres of chemically soaked silk into a light-tight black bag. In the venue, I unfold and arrange the fabric, and then hang it in light. I have a metal darkroom tray to catch excess chemistry as it drips off the wet silk (**B:68-75**). As soon as the fabric is unwrapped the chemistry and sunlight start to work, catching the remaining rays of the day. The wetter areas react more quickly. This is a group exhibition and the work is listed as a performance in the programme. Any 'theatricality' of spectacle is left to the materials and their reaction to the elements in the space. This is a temporary piece: with my conceptual decision not to fix this work, it will soon exist only as a decaying artefact. The exhibit is active yet silent (though fellow student performances create an unanticipated audio accompaniment). It hangs and I stand back, waiting, hoping, for the fabric to perform.

Impermanence is the pursuit, an opportunity to haptically explore the materiality of fading in a medium known for fixing (Ramalingam and Waycott 2020). This search is driven by a desire to close historical distance (E. Edwards 2016, 309), to be in resonance (Hebson 2019) with the protophotographers before me. Like Fulhame, without fixer or digital capture, I too would be left with a memory of this work, an orally transmitted record of the afterlife of a photochemical moment. Though my pursuit is a live temporal work,

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[40] Examples of Black's works can be seen here: https://www.nationalgalleries.org/art-and-artists/features/karla-black

[41] See The University of Edinburgh Special Collections Coll-16/III/131-132.

[42] Fulhame's work involves dipping silk threads into metal salts (Brazil 2022) and she makes one reference to a yard in her text. Given the short supply of visual material for experimental chemistry in this period, viewing Black's samples is helpful. Though his are a study of heat, their small, vertical form is repeated in other scientific studies, including, for example, Herschel's notebooks and Mary Somerville's anthotypes (see Chapter II). For reading on blue and the indigo trade in the eighteenth century, see Beeson (1964) and Mavor (2013).

I am soon faced with a practical decision whether to allow it to decay organically, or to document the process digitally as Karla Black does. In choosing the latter, it feels like a transgression of method, but it is one I am prepared to accept. The purple hues of Fulhame's view come into my own. By chance, I find I am working with a similar pallet to Josiah Wedgwood's jasper trials from 1773 (**B:76-79**) (like Black's indigo experiments, these are also heat related colour studies, only in his case across ceramics). What kind of history might be gleaned from this fabric? I surrender control as the light performs its action.[43]

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Silver Pictures

Returning to Joseph Black and the circle around him, we can continue to assemble our picture of Fulhame's life and work. James Watt, mentored by Black during his Glasgow years, is best known as an engineer and inventor. In the archives of the Science Museum Group there is a letter, long thought by historians to have been lost, written by Watt to Josiah Wedgwood (Tom's brother) simply dated 'Thursday'. Written in the year 1799, James thanks Josiah for sending Tom's instructions for making 'silver pictures', stating that he intends to 'make some experiments' of his own based on Tom's guidance (J. Watt 1799) (**B:82**).[44] This document is widely interpreted as evidence that Wedgwood undertook the first to attempt to 'fix' a photographic image with silver and light (Batchen 1993, 172). So here are two men, both mentored by Black, in protophotographic conversation at the close of the eighteenth century.

Another former student of Black's, Thomas Beddoes, had a close friendship with Tom Wedgwood whom he met in 1793 in Bristol. Beddoes would hire a young research director at his Pneumatic Institute, Humphry Davy. Davy, in turn, was the key photographic collaborator of Wedgwood's. Around the same time, another of Black's students, Thomas Young, was experimenting in light and drew directly on Wedgwood's work (Gernsheim and Gernsheim 1969, 42). These figures – Watt, Wedgwood, Young, Davy and Beddoes – were all mentored by Black and have their established place in the discourse on early photography. By the time of their collaborations in the late 1790s, Fulhame's 1794 work had already been in circulation for several years. I want to put forward the idea that not only was her work was in their orbit, but that they also engaged with it.

During the year 1794-1795, another student of Black's was engrossed in experiments on colour and light in Edinburgh (Aitchison 1794a). This was teenager Henry Brougham, who would later go on to be a politician and Lord Chancellor. In his posthumously published memoir, Brougham writes: 'Great as was the pleasure and solid advantage of studying under such men as Playfair and Stewart, the gratification of attending one of Black's last courses exceeded all I have ever enjoyed' (Brougham 1871, 1:59). Like Watt and Wedgwood, Brougham was undertaking protophotographic experiments in Edinburgh as the eighteenth century drew to a close. His work on colour and light was carried out in 1794, the same year

[43] The video documentation can be seen in full here: https://www.carolinedouglasphotography.co.uk/works/a-view-to-a-new-art-of-dying-sic-and-painting

[44] This is no known record of Watt undertaking this task (Schaaf 1990, 19).

Fulhame's text was published. Again, we find a coalescence, a proximity, but as yet no tangible association between the two figures. Like Fulhame, Brougham's work has been overlooked. According to Batchen, 'of all the British claimants to the invention of photography, Brougham is the one whose experiments have been given least attention in existing histories of photography' (Batchen 1991, 240). His paper, 'Experiments and observations on the inflection, reflection, and colours of light' was published in 1796 in the Royal Society's periodical Philosophical Transactions[45] For Batchen, it represents 'one of the earlier inceptions of the idea, if not the practical implementation, of photography' (Batchen 1991, 240). Through Scottish Post Office Directories, I can locate Brougham's 1794 residence in Edinburgh to 'No7 George Street, South Side'.[46] Once again, this is just a few hundred metres from the addresses for Black, Fulhame and Wedgwood established earlier in this chapter. This proximity of protophotographic activity emerging within less than a mile of the same city has not yet been noted in the existing literature (**B:84-85**). As James Ryan notes, 'much writing on early photography has tended to focus on questions of origins and priority…matters of geography and connectivity have, in contrast, received far less attention' (Ryan 2017, 343). The prospect of uncovering the cross-fertilisation of ideas within and across this network once more rises to the surface in my research.

In the moment of doing so, however, I am cautioned by the archive. Fulhame does not mention Black by name at any point in her text, and nor does she mention any of the figures in the aforementioned circle of protophotography in Edinburgh. Instead she writes: 'Were I not encouraged by the judgment of some friends, and possessed of specimens, to shew the progress made in the art, I should never perhaps venture to publish this Essay' (Fulhame 1794, xx). Unfortunately, we are not told who these friends are. In the introduction to her text, Fulhame presents a range of citations which show her undoubtedly immersed in chemical theory, but the protophotographers discussed in this chapter are absent.[47] The extent to which Fulhame was privy to their exchanges has thus far proven untraceable. Instead, it is useful to flip this inquiry to question the extent to which these figures were familiar with her work.

One name that is mentioned by Fulhame is significant. After her husband's 'friends' had subjected her ideas to criticism, she took the decision to suspend her 'intention of publishing this little work'. However, everything changed after a meeting with 'a celebrated philosopher…some time in October 1793', who after seeing 'some of the same pieces, and indeed some of the worst, viewed the performance in a very different light' (Fulhame 1794, xxx). Though she did not state explicitly who this figure is, it was confirmed a few years later as Joseph Priestley (1733-1804) (Priestley 1800, Monthly Review:59).

Priestley (1733-1804) was a chemist and religious dissenter who was 'committed to the interrelation between scientific knowledge and social reform, between chemistry and public culture' (Bahar 2001, 43). He moved

[45] Batchen summarisers the paper as an attempt to discover 'analogous relationships between the bending of light within bodies (refraction or, using the eighteenth century term, 'refrangibility') and the bending of light outside of bodies (reflection and diffraction or, in Brougham's terminology, flexion)' (Batchen 1991, 240)). For further reading on Brougham and his relationship to Thomas Young's theory of light, see Cantor (1971).

[46] For the year 1794, sources at the Scottish Post Office Directories locate Brougham at a No. 7 George's Street, South Side: https://digital.nls.uk/directories/browse/archive/83084788.

[47] Fulhame cites, among others, Beccker (sic), Stahl, Lavoisier, Macquer, Scheele, and Kirwan (Davenport and Ireland 1989).

to Birmingham in 1780, where he became a founding member of the Lunar Society, a small group of scientists and industrialists who met each month on the night of the full moon to discuss the issues of the day. Two of the other five co-founders were the aforementioned James Watt and Josiah Wedgwood (father of Tom), both of who were intimately connected to Joseph Black and the world of protophotography in Edinburgh. In her study of the Lunar Society, Uglow writes: 'The ideas of such men, the concerns of the Edinburgh clubs and the varied interests of Watt's circle in Glasgow would permeate the culture of the Lunar men. So much so, indeed, that at times it would seem as though Birmingham itself was an intellectual colony of Scotland' (Uglow 2002, 34).[48] The connections between the Lunar Society and early photography were not only a matter of personnel, but one of ideas: in sessions of the Society, discussions were held about the 'action upon nitrate of silver, and the application of this phenomenon to the production of pictures' (Priestley and Bolton 1892). In short, protophotography.

After the Birmingham Riots (also known as the Priestley Riots) of July 1791, in which protestors targeted religious dissenters and supporters of the French Revolution, including Priestley himself at his home, he, together with his family, left for London, settling in Lower Clapton (today's borough of Hackney). He would stay there until early 1794. Significantly, it is in this period, the early 1790s, when tangible evidence emerges that the worlds of Fulhame and the protophotographic network sketched in this chapter did indeed overlap.

In October 1793, Fulhame met with Priestley in London where she showed him some samples of her work – colour photochemical experiments.[49] Priestley notes this encounter with Fulhame in an essay published in *The Monthly Review* in 1800, where he writes: 'she was so obliging as to shew me the result of some of them in London, I was greatly struck with them'.[50] This encounter with Priestley represents a crucial point of contact between Fulhame and the world of protophotography. While this is not a new finding, I want to propose that the Edinburgh connections provide a key and overlooked backdrop to this encounter between Fulhame and Priestley. Just prior to their meeting, Priestley was also in correspondence with Tom Wedgwood. We know from a letter in the Dickinson archives that Priestley rebuilt a laboratory in Clapton, with Tom's father Josiah Wedgwood providing equipment (Bahar 2001, 43). In June 1791 Priestley wrote directly to Tom himself discussing Wedgwood's plans for experiments on *Light* and *Heat*: 'The experiments will no doubt be labourious [sic], but nothing of value is to be had without labour' (Priestley and Bolton 1892, 107). And by October 1791, Priestley again in encouragement, wrote to say his experiments were 'curious and important' (Priestley and Bolton 1892, 116). By February 1792, he told Wedgwood that 'the subject of heat and light…is a business reserved for you. It is ground unopened' (Priestley and Bolton 1892,

[48] On the Lunar Society and women, see Phillips (1990).

[49] Though Fulhame did not have formal access to science education, she had contact with prominent scientists of her day. This was the case for 'intelligent women of the upper and upper-middle classes' of the period (Rayner-Canham and Rayner-Canham 2020, 1). These intersections of class and gender become even more tangible in the act of retouching the archives. In the Joseph Black Papers at the University of Edinburgh, we find scores of letters to Black from literate persons with neat handwriting putting forth their sons and male heirs for university tuition. Women appear in these letters only in relation to marriage.

[50] This comment refers to Fulhame's work in relation to the decomposition of water. This 1800 Priestley text is often quoted for his quip that Fulhame's finding 'appears to me to be as fanciful, and fabulous, as the story of the phenix (sic) itself' (Priestley 1800, Monthly Review:60). Yet only a few paragraphs prior, he refers favourably to her 'ingenious experiments' (Priestley 1800, Monthly Review:59).

125–26). To make this transparent, during his London period, Priestley was simultaneously encouraging both Tom Wedgwood and Fulhame in their pursuits where they shared their work with him. The threads connecting Fulhame to protophotographic Edinburgh, so long occluded by the archive, at last become tangible. Fulhame herself reflects on this exchange with Priestley in the preface to her 1794 work, where she recounts that after showing Priestley examples of her work, he encouraged her (to her surprise) to pursue the project to the point of publication:

> This illustrious friend of science, not only approved of the specimens shewn him, but offered to have a memoir on the subject presented to the Royal Society: but different incidents dissuaded me from that mode of publication, and induced me to adopt the present (Fulhame 1794, xiii).

We can only speculate on the reasons why Priestley's suggestion of a publication at the Royal Society (presumably to be presented in his name) was not pursued. It is possible there were wider political forces in play concerning Priestley and the Royal Society.[51] At any rate, this would have been the first experimental paper published in a woman's name at the Royal Society. It would be another thirty years before that accolade would be bestowed to Mary Somerville in 1826, in another moment of protophotographic significance (discussed in detail in Chapter II of this thesis).[52] Fulhame's work duly appeared in 1794 and for so long this was the only concrete date associated with her life. 'Flourished, 1794'. Her publication was registered at Stationer's Hall on December 13 of that year.[53] It is the first and only known record where her forename appears in print (at least it nearly does): 'Eliz. Fulhame Do. Certificate given Dec 15 1794' (**B:86-87**). The preface to the book, dated 5 November 1794, carries a protofeminist current. Fulhame writes with 'hope' that her work will 'be thought inoffensive by the liberal and the learned'. Yet she anticipates reactions of a different sort, noting that 'censure is perhaps inevitable'. She reflects on the 'dictatorship in science' which manifests as a 'boisterous tide' of 'innuendos, nods, whispers, sneers, grins, grimace, satanic smiles, and witticisms'. She paints a monstrous portrait of the forces of exclusion, depicted as a 'goblin' 'full of rage', which turns 'violent' on account of its privileges and rights having been 'invaded' by the presence of others. This is particularly so, argues Fulhame, if the 'spectre' of learning appears 'in the shape of [a] woman' (**B:89**). Her experiences of patriarchy – past, present and those yet to come – are audible. Her text is an 'arena' where she presents herself. As Lütticken suggests, 'a presentation…is also a representation of who they want to be or must be in a certain situation' (Lütticken 2005, 17). This is not a silent work. The

[51] In 1793, Priestley had frictions with the institution, as did Beddoes and the aforementioned Thomas Cooper. After Cooper was rejected for his political beliefs, Priestley decided to stop sending his scientific papers there (Priestley and Bolton 1892, 102). If Priestley made his offer to Fulhame in October 1793, by the following month it would likely no longer hold, since he had decided 'not to trouble the society' with his scientific papers (Priestley and Bolton 1892) and by April of 1794 he left England for the United States (APS Source, B P931).

[52] On 2 February 1826, Mary Somerville became the first woman to have a scientific experimental paper presented in her own name to the Royal Society and published in *Philosophical Transactions* (Patterson 1983, 48). This is sometimes miscited as the first time a woman was published in the periodical: Caroline Herschel was in fact the first earlier in the same year, when her astronomical 'observations' (not a paper as such) appeared (Moxham et al. 2022). The two never met, but would later be first women to be granted honorary memberships to the Astronomical Society in 1835.

[53] Company Registers, Entry Book Copy 1794, The Stationers Company.

protofeminism running through Fulhame's protophotography can also be tracked in this address from the chemist Thomas Cooper to Parliament in 1792, he proclaimed:

> The fact is, that we behave to the female sex, much in the same Manner as we behave to the Poor. We first keep their Minds, and then their Persons in Subjection ...I have read the Writings of Mrs. Wollstonecraft, of Mrs. Barbaud, of Mrs. Montague, etc., in England ... I have conversed with Madame Condorcet, Madame Robert, Madame Lavoisier, etc., in Paris. What these Women are, other Women might become. I have often felt my own Inferiority, and often lamented the present iniquitous and most absurd notions on the Subject of the disparity of Sexes ... Let the Defenders of male Despotism answer (if they can) 'THE RIGHTS OF WOMAN' by Miss Wollstonecraft. (Cooper 1792b, 98-99).[54]

Reenacting and Relocating Fulhame

We can now begin to trace the influence Fulhame had on her better known (male) contemporaries who drew directly on her work. Perhaps the most significant example can be found in the case of the physicist Benjamin Thompson (Count Rumford) (1753-1814).[55] Though not defined as a protophotographer, Rumford was deeply entwined with those networks through his research on heat and light. In particular, it was his interest in the chemical effects produced by light that led him to Fulhame. In a paper read before the Royal Society in London on June 14th 1798, Rumford adds a footnote: 'This agrees perfectly with the results of similar experiments made by the ingenious and lively Mrs. Fulhame…It was on reading her book, that I was induced to engage in these investigations; and it was by her experiments, that most of the foregoing experiments were suggested' (Rumford 1798, 10). This was the first time Fulhame (or rather, 'Mrs Fulhame') had been mentioned at the Royal Society and its journal, *Philosophical Transactions*. It is important to note that Rumford was not only citing Fulhame, he was reenacting her through his chemical practice.

The following year, in 1799, Rumford co-founded the Royal Institution of Great Britain, with the aforementioned Humphry Davy chosen as its first lecturer.[56] As noted earlier in this chapter, Davy would later present Wedgwood's seminal protophotographic experiments at the Institution in 1802. This is widely cited as the single most important protophotographic moment. Was Davy aware of Fulhame's work in 1802? Did he draw on it, implicitly or explicitly, in this pivotal intervention? In his syllabus and lectures,

[54] Cooper's speech was sold by the aforementioned Joseph Johnson, Fulhame's bookseller. He was a friend of James Watt's son and travelled with him to Paris during the French Revolution earlier this year of 1792. Cooper during this time was an abolitionist as well as a protofeminist. However, by the early 1800s he had made an about-turn to become an outspoken defender of slavery. See the University of South Carolina's webpage (University of South Carolina, n.d.).

[55] Benjamin Thompson is the only figure other than Fulhame to be mentioned in Herschel's 1839 address on photography, and even then, he is referenced in relation to his reenactments of Fulhame.

[56] Rumford established the Royal Institution in 1799 with Joseph Banks. The first chemistry lecturer was Thomas Garnett, a student of Black's (Partington 1972, Volume IV:31). Michael Faraday was appointed as Davy's assistant. His protophotographic activity will be charted in Chapter II.

Davy makes no mention of Fulhame (Schaaf 1992).[57] But in the digital archives of the Wellcome Collection, further entanglements between Fulhame and Davy (and indeed the wider protophotographic network sketched in this chapter) become more apparent. In the published version of Wedgwood's address, filed under 'F' is an item 238, a genderless entry listed as 'Fulhame's Essay on Combustion, 8vo. London, 1794.' ('Journals of the Royal Institution of Great Britain' 1802).[58] Fulhame and Wedgwood, in the same pamphlet, pages apart. Published 'under Count Rumford's direction…conducted jointly by Dr Young and Mr Davy', and sold by Johnson in his St Paul's Churchyard. Though this does not represent irrefutable evidence that Davy engaged with the work, it shows how closely entwined the worlds of Fulhame and protophotography were. Where Batchen suggests that 'it does seem likely' that Davy knew of Fulhame's work (Batchen 1993b), I would say it is almost certain. Moreover, we can add that the co-founder of the Royal Institution, Rumford, was a deep admirer of her experiments and that he cited her explicitly.

Fulhame's influence extended well beyond Edinburgh to London, France and the United States where she was made a corresponding member of the Chemical Society of Philadelphia in 1798. It is in Geneva where new findings can be located. And at last, a tantalising moment of proximity finally arrives where the connections sketched in this chapter become tangible.

Genevan Reception

A contemporary of Fulhame's, Jean Senebier (1742-1809), was also undertaking research into light sensitivity and silver chloride. Like Fulhame, he was supported by Priestley in his research and experimentation. Senebier was an early pioneer of photosynthesis research and in 1782 published a paper on the spectral sensitivity (photochromy) of silver chloride. Senebier's place in early photography is widely recognised (see Eder 1945; Ware 1997; 2008; Alschuler 2008; Batchen 2008). Indeed, he was referenced in Davy's 1802 address. What has not been understood until now, however, is the extent to which he was also influenced by Fulhame. In a letter to August Pictet on 24 December 1797, he writes, enthralled:

> Sir, It's not my fault you didn't know of Mistress Fulhame's arrival in Rolle or rather of her work which I shall perhaps like better than her…The preface of your English Chymiste [sic] is very dark, it seems to me that we have treated her very badly, I am really sorry because I love her work very much. I see that I did not have the same successes as her because I did not have the same perseverance in my experiments and I had not moistened my oxides; however I had lead oxides perfectly reduced and blackened silver oxides like those of Mercury…I'm still only at the 2nd

[57] According to Schaaf, Davy 'likely…incorporated Wedgwood's work into his evening course on the 'Chemistry of the Arts''. Schaaf further notes that the introductory lecture of this series was given on 9 February 1802, a few months before Davy's paper was delivered (Schaaf 1992a).

[58] The digitised copy of this document on the Wellcome website has some anomalies: the pages are not in sequence. See https://wellcomecollection.org/works/b2nxduz9

chapter and I will read the others immediately, but really this book is original and thought provoking. I thank you a thousand times, you have often amused and occupied my loneliness.[59]

To my knowledge, this letter has not been cited or discussed in the literature on early photography. It is significant because it shows how Fulhame's work directly influenced Senebier, pushing him into new territory. But it is also revealing of the network of contemporaries who engaged with her work. The recipient of this letter, Marc-Auguste Pictet, was co-founder of the *Bibliothèque Britannique* in 1796, a literary and scientific Swiss journal (Leigh 2017). Pictet was also elected as a member of Royal Society of Edinburgh that same year.[60] It is through Pictet that the most substantial finding of all is to be found. On 22 February 1798, he writes a letter to Fulhame herself. This is the first and only known letter to be written directly to her. It is worth quoting in full:

> Madam, I am on two accounts particularly indebted to you. As a lover of Science I most sensibly felt what she owed to your ingenious patient and successful labours, and I endeavoured to do my best towards making them known as far as the circulation of our periodical performance goes.[61] I am besides personally obliged to you Madam for the map you favoured me with; it is a very elegant specimen of your handsome discoveries, and a token if not of a friendship I am not so bold as to bespeak, at least of a consideration I shall ever be proud to deserve. I take the liberty of forwarding to you by a friend who sets off for London the two numbers of our Bibliotheque Britannique in which the extract of your work is to be found. I wish it may be as acceptable to you as it has been to the scientifical world here and I may say to the public at large. Every reader felt a peculiar interest in seeing a woman so deeply proficient in chemical knowledge and applying to the slow and difficult pursuit of science a stock of talents and ingenuity but seldom thus employed by the fair sex.
>
> Were you Madam to follow any farther the carrier you are so well qualified to pursue, I should be very happy for such communication of your performances as you would favour me with. The Revd. Mr Prevost n° [8] Mount Street Berkley Sq. will forward to me any thing you think proper to trust him to that purpose.
>
> I have the honour to be [etc.]

---

[59] This was kindly translated for me by Nathalie Boulouch from the original French. Letter number 51, Jean Senebier to Marc-Auguste Pictet, 24 December 1797, Rolle (Pictet 2016, Tome I: Les Correspondants Genevois:642–44). I thank David Bickerton for bringing this source to my attention and kindly sharing it with me. See part B for the original full-length letter in French (B:90-91). Senebier mentioned Fulhame in another letter to Pictet on January 7 1798 proposing an application of her experiments with gold for the production of Indian fabric. See Part B (B:92).

[60] See Former Fellow of the Royal Society of Edinburgh, Date of Election: 27/06/1796. Proposers: John Playfair, Andrew Coventry, Andrew Dalzel as Foreign Fellow (Literary Section Minute 21/12/1795 NLS Acc10,000/3).

[61] The reference Pictet makes here is for *Bibliotheque Britanique*, June 1796 (t. 2, pp. 183-184). I have not been able to find this reference to Fulhame in this source. I have, however, found Fulhame in the other editions of the same publication, for example in volume 6 (pp. 123-139 and 262-293). In this edition of *Bibliotheque Britanique*, the opening pages begin with references to the work of Beddoes, Watt, Black, Priestley, Scheele, Cavendish, and Lavoisier – in other words, the network sketched in this chapter.

[Pictet][62]

Fulhame's 'patient and successful labours' are here acknowledged by a contemporary of hers, he cites her and promotes her work in a scientific journal. The letter shows that not only did Fulhame influence key figures in the field of protophotography, including those beyond Britain, it demonstrates, most significantly of all, that Fulhame made and shared physical, visual, protophotographic works. Pictet thanks her 'for the map you favoured me with'. He describes it as a 'very elegant specimen of your handsome discoveries'. It is within the realms of the possible that this map sent to Pictet sits today in an archive in Geneva. So far, my efforts to access this document have failed. But through Pictet and his December 1797 letter, we can now say that Fulhame made protophotographic works. Her place as maker of images by the action of light can now be considered secure.

Fabric of Pure Gold

Two other significant findings emerge from the broader Pictet correspondence. First, the letterbooks contain a long-awaited piece of crucial information: her year of birth. According to Pictet, it is 1765. This is the first and only time I have come across a date of birth for Fulhame. If correct, it would mean, like her Edinburgh protophotographic contemporaries Wedgwood and Brougham,[63] she was young when she conducted her experiments, at least 15 and no older than 29 when her book was published in 1794. Combined with Teanby's finding of Fulhame's approximate year of death, we can now state that she was no older than 37 when she died. Second, and in a prevailing theme for Fulhame, we find within a footnote (in the *Bibliothèque Britannique* review that Pictet mentioned to her) another significant finding:

> L'un de nos amis, Docteur en Médecine dans l'Université d'Edimbourgh, a vû & manié chez Mistriss Fulhame comme un morceau d'étosse qu'elle avoit préparé, grand comme un mouchoir, parfaitement souple &. qui sembloit un tissu d'or pur.
>
> One of our friends, a Doctor of Medicine at the University of Edinburgh, saw and handled at Mistress Fulhame's house a piece of cloth that she had prepared, as big as a handkerchief, perfectly supple, and which seemed like a fabric of pure gold (**B:96**).[64]

The doctor noted here is unknown, but there are several potential candidates and they all return us to Black's students at the University of Edinburgh. It could be one of three men, all born in Geneva who studied medicine in Edinburgh graduating in 1797 under Black: Alexander Marcet (1770 – 1822), Charles Gaspard De La Rive (1770-1834) or Jean Francois Coindet (1774-1834). Of the three, the most probable is the aforementioned chemist Condiet. In 1798 he published an account on Fulhame's work in French in which he describes the visual and coloured effects of her experiments (Coindet 1798; Davenport and

[62] This letter was written by Pictet in English for Fulhame. *Marc Auguste Pictet to Elizabeth Fulhame, 22 February 1798,* (PR: j. corr. I/5, 1795-97), (Pictet 2015, Tome III: Les Correspondants Britanniques:213) Again, the original French letter can be read in full in Part B (B:93).

[63] Wedgwood was 15 when he enrolled at Edinburgh. Brougham was 16.

[64] (*Bibliothèque Britannique* 1797, 125). I thank Nathalie Boulouch for translating this text from French to English for me.

Ireland 1989, 37; Laidler and Cornish-Bowden 1997, 125). The text has been read as an account of him remaking (or rather, reenacting) her work like Rumford. However, following this footnote in the *Bibliothèque Britannique*, we can instead suggest that he was in a room with Fulhame, bearing witness to her experiments. Whichever Edinburgh doctor this belongs to, the document carries great significance in that it confirms her place in the Edinburgh networks, and importantly, it shows the domestic sphere as a site of production and protophotographic activity. Gold stuff being touched and handled, in her home of protophotography. In this finding, I now have a sense of the scale of her work. This project began with thoughts conceived on Lake Geneva; this chapter closes with visions of maps with metallic lakes, holding their own photographic imprint of a woman's scientific imagination.

Chapter II

Experiments on Light: Reenacting Mary Somerville

Published Experimental Papers

1826 'On the magnetizing power of the more refrangible solar rays, philosophical transactions', *Philosophical Transactions*, the Royal Society, London (M. Somerville 1826)

1836 'Expériences sur la transmission des rayons chimiques du spectre solaire, à travers différents milieux', *Comptes Rendus III*, Paris (M. Somerville 1836)

1837 Translation of 1836 experiment: 'Extract of a Letter from Mrs Somerville to M. Arago, detailing some Experiments concerning the Transmission of the Chemical Rays of the Solar Spectrum through different Media', *The Edinburgh New Philosophical Journal*, Edinburgh (M. Somerville 1837)

1846 'On the Action of the Rays of the Spectrum on Vegetable Juices', *Philosophical Transactions*, the Royal Society, London (M. Somerville 1846)

So numerous are the objects which meet our view in the heavens, that we cannot imagine a point of space where some light would not strike the eye; - innumerable stars, thousands of double and multiple systems, clusters in one blaze with their tens of thousands of stars, and the nebulae amazing us by the strangeness of their forms and the incomprehensibility of their nature, till at last, from the limit of our senses, even these thin and airy phantoms vanish in the distance.

— *On the Connexion of the Physical Sciences* (M. Somerville 1834, 404)

SOMERVILLE, MARY FAIRFAX GRIEG

(b. Jedburgh, Roxburghshire, Scotland, 26 December 1780; d. Naples, Italy, 29 November 1872)

Chapter I mapped a network of figures across the eighteenth and early nineteenth centuries whose protophotographic activities can be traced through Edinburgh. To that list I can add another thinker and experimentalist whose contributions to photography have been almost entirely overlooked, Mary Somerville. Like Fulhame before her, Somerville's role in the making of photography was recognised in the opening pages of Hunt's *A Popular Treatise on the Art of Photography* (Hunt 1841). Specifically, Hunt drew attention to her 1826 experiments on magnetising and violet rays, which he highlighted as a 'principal point of discovery' (Hunt 1841, 2). It was not only Hunt who recognised Somerville's contributions. Her experiments with silver chloride and light were presented by François Arago at L'Académie des Sciences in 1836, a full three years before Arago would declare Daguerre's invention of photography in the very same building (M. Somerville 1836). Her 1836 experiments were also translated to English and published in Edinburgh the following year (M. Somerville 1837). To underline the regard within which she was held in protophotographic and early photographic circles, her 1846 colour experiments with light were communicated by John Herschel at the Royal Society some sixty-seven years before James Clerk Maxwell's invention of colour photography (M. Somerville 1846). Without doubt, Somerville's thinking and creativity were recognised within the networks of proto and early photography in her lifetime. It is all the more striking, therefore, that she was subsequently ignored in the histories of photography written from the late nineteenth century onwards.

In both popular and scholarly histories of photography, Somerville's name is almost entirely absent.[65] In fact, the first time I encountered her in my research was in a text drawn from another discipline entirely, Mary Brück's *Women in Early British and Irish Astronomy* (Brück 2009, 67–89). In a chapter devoted to Somerville's contributions to astronomy, Brück notes in passing (in fact, in parenthesis) that her work was 'important in the evolution of photography' (Brück 2009, 75).[66] In the vast literature on photography, however, Somerville is nowhere to be found. There is no mention of her in what McCauley (1997) refers to as the 'handbook histories' (e.g. Eder 1945) [67] and nor does she appear in Batchen's list of protophotographers (Batchen 1999). While Fulhame is given an entry in the *Encyclopaedia of Nineteenth Century Photography* (Wilder 2008, 564), Somerville is mentioned just once across the 1630 pages in that volume, and only as a reference in the biography of somebody else (Hannavy 2008, 209).

This is surprising considering her work *On the Connexions of the Physical Sciences* was one of the best-selling books of the nineteenth century. First published in 1834, it ran to ten editions. Within them, her protophotography sits in plain sight. In the first edition of *Connexions*, she writes of the blackening of silver

[65] There is a fleeting reference in Schaaf to her 1845 experiments that were shared with Herschel (Schaaf 1992a, 126; 1992b, 91; 1992b, 98–99; 1992a, 182). See the final section of this chapter for an extended discussion.

[66] Brück was likely led by a reference to Somerville's 'primitive photography' in Patterson (1983, 173).

[67] Somerville is also absent from the histories of photography presented by Newhall and Gernsheim and Gernsheim (Newhall 1984; Gernsheim and Gernsheim 1969).

salts. In the fifth edition, published in 1840, she makes references to her own experiments with silver chloride and light (Teanby 2023). By chapter XXIV of the ninth edition in 1858, she gives the reader the following overview of the emergence of photography, covering a range of processes and developments:

> Chemical or Photographic Rays of Solar Spectrum - Scheele, Ritter, and Wollaston's Discoveries - Wedgwood's and Sir Humphry Davy's Photographic Pictures - The Calotype - The Daguerreotype - The Chromatype - The Cyanotype - Collodion - Sir John Herschel's Discoveries in the Chemical Spectrum - M. Becquerel's Discoveries of Inactive Lines in ditto - Thermic Spectrum - Phosphoric Spectrum - Electrical Properties - Parathermic Rays - Moser and Hunt's Experiments - General Structure and antagonist Properties of Solar Spectrum - Defracted Spectrum (1858 9th edition M. Somerville 1834, 7–8).

In recent months, however, Somerville's contribution to early photography has finally started to gain some attention (Douglas 2021a; Teanby 2021; 2023; Batchen 2023). This project is therefore part of an emergent field on Somerville as a protophotographer. In focussing on her three published experimental papers (M. Somerville 1826; 1836; 1846), I locate Somerville as a protophotographic thinker and practitioner. Taken together, I propose that they comprise a study of light (solar radiation) and position her as a thinker of photography's future history. In doing so, I insert her into the history of photography. More substantially, the chapter tackles two questions: first, how photographic art practice can help locate Somerville, and second, how does this repositioning of her as a protophotographer change the way we think about the history of the medium?

Continuing from Fulhame, the chapter explores a form of women's agency that is traceable in the published form but whose protophotographic object remain absent or no longer extant. Going in search of a photographic practice that involved no camera and left no lasting photographic trace, the chapter in turn offers a repairing of a marginalised history through practice-led reenactment. Through my practice I am able to create and recall, visually, Somerville's no longer visible contribution to early photography. My practice-led feminist methodology is to reenact Somerville's chemical, optical and sun-bleaching experiments, to loosely perform them into photographic artworks. In the production of unfixed lumen prints, reenacted using a contemporary interpretation of Somerville's methods, a new appreciation of the colour that once permeated her fugitive images emerges. Somerville's protophotographic test strips and prints are revealed in colour and in their fragility, their permanence at permanent risk. This aliveness and commitment to practice-led research enables me to (re)write a photographic history that accounts for Somerville as a protophotographer, repairs her legacy and generates new understandings of women in early photography. It is an embodied form of research that builds from an encounter with the materiality of photographic processes and a haptic engagement with its making.

Alongside this practice-led enquiry, like Fulhame in Chapter I, Somerville is located archivally in a network of protophotographic collaboration. Across her published works and archival collections, I find Somerville in correspondence with key protophotographic figures including David Brewster (1781-1868), Henry

Brougham (1778-1868), Humphry Davy (1778-1829), Michael Faraday (1791-1867), John Frederick William Hershel (1792-1871), John Leslie (1766-1832), William Henry Fox Talbot (1800-1877), William Hyde Wollaston (1766-1828), and Thomas Young (1773-1829). Indeed, in some instances she was also working in collaboration with these figures. Through an encounter with Somerville's published and unpublished materials, including a vast corpus of letters, I position her as a protophotographer.

The Many Marys

Born Mary Fairfax in 1780, Mary grew up in east Scotland on the Firth of Forth in the coastal village of Burntisland. She lived with her parents, two brothers, and a servant by the name Betty Adamson.[68] Her father was largely absent due to his naval work at sea, and her mother was 'opposed [to] needless learning for anyone, and especially for young females' (Patterson 1969, 31). With her father away, Mary was born not in the family home of Fife but in Jedburgh, with the care and support of her mother's sister and her husband, Martha Charters and Thomas Somerville. The same auntie and uncle would later become her mother and father-in-law when Mary married her cousin. As she would put it herself: 'I was born in the house of my future husband, and nursed by his mother – a rather singular coincidence' (M. Somerville 1874, 9).[69]

As a child, her curiosity was said to be so keen that at night when her candle light was confiscated by servants at the instruction of her parents, she would lie in bed and recite passages of the mathematician Euclid by memory. Despite these obvious talents, she was nevertheless denied the formal education given to her brothers. In her memoir *Personal Recollections* published in 1873, she reflects on the gendered barriers that stood in the way of her learning: 'I was annoyed that my turn for reading was so much disapproved of, and thought it unjust that women should have been given a desire for knowledge if it were wrong to acquire it' (M. Somerville 1874, 28). Further, she 'resented the injustice of the world in denying all those privileges of education to my sex which were so lavishly bestowed on men' (M. Somerville 1874, 46).[70] When Mary encountered these gendered barriers as a girl at the start of the 1790s, Elizabeth Fulhame was writing her protofeminist account of the 'boisterous tides' of 'innuendos' that excluded her. Though Somerville did not engage with Fulhame's work in her own writing,[71] their lives were shaped, in different junctures, in similar ways.

[68] (Servant Tax Records and National Records of Scotland 1785).

[69] Somerville's usage of the term 'nursed' here means being breastfed. Endogamy was not uncommon in this period of eighteenth century Britain (Corbett 2013, 74–75). Indeed, several of the protagonists of protophotography and early photography married within the family, with the 'densely intermarried Wedgwoods' often cited as a key example (Kuper 2009, 100).

[70] Her memoir is replete with passages such as these. For example: 'I felt in my own breast that women were capable of taking a higher place in creation than that assigned to them in my early days, which was very low (M. Somerville 1874, 60).

[71] I have not come across any evidence that Somerville read Fulhame's work. Certainly, she did not cite it. However, her close friend Herschel was well aware of Fulhame's work, referencing it in his 1839 address on photography (see Chapter I). It is inconceivable (to me, at least), that he did not mention it to Somerville.

With a bedroom facing south and a small close facing north, the young Mary Fairfax spent her time studying the stars by aid of a celestial globe which she had been given permission to use by her mother and the schoolmaster (M. Somerville 1874, 29). More than a century later, during restoration work on the Fairfax family home in the 1950s, a series of seventeenth-century painted celestial arrangements were found in the ceilings. Concealed by plaster, young Mary would have been unaware of the astral sights above her. Yet underneath she lay, charting their path through her childhood, the same woman who as an adult would bring celestial concepts to popular audiences.[72] These panel arrangements today sit in the Historic Environment Scotland archives and have been documented for this practice-led thesis (**B:104-105**). Their significance for the project lies in the theme of the unseen: just as they were concealed from young Mary, so too are her photo works, produced as an adult concealed from us. As before, this project contends with what cannot be seen and gives it visual form through art practice.

Somerville's formal education commenced at the age of ten when her father, William Fairfax, sent her to a girls' boarding school in Musselburgh, near Edinburgh. So appalled by her Scottish accent, he viewed 'finishing' school as a corrective to his daughter's 'savage' behaviour (M. Somerville 1874, 20–21). Mary recalls this as a torturous time in which 'I was perpetually in tears' (M. Somerville 1874, 21). Despite her mother's aforementioned opposition to 'needless learning', she taught Mary to read, and around the age of 13 together they shared a bedroom in a small apartment in Edinburgh where Mary attended a 'writing school' for the winter period. 'I soon learnt to write a good hand, and studied the common rules of arithmetic' (M. Somerville 1874, 35).

Protophotographic Networks

In Edinburgh in her early teens, Mary was settled in a city ripe with protophotographic chemical activity (Chapter I). From this point onwards, she began to acquire what she described as a 'dim view of several subjects' (M. Somerville 1874, 47). Algebra was her first stopping point and it served as a gateway to further scientific thinking. Yet she writes that this was an intellectually lonely time. Without access to an existing network of science, she was 'often very sad and forlorn; not a hand held out to help me' (M. Somerville 1874, 47). This began to change when aged 14, she enrolled at the newly formed school 'The Trustees Academy' in Edinburgh in 1795. Founded by the landscape painter Alexander Nasmyth (1758-1840), it was forward-thinking in terms of women's education, and played a significant role in giving shape to Somerville's protophotographic biography. In Nasmyth's painting classes she would be introduced to 'mathematical structures within art' (Chapman 2004, 17), optical drawing techniques, geometry, perspective, light and shadow. This period is widely cited as Mary's introduction to Euclid's Elements of Geometry and to mathematics more generally. However, it was here, in Nasmyth's circle, where she also encountered, likely for the first time, the camera obscura. Nasmyth's circle included artists, poets and professors who met at

[72] Somerville's contributions to astronomy are well known. In the sixth edition of her book *Connexions,* she predicted, through a set of calculations, the existence of a hypothetical planet gravitationally pertubing Uranus. She would be proven correct, and the planet Neptune was duly discovered using those same calculations (that she did not try herself) (O'Connor and Robertson 1999). However, see Brück for the counterclaim that Somerville's role regarding Neptune could be overstated (Brück 2009, 80). In 1835, Somerville was elected the joint first female Honorary Member of the Royal Astronomical Society alongside Caroline Herschel (1750-1848).

the intersections of art and the study of light. As Stevenson and Low note, this 'mingling and cross-referencing of subjects [in Nasmyth's school]…would prove so effective and providential in the advancement of photography' (Stevenson and Morrison-Low 1995, 8–11. See also Loader 2018, 245). Like other women of the period, Somerville was taught the art of drawing and perspective through the employment of the camera obscura. The optical devices were used to harness light and to render a depiction of the outside world (presented in reverse, upside down, in motion). The camera obscura was not new nor novel; it had been in use in one form or another since at least the sixteenth century (Hannavy 2008, 669). However, in the era of protophotography, it was to hold central importance (**B:106-107**).

> While camera obscuras had previously been a room in a house, by the late eighteenth century they became portable tools used in a variety of contexts: for some it was an artist's aid, used for sketching, while for others it served a role in astronomy, from the studying of sun spots to planetary observations. The most popular form was the reflex box camera obscura, in which the lens formed an upright image on a sheet of translucent paper after reflection by an inclined mirror (National Science and Media Museum 2011).

At this time in Edinburgh, two of the most important technical components of the photographic apparatus were being used and developed in tandem: first, the camera itself, and second, experiments in light-sensitive chemicals. The 'invention' of photography required each of these components: the box or the apparatus, the chemicals to arrest the view contained within, and the means to fix it. As Chapter I demonstrated, Fulhame was engaged in the exploration of light-sensitive chemicals, and in 1794 she published her experiments conducted from her home in Edinburgh. Less than a mile away, a 14-year-old Mary Fairfax was being introduced to optical drawing aids and lessons in rendering light. Although they did not define it in this way, both Fulhame and Somerville can be understood to be engaging in the pursuit of the photographic image.

In 1804 Mary married her cousin Samuel Grieg, precipitating a move from Edinburgh to London, which in turn would have consequences for her early encounter with protophotography. After arriving in London, she continued her mathematical studies but 'under great disadvantages' (M. Somerville 1874, 75). Her academic interests were hardly encouraged by her husband Greig, who 'had a very low opinion on the capacity of my sex' (M. Somerville 1874, 75; Douglas 2023). Describing her life in the early 1800s as lonely, she gave birth to two sons in three years, yet against the odds, found ways to ensure her time was not entirely confined to the domestic setting. In 1805 she was a subscriber to the Royal Institution (RI). Although Mary makes no mention of this in her memoirs, lists of subscribers from 1805 show a 'Mrs Greig of Great Russell Street', and it is thought that she attended the lectures too (Lloyd 2019, 208; Stenhouse 2021, 26). With this information, it feels possible to potentially locate Mary in the same room as some of the key protophotographic figures established in Chapter I of this thesis, including Humphry Davy and Thomas Young. Though Davy and Young's protophotographic papers were delivered a year or two before Mary's

arrival to London, these would be in circulation in the *Journals of the Royal Institution of Great Britain* and the Royal Society's *Philosophical Transactions*.[73]

Change once again soon came her way, however, when after only three years of marriage her husband Grieg died in 1807 and Mary, still nursing the newborn, returned with the children to Edinburgh. Being a widow had its benefits: with new-found independence and a financial inheritance, she was able to establish social connections in Edinburgh, particularly in the fields of astronomy and mathematics (Brück 2009, 67–79). This period was also marked by a deepening of her entanglement with the world of protophotography. As she writes in her memoirs: 'I became acquainted with some of these illustrious men, and with many of their immediate successors. I then met Henry Brougham, who had so remarkable an influence on my future life' (M. Somerville 1874, 81).[74] Upon her return to Edinburgh, Mary also entered into correspondence with the self-educated mathematician William Wallace (1768-1843). Wallace soon became a trusted mentor in her mathematical pursuits, and at his suggestion she bought herself a library of scientific texts which enabled her to maintain some momentum in her studies and thinking. For protophotography more specifically, Wallace is significant not only for his mentorship in analytical mathematics, but for the introduction he facilitated with the Herschel family. This meeting occurred in 1812, when Mary married again, this time to another cousin, William Somerville (1771–1860), the son of her Jedburgh tutors. Together they visited the Herschel family in their Slough home. As Fox Talbot made significant findings on his honeymoon, so too did Mary. By introduction of Wallace, she met astronomer and inventor of early photography John Herschel, who would go on to be a lifelong correspondent and trusted friend. Both Herschel and William Somerville played a key role in facilitating Mary's access to the world of science. As a member or fellow of learned societies, William worked as her secretary, facilitator, supporter and conduit. This willingness to support his wife's work was central to her scientific success. Herschel likewise served as an enabler for Mary, and in many ways is better understood as her collaborator.[75]

When William Somerville was elected as a Fellow to the Royal Society of Edinburgh (RSE) in 1813, his (and by extension Mary's) entry into Edinburgh's scientific circles was established. Entry by proxy was as good as any woman of the period could get. Through these new networks at the RSE, Mary met early photography pioneer (and family friend) David Brewster (1781-1868), who was also a fellow. During this period, she also met John Leslie, Professor at the University of Edinburgh. Though a peripheral figure in the history of photography, Leslie is noteworthy here for his protophotographic connections to Tom Wedgwood, a figure

[73] At the RI, Davy presented the Wedgwood's protophotographic experiments in 1802 (T. Wedgwood and Davy 1802). Gernsheim and Gernsheim note that Thomas Young 'immediately applied Davy and Wedgwood's findings' and presented his experiments with ultra violet rays and nitrate of silver at the Royal Society the year after (Young 1803).

[74] Her introduction to Brougham came about through a friendship with his sister, Mary Brougham (National Records of Scotland 1787).

[75] According to Brück, Herschel was an 'adviser' to Mary (Brück 2009, 73). Yet this does a disservice to their relationship. Reading their communications across the Royal Society letters and the Bodleian, they engage as equals and are respectful of each other's scholarship.

of central importance encountered in Chapter I.[76] It is not a stretch to imagine that during the Somervilles' invitation to view Leslie's experiments, discussions around protophotography were had. Frustratingly, in her memoirs we are so often denied crucial scientific details such as these. Whether through choice of her own or that of her editors, her autobiographical persona was carefully balanced with what McMillan (2001, xx) refers to as a 'daughterly eulogy' that presented a maternal, lightly scientific and humble Somerville – in keeping with nineteenth-century ideals of femininity. Significantly, in a passage that does make the final edit, Somerville describes her interactions with Leslie and positions them in another light, noting that he always asked her to behave as his 'decoy duck' and bring women to the experiments (M. Somerville 1874, 91). Indeed, even when Mary's daughter Martha Somerville, the feminist journalist Frances Power Cobbe and publisher John Murray edited Somerville's memoir at the close of the nineteenth century, they elected to focus on Mary's 'domestic and maternal qualities, eliminating passages that might appear too outspoken or 'unladylike" (Alic 1986, 337). It is not inconceivable that among the casualties of these gendered editorial processes are key details on Mary bearing witness to, and participating in, protophotographic experiments.[77] Mary likely played a role in acquiescing to nineteenth-century expectations of womanhood (Stenhouse 2021, 11). As historian Rosalind Carr notes, this was not untypical for Scotland at the time, when 'women's performance of refined femininity was vital…[and] the performance of "civilised" femininity placed significant restrictions on the character of women's public presence' (Carr 2014, 12).

It was not only gender stereotypes that would impinge on her intellectual development. Tragedy arrived when Somerville lost a son from her first marriage aged 9 in 1814. Her first daughter to William, born in 1813, would also die in childhood aged 10 in 1823, and before then they lost another son in 1815 at just a few months old. In a turbulent period, two further daughters arrived, first in November 1815 and again in 1817. Amid the grief and ongoing childcare, Mary 'put an end to scientific pursuits for a time' (M. Somerville 1874, 82). In this brief passage of biographical 'detail', the actualities of Somerville's life as a mother come painfully into view. Despite the considerable challenges of her personal life, by 1815 Somerville had established correspondence with key figures in the world of protophotography, including Nasmyth (who used mechanical aids/camera obscura for drawing), Leslie (who conducted his own experimental chemistry and was witness to Wedgwood's experiments of shadowgrams formed with silver nitrate),[78] Brougham (who conducted protophotographic experiments with colour and light), Brewster (who published discoveries on polarisation of light), William Herschel (who discovered the existence of infrared light by passing sunlight through a glass prism), and above all, his son John Herschel (a pioneer of early photography).

In 1816, the Somervilles left Edinburgh as Mary, again following her husband's career, was transferred to London. Far from marking the end of her connections to the protophotographic networks in Scotland, she was to enlarge them. Patterson notes that two of Somerville's 'earliest scientific intimates' at this time were

[76] Leslie is often cited in photographic history for his proximity to the Wedgwoods and for a 1800 letter to Tom which helps to date some of his experiments (Gernsheim and Gernsheim 1969, 39). Leslie's knowledge of the 1790s experiments can be further substantiated by the first publication by Wedgwood and Davy (T. Wedgwood and Davy 1802) which was republished by Brewster in the December 1802 issue of *Edinburgh Magazine* (Brewster 1802).

[77] These experiments would have taken place sometime between 1812-15.

[78] Later in 1819, Herschel mention's Leslie's experimental chemistry in the *Edinburgh Philosophical Journal*, published by Brewster.

Thomas Young and William Hyde Wollaston, who both served as officers on the committees of the Royal Society (Patterson 1983, 85). In 1806 Wollaston had designed and patented the optical drawing tool the camera lucida – famously used by Talbot on Lake Como. It consisted of a glass prism suspended at eye level (Wollaston 1807). It was used to trace an impression onto paper, and required much skill on the part of the artist 'looking through the prism the operator saw at the same time both the subject and the drawing paper; his pencil was guided by the virtual image' (Newhall 1984, 10). For Schaaf, it was a 'contrast to the murky room of the camera obscura' (Schaaf 1992a, 29). Wollaston was also key in the development of the camera obscura when in 1812 he invented the improved 'periscopic' (meniscus) lens. Despite these inventions, and the notoriety of the camera lucida in photography historiography (see Introduction), Wollaston is a figure whose contribution to early photography remains underexplored (Schaaf 2004).[79] Somerville, in one of the more scientific passages of her memoir, writes about an exchange they shared:

> One bright morning Dr. Wollaston came to pay us a visit in Hanover Square, saying, 'I have discovered seven dark lines crossing the solar spectrum, which I wish to show you' then, closing the window shutters so as to leave only a narrow line of light, he put a small glass prism into my hand, telling me how to hold it. I saw them distinctly. I was among the first, if not the very first, to whom he showed these lines, which were the origin of the most wonderful series of cosmical discoveries, and have proved that many of the substances of our globe also constituents of the sun, the stars, and even of the nebulae. Dr. Wollaston gave me the little prism, which is doubly valuable, being of glass manufactured at Munich by Fraunhofer, whose table of dark lines has now become the standard of comparison in that marvellous science, the work of many illustrious men, brought to perfection by Bunsen and Kirchhoff (M. Somerville 1874, 133–34).

Far from being a bystander, Somerville writes herself into this key scientific moment. Although the dates in which this encounter took place are unclear[80] (Wollaston died in 1828), in this short passage she uses her memoir to place herself in proximity to this historic moment of invention. William Henry Fox Talbot did similar. In his 'Note on the early History of Spectrum Analysis' at the RSE, he writes about his experience of being witness to these events:[81]

> Wollaston was the first who observed some obscure bands in the spectrum, by viewing with a prism the aperture left by the shutters of his room when nearly closed…. It is surprising that this acute philosopher did not follow up the hint thus accidentally presented to him, but contented himself with the rude observation above mentioned… About the year 1824 or 1825, Dr Wollaston gave

[79] As early as 1802, Wollaston was noted as the first to discover dark lines in the solar system (Brück 2009, 73). Much later, in 1839, the Daguerre-Giroux camera would use a Wollaston-type lens (Hannavy 2008, 1503).

[80] There are some inaccuracies in the chronology presented in Somerville's memoir, which was written many decades after the event, in her early 1890s. As Patterson notes, Somerville's claim that she was among the first to have sight of Wollaston's lines is 'puzzling', since Wollaston reported his discovery as early as 1802 (Patterson 1969, 316).

[81] The British Library notes the date as 'after 1842'. This is a draft of an article published much later in Edinburgh in 1872. In the draft paper, Talbot refers to Fraunhofer, Brewster and Wollaston. There is no mention of Somerville, however. See British Library, MS 88942/1/210.

> one of his evening parties, to which men of science and amateurs were invited, and it was the custom to exhibit scientific novelties, and to make them the subject of conversation…[82]

Talbot's interaction with Wollaston's camera lucida are firmly part of photographic history and understood as a key step towards his invention (Talbot 1844; Schaaf 1992a, 28). Yet it was Somerville who had the more intimate connection to Wollaston. Indeed, Wollaston gifted Somerville the very prism that had demonstrated the dark lines in the sun's spectrum. Designed by Fraunhofer, owned by Wollaston, viewed by Talbot and gifted to Mary, this object sits today in the Science Museum Group Collection (**B:108**). In the archive, a note written by an elderly Somerville's frail hand reads: 'This is the Prism mentioned in my Autobiography with which Dr Wollaston discovered the dark lines in the solar spectrum. M.S' (**B:109**).[83] One of the few scientific instruments that she ever possessed, Somerville would soon put the prism to use in her 1826 protophotographic experiments (discussed below).

The difference in tone between Talbot and Somerville's accounts of their interactions with Wollaston is also striking. While Talbot is evidently trying to narrate the invention of photography (and place himself within it), Somerville's seems more interested in locating her proximity to Wollaston's accomplishments. Further, given her own artistic abilities perhaps she did not feel the same frustrations in 'sketching nature' that drove Talbot to the invention of photography. As suggested in the Introduction to this thesis, Somerville was concerned with the physical sciences, and in particular, sound, matter, light, electricity and astronomy. While her research encompassed protophotography in ways that have not yet been recognised, the pursuit of the photographic image was not her concern. This draws parallels with Fulhame, whose protophotography, as noted in Chapter I, was driven by a broader development of a theory on combustion.

Somerville's other 'scientific intimate' of the time, Thomas Young, also studied the properties of light (but to greater fame and less photographic significance). In 1803 he delivered the Bakerian lecture, in which he reenacted the work of Wedgwood and Davy, testing the 'theories of light' and solar rays:

> The existence of solar rays accompanying light, more refrangible than the violet rays, and cognisable by their chemical effects, was first ascertained by Mr Ritter: but Dr. Wollaston made the same experiments a very short time afterwards, without having been informed of what had been done on the Continent….I threw this image on paper dipped in a solution of nitrate of silver, placed at a distance of nine inches from the microscope. In the course of an hour, portions of three dark rings were very distinctly visible' (Young 1804, 15).

[82] British Library, MS 88942/1/210.

[83] Science Museum Group Collection, 1927-969/1. Exchanges of this sort were not uncommon for the period. Like Somerville, Brewster was also gifted a Fraunhofer prism, this time by Talbot (A. D. Morrison-Low 2020).

When in 1807 Young published the lectures he had delivered in 1801-03, he was Professor of Natural Philosophy at the RI.[84] Patterson notes that Somerville knew his work well and characterized it as 'a mine of riches' (Patterson 1983, 124). For Gernsheim and Gernsheim, despite having built on Wedgwood and Davy's undoubtedly protophotographic work, Young was 'only interested in investigating the behaviour of light' and did not carry his experiments further in the field of photography (Gernsheim and Gernsheim 1969, 42). For Batchen, Young's experiments fall short of the 'desire' for photography as he made no attempt to make these experiments with light permanent (Batchen 1999, 32). Nevertheless, both Wollaston and Young's experiments with light are central to protophotography, a landscape in which Somerville was increasingly embedded both intellectually and personally.

These connections were deepened further still in 1817 when the Somervilles departed for France. Mary arrived 'not as a tourist, but a woman of note' (Chapman 2004, 26). Significantly, prior to this trip she had met the French physicist Jean Baptiste Biot who had encouraged her to go to Paris (Brück 2009, 74). Biot's own connections to early photography are notable (Levitt 2003; Siegel 2017). During her time in the city she was also entertained by Arago and his wife Lucie Carrier-Besombes (1788-1829) at the Paris Observatory (M. Somerville 1874, 108). Arago would soon hold great significance in Somerville's protophotographic activity.

The first optical representation of Somerville exists from this period of travel in the form of a pencil camera lucida portrait. On their travels in Modena in 1818, she and William sat for their portraits with the optical instrument maker Giovanni Battista Amici (**B:111**).[85] The technology of the camera lucida was starting to replace the act of silhouetting (Rosenblum 2015, 40). Despite its limitations, the camera lucida was used widely by artists (Schaaf 1992a, 30), and was particularly popular in Scotland. Somerville sat in direct proximity to these inventions, their inventors and the discussions around their protophotographic potential (**B:112-113**).[86] For Schaaf, as the camera lucida was being used covertly by artists, it was also being turned towards photography, most notably by two French men Daguerre and Nicéphore Niépce (Schaaf 1992a, 30). This is also a period of significant chemical protophotographic development. The following year of 1819, John Herschel discovered the missing ingredient for protophotographers needed to make their experiments permanent, when '[c]hance launched him on a series of experiments on hyposulphurous acids. These formed a family of compounds related to the modern photographic hypo, the fixer familiar to working photographers today' (Schaaf 1992a, 26). Significantly for this thesis, like Amici's advancements in the camera lucida, these findings were also published in Edinburgh, this time in the *The Edinburgh Journal of Science* (1825, 157–59). It is curious that the formal invention of photography did not take place until 1839 given

[84] Gernsheim and Gernsheim note the 1803 paper as Young's first Bakerian lecture (Gernsheim and Gernsheim 1969, 42) but it was actually his second, his first being 'On the theory of light and colours' (Young 1801).

[85] The Amici drawings are held in Somerville College at the University of Oxford.

[86] It would be another six years before Herschel would meet Amici (in Modena in 1824) and Talbot, with whom he shared his drawings. Herschel adopted this new form of drawing using the camera lucida. This is learned through Basil Hall, a correspondent of Mary's and friend of the Fairfax family who published on the camera lucida in Edinburgh in 1829 (Hall 1829). Schaaf notes that 'an inexplicably high proportion of those who publicly confessed to its '[the camera lucida's] use were, like Hall, Scottish' (Schaaf 1992a, 29–30). For further reading on the limitations of the camera lucida for artists such as John Ruskin and Francis Chantrey, see Schaaf 1992a, (29–30).

that Herschel's publication arrived as early as 1819. Nevertheless, by the middle of the 1820s, Somerville had established her place in important scientific networks and was ready to make her first contribution to protophotography.

1826: First Experimental Paper

On 2 February 1826, a significant 'first' occurred: Mary Somerville became the first woman to author a scientific experimental paper presented in her own name to the Royal Society and to have it printed in *Philosophical Transactions* (Patterson 1983, 48). The work commenced during the summer of 1825. Working with the August summer rays, she conducted the beginnings of her first experimental paper which forms a key moment in her contribution to the development of protophotography. Fittingly, she used the aforementioned prism gifted to her by Wollaston. The work was an exploration of the violet rays of the solar spectrum and the magnetizing power of sunlight. Chapman describes the scene:

> It was the blue end of the spectrum which became the subject of Mary Somerville's first publication in the Philosophical Transactions of the Royal Society in 1826. Hearing that Professor Morichini in Rome had supposedly magnetised small pieces of iron by exposing them in the violet rays of the solar spectrum, and that others had failed to replicate his results, she addressed herself to the task over the clear days of August 1825. She fixed a glass prism into a window shutter, and using a 'very large lens'—loaned to her by Wollaston—to focus the violet rays, exposed carefully demagnetised needles and slips of old watch spring. She claimed that after 2 h of exposure, preferably some time between 10 am and 1 pm, her needles exhibited a clear magnetic charge when placed near a compass (Chapman 2004, 3).

The significance of Somerville's 1826 experiments for the subsequent development of photography has been almost entirely ignored. One of the few to note it was Brück who, in a text on astronomy, mentions it literally in parenthesis. Somerville, she writes:

> attempted to understand the nature of ultra-violet radiation (beyond the visible limit of the solar spectrum). This radiation was known to affect certain chemicals, specifically salts of silver (a fact that was important in the evolution of photography) and was thought perhaps to be in some way associated with magnetism, then a mysterious phenomenon (Brück 2009, 75).

This analysis of ultra-violet radiation from the sun was part of a broader field of experimentation on magnetism that would impact directly on the emergence of photography (Batchen 1999, 154–55). Significantly, though others have drawn on the connection between magnetism and early photography, Somerville's 1826 experiments are scarcely mentioned. This omission can be partly explained by Somerville's own actions. Embarrassed by the 'failure' of her 1826 experiments which were later deemed erroneous, she did not include them in the corpus of her work (Parkin 2001). For Somerville, clearly holding herself to a

higher standard, this was a personal failing. Devastated, she wanted all copies 'committed to the flames' (**B:116-117**).[87]

1835: Second Experimental Paper

It is in the 1830s in which Somerville's contribution to protophotography comes into view. In 1834, the first edition of *On the Connexion of the Physical Sciences* was published.[88] Here, Somerville advanced the idea that radiation was known to affect certain chemicals, specifically salts of silver (Douglas 2023; Teanby 2023). In 1835, aged 54, she undertook a chemical study of the solar spectrum. Developed from her longstanding engagement with Macedonio Melloni's work, she set out to understand the permeability of surfaces and the blackening effect from the chemical rays of the sun. The making of this work was not only protophotographic in itself, it can also be traced to the networks of protophotography in Edinburgh already sketched in this project.

By the late 1820s, Somerville had formed a friendship with protophotographer Humphry Davy (Patterson 1983, 40). Early drafts of *Connexions* were shared with Davy's assistant, Michael Faraday. His scientific world was one that included women, and his pathway to chemistry had famously been paved by Jane Marcet's *Conversation in Chemistry*.[89] In addition to his written feedback for her *Connexions*, Faraday's support also arrived in the form of silver chloride. On 12 October 1835, he prepared and sent Somerville a package of light sensitive chemistry with the following protophotographic note: 'allow me to suggest that when you open it and apply it to paper for your experiments you should do so in a dark place or by candle light' (**B:121-122**).[90] Ten days later she replied 'the chloride of silver answers perfectly'.[91] These exchanges between Somerville and Faraday present an early history of rudimentary darkroom practices before such a language had even been established (**B:122-123**). For Somerville, their exchange is all the more significant when we consider that it occurred four years before the declaration of the invention of photography in 1839.

Somerville conducted her experiments with Faraday's solution in her London garden in the early autumn of 1835, catching the end of the same brilliant summer from which Talbot had benefited (Schaaf 1992a, 40). With sheets of paper coated with his silver chloride, she observed the permeability of surfaces to the chemical rays of the sun by placing different objects directly on to the paper: glasses, crystals, emeralds, rocks. Her interest here was not to produce a 'photographic' image on the coated surface, but to observe

[87] Draft manuscripts of Mary Somerville's *Recollections*, Bodleian Libraries, Dep c.355,5,MSAU-3: p.104.

[88] This was, in fact, her second book. Her first, *The Mechanism of the Heavens*, published in 1831, had been commissioned by protophotographer Henry Brougham who suggested to Somerville that she write an account of LaPlace's *Mécanique Celeste*.

[89] As mentioned in Chapter I, Marcet's book (Marcet 1806) was published by Joseph Johnson, who was also Fulhame's bookseller. Faraday's name is often associated with a well-quoted phrase that delivered the evening of 25 January 1839 at the Royal Institution. Addressing an assembled audience of more than 300 people, he announced the parallel discoveries of Daguerre and Talbot, and did so in a strikingly gendered way: 'what man may hereafter do, now that Dame Nature has become his drawing mistress, it is impossible to predict' (Schaaf 2016). This gendering of photography, then, was taking place even before its birth. Yet there is a complexity here too: Faraday was an enabler of Somerville, and as noted above, he was someone who spoke about his entry to chemistry through the work of Marcet.

[90] Michael Faraday to Mary Somerville, 12 October 1835, *Oxford, Bodleian Libraries* Dep c. 370, fols. MSF-1.

[91] Mary Somerville to Michael Faraday, 25 October 1835, Royal Institution, RI MS F1 H09. Faraday 0824 in *Epsilon: The Michael Faraday Collection,* accessed on 8 March 2023).

the discoloration as the sun's rays passed through her objects and onto the paper (Patterson 1983, 173). In her 1835 paper she writes:

> the chloride of silver which they [her objects] covered, at the end of an hour's exposure to the sun, had become quite brown...the alteration in the colour of the chloride of silver very speedily takes place in spite of the interposition of a plate of blue glass of the deepest tint, and nearly a quarter of an inch thick (M. Somerville 1837, 182).

Like Talbot, she too was advancing a technique that produced cameraless images – photograms. A form of skiagraphy, it enabled her to depict shadows through objects. Her photogenic drawing paper was blackened (or made brown) in portions, leaving a resulting shadow or negative image through which she could measure the permeability of the sun's rays.[92]

At the end of the published version of her experiment, Somerville wrote: 'in concluding, I may observe, that I purpose shortly to resume the prosecution of the subject' (M. Somerville 1837, 183). She was going to continue the experiments, and extend them. But she didn't. To think how close she was to photographic representation, invention, even. It was within reach. For Brück, 'circumstances' prevented her pursuing these experiments further (Brück 2009, 81). *Circumstances*. For Schaaf, had Herschel been 'motivated' he could have invented photography. Herschel's 1819 writings on the properties of hypo (sodium thiosulphate) contained all the information needed to make an image permanent (Schaaf 1992b, 81). Yet it was not only Talbot that Herschel was in correspondence with but Somerville too. Indeed, Herschel was Mary's closest adviser from 1829 to the mid 1830s, and it was to him that she turned for guidance (Patterson 1983, 125; Chapman 2004, 36).[93] If Herschel could have invented photography, the same is true of Somerville.

In 1831, Herschel demonstrated that light-sensitive platinum compounds could be distinguished from silver (Schaaf 1979, 56–57; J. F. W. Herschel 1832).[94] Over the course of the next year, he showed his findings to a number of people including 'Sir D Brewster, Mr Babbage, Mr Talbot, and others' (J. F. W. Herschel 1832, 59). According to Schaaf, it is 'certainly tempting' to conclude that Talbot was inspired directly by Herschel's experiments. After all, it was less than a year later that Talbot had his own vision on Lake Como (Schaaf 1979, 56–57 fn 11). However, I am drawn to the last two words of Herschel's sentence: 'and others'. These are the moments my research has become alive and attentive to, my approach of *just in case*. Was Mary among the 'others'? Elsewhere on the same page of the text, Herschel reveals that a certain 'Dr Somerville' bore witness to his experiments in June (J. F. W. Herschel 1832, 59). Only William, her husband, is listed. Again,

[92] On Talbot's experimentations with shadows, carried out in the same year as Somerville, see (Schaaf 1992a, 41–42).

[93] In 1835, when Somerville and Herschel's auntie Caroline Herschel became Honorary Members of the Royal Astronomical Society, John wrote to Thomas Somerville, 'I can now claim Mrs Somerville a colleague', Royal Society Library (JH/A/1026/40) (J. F. W. Herschel 1835) (B:124-125).

[94] This was at a well-cited breakfast at Charles Babbage's house. Schaaf notes that Babbage 'gathered together a circle of friends and to show off the latest progress on his calculating machine'. For Schaaf, 'John Herschel was delighted at the prospect of sharing new discoveries with old friends'. A diary entry of Herschel's records this breakfast at Babbage's on 26 June 1831 (Schaaf 1992a, 33). Somerville also frequented Babbage's house. In 1831 she was invited to view his 'calculating engine'. See Bodleian Libraries, Dep c 369 MSB-1.

I go in pursuit of Mary, to know if she can be placed there too. A document in the Royal Society collections comes to my aid: a letter from Somerville to Herschel, confirming not just her husband's attendance but hers too. The year of the letter is uncertain - the archivist has placed a cautious '1831?' in the top right corner. I latch on to this. Mary writes:

> My dear Mr Herschel, We shall have the greatest pleasure in accepting your very kind invitation on Tuesday, and only regret that the distance prevents us from meeting as often as we could wish. With best regards to Mrs Herschel, Believe me very truly yours, Mary Somerville.[95]

Whether it was 1831 or 1832, I can now locate Mary in the room as an active agent. Knowing this, the orthodoxies of early photography that have long been subscribed to can be challenged and complicated. Herschel was a source of inspiration not just for Talbot, but for Somerville too in her protophotographic activity. If Virginia Woolf established that 'Anon' was a woman (Woolf 2002), in photographic history we might say 'and others' are Mary.

Where Talbot was unable to share his early photographic findings with Herschel due to his absence in the Cape of Good Hope,[96] the same goes for Mary. With Herschel away, Somerville's experiments with silver chloride in light were shared instead with her French networks. Her 1835 experimental paper was presented at the Académie des Sciences by Francois Arago in 1836 and published in *Comptes Rendus* (M. Somerville 1836) (**B:126-129**). In the Somerville archives there are two undated and unfinished letters to Arago, where she describes her experiments as 'new as far as I know'.[97] In the published version of her paper, she writes:

> In my experiments…I employ the chloride of silver, which Mr Faraday was so kind as to prepare for me, and which, accordingly, was perfectly pure and white. It was liquid, and might be uniformly spread over paper. Although this substance is exceedingly sensible to the action of the chemical rays; yet as we have no precise means of appreciating the changes of colour produced by their actions, some uncertainty as to the result might remain were we to compare only those tints which differ but little from each other (M. Somerville 1837, 181) (**B:130-133**).

Experiments like this were critical to the evolution of photography. In 1835 Somerville was by no means the only one to be working in this area; but while others have been acknowledged for their contributions, Somerville, though recognised in her lifetime and on this occasion published by Arago, was ignored in the histories that followed. Her 1835 work was republished in English by David Brewster in 1837. Brewster was a close friend of Talbot's. The intersections of their work must have been known, but frustratingly the only recorded contact between Talbot and Somerville makes no reference to this.

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[95] Mary Somerville to John Herschel, Royal Society Library, JH/A/1026/346. This collection of letters has just been digitised by the Royal Society.

[96] The entangled co-emergence of early photography and colonialism is explored, via Herschel, in Gapper (2023). See also Winterburn (2024).

[97] Bodleian Libraries, Boc.352,2,MSSW-5.

For Herschel, the defining feature of photography is that 'it was necessary not only to produce, but to preserve the blackened traces'.[98] Although Somerville had an advanced understanding of light, she appears not to have engaged in the desire or pursuit of the *fixed* image. Despite locating Somerville in the making of protophotography through her 1835 experiments, there is still no physical image to show for her labour and creativity. It is through art practice, above all, that my reckoning with her role in the making of photography takes place.

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Reenacting 1835

On a sunny day I turn to retouching and set about reenacting Somerville's 1835 experiments. I prepare my light sensitive paper and arrange coloured glass objects in a darkened room (my bathroom). Like Somerville, I make my work in the domestic setting. Childcare is in place (my time is short and must be well spent). I think about Somerville's pursuit: although a solitary act, it is essentially a work of collaboration - made with Faraday, and at the suggestion of Herschel. According to Brück, Somerville's experimental physics are 'worth remembering as an example of how a woman, working alone, felt the urge to undertake research in the manner of her male compatriots' (Brück 2009, 83). Yet these multiple hands are important: as much as I want to hold up her singular achievements, the invention of photography is indeed collaborative (Azoulay et al. 2024). Carrying my board of paper and glass objects from darkness into light, I too become one of Somerville's collaborators.

At this early stage of the photographic process, everything is about touch. I take care not to leave fingerprints on my materials of coloured glass and light sensitised paper, knowing that the moment the glass and paper are brought into light, the sun will start its simultaneous action of exposure and destruction. Emerging from the dark, I place the arrangement of light sensitive paper and coloured glass within the reach of the sun, and almost immediately the chemical and optical properties are brought into view. The process of making, so often unseen, is presented in front of me. I observe the colour shifts of the paper and use the darkening colours as my barometer of exposure, drawing on decades of darkroom practice. As the 'intermediate tints' and 'different states of light' appear (J. F. W. Herschel 1832), I remove the collection of glass and return the paper to the light-tight bag. This is an image in potentia (Batchen 2022, 74). To view it, I have two choices: to look at it in the light and observe its disappearance in front of me (from lilac into hues of reddish brown through to brownish grey), or to place the temporal image on my flatbed scanner and create a digital copy before it fades. I choose the latter. It is through the retina display of my laptop screen that the 1830s resurrection comes into view. The term reenactment here feels looser with every digital step I take, but the fundamental photographic processes are upheld. The resulting photogram feels almost contemporary in its abstraction (**B:135-137**). Schaaf's description of Talbot's 1835 experiments resonate here: they are 'mere shadows made by direct contact of the subject and sensitive paper' (Schaaf 1992a, 41).

[98] James 510, St John College, Cambridge.

As with Fulhame, my feminist art practice contains within it a cyclical quality that feels almost contradictory: in reenacting and realising a non-visual history, the work produced is fleeting, unfixed and eventually fades (like its 1835 predecessor) back into obscurity. In a letter to Talbot in 1834 Laura Mundy (1805-1842) reflects on the 'beautiful shadows' that he had sent her. His process was similar to Somerville's: these too are impermanent silver chloride images. Mundy 'grieves' their 'gradual disappearance', admitting that she 'had no idea the art could be carried to such perfection' (Mundy 1834). This resonates almost two centuries later, but my method of reenactment takes me beyond loss: through touch, retouching, a haptic encounter is produced and a new way of thinking about the history of photography is made possible. In creating my own temporality, I am brought closer to another, to Somerville's. While her pursuit was a scientific encounter at the threshold of photographic invention, mine is an embodied encounter within and against dominant narratives in the history of photography.

Reenactment has given me the prompt to begin to imagine what form these images might have taken, their material state, and what they might have offered us visually, photographically. Rather than speculating, through making I am witness to the latent capacity of this raw image, its chromatic shifts, and the labour of its maker. More than this, the process of reenactment serves as an invitation to imagine the conditions of the making, the everydayness of the setting, the moment that has long since passed. I think, for example, of Somerville's servant, and wonder what she might have seen.[99] I think of the birds that accompanied Somerville during her experimentations in the garden which she so adored. In *Recollections*, she describes one little bird as a constant companion that had 'both memory and intelligence', that would sleep upon her arm while she worked (M. Somerville 1874, 351).[100] Though unknowable, reflecting on these 'moments' is still generative to me.

The process of exhibiting these durational and temporal prints is also one that generates insights. I select one reenacted image for a show at the Beaconsfield Gallery, Vauxhall, (Douglas 2024), knowing that the very act of exhibiting the work will destroy it. In embracing its vanishing, I come to know, visually, how the work fades, and how Somerville's did too. Its luminosity is short-lived, and reserved for a strikingly narrow window of time. The work is activated instantaneously and within an hour begins to fade (**B:138:141**). The morning after the opening, the images has faded to a rather dull and unwanted shade of nothing-much-ness; the earlier, angular forms shaped by glass is no longer visible. But as Ramalingham notes, these 'faded, damaged, illegible' works provide a constructive place for scholarly thinking (Ramalingam 2023), or as Bajorek puts it, a 'different form of photographic temporality' (cited in K. P. Albers 2021, 7). It shifts us to reconsider what counts as a photographic image. As Albers notes, the emergence of the field of photography was profoundly shaped by an attachment to the idea of permanence. This assumption about how long

[99] In a letter from Adam Sedgwick in April 1834 inviting Somerville to stay at the Observatory at Trinity College, Cambridge, he notes: 'your handmaid may safely rest her bones in a small inner chamber' (M. Somerville 1874, 180).

[100] 'On coming home from the journey I was quite broken-hearted to find my beautiful goldfinch, which used to draw its water so prettily with an ivory cup and little chain, dead in its cage. The odious wretches of servants, to whose care I trusted it, let it die of hunger. My heart is deeply pained as I write this, seventy years afterwards' (M. Somerville 1874, 66).

something was expected to last impacts, to this day, 'how we experience it, as well as how we care for, describe, and remember it' (Albers 2021, 7). In following Albers, I commit myself as an artist to a 'conditional' understanding of photography, conceived as a 'durational process to be performed, to be experienced' that produces something temporary, fleeting and ultimately hidden (K. P. Albers 2021, 4). In creating my own temporality, I am brought closer to another, to Somerville's. Through reenactment I have cultivated a sense of the physicality of protophotography. In restoration, I consider the ways in which colour plays an unanticipated role in protophotography. In bringing the past back as they saw it. The historical distance that Elizabeth Edwards discusses in photographic looking, is my foundation of control; I have made contact.

'Photographs shape a moment and project it into the future. In the event we see 'there-then' becoming 'here-now' at work with greatest force and lucidity' (E. Edwards 2022, 69). For a short moment, the 'there-then' that only exists in Somerville's written account becomes the 'here-now' through my practice. Even if my work only exists in digital capture, I have a material engagement. Time, vision and a gendered photographic history, once unimaginable, have been provoked.

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1845: Third Experimental Paper

In the 1840s, now living in Rome, Somerville conducted her third and final experimental paper, 'On the Action of the Rays of the Spectrum on Vegetable Juices'. All three papers were gathered under the rubric 'physical chemistry' (Laidler 1992, 4), with each exploring solar radiation. Once again, they were profoundly photographic. By 1845, both Somerville and Herschel were pioneering a technique known today as anthotypes – a non-chemical positive printing process using juices extracted from flower petals and vegetables. It works in the opposite way to her previous experiments of the darkening of silver salts. In the case of the anthotypes, the coloured-extract dyes the paper and exposure to sunlight then bleaches it. [101]

Both Herschel and Somerville corresponded on this topic in their pursuit to extend photography beyond the use of metallic salts. Beginning in 1840, Herschel undertook over a thousand experiments with plant dyestuffs. His hope was to supply the primaries for a colour printing system (Ware 1997, 265). By 1844, Somerville was also engaged in these practices. Her aim, according to Chapman, was to ascertain the effects of different spectral colours on papers coated with an array of different vegetable and flower petal emulsions (Chapman 2004, 47). On a return visit back to Britain, she writes to her daughter from her stay at the Herschels in Collingwood on September 1 1844:

[101] Senebier was a pioneer of the closely related process of photosynthesis, the same Senebier who engaged with Fulhame's work (see Chapter I).

> I have got loads of things for experiments on light from Sir John with a variety of papers, and you may believe that I have profited not a little by this conversation, and have a thousand projects for study and writing, so I think painting will be at a standstill (M. Somerville 1874, 271–72).

This exchange was far from unidirectional, and did not flow solely from Herschel to Somerville. The following year, on 21 November 1845, Herschel wrote to Mary: 'I always suspected there is a world of wonders awaiting disclosure in the solar spectrum…pray go on with these delightful experiments' (**B:147**).[102] Though Herschel was evidentially the stimulus in the making of this work, this was an exchange, a collaboration. Yet while Herschel's experiments have been explored extensively, to the point where framing them solely through the lens of photography has become a 'limiting one' (Wilder 2023a), with Somerville, the opposite is the case. Her efforts have again been studiously ignored in the literature on photography. In her turn from painting to photography she thought of this work as both creative and scientific. And so, I turn once more to the two questions that have animated this chapter: how does a repositioning of Somerville as a photographer (in this instance, through her 1845 experiments) change the way we think about the history of the medium? And second, how can photographic art practice contribute to task of locating Somerville in the early history of photography? In the absence any surviving photographic work by Somerville, my photographic practice becomes an act of retrieval, a reenactment of these organic, optical experiments of 1845.

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Reading Somerville's published 1845 paper and digitised scientific notebook, her botanical materials are laid out through systems of science. I am driven by colour and aesthetics. Following Herschel's interest in the primary printing system, I produce a responding secondary system in the hues of (C)yan, (M)agenta and (Y)ellow. I work with platine paper, red cabbage and vinegar (cyan), beetroot (magenta) and turmeric (yellow). These vegetables, and their corresponding colours in emulsion, are specifically chosen to establish a dialogue with contemporary forms of colour printing, both in the darkroom and digitally.

Again, this art practice is conducted domestically, my home is the studio. This is frugal science, and the chemical experimentations of the eighteenth century are upheld in the scarcity of time, labour and materials (Werrett 2018, 75). I use objects within reach: kitchen appliances, soup bowls for emulsions, my toddler's cotton vests or socks as a strainer (**B:148-149**). Martha Rosler's *Semiotics of the Kitchen* come to mind as I misuse objects for their intended purpose, replacing the domesticated 'meaning' of tools (Rosler 1975). Using the outgrown baby clothing repurposed in economy and ecology, I pull the socks taut over a tall glass and pour my light sensitive vegetable emulsions of bright purple, magentas and yellow through them. Distilling each coloured liquid, I simultaneously mourn for the wee feet that used to slink inside whilst being grateful for their absence to make work. As the socks are stained in my vegetable emulsion, I don't have the heart to bin them. Another photographic relic is born. I have chosen this domestic setting for myself and in trying to locate another women's agency, the kitchen is my site for exchange. I coat the

[102] John Herschel to Mary Somerville, dated 2 November 1845, Royal Society Archives, MS, Herschel Papers HS/16/352.

emulsions over (chemical free) cotton rag white paper using a sponge brush. It gives me an even application – back and forth, steadily cross hatching the application of coloured liquid (**B:150-151**). I gently stroke out impurities, dust and residual vegetable matter. The prints are taken into my bathroom-come-darkroom to dry. Later, I take the vegetable coated paper to my balcony for exposure. It is a slow and durational process, and one that requires sunlight. Like my Victorian counterparts, I am at the mercy of British weather and air pollution. Working throughout the year, I learn that the emulsions have a seasonal shift as the pigment in the plant changes. Sourcing materials on my local high street – beetroot, turmeric, red cabbage – I consider their availability in 1840s Rome for Somerville (and in England for Herschel).[103] I realise over time that the freshest possible produce yields the best results. I incrementally expose portions of my paper canvass to the sun while covering others, creating the appearance of large test strips. My exposure time ranges from hours to weeks. While Somerville's actions were scientifically specific in their pursuit, mine is a visual reenactment to recall her place in early photographic studies of colour.

Printing with these organic materials, I continue to question what photography is. Created in 1845, in a new photographic age, Somerville's anthotypes were not marked by the obsession with permanence that so characterised the emergent discourse on photography (K. P. Albers 2021, 7–8). Instead, her experimentations represent an exploration of colour, a pursuit of new boundaries to breach. Today, they push me, in my making and restaging, to think photography anew, and to undo the inherited conception that has shaped my own understanding and that of so many others since 1839.

The prints require exposures of hours or days in bright sunlight. Unlike Somerville's silver chloride of 1835, photo-bleaching dyes extracted from plants have 'low quantum efficiency' (Ware 1997, 265). The result is a direct positive colour image. The colour photographs I produce, again, are ephemeral: they disappear over time (**B:152-154**). Even today, there is no known process to arrest the fading plant-based images other than to 'fix' them digitally. In the moment of making, in the process of art practice-led research, I gain a new appreciation of the colour that once permeated Somerville's images. Yet I also discover that they are not quite as fugitive as I had previously imagined.

Since starting this project, I have kept a set of working notebooks that now comprise several years of research. The books contain my ideas alongside other the words of others – notes from seminars and conferences, research groups and all the jottings, thoughts, further reading and to-do lists they generate. Never did I consider that I would turn back to these sources for first-hand knowledge. Wilder describes the notebook as a 'critical part of observational and experimental practices in the lab and the field' (Wilder 2022, 279). This holds true for the notebooks I encountered in the archives. Mine, however, feel far from

[103] Somerville used saffron, nasturtium, pomegranate, beet juice, rose verbena, walnut juice, fig juice, turmeric, dahlia juice. Herschel worked with specimens from Cape of Good Hope (Gapper 2023). This elicits a more immediate relationship to colonialism than my other reenactments with silver, though all these processes are also inextricably linked to extraction of some kind. For Peirson, 'colonial botany involved a process of both extraction and erasure: the extraction of local knowledge, plants, information and labour; and an erasure of Indigenous knowledge and ecological practices' (Peirson 2021). As with decolonial studies in botany, scholarship is growing in this area for photography where erasure, labour, colonisation and 'the minerals of the medium' are being explored on new terms (Angus 2024).

this definition. They are a space for thinking, for ideas, a place to record and hold memory. Reading them back, they resemble incomplete projects and naïve lines of inquiry. As I read, I correct my historical self. These notes are usually taken in planning, rather than in any stage of execution. The creative act of making often feels disrupted by pencil and paper, and I invariably let the aesthetic pursuit override the scientific. Although in salt printing written notes are always made during the exposure, in general, the act photographic making is often incompatible with notetaking. Touch is paramount and hands are often wet.[104]

While my early thinking can be traced in my notebooks, my art practice exists elsewhere: in portfolio boxes stored under my bed or in a digital filing system with patterning only I can make sense of. On occasion, I open up my portfolio box to consult the fading and decay of my anthotypes. Just to check on them, like some work that lives without me. Blotches appear in test works where less care was taken at the point of making, but I am struck by the way the colour holds. Even after a year they have an aliveness and a permanence. I scan the prints at various stages of their decaying life and learn they can withstand quite a lot of exposure to light when handled properly. **Laying them** around my living room, I have an abundance of strips and sheets of vegetable-stained and sun-bleached papers. They have retained their colour (**B:156-157**).

Back among my notebooks, I find one residual test strip. Unlike my artworks it is a small, irregular piece; one that travels with me and eventually becomes a bookmark. I think again about Somerville's notebooks held at Oxford, and consider the possibility that the separation between text and image is similarly incomplete in her case. Up to this point I had only consulted her notebooks digitally. What if retouching them could yield insight into her practice (**B:158-159**)?

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In July 2022, in hope rather than in expectation, I travel to the Bodleian for the first time since the pandemic. *Just in case.* I order Somerville's 1845 notebook, on the first page she writes *Experiments on Light Rome 1845* (**B:160-161**).[105] I first wanted to access this in 2021 but was unable to during the COVID-19 lockdowns. An archivist at the Bodleian kindly made me a digital copy in March 2021, which proved useful but raised more questions than it answered. In the making of my own anthotypes, and living with their aftermath in my cupboards and notebooks, the thought, the possibility, that Somerville's test strips might have survived stays with me. Perhaps something photographically visual could remain, a lasting documentation of her photographic experimentations in colour? This pursuit is driven by an understanding of her 1845 experiments accrued through my art practice. But it remains speculative.

[104] Although, when teaching colour darkroom courses (sometimes with literal hand-holding in the dark), I insist upon exact notetaking. When students first emerge from the darkroom into the light, I encourage everyone to place their cyan, magenta and yellow values on the reverse of their test strips before we discuss the images.

[105] Somerville Papers, Bodleian Library, MSSW-13 Dep C 354.

In a grey archive box, I remove her small diary. It is blue with a well-worn cover. It appears she carried these workings with her. I browse the notebook slowly and take my time; though the blue cover was a surprise, its contents are quite familiar by this point. I ready myself for disappointment. But this time, my speculation and dedication are rewarded by the presence of small slips of paper. Blue dips, brown washes, hues of cream and indications of past colours. The smallest of test strips, unfoiled and resting (preserved) in the margins of her scientific notebooks (**B:163**). Understated in scale, but glowing in the folds of the pages holding them. Their value is immeasurable for my project and the broader study of women in early photography. This is the elusive, physical form of a woman's contribution to early photography that I have been in search of for six years (**B:164-165**).[106]

The strips look like they may fall out of the seams of the book or be crushed in the folding of the page. If these were Herschel's or Talbot's they would have a catalogued entry of their own, digitised and filed in archival sleeves, arranged to view in only very controlled circumstances. I turn off my table light as a duty of care (Graham 2020). In what I believe to be the first paper presented on Somerville and photography, I had previously speculated on the existence of these works (Douglas 2021a), but here they were. A single grey hair lies between two blank pages. There she is. I create a new folder on my desktop: 'Somerville's Anthotypes', and take out my iPhone SE to photograph what I see, retouching with paramount care. A soft touch is needed, slow looking, careful study, a tender engagement (Graham 2020, 76). The low-resolution images will turn out to be the last and only documentation of my physical encounter with her works.

The archivist seems unaware of their existence. They have not been catalogued in the otherwise meticulous reading guide. On my train home I stare at my phone and view the tangible physical record of a woman's contribution to early photography, in colour. Their form is abstract, small, annotated and their orientation clearly vertical. I dream them into large canvasses; elevated into a superior, bolder form. William Somerville noted that is wife "would rather talk on science than on art" (Brück 2009, 84). I am the reverse of this. But these need no enlargement to signify their value. These minimal works are some of the earliest examples of colour and photographic inquiry. Their restraint is part of the appeal. Somerville's colour studies were never intended as art. She was a painter but these are controlled, scientific experiments, vertical solar studies with light which still hold the pin marks where they were once mounted in their moment of study. They closely resemble Herschel's test strips (of course they do). It becomes all the more clear that Herschel and Somerville's works were made in dialogue. But, in my research, they are also conceptual photographs, experimental in form and inquiry, proposals to imagine another way of seeing photographic history. I would argue they also offer a proposal for a sustainable photographic future today.

A year on, I finally decide to write to the Bodleian to ask for permission to rephotograph Somerville's 1845 experiments on a copy stand for the purposes of the creation of an artwork for my viva. The request is denied: Somerville's prints, now 'found', have been taken out of the notebook in which they sat for nearly

[106] These strips also likely have implications for Somerville's contributions to photochemistry and spectroscopic techniques, an area that has yet to be studied thoroughly (Hentschel 2002, 202–3).

two centuries and placed in a light-tight box in cold storage. They cannot, I am told, be viewed under any circumstances; 'they are simply too precious and fragile'. While in full agreement with the curator, the email is a disappointment. The low-resolution iPhone images are all that I have. The Bodleian online finding aid is also updated to reflect the existence of Somerville's anthotypes, having previously said nothing on the matter. Soon after, an article in *The Observer* appears declaring Somerville as a photographer (Thorpe 2023). Perhaps inadvertently, my retouching in the Somerville archive has made a contribution: these test strips are now preserved. I remind myself: to view these works is to destroy them. My encounter with them in the archive was an act of recovery, not possession. I am privileged to have had the touch.

Chapter III

The Woman Who Was Alive There: Elizabeth Johnston Hall: Subject and Subjectivity

I think you will find that we have, in Scotland, found out the value of your invention not before yourself, but before those to whom you have given the privilege of using it.

— David Brewster to William Henry Fox Talbot, 3 July 1843 (Brewster 1843a)

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What wonderful things they are!...these clean, sonsy, caller, comely, substantial fishwives, - what a refreshing sight! As easy, an unconfined, as deep-bosomed and ample, as any Grecian matron. Indeed, we have often been struck, when seeing them sitting together round their oyster creels, with their likeness to those awful and majestic women, the Fates of the Elgin Marbles.

— Exhibition of the Royal Scottish Academy, *The Witness*, April 22, 1846 (Brown 1846)

JOHNSTON HALL, ELIZABETH

(b. Newhaven, Edinburgh, Scotland, 18 August 1822; d. Newhaven, Edinburgh, 31 January 1901)

With the contextual and conceptual beginnings of protophotography in Scotland now established, this chapter works with, and reflects on, what is commonly understood to be a photographic image. It does so by turning to the photographed subject in 1840s Edinburgh. This was a moment when photography was in its infancy, when it was practiced by a select few. The term photography itself was not widely used in this period, and sitter/maker relations had yet to be established. Importantly, sitters had not been exposed to the capacity for the camera to produce a photographic likeness of themselves. The 1840s also present the arrival of the first photographic process which allowed for reproduction: the calotype.

The calotype portrait is known not only as one of the foundational forms of photography, but as one of the first to be self-consciously presented as art (Stevenson 1981, 23; Hacking 2018). It is a paper process in which silver iodide is used to create a unique negative 'photogenic drawing' which is then reproduced as a salted silver positive paper print. The calotype, salt print and photogenic drawing, though related, are different processes, each with a history of their own.[107] In the making of the calotype, a solution of nitrate of silver and iodide of potassium is applied to writing or drawing paper, and then a further solution of gallonitrate of silver (Stevenson 1981, 5–6). The sensitised paper is then placed in a camera and exposed to light for a period of time.[108] Finally, the paper is then made permanent with sodium hyposulphate, a discovery of Herschel's first published in Edinburgh (J. F. W. Herschel 1819).[109]

This chapter focuses on one photograph in particular: a calotype portrait of Elizabeth Johnston Hall taken by the photographic partnership of Robert Adamson (1821-1848) and David Octavius Hill (1802-1870) at some point between the years 1843 and 1847 in Newhaven, Edinburgh (**B:173**).[110] In turning to the sitter Johnston Hall, I explore how her labour and life can be accessed and understood, and how she, in turn, can

[107] What defined the calotype negative was its short exposure times and that it allowed for reproducing multiple positive salt prints of the same image. It was also fundamentally different to the photogenic drawing in that it was 'developed out' in the darkroom (a developing out process 'D.O.P.'). The photogenic drawing and salt prints are printing out processes ('P.O.P'). Recipes for each of these evolved over time and each have their own stages of scientific development. The George Eastman Museum offers a useful entry in its glossary of early photographic processes: 'The calotype negative was the first to rely on the chemical development of a latent image on light sensitive paper that had been exposed in a camera. Patented in England in 1841 by William Henry Fox Talbot, the process was an advancement on Talbot's first paper negatives, called photogenic drawings, that were produced solely by the effect of light on light-sensitive paper. The chemical development process meant that calotype negatives required much less exposure time than photogenic drawings. One calotype negative could be used to make many prints (at the time, salted paper prints), and this negative-positive process was the direct antecedent to modern photographic printing'. (George Eastman Museum 2024).

[108] The early apparatus of the camera followed the principles of the camera obscura explored by Wedgwood and Davy. See Chapter I for a discussion.

[109] This technology followed from the multiple experimentalists already explored in this project, from the early blackening of silver salts under the influence of light, to Fulhame's development of photochemical imaging, and from further chemical experiments with solar rays and silver chloride (Somerville) to all the other collaborative steps of the multiple authors of early photography.

[110] The first photographic portrait made in Scotland using Talbot's calotypes process was by John Adamson, Robert's brother, in May 1840. National Museum of Scotland, 'Calotype depicting Miss Melville Adamson, negative calotype, part of an album of calotype photographs compiled by Dr John Adamson', Museum reference, T.1942.1.1.19. These are the lilac shaded shadowed portraits running through Part A and Part B (see Image Credits (Part A)).

further open up our understanding of women's thinking and practice in the making of photography in Scotland.

This shift to the sitter is significant and deliberate. In their call to move beyond photography's 'single creator' tradition and bring into light tangible traces of collaboration, Azoulay and her co-authors draw our attention to 'the various relationships, exchanges and interactions that occur between all participants in the making of any photograph' (Azoulay et al. 2024). This chapter focuses on the sitter as one such element of collaboration, and demonstrates its importance as a neglected area of women's contribution to early photography in Scotland. The experience of the sitter has been under-explored in the literature on photography. Barthes' 1980 reflections on an 1852 photograph of Napoleon's brother in *Camera Lucida* is a contribution that still holds for me: "I am looking at eyes that looked at the Emperor'. Sometimes I would mention this amazement, but since no one seemed to share it, nor to even understand it (life consists of these little touches of solitude), I forgot about it' (Barthes 1981, 3). What interests me is Barthes' understanding of the sitter not just as a subject but as somebody with subjectivity. Saidiya Hartman, in her speculative history of the lives of unknown young Black women at the close of the 19th century, advances a method in which she sets out to 'understand and experience the world as these young women did, to learn from what they know' (Hartman 2019b, xiv). Carol Mavor has also grappled with the sitter's role in a photograph, describing it as a 'silent performance'. In particular, she invites us to understand the sitter as somebody who 'lived in an actual cultural moment' (Mavor 1996, 18–19, 28). Elizabeth Edwards, contending with the question of presence in colonial photography, writes about the photograph carrying 'traces of experience – of what it was to live through that moment. It is about the embodied experience of the encounter' (E. Edwards 2016, 313).

The chapter responds to the same core research questions that animate this project but with the specificity of the sitter in mind. What happens to our understanding of early photography when its visible yet unknown sitters become known? How might our understanding of the making of early photography be enriched by a coming to terms with the experience and biography of this working class, fisherwoman sitter about whom so little is known? And fundamentally, how can practice-led research help us to understand the life and experience of the sitter, and in turn, the sitter's significance for grasping the role of women in early photography? In addressing these questions, the chapter traverses the limits and possibilities of getting close to the early photographed historical subject through art practice and archival research.

Indeed, my desire to 'get close' to my historical subject carries significant limitations. Elizabeth Edwards lays out what she names as the 'problems' historians face when they 'encounter the proximity of the past, literally facing history, through the mediation of a photograph'. She notes that as historical source material, photographs are 'strange and different', and herein the 'promise of seduction' lies. She encourages readers to 'think through' photographs to 'stretch the habits of the discipline' and consider the inscription of the moment not 'merely an event…but an experience someone lived through' (E. Edwards 2016, 305–6).

I begin the chapter by going in search of Johnston Hall in her archival state. Documents include birth, marriage and death certificates in the parish files, entries in census records and a note from a solicitor in state records. Yet in these sources, I find nothing written in her hand. Johnston Hall, as author, is absent. In the photographic archive, images of her abound. Held and preserved in special collections across the world, there are reproductions of Johnston Hall. As noted above, this is a defining feature of the calotype: they are reproducible. These sun pictures are not touchable; in fact, they are damaged by the act of viewing them. In studying the sitter as both subject and somebody with subjectivity through the case study of Johnston Hall, I interrogate and retouch the archival systems in which her portrait belongs. More specifically, I challenge the narratives and stereotypes that have shaped the discourse of her reproduction in curatorial practices. Through a placement at the Victoria and Albert Museum, I work slowly through the catalogue, website and inventory, altering each along the way. With access to the museum's editing software, I name the working-class sitters, pushing against the tide of gendered representation that has so defined these works.

And yet, having 'pressed at the 'limits of the case files and documents' (Hartman 2019b, xiv) my search runs to ground. Johnston Hall, the woman who was alive there, remains unknown to me. Johnston Hall's life, to quote Hartman, 'has not only been overlooked, but is nearly unimaginable' (Hartman 2019b, xiv). It is here that my art practice enables me to deepen my research. Through a process of retouching, this time in art practice, I move beyond the haptic absences of the archive by recreating and experiencing the making of the calotype paper negative, retouching the object on my own terms. My method here is reenactment, and it provides what Catherine Grant calls a feminist 'space of learning' (2017, 262). It is a method of learning through contemporary art about my topic, my subjects and their subjectivities. As Blackson suggests, 'reenactment is distinctive in that it invites transformation through memory, theory and history to generate unique and resonating results' (Blackson 2007, 29). Through reenactment as art practice, I make calotype portraits using Adamson and Hill's mid-nineteenth century processes to create an art work, and its results enable me to address my research questions in ways that the archival research cannot. Through making as a durational and haptic encounter, I attempt to get close to Johnston Hall, to explore the extent to which I can understand her subjectivity as a sitter and how the making of her portrait might have been experienced by her.

Writing on Julia Margaret Cameron, Mavor notes that the 'pictures are haptic in the fullest sense of the word. Not only did she especially scrub, scratch, brush and fingerprint her glass plates, she also focusses on the ways in which women touch' (Mavor 1996, 48). In making my own calotypes as art works, the methodology of reenactment comprises a haptic, material engagement with early photographic processes. I become familiar with its paper surfaces, its durational demands, with dipping, exposing and protecting the light-sensitive paper, with the measuring and mixing of iodine, ammino nitrate of silver and salts, the washing, 'fixing' (washing out), cleaning and coating, the gentle notations in pencil on the paper negative…These encounters with materiality through making and reenactment prove to be generative: new research findings are made that contribute substantially to the project.

As Edwards and Hart note, 'materiality is closely related to social biography…an art object cannot be fully understood in any single point in its existence, but should be understood as belonging in a continuing process of reproduction, exchange, usage and meaning' (E. Edwards and Hart 2004, 4). My own encounter with the materiality of the mid-nineteenth century calotype takes an unexpected autobiographic turn towards the end of the chapter. I grew up within a couple of miles of the fishing community of Newhaven where these portraits were made. For generations, in fact, my extended family has lived in the surrounding area of Leith, Edinburgh. During the courses of the research, I learn that I am related to some of the sitters I encounter in archives and reenact through my practice. As my family history becomes entangled with the sitters depicted by Adamson and Hill my own subjective encounter – indeed, my own subjectivity – with these works inevitably becomes part of the research process. Something touchable becomes touching.

1840s Scotland

In 1843 Scotland, a revolution in visual culture was underway following the announcement of the invention of the daguerreotype and Talbot's paper negative invention four years previously. A key figure in bringing the newly established photographic process to Scotland was the optical physicist, David Brewster, encountered in Chapter II. To Somerville he was a 'valued friend' (M. Somerville 1874, 38) and to Talbot a scientific associate and one of his closest friends.[111] So close, in fact, that owing to their friendship Brewster was able to convince Talbot not to extend the patent of his calotype to Scotland,[112] thereby allowing scientists and artists to experiment with this new invention without restriction.[113] This was not Brewster's only significant contribution to photography. Later that same year he introduced the engineer Robert Adamson to the painter David Octavius Hill, and in doing so helped establish a partnership of great significance for early photography, both in Scotland and beyond.

Based at their Edinburgh studio Rock House, Adamson, Hill and their assistant Jessie Mann[114] practiced this method tirelessly to calotype the city's landscapes, its architecture, and above all, its people. Their output was extraordinary.[115] Together they pioneered this method as an art form between 1843 and 1848.

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[111] Somerville's copies of Brewster's scientific papers are now held in Girton College, Cambridge. The papers hold a personal dedication from Brewster to Somerville, again underlining how engaged she was in these protophotographic networks. In her published memoir, she names him 'one of the most distinguished philosophers and discoverers of the age' who later became 'my valued friend' (M. Somerville 1874, 37–38).

[112] This also applied to Wales and Berwick Upon Tweed – see Talbotype patent 1841

[113] By contrast, in England and Wales where the patent was in place, Talbot pursued through court action those whom he considered to have infringed the patent (Gartlan 2022). Brewster writes to Talbot in 1843 about those freely practising the calotype in Scotland (Brewster 1843b).

[114] Jessie Mann's efforts are known largely down to a letter written from James Nasmyth to Hill, first noted by historian Larry Schaaf in a letter held at the Royal Observatory (Simpson 2008). Scholarship on Mann's contribution to this history is gaining its own belated recovery (Simpson 2008; 2010; Bacon 2018; Sheridan 2024). The Signet Library recently discovered an Adamson and Hill album in their collection. In it, Mann's title has been raised from assistant to also the 'world's first female photographer'. Though this is somewhat speculative, it does signify an important shift in the field. (The Signet Library 2023).

[115] A comprehensive visual overview of these portraits can be found on the National Galleries of Scotland website. See here: https://www.nationalgalleries.org/art-and-artists/features/hill-adamson. This webpage was created to coincide with the exhibition *A Perfect Chemistry*, curated by Anne Lyden (Scottish National Portrait Gallery 2017). In the display, Lyden presented calotypes as well as salt prints. Jessie Mann's contribution was also given more attention with one work being potentially attributed to her. The

In just short of four years, they created some 3000 images that are today known as some of the foundational works of nineteenth-century photography.[116] It is the fishermen and women of Newhaven who have come to symbolise their achievements (Kingsley and Braun 2015b). Newhaven is located a mile and a half outside of Edinburgh to the north of the city centre. The town sits on the south bay of the Forth estuary. Typically, there was a gendered division of labour in Newhaven where the men carried out work at sea, and the women did most of the land work such as gutting and preparing fish to carry into town for trading. Like so many of the subjects in Adamson and Hill's output, the sitters' labour is two-fold. Their occupation as 'fisherwomen' is placed centre-stage and is the object of depiction; yet they also undergo a secondary form of labour, for the artists' lens. These sitters were no strangers to invitations to be portrayed and arranged artistically. Before a camera was brought to Newhaven, they featured prominently in popular culture of the early-to-mid nineteenth century, from poetry to painting, and from pottery to song (Bertram 1873). In Newhaven, they knew how to perform (**B:174-175**).

When art critic and friend of Hill's Elizabeth Rigby (later Lady Eastlake) visited Newhaven, she spoke to a fishwife by the name Jinny Wilson, asking why she chose her distinctive dress. She replied: 'you know, it's just the fashion of the place' (Eastlake 1895, 93). Indeed, Adamson and Hill's decision to document working people was not entirely unusual. In the middle of the nineteenth century, working women, in particular, provided the foil for gendered representations of class, with the rural woman worker depicted as passive, content and natural; a positive embodiment of the working class in contrast to the moral uncertainties of the urban (often male) worker (Nochlin 2007, 97).[117] This was true of the fishwives too.

This concern with labour – in particular, women's labour – can be traced in early photography too, where servants and working people featuring as some of the earliest photographic subjects (Anonymous 1845; Collie 1847; Tennent and Tennent 1848). Adamson and Hill were not the only image makers in Edinburgh in 1843 to render the fisherwomen and men of Newhaven into photographic subjects. 'The Edinburgh Calotype Club', perhaps the first photographic club in the world, was established that same year and its members also took interest in the people of Newhaven (National Library of Scotland 2002; Hannavy 2007, 452). When Adamson and Hill arrived in Newhaven, they set about conjuring and capturing through image a close-knit, almost pre-industrial community. MacFarlane describes their aims and intentions:

> The photographs were in part addressed to the enlightened middle classes of which Hill was a member, many of whom were preoccupied with the social problems exposed by the inadequacies of poor relief in Edinburgh. Although these elites lived only a mile or so away, the fisherfolk

Harry Ransom Center in Texas currently has the Hill & Adamson: The Clarkson Stanfield Album on display. See here: https://www.hrc.utexas.edu/exhibitions/2024/hill-and-adamson-the-clarkson-stanfield-album/ (Harry Ransom Center 2024; Adamson and Hill, n.d.)

[116] The literature on Adamson and Hill's output is considerable and continues to grow (Schwarz 1932; Michaelson 1970; Bruce 1973; Strong and Ford 1976; Stevenson 1981; Weaver 1989; G. Smith 1990; Stevenson 1991; A. Lyden 1999; Kraus and Schaaf 2002; Stevenson 2002; Simpson 2002; Stevenson and Morrison-Low 2015; A. D. Morrison-Low 2015; A. M. Lyden 2018). Yet within these works, many of which are path-breaking, very little attention has been given to the biographies of the sitters of the Newhaven photographs.

[117] This representation of the ideal figures of the village, especially its women in colourful 'costume', appears most famously in the fiction of Sir Walter Scott (Scott 1816) and Charles Reade (Reade 1853).

> depicted in the photographs were perceived as exotic in manner, dress and speech. More importantly, however, their coherent and self-sustaining communities represented an alternative model of working life that appear to present a solution to the deprivations of the slums of industrial Edinburgh (MacFarlane 2013, 144).

From the beginning, photography in Newhaven was informed by a romantic longing for a pre-industrial society untouched by the ravages of the modern city. In diaries and memoirs of the period, such representations of Newhaven and its fishwives are prevalent. The journal of an English actor Fanny Kemble offers a fascinating set of reflections on Newhaven in 1828 (Kemble 2000). She reminisces about those she met, about her experience of being taken out to sea and being 'invited' into the homes of the fishwives. She describes their living conditions, quantity of children, putrid scents, working methods, and offers up local dialect for authenticity:

> I stopped at a cottage on the outskirts of the fishing town (it was not much more than a village then) of Newhaven, and knocked. Invited to come in, I did so, and there sat a woman, one of the very handsomest I ever saw, in solitary state, leisurely combing a magnificent curtain of fair hair that fell over her ample shoulders and bosom and almost swept the ground. She was seated on a low stool, but looked tall as well as large, and her foam-fresh complexion and gray-green eyes might have become Venus Anadyomene herself, turned into a Scotch fish-wife of five and thirty, or "thereawa". … Before I went, she showed me a heap of her children, too many, it seemed to me, to be counted; but as they lay in an inextricable mass on the floor in an inner room, there may have seemed more arms and legs forming the radii, of which a clump of curly heads was the center, than there really were…She was a splendid specimen of her tribe[118]… It always seemed to me that these women had about as equal a share of the labor of life as the most zealous champion of the rights of their sex could desire (Kemble and Kemble 2005, 148–49).

The novelist Charles Reade also spent time in Newhaven while writing his novel *Christie Johnstone* (Reade 1853). Reade's fiction was based on a real-life relationship he had with a Newhaven fishwife, Marion Johnstone, who died giving birth to Reade's son.[119] This transgression across the lines of class with a labouring woman – Reade was Vice President of Magdalen College, Oxford at the time – rendered the child 'illegitimate'. The Newhaven fisherwomen were accustomed to the presence of writers and artists who documented the community and its people. One such account is the aforementioned Rigby (later Lady Eastlake). In her memoirs, she reflects on meeting the fishwife Jinny Wilson, describing her as 'a lovely looking creature, with a complexion of that transparent kind of which our aristocracy are most proud; her eyes laughing, her hair without any figure of speech, golden – such a colour as indoor life never permits'

[118] Not only was there a classing gaze as shown by this passage, early engagements with photography were also marked by a colonial gaze. On the colonial dimensions of early photography, see Ariella Aïsha Azoulay's *Unlearning Imperialism* (Azoulay 2019). See also Elizabeth Edwards *Facing History* (E. Edwards 2016) and Tina Campt *Listening to Images* (Campt 2017).

[119] I owe this point to the genealogist Alex Wood, whose as yet unpublished research identifies Marion Johnstone as the real fishwife from Reade's novel.

(Eastlake 1895, 93) (**B:177**). Writing on 3 September 1842, just months before Adamson established his studio on Calton Hill, another sketch of the fisherwomen of Newhaven was offered, again in full colour:

> The view of Edinburgh, before entering Leith is quite enchanting, & only what one could imagine to dream of, or see in a picture…It is not a pretty town, but the people were most enthusiastic …but the Fisherwomen, are the most striking looking people, & are generally young & pretty. They look very clean & somewhat Dutch like, in their snowy white caps & bright coloured skirts. I have tried to make the annexed little sketch' (Victoria 1842) (**B:178-179**).

The author of this passage was a twenty-three-year-old Queen Victoria. Just weeks after she jotted down these reflections, the image of Newhaven which could only 'imagine to dream of' would be realised in the form of Adamson and Hill's calotype series. Not long after the formation of their photographic partnership, the *Edinburgh Evening Courant* announced on 3 August 1844 the planned publication of a series of six bound volumes of calotypes, of which the first was to be titled 'The Fishermen and Women of the Firth of Forth'. As the fisherwomen were captured baiting the lines in the spring sunshine that followed in 1845, Hill wrote in a letter to a friend on 26 April: 'we are preparing fishwives for a book, and have done some fine things lately' (Stevenson 1991, 13). This ambitious project failed to materialise. Not one of the six volumes was ever published, including the planned collection on fishermen and women.[120]

What makes their Newhaven output so unique is not just its scale in the form of thousands of calotype portraits, but the way its subjects are named. In several photographic albums compiled by Hill in 1851, he wrote the names of many sitters underneath the portraits in pencil. At times he borrowed from one of his literary heroes, Sir Walter Scott, and gave the titles a romantic treatment. For example, in the portrait of Johnston Hall, Hill gave it the title 'The Antiquary 'It's no fish ye're buying—it's men's lives' – a line lifted from Walter Scott's 1818 novel The Antiquary (Lyden 1999b). On other occasions no names were presented at all. But often, Hill named his subjects using both their forename and surname. This was a radical act and one that can be attributed to Hill, not Adamson who died in 1848. It was highly unusual for working class subjects, not to mention labouring women, to be named at this particular juncture in art history (MacFarlane 2013). Later in this chapter, I retouch the Hill and Adamson collection in the Victoria and Albert Museum – providing names and biographical details where they don't exit – as a feminist act in my encounter with the Newhaven fishwives, challenging the gendered representations that have so defined these works.

Retouching - National Galleries Scotland: Portrait

The historical seduction of photography, Elizabeth Edwards points out, lies precisely in the way that the photograph seems give an appearance of a direct experience of the past. And yet, as Edwards admits, the

[120] Stevenson's 1991 work *Hill & Adamson's The Fishermen and Women of the Firth of Forth* represents an attempt to compile what that first volume might have looked like (Stevenson 1991).

promise of seduction remains (E. Edwards 2018, 25). Photographs, she suggests, have 'far-reaching closeness effects, in that they carry a sense of immediacy'. As such, photographs can 'modify and refigure the…irresolvable tension between distance and closeness' (E. Edwards 2018, 29). This can produce she notes, citing Mark Phillips, an altering of historical distance 'which can be diminished or augmented in ways that can fundamentally change our sense of what history represents' (Phillips in E. Edwards 2018, 29). These ideas of distance and proximity, of space and of time, she points out, 'are manifest through the idea of presence' (E. Edwards 2018, 29).

In working with photographs through my adulthood – whether that be making, teaching, or researching – I have, at times, become desensitized to this capacity of the photographic image to enact this closure of historical distance. But every so often a photograph stops me in my tracks. This is one of them (**B:174-175**). Held in the National Galleries, it is one of Adamson and Hill's lesser-known salt prints. A collective gathering of unknown women in another time and place. The presence of these fisherwomen draws me in and holds me: the uniformity of their multiple striped petticoats, their ballooning aprons, hair centre-parted, their arms entangled – 'women touching women' (Mavor 1996, 48). Weight-bearing limbs are leaning, lifting, working (always, working) and caring for each other. These women, to return to that quote from Mavor again, 'lived in an actual cultural moment' (Mavor 1996, 18–19).

Artist Holly Graham points to the importance of care in the haptic encounter with the photographic image. Photographs, she suggests, 'demand that we handle them with care. I'm interested in the forms that careful handling might take, and in what we might discover about the lives of images when we examine them closely and slowly, thinking through touch and through sound, haptic registers' (Graham 2020, 80). She invites the reader to care for the photograph with '[s]oft touch. Slow looking. Careful study' (Graham 2020, 80). These insights build on the work of Tina Campt, who describes the encounter with the photograph as a haptic encounter that foregrounds the frequencies of images and how they move, touch, and connect us to the event of the photo. Such a connection may begin as a practice of 'careful looking' (Campt 2017, 9).

Following Graham and Campt, I undertake a slow and careful looking of the objects in my view: creel, washing, basin, baby. I am asked by the archivist not to wear gloves because to do so would increase the chances of damaging the paper. The thinking here is that these images are better cared for when they can be touched and sensed, haptically. Touching, retouching. With my cool, freshly washed hands, I consider anew the conditions that lie outside of the image. For Barthes, 'in order to see a photograph well, it is best to look away or close your eyes' (Barthes 1981, 53). I imagine what lies beyond the frame: the sounds of the shore, the spectators, the directions to assistants, the photographer's compliments, the tending to children, the tensions, the fish offal offered to keep gulls away, the conversations, accents, their fishwives' fish-sodden garments, the colour of the stripes (yellow and red), the pausing of work, friendships, payments, technology .... all those breathing, beating bodies, stopping still for the lens, in collaboration. The historical moment almost feels touchable. As Carol Mavor reminds us, 'photographs literally transport light from days gone by to the modern viewer'. This travelling of time is what grips me here: the light that once touched the fisherwomen now touches me (Mavor 1996, 28). Batchen addresses the same theme: 'unlike

other systems of representation, the camera does more than just see the world: it is also touched by it.' (Batchen 2001, 21). It is Barthes notion of the 'having-been-there' (Batchen 2001, 21) nature of the thing depicted in the photograph – specifically this photograph of the fisherwomen of Newhaven – that draws me in. But it is not my most intense encounter with a Newhaven calotype.

(She) Will Never Yield Herself Entirely into Art

Among the scores of Adamson and Hill images, there is one that has commanded more attention than any other. Its status owes much to the fact that it was discussed by the critical theorist Walter Benjamin (1892-1940) in his 1931 essay 'Little History of Photography'. He writes:

> With photography, however, we encounter something new and strange: in Hill's Newhaven fishwife, her eyes cast down in such indolent, seductive modesty, there remains something that goes beyond testimony to the photographer's art, something that cannot be silenced, that fills you with an unruly desire to know what her name was, the woman who was alive there, who even now is still real and will never consent to be wholly absorbed in 'art' (Walter Benjamin 2008, 276).

Benjamin's essay was originally published in German over several issues of *Literarische Welt* in 1931.[121] His interests in photography spanned its invention, history, and in particular the 'effects of technology on aesthetic perception' (Puppe 1979, 273). He likely came into contact with 'that fishwife from Newhaven' in the form of a photogravure reproduction in Heinrich Schwarz's 1931 *David Octavius Hill: der Meister der Photographie* (Schwarz 1931), the first book in any language to be published on Adamson and Hill's photography (**B:180-181**). As the title indicates, only Hill, the painter, is recognised as an author. Adamson, by contrast, is noted as a technician. Their assistant, Jessie Mann, goes without mention altogether.

I bought the Schwarz book in an attempt to restage Benjamin's encounter, to see what he saw.[122] The paper in this volume has a distinctively different shine to the gravel texture of the salt print in the early photography collections. Significantly, Johnston Hall's name is occluded by Schwarz. Benjamin, then, encountered her simply as number '26. Fischweib aus Newhaven' (Schwarz 1931). This erasure was hardly unique to Schwarz. It was common at the time and has persisted in the decades since, including in curatorial practices. An exhibition of 1981 at the Museum of Fine Arts, Boston, for example, referred to the sitter Johnston Hall not by name but as a 'celebrated Newhaven beauty' (Ackley 1979). In 2019, the National Galleries of Scotland website referred to the fishwives' 'natural beauty' and 'their heroic character' (SNPG 2019) while the Victoria & Albert website describes the fishwives as 'compelling subjects on account of

[121] See Puppe (1979). The text later appeared in English in *Art Forum* in 1977 (Patton 1977). There are several translations in circulation. The one used here is from Benjamin (2008). See also Benjamin (1972). Benjamin himself famously wrote on the topic of translation (Walter Benjamin 2015).

[122] In conversation with curator, critic and writer David Campany, I learn that he too bought the same book in search of Benjamin's encounter with photography. 'I'm trying to picture him, sitting at his desk, surrounded by the books of photographs by Atget, Blossfeldt, Renger-Patzsch and the others, looking at pages, writing on pages. And of course thinking about our contemporary screens' (Campany 2017).

their beauty' (Victoria and Albert Museum 2022). Such practices are significant, and have stood in the way of a more serious coming to terms with these images, the women they depict, and their place in the history of the medium. More commonly, Johnston Hall has become known to us as 'A Newhaven Beauty'. As early as 1930-37, she appeared in a glass plate reproduction accompanied by the etching 'The Newhaven Madonna' (Caird 1930). The Madonna analogy is all the more striking given Johnston Hall did not have any children. This persistence of the term 'beauty' runs across 20th and 21st century framings of her. These gendered representations position her as an object of desire rather than a historical subject in her own right. Instead, she serves as an 'allegorized object of desire' (Nochlin 2019, 131). Frustrated, I go in search of Johnston Hall, in pursuit of the most basic data that might enable me to build a picture of the life of this sitter and her subjectivity. I turn to first the archive and then practice to explore the extent to which I can get to know what Benjamin describes as 'the woman who was alive there'.[123]

Her Name, Her Labour

According to parish files in the National Records of Scotland, she was born on 18 August 1822 in the village of Newhaven and baptised a few weeks later on 4 September (**B:183**).[124] On 9 December 1842, aged twenty, she married local fisherman Daniel Hall.[125] In custom with Newhaven tradition, she kept her 'maiden' name and attached to it her new married name, becoming Elizabeth Johnston Hall. They lived at 2 Wester Close in Newhaven, just yards from the port. She would have been newly married and between 21 and 26 years old when she was approached for her portrait. All the men in Johnston Hall's family – her husband, father, brother, brother-in-law, cousin, father-in-law and nephew – were fishermen in Newhaven; her sister is listed in the archive as a 'fish dealer'. The 1841 census recorded a Newhaven population of 2103, of which 300 were men and boys employed in the local fishing industry (Stevenson 1991). With men working mostly out at sea, it was the women of Newhaven who became the more familiar presence in the village. Their work was tireless and uninterrupted: they would gut and clean fish at a rate of twenty-four a minute, before carrying the catch for up to six miles to the markets across Edinburgh and beyond (Stevenson 1991, 18–20). Johnston Hall was one of these women, known as the 'fishwives'.

The fishwife was a familiar figure in sixteenth and seventeenth-century Scotland, known alongside the many female taverners and brewers, and part of a wider-still network of women occupied with the purveying of food. Trades such as 'butter wives' and 'fruit wives' date back to the 1680s. A fishwife named Bessie, who lived in Fisherrow at Newhaven, used to supply her upper-class clientele with 'delicacies such as oysters, lobsters, and flounders'; apparently, she was capable not only of signing her own name but of writing out her own receipts (Marshall 1983, 153). They reportedly drove a hard bargain and raised prices in times of

[123] A significant portion of my archival research on Johnston Hall was carried out in collaboration with historian Roddy Simpson. I am grateful for Roddy's expertise which led me to sources that I might otherwise not have located.
[124] (Old Parish Registers and National Records of Scotland 1822).
[125] (Old Parish Registers and National Records of Scotland 1842).

bad weather. To return to that line from Walter Scott, borrowed by Hill as a title for one of his calotypes: 'it's no fish ye're buying the day, it's men's lives' (Ward and Stevenson 1986, 152; Scott 2004).[126]

I go in search of first-hand accounts of Johnston Hall but find no memoir, letter or document that gives a sense of her own voice. And so, I turn to other sources portraying fishwives in Newhaven and beyond to get a sense of 'the woman who was alive there'. Such accounts tend to refer to the fishwives' hard work and labouring bodies: women with creels (baskets) crying their wares of 'caller cod', 'caller herrin' 'new drawn frae the Forth' (Strong and Ford 1976, 36). These 'fishwives and their husbands were industrious, hard-working people' (M. Somerville 1874, 14). A remarkable first-hand account from a 47-year-old fishwife in Fraserburgh by the name Christian Watt offers a more brutal assessment of their working conditions: 'as solitary women on the road…fishwives were often attacked both for money and carnal knowledge. All carried sharp gutting knives. I would not have hesitated to plunge it into anybody who attempted to molest me' (C. Watt 2004, 36). Laurence-Allen notes that the St Andrews' fishing community was 'consistently vilified for a way of life that was deemed insalubrious and slovenly by middle class moralists' (Laurence-Allen 2012, 171). A contemporary report on the sanitary conditions in St Andrews referred to the 'highly offensive' habits of the fishermen. This reflected a widespread tendency to view fishing communities as in need of moral guidance (Laurence-Allen 2012, 171). This report was written, no less, by Robert Adamson's brother John Adamson in 1841, the same person to have made the first known photographic portrait in Scotland, just two years before his brother Robert took his calotype apparatus to Newhaven.[127]

Records in state archives shows that Johnston Hall died in 1901, and that she was buried on the same day as Queen Victoria. Today, Newhaven is no longer operational as a significant trading port. Its last working fishwife was Esther Liston, who retired in 1976. She was interviewed not long before she died:

> My mother said it was too hard a life and wouldn't let me learn it…at 36, I started with the creel. It seemed like the natural thing to do. At first I felt as if my neck was breaking. It's an art you know. I used to practise with a two stone box of kippers, then I got used to it (Brace 1998, 37).

In the Newhaven Community archives, I view a video of Liston titled *Esther Liston Leaves Her Home in Ann Street For The Last Time*. It was made in the 1970s by her son, George Liston (Liston, n.d.).[128] Despite more than a century of historical distance between Hall and Liston, this shift in technology from photography to moving image, brings me closer to the 'woman who was alive there' (Benjamin). Or so I think. As Duncan

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[126] Mary Somerville's memoir makes mention of the Newhaven fishwives. Her account reveals the class distinctions that so defined the relation between this inventor of photography and the working class subjects that would soon be its sitters. She writes that her brother Sam who used to attend the (private) High School in Edinburgh would buy 'a dozen oysters for a halfpenny, and a kiss for the thirteenth'. Meanwhile a cousin of hers tried to 'intrude' at a party organised by Newhaveners only to be 'pelted with fish offal by the women'. (M. Somerville 1874, 14).

[127] On John Adamson's 1841 report see Graham Smith 'John Adamson, sanitary reform and the St Andrews fishing community' (G. Smith 2001).

[128] *Esther Liston Leaves Her Home in Ann St for the Last Time*, Newhaven, Edinburgh, 3:39 minutes, Colour, Original format: 8mm cine film, Source: YouTube Newhaven Heritage Centre (Liston, n.d.). See also: https://www.carolinedouglasphotography.co.uk/works/newhavenslastworkingfishwifequeenvictoria

Campbell notes, 'documentary is a peculiar form of fiction. It has the appearance of verity grounded in many of the same formal conventions of fiction-narrative drive, linear plot, and closure' (D. Campbell 2008). In a silent, short digitised 8mm cine film, a woman (Esther Liston) is filmed leaving her home on Ann Street in Newhaven. She walks with a stoop and I wonder if this represents the after effects of her trade as a fisherwoman on her body (**B:184-185**). At last, a living trace of her labour. I decide to reach out to the family whose grandmother is depicted in the footage, to explore what it might reveal about the fishing trade, and perhaps even Johnston Hall. Her grandson informs me: her stooped back was brought on by her previous occupation working in a butcher's shop. What I thought, or rather hoped, was a visual trace of the life of a fisherwoman is in fact something else: the physicality of a differently performed labour. He further informs me that the footage is 'slightly staged'. The limits of my method of 'getting close' to the 'woman alive there' come into view.

Why Are You Angry?

Moving away from memoirs and archival sources, I turn to contemporary art to think further about Johnston Hall, the sitter/image-maker relation, and the real-life subject who is depicted. Photography has always been implicated in voyeurism. In the nineteenth century, as Azoulay notes, it was an instrument in 'othering', in measuring, cataloguing and categorising (and worse) (Azoulay 2019). The 2017 Rosalind Nashashibi and Lucy Skaer filmwork *Why Are You Angry?* (Nashashibi and Skaer 2017) confronts these themes visually, and viscerally so, and offers a way of understanding the subjectivity of the sitter.[129] Their 16mm work reimagines Paul Gauguin's paintings in video form, filming women – often without clothes – positioned as figures resembling his late-nineteenth century subjects. The artists offer up colourful tableaus and women's bodies for the viewer. In subjecting these women to the gaze, this time a 'filmic gaze' across eighteen minutes of silent moving image, they explore the problems and potentials of 'reclaiming' Gauguin's fetishised subjects (Laura Smith 2017).

Questions of collaboration and voyeurism linger every second. The subjects' agency is left for the viewer to contemplate alongside their own complicity. But unlike Gauguin's subjects, these figures are no longer static, but breathing, reclining, driving, dancing, sometimes naked, sometimes dressed; always conscious of the camera, and in full performance for the makers' lens. They are working for the artists. When Nashashibi presented this work at the Royal College of Art in 2018, there was hostility in the auditorium – an audible few were angry: 'why would you repeat this gaze as a woman artist?'. Nashashibi was remarkably defiant. The work was not a 'redemptive piece', she insisted. It was never about trying to give the women a voice. The problem of the colonial gaze is not 'solvable', she added. Nashashibi was more interested in 'seeing than in solving': 'we wanted to make a film where we were Gauguin and explore what that meant'. She added: 'The situation is too complex to just 'decode'. It's problematic, it's beautiful, it's sensitive, it's colonial and fucked up, it's real. It's fiction too' (Nashashibi 2018). Nashashibi's insistence on the messiness of representation underline to me the limits of 'getting close' to 'the women who was alive there'.

[129] *Why Are You Angry?*, Nashashibi/Skaer, United Kingdom, French Polynesia, 2017, 18 minutes, Colour/B&W, Stereo, 4:3, Original format: 16mm film, Source: HD Digital file, LUX.

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Retouching and Editing – V&A

Through her method of critical fabulation, Hartman writes that 'without a name, it was unlikely that I would ever find this particular girl….In being denied a name or, perhaps, in refusing to give one, she represents all the other girls who follow in her path' (Hartman 2019a). Following Hartman, I turned back to the archive, only this time, to retouch the calcinatory systems of the archive itself. Through a placement at the V&A early photography collection, I worked steadily for three months going through the catalogue, website and inventory, slowly naming the working-class sitters, adjusting the language and terminology used to describe them, working against the tide of gendered representation that has so defined these works. I began by undertaking Collections Management System (CMS) training, which enabled me to digitally retouch the inventories and catalogues. Once approved, I was let in to the V&A editing system. My first port of call was Johnston Hall. I corrected the spelling of her name, dropping the 'e' from 'Johnstone'. On the image webpage, I added a new entry under 'Subjects Depicted' and type the words 'Elizabeth Johnston Hall'. This entry now carries a hyperlink, locating her as a subject in the V&A online collection among thousands of others. I then worked through the entire collection, refining and narrowing dates and titles for each of the three hundred and forty-nine sitters depicted. Where possible, for every Adamson and Hill photograph, I paired it with its corresponding calotype negative held in various collections across the world so that future researchers can build a more comprehensive understanding that incorporates the original calotype document. Lastly, I changed the order of artist maker across the collection to alphabetical so that Adamson comes first, reversing a trend in the literature which has privileged Hill in presenting the partnership as 'Hill and Adamson'. These changes (or rather, digital retouchings) are today reflected in the catalogue of the V&A's early photography collections (Victoria and Albert Museum 2022).

I have since developed this work further in new and important ways by systematically undertaking fresh archival research on each of the named Newhaven subjects to build a better picture of their lives. I began this work at the National Records of Scotland, checking each of these names within the census records to acquire basic biographical details such as named occupation and age at the point of the census return (1841, 1851 and 1861). With these new details to hand, I then worked backwards to baptism records obtaining the sitters' place and date of birth, cause and date of death and address. By then bringing this research to bear on the V&A collection, new insights and contributions to knowledge are made. For example, in the case of the subject named (by Hill) as 'Annie Linton', my archival research shows that she married in November 1843, changing her name to Annie Linton Logan. This indicates her portrait was taken before her marriage, thereby making her one of the earliest Newhaven portraits (Adamson and Hill commenced their work in 1843). By retrieving these basic biographical details through archival research, I can now digitally retouch the V&A catalogue of the Newhaven sitters. This enables me to date some of world's earliest extant photographic portraits. More substantially, it I can build a picture of the pace of Adamson and Hill's output, the chronology of their work, the shifts in the technologies that they employed and the labour of the sitters (for example, several came back for re-sittings). This archival research is not limited to the V&A but can

be brought to bear on other Adamson and Hill collections across the world. For this chapter first and foremost, however, it enables me, as Hartman puts it, to 'redress' what she calls the 'absences and silences' of the archive (Hartman 2021).

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Her Mark

I have encountered Johnston Hall's portrait in the archival collections of the V&A, the Scottish National Portrait Gallery (SNPG), University of Glasgow (UoG), and the Wilson Photography Centre. In the photographic archives, the routine is both exhilarating and familiar: the blinds are drawn, gloves are offered (though not always[130]), and cushions are plumped to cradle the albums. An urge arrives; it is Benjamin's question, residing and resurfacing: who was the 'woman who was alive there'? The temptation to reach out and touch the salt prints and calotype negatives is strong, as though feeling the surface of the handmade nineteenth century 'J Whatman' paper might somehow bring me closer to the lived moment. These are some of the earliest extant experimentations in photography: exposing the prints to direct sunlight – even handling them – contributes to their degradation. Whatever the protocol, I follow it with care.

At the SNPG, the setting of the Reading Room makes for a truly unique encounter (**B:186-187**). Rock House, the studio where the majority of Adamson and Hill's portraits were taken, is located just a few hundred metres away. The village of Newhaven is less than a mile down the road. The proximity of the sources to their place of origin makes for an intimate, sensory and haptic experience. Technologically much has changed, but there are continuities, too. By the harbour, many homes of the old fishing village still stand in remarkable, touching condition. I visit 2 Wester Close where Johnston Hall once lived. As part of a Andrew Wyld Support Grant from The Paul Mellon Centre, I am asked to talk about Johnston Hall on camera outside her home (Paul Mellon Centre 2021).[131]

The fishing industry offered a precarious living and a potentially violent death. Census returns between the years 1851 and 1891 show that Elizabeth Johnston Hall and her husband, Daniel Hall, avoided this fate. Yet her life was far from straightforward: in older age, widowed and without children, she died in poverty. Her body was buried, unnamed, in a communal plot. The disconnect between the representation of Johnston Hall (the 'Newhaven Madonna') and the material conditions of her life is stark. What might she and the fishwives have thought about the subsequent (even contemporaneous) commentaries on their portraits? Might they have read the 1846 'sonsy fishwives' review in *The Witness* (Brown 1846)? How might Johnston Hall have responded to those ideological, often erotic interpretations of her as Madonna and nurturer? A document in the NRS provides a partial answer to my questions. Written by a solicitor dated

[130] This depends on the regulations unique to each archive. Over time, I return to each collection with embodied knowledge of the last visit. I share different protocols with archivists as we occupy the same space, them observing me look at the images, both of us with care.

[131] To view the interview, see https://www.paul-mellon-centre.ac.uk/grants-and-fellowships/new-discoveries-calotype

1899, it reads: 'Mrs Elizabeth Johnston or Hall who declares that she cannot write on account of never having been taught' (**B:189**).[132]

I return to an image by Adamson & Hill, a group portrait often used to evidence literacy among working people in the nineteenth century, often titled 'The Letter' (**B:190**).[133] It features three fishwives huddled around a piece of paper. Their names, provided, are Marion Finlay, Mrs Margaret (Dryburgh) Lyall and Mrs Grace (Finlay) Ramsay. True to Hill's practice of naming his subjects, my research in the National Records census returns confirm the names and adds additional information regarding their occupation. But were they literate, as Adamson and Hill's calotype purports to show? In the census returns, a field titled 'her mark' is often accompanied by a hand-written 'x'. This, I take as an indication of illiteracy: they cannot write their own name. My search for an account written in their own hand again runs dry. In Ní Ghríofa's creative non-fiction work *A Ghost in the Throat*, she, like me, is concerned with the search for a historical female subject, her subjectivity. She writes about being faced with what she calls 'another grand deletion…another ordinary obliteration of a woman's life' (Ní Ghríofa 2020, 124). Looking again at Adamson and Hill's 'The Letter', I remind myself this photograph is not a depiction of literacy or otherwise. Rather, it is a *performance*.

Mavor's suggestion that the sitter's role in a photograph is a 'silent performance' (Mavor 1996, 28) prompts a different way of appreciating the fisherwomen's subjectivity in the Newhaven calotypes. One of the only dated Adamson and Hill negatives from Newhaven places a group of fisherwomen (with Rev Dr James Fairbairn) up in the Rock House south-facing garden studio in 1845. It is not implausible that many other portrait sittings happened here at the studio. While it is tempting to think of Johnston Hall captured by the harbour sunlight in her place of work, a more likely interpretation is that she was photographed in Adamson and Hill's garden at Rock House, with a black backdrop behind her. This 'non-place' suspends her in some otherworldly time, not quite off or on duty. Her image is consumed, time and again, as a 'social document'; a portal, even, into a long-lost historical era. What actually gets lost, however, is the labour of the sitter in the making of the photographic image. The portrait's allure (and construction) lies precisely in its invitation to the viewer to suppress this duplicity of labour, the labour at the harbour and that undertaken for the photographic image. Knowing the literacy of the fishwives in 'The Letter', this mise-en-scène feels all the more performed.

In the literature on Adamson and Hill, the social conditions of the portraits have been overlooked. I want to consider the idea that the fisherwomen of Newhaven were most likely paid for their sittings. Their work after all, infamously depended on trade and haggle. In the archives, the studio portraits are interleaved with calotypes captured by the sea, in particular the Newhaven harbour and St Andrews Fishergate (Adamson and Hill 1845). These portraits, then, depict models, who were taken out of their area of work only to be recast in a new labour relation (paid as sitters), and then positioned for a camera in a studio setting. The

[132] (Old Parish Registers and National Records of Scotland 1889).

[133] David Octavius Hill and Robert Adamson, Marion Finlay, Mrs Margaret (Dryburgh) Lyall and Mrs Grace (Finlay) Ramsay. Called 'The Letter', taken 1843-47, salt paper print from original calotype negative, 20.80 x 15.70 cm, Scottish National Portrait Gallery, PGP HA 298 (Adamson and Hill 1843b). See: https://www.nationalgalleries.org/art-and-artists/27649

more time I spend in the archive, the more difficult it becomes to sustain the interpretation, advanced by some, of these images as 'documentary' photographs (Wilson in Kingsley and Braun 2015a, 36), or as authentic snapshots of the Newhaven community. The calotypes are transformed when thought of as pre-arranged and above all performed sessions.

The aforementioned 'seduction' of photography (E. Edwards 2018) – that the moment depicted is within reach, within touch – becomes all the more apparent when viewing the calotype negatives in the Adamson and Hill collections. This is where the indexical quality of photography comes into view. A close look at the calotype negative reveals extraordinary details which are rendered invisible in the resulting positive salt print. When Hill marked and retouched his calotypes, he established the new fixed vision for reproduction. This is one of the earliest examples of historical 'retouching' as the term is widely understood in photographic practice.

While it is common practice to retouch prints, it was unusual to retouch a negative in the way Hill did. Salt prints are made as direct contact prints from calotypes, the negative and sensitised paper touch face-to-face when printing, meaning they have a 1:1 ratio in scale with each other (this is different from the standard enlargement of a negative in the darkroom). These technical details are important: Hill's calotype retouching reflect drawing skills to enhance a vision made in camera (**B:193**). Pencil marks on the calotype surface show hair lines being attended to (**B:195**), blots of chemistry pencilled over, and figures made more distinguished as their silhouettes are redefined. Most revealing is the erasure of the apparatus and materials used in pencil and ink removal of the watermark of the J Whatman Turkey Mill paper (**B:198-199**). Head brace at the neck, metal stands running up bodies, pegs on clothing are carefully retouched out of sight (**B:193:196**). We can't see the head brace in the Johnston Hall portrait, but from studying other calotypes, it most likely was there.

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Sun Prints in the Darkroom

In an attempt to better understand the photographed moment, I turn to art practice, and to the making of the calotype portrait. Using camera, chemistry and light, I attempt to open-up the object's history. Working with an expanded idea of reenactment, I am interested in the processes of the event, not so much an exact restaging. Lenses, materials, chemicals and paper quality are paramount. I visit the Special Collections room at the University of Glasgow to view and handle their calotype printing frame (**B:202-203**). It is huge and heavily used. The silver nitrate stains have soaked into the wood. Adamson's repetitive motion of twisting the spinning locks by hand to load and remove the light sensitive paper are visible. His labour is worn into the surface. One side of the printing frame bears several inscribed markings – retouchings – carved into the wood resembling the letter 'X'. This provided a way of moving in the dark by touch, navigating the apparatus in the absence of clear sight.

Adopting the multiple roles of the sitter, assistant and photographer, I receive training from a 'contemporary calotypist' Rob Douglas (no relation). I want to make images as historically close to Robert

Adamson's methods as possible. I approach a former fellow student from my time in Edinburgh, Catherine Cant. She reminds me of Johnston Hall, physically. She agrees to be my sitter. I make the terms of payment clear and we set the date to make the work.

The making of the calotype is a lengthy, physical and haptic process. It involves a large format camera, mounted on to a tripod. Before the sitter arrives, I select an outdoor space and hope for the Edinburgh August sun. The shoot is dependent upon it: there is no success without its rays.[134] I am in luck. In large format photography like this, I am granted a perspective of safety, hidden in the act of focussing under a dark cloth large enough to cover my head, shoulders and the apparatus. My selected view through a ground glass screen takes some getting used to: what I see is not what is before me. I am composing an image that is both upside-down and reversed, in keeping with the apparatus' predecessor, the camera obscura. Once under the cloth my vision adjusts from the bright outdoors and my new field of view is encompassed by the optical scene in front of me. It is in full colour and in motion. I am looking through a small glass ground screen with a very shallow depth of field. Focussing is paramount. I twist the focus on the camera slowly back and forth, selecting the area I want to be sharp, and it takes time – minutes. The sitter must stay still throughout this duration. Again, this is not an exact reenactment: while I have access to a more modern lens[135] that allows focussing to take place, Adamson and Hill had to measure the distance between sitter and photographer. To achieve the shot, they would physically lift the camera or instruct the sitter to move until the correct distance was established. Once the composition is ready and focus secured, I re-emerge from the seclusion of the cloth to ask (remind) the sitter not to move but to listen to further instructions.

> Ok, hold really still please. Try not to hold your breath, yeah just as still as possible. That's it, try to relax your shoulders, that's it, but shoulders down. Lovely, hold it. Beautiful. Thank you, still – there…hold…lovely

I simultaneously request truth from her, my sitter, while producing their unease. Flattery plays such an important part of the process as the photographer makes sure they get what they want from the subject. These relations are never equal, however best intended. I insert a large format film holder into the camera back, 'loaded' with my previous labours of sensitised paper (which in itself involved two stages of preparation, first in iodising the paper, then in sensitising as close to exposure as possible). Then, removing the darkslide, I inform the sitter that the portrait will take place in three, two, one….lifting the lens cap, I make my exposure. It captures not a singular moment but a durational period in which the charged paper (negative) is revealed through gradual exposure to light. For thirty seconds or so, Catherine sits motionless (**B:205**). I wonder what ongoing time will be captured in the calotype. With the lens cap returned the exposure stops (this is a primitive form of camera shutter). I replace the darkslide and prepare to return to the nearby darkroom.

[134] From Adamson and Hill's dated negatives, we can ascertain that their output flourished in the spring, summer and early autumn.
[135] Petzval lens, made by Squire & Co, in early 1860s (made for carte de visites).

The long exposure brings a degree of unpredictability: any minor movement will leave its trace in the image. Knowing now just how long it takes to make one portrait, I start to witness in real time what is asked of someone for a calotype sitting. It is durational – in this case, one hour to make two portraits – and given the Newhaven fisherwomen's trade in fresh produce, I feel increasingly certain that there must have been some monetary compensation for the suspension of their work. Again, I remember that the sitters would not bear witness to the development of their portrayal; this was a process which would have occurred in a controlled darkroom environment. I invite Catherine to join me in that space to see the development of her portrait.

In the darkroom, the negative is taken out of the film loader and placed into the developer. Units of precision are measured. The calotype paper process involves silver iodide to create a negative, which is then reproduced as a 'salted silver' positive paper print. Unlike photogenic drawings, there are two stages of chemical development, first in the calotype and then, in the salt print. I do this over two separate days. Clouding liquids are mixed until clear. In the dark, scent and taste can be used to distinguish between chemicals. I learn that silver nitrate tastes like sugar. As Schaaf notes, 'the tongue was an important analytical tool in the early days of chemistry' (Schaaf 1992a, 27). I am not prepared to try it in my pregnant state.[136] The calotype has a 'developing-out' process, in which the paper exposed to light, produces a latent image that becomes visible only after developing. It is here, in the negative's development in a solution of gallic acid, where a figurative encounter re-emerges, where the image slowly comes into view. Again, it is durational – several minutes. The process is irreversible. If the photographer becomes intimately familiar with the faces they reproduce, this is heightened in the case of the calotype.

The first thing to appear are little triangles of light captured on the neck of the sitter's t-shirt. These represent the brightest whites of the scene. In a previous discussion with my calotype trainer Rob, I asked whether Adamson and Hill's use of white shirts may have provided a measure for exposure. He had had the same thoughts. In the course of our conversation, we turned to Fishergate, one of the most discussed Adamson and Hill image. Rob put forward a convincing argument that the white linen hanging out the window was a prop for exactly this purpose. I begin to wonder whether the clothing Adamson and Hill's subject wear – their tartan, paisley, the fisherwomen's stripes of red and yellow – should be taken more seriously and their place in the making of the calotype better appreciated. As Nicklas and Pollen point out, discussing the work of historian Lou Taylor, dress 'has a long history of being marginalised and perceived as trivial…examining clothes in great detail has been seen as merely 'women's work". Taylor, they note, warns that we should 'not scrimp on the study of the 'minute detail' of garments…the actuality of clothing must come first' (Nicklas and Pollen 2015, 5). In the darkroom, I come to realise the importance of dress in the making of the artwork, learning that the red and yellows of the fisherwomen's clothing render well to the calotype. Perhaps the appeal of the fisherwomen lay in how well their clothing and dress lent themselves to the calotype camera.

[136] Before entering the darkroom, I had searched without success to find information on the risks posed by nineteenth century darkroom processes for pregnant women.

In the darkroom, the development is slow to reveal itself: at first it manifests as a latent image, then the darker tones emerge. We bear witness to the subtle yet fluent emergence of representation. Once the image achieves a certain level of a brown tone, a decision is taken to extract the paper from the developing bath. The physical experience heightens the senses and an intense relationship is formed with the emerging photograph. Performance studies theorist Rebecca Schneider suggests that reenactment produces a 'syncopated time…where *then and now punctuate each other'*. She asks: 'what if time (re)returns? What does it drag along with it?' (Schneider 2011, 2 emphasis added). It is this punctation (perhaps even suspension) of then and now that grips me in the darkroom.

As this encounter with the paper surface enhances, so does my understanding of the historical moment concealed and contained by these calotypes. The materiality of the process generates new knowledge. Reenactment creates a scene of learning where the historical distance is again narrowed, and a temporal disruption occurs. I learn how hair colour, freckles, skin colour, head clamps, clothing, all reveal themselves in new and immediate ways. Folds of cloth captured on paper are submerged in gallic acid developer and a new wet, temporal pictorial plane is activated. Remarkably, my sitter Catherine does not recognise her calotyped self as it appears before her. Her tattooed arms do not render in the calotype's light spectrum. Her auburn hair is no longer visible. Meanwhile, new freckles appear on her face that she has never seen before (**B:207**). As Dana Macfarlane notes, 'calotypes posit a truth, a glimpse of the world as if just disclosed, yet the moment of exposure of these individuals and the world they inhabit as 'true' or 'authentic' is at once undermined by the multiplicity of appearance of different selves' (MacFarlane 2018). The calotype presents to us a Catherine that is not the one that I saw through the glass screen in those durational thirty seconds, and nor is it the self she feels she knows. The reasons are chemical and optical. As Wilder suggests, the calotype can 'show or reveal different characteristics' owing to its 'limitations in reproducing equally all colours of the visible spectrum' (Wilder 2018).

In the case of the calotype, the image is contained within the fabric of the textured paper. This is its unique feature (it does not sit on top a sleek sheet of glass or metal that can be washed off and reused). I learn first-hand that one single photograph contains at least fourteen hours of labour and cannot be made easily without assistance. In the darkroom, layers of marginal and hidden labour come into view. The washing alone takes hours of care and is central to the calotype's survival. No wonder a woman was employed to do the washing. Jessie Mann, Adamson and Hill's 'thrice worthy' assistant (Simpson 2010), likely did the bulk of it (**B:208-209**). 'The Newhaven Madonna', then, possibly entails the labour of not just one woman (Johnston Hall), but a second (Mann). Certainly, Hill was not involved in the process. As he noted in a letter: 'I know not the process though it is done under my nose continually and I believe I never will' (Ware 2003, 36). Since the durability of these works resides in the fact that they were 'scrupulously' washed, (Ware 2003, 38), this labour (likely Mann's) retains its significance nearly two centuries on. In the washing, my fingertips become stained by the handling of and exposure to the chemicals, now imprinted on my skin. The Victorian terminology of the 'black art' associated with calotype making is finally understood, even as I wince at its racialised meanings.

In art practice, these material processes allow me to understand the nineteenth-century calotypes on new terms. I learn that bright sunlight is essential to the making of a successful calotype. This prompts a new insight into a by now highly familiar image: perhaps Johnston Hall was looking downwards not in 'seductive modesty', but because she had the bright sun in her eyes. This scene starts to emerge as not some private moment of contemplation but instead reveals a prearranged stage where Benjamin's interpretation of her 'modesty' no longer holds. Whether the portrait depicts inwardness or dazzling brightness, no matter how faithful a replay I arrange, the object will always belong to a 'historical force-field which is never fully knowable' (Diamond in Grant 2011, 362). I return to the archives with new knowledge and renewed curiosity derived from the materiality of the making of the artwork. The process of reenactment has shifted my focus, prompting me to re-look again, but this time with a new question: what other 'selves' (MacFarlane) might exist? At the University of Glasgow Library Special Collections, I come across exactly what I have been in search of.

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Maggie Johnstone

An 'outtake' calotype negative entitled 'Mrs Elizabeth (Johnstone) Hall' and 'Maggie Johnstone' presents a new depiction of her just moments before (or after) the original, 'iconic' portrait was taken. Fleetingly, I enter into a new encounter with Johnston Hall. The negative has been retouched in ink and inscribed with the pencil markings 'U.69', 'D+' and 'Gum' (**B:211**). What is extraordinary about this imperfect outtake is that Johnston Hall stares back. This is a move from absorption to theatricality (Fried 1998; 2008). The gaze is returned and initiates a form of communication, an exchange; she suddenly appears as a collaborator, an active agent in the making of the image. In doing so, with her eye contact and slight smile, she disrupts a century of analysis of her seductive modesty. She becomes conscious of being looked at (Jay 1993, 288). As Edwards reminds us, the capacity of the photograph to collapse historical distance and proximity lies in the manifest sense of presence that it can convey (E. Edwards 2018, 29). While her written hand is absent in the archive, here, her presence is felt in abundance in the photograph. Indeed, her subjectivity.

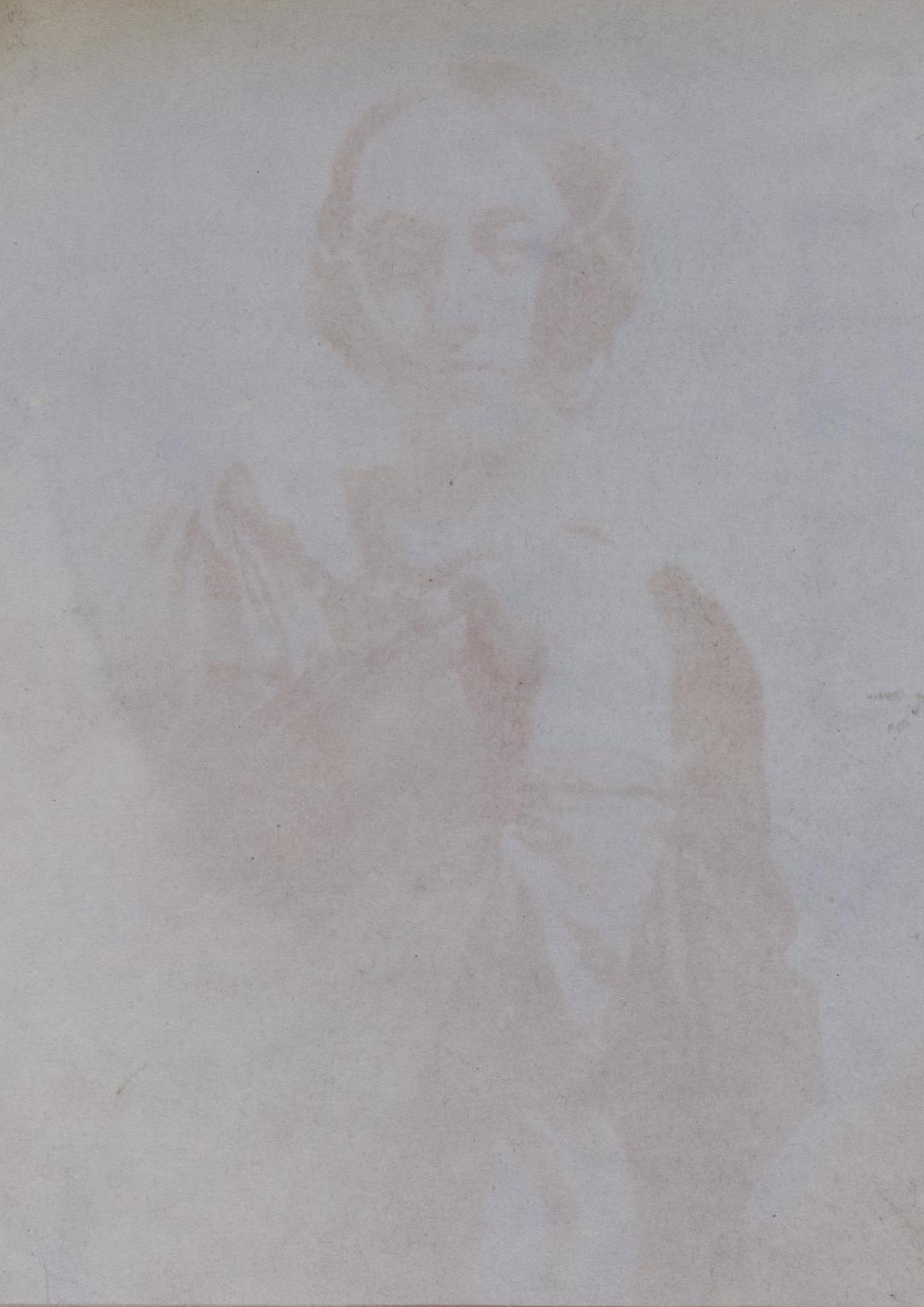
Millar has suggested that for Benjamin, the 'reality of the woman's [Hall's] presence' lies in the way she is 'reaching out of the frame'. For Benjamin, this allows for an 'encounter with the 'real' woman' (Millar 2015, 12). Yet I wonder what might have happened had Benjamin been presented in 1931 with this outtake calotype negative of Johnston Hall instead? Or, if he had encountered another woman altogether: Annie Linton (Adamson and Hill 1843a) (**B:212**). Like the outtake discussed above, Linton does not offer up 'seductive' shame or downward 'modesty'. Her direct eye contact with the photographer (and therefore viewer) distinguishes her, and invites a different reading. Unlike the polished reproduction to which Benjamin had access, this calotype negative elicits a full-frontal collaboration of the sitter, a different, more immediate sense of subjectivity.

As my time and focus is spent on Johnston Hall, something happens to ground my point of view. A new finding that changes the terrain of my research. In trying to 'get close' to the fishwives, I learn they are my ancestors. For generations, my family has lived in the surrounding area of Leith. Through research at the National Records of Scotland, I find that not only did my family hail from Newhaven, but it comprised fishermen, fisherwomen, boatmen, ship carpenters, shipwrights and fishing net makers during the period of Adamson and Hill. In the archive, I find several of my ancestors' wedding certificates bearing the signature of Rev Dr James Fairbairn, considered by scholars to be the figure who arranged the introductions between Hill and the people of Newhaven (Fairbairn was also the signatory on Johnston Hall's marriage certificate).[137] Through this archival turn, I can now locate several portraits in Adamson and Hill's Newhaven series as members of my extended family (Gray and Gray 1991) (**B:215-219**).[138] Perhaps most significantly, the aforementioned group portrait, 'The Letter' – an image upheld as an example of working-class literacy – depicts two distant ancestors of mine. In my pursuit of scholarly and practice-based findings, I had overlooked a source closer to home. Both practice and archive, then, lead to a rethinking of the making of the calotype, a rethinking where I am even more implicated as a researcher (Guy 2019).

I never did find the trace of Johnston Hall in her own hand. But this autobiographical finding stands in its place. In his *A Little History of Photography*, Benjamin wrote that Adamson and Hill's photograph of Johnston Hall led him to go in search of 'the tiny spare of contingency, of the Here and Now, with which reality has so to speak seared the subject, to find the inconspicuous spot where in the immediacy of that long-forgotten moment, the future subsists so eloquently that we, looking back, may rediscover it' (Walter Benjamin 2008, 276–77). That 'spark of contingency' has been met, to a degree, by research in the archives and my method of reenactment in art practice. But so much remains unknown and unknowable. My own desire to get close to 'the woman who was alive there' has been met in an unexpected autobiographical uncovering. By looking again at Adamson and Hill's fisherwomen, retouching through research and through practice, the experience of the sitter has provided new ways to comprehend how women shaped the making of early photography. My closeness to the photographed moment is not so much known as felt through the materiality of my haptic method. Through retouching I have been able to study and situate the paper calotype as a photograph that can be experienced and sensed, with a life of its own, and one that offers a glimpse of the subjectivity of the sitter.

[137] Old Parish Registers and National Records of Scotland 1822. Fairbairn was also the minister in the only dated Newhaven calotype (see discussion above).

[138] See, for example, David Octavius Hill and Robert Adamson, 'Group of Newhaven Fishermen', taken 1843-47, printed 1991 by Michael and Barbara Gray, Modern salt print from original calotype negative, 21.30 x 15.70 cm, Scottish National Portrait Gallery, PGP HA 5358 (Gray and Gray 1991). See https://www.nationalgalleries.org/art-and-artists/89573



Conclusion

This practice-led project has researched and made artworks about the contributions of marginal figures in the early history of Scottish photography: the eighteenth-century chemist Elizabeth Fulhame, the barely known mid-nineteenth century protophotographic experiments of Mary Somerville and the photographed 'fishwives' of Newhaven. In encountering this underside of the early history of photography in Scotland, my aim has been to bring the gendered and near invisible labour of early photography into view. Though localised to Scotland (and in particular, Edinburgh), my hope is that its methods – and in particular, the feminist research method of retouching that has driven the project – can be deployed in other archival and art practice contexts. Each chapter of this work has woven together historical research and art practice, with one inflecting and informing the other. The reenactments were never conceived as technically precise, utterly faithful *repetitions* of Fulhame and Somerville's experiments. Rather, my aim was to approach them more creatively and experimentally as ways of getting materially closer to the processes and methods of my historical subjects. My reenactments adopted a creative freedom and 'playful irreverence towards source material' (Thompson 2023, 598). They are art works: experimental, speculative and suggestive. Though undertaken with attentiveness to the science of the original, they have not been defined by it.

The genesis of this project was in art practice. Nevertheless, Part A has provided ample space to explore the extensive archival research undertaken. It was necessary to present the work in this way in order to provide as comprehensible an account as possible of the context, networks and biographies through which these marginal contributions to photography were made. In making this contribution, the project has addressed significant absences in the existing literature. The questions that I asked of the archive were shaped, indeed *answered*, through art practice. In turn, practice generated new research questions. This mutual back and forth between practice led-research and archival research was the animating feature of the unfolding of this project. In the final analysis, it was in and through art practice where the research questions were been probed, pushed and addressed in new ways. Reenactment provided a feminist 'space of learning' (Grant 2017, 262) in which I came to know the proto and early photographic contributions of my historical subjects and made them visible.

The realised project has been limited to three historical figures: Fulhame, Somerville and Johnston Hall. However, the broader research process expanded well beyond these boundaries, and included, for example, a reenactment of Maria Theresa Short's 1835 camera obscura in Old Observatory House on Calton Hill, Edinburgh. Short's life and work has barely been discussed in relation to photography, yet her camera obscura was open for the public through the 1840s and was situated just meters away from Adamson and Hill's Rock House studio. Though not included in the thesis, in reenacting her camera obscura I was able to bring protophotographic optical experiences into view and add another dimension to my wider study of women and early photography, one that will continue beyond the life of this doctoral project (**B:225-230**).[139]

[139] On Maria Theresa Short's life and work, see Loader (2018).

When I commenced my doctoral studies in late 2017, early photography was being brought into contemporary art practice on new terms. Artists and Mat Collishaw, Cornelia Parker and Hiroshi Sugimoto had work on display at Photo London 2017 and 2018 with a direct lineage to Talbot.[140] Collishaw's work, *Thresholds*, created a virtual reality experience in which visitors were invited to 'travel back in time to 1839 when British scientist William Henry Fox Talbot first presented his photographic prints to the public' in Birmingham (Photo London 2017). The work was technical and the design minimal: in a white room filled with white vitrines, viewers were fitted with VR headsets and prompted by gallery attendants to move around the space. Designed to 'restage' the first photographic exhibition held in the United Kingdom, viewers would stop to hold their hands midair over the empty physical display cases and 'pick up' the virtual contents. Here, touch was both gestured and virtual (the only physical contact I had was with the headsets and the other viewers I brushed past in the gallery space). This relative absence of touch enhanced the desire for more, and it was in this moment that some of the first ideas for my project were generated, particularly around the materiality of the image and its representation.

A key feature of this thesis has been the making of photochemical works that have carried the argument beyond the limits and absences of the archive, prompting findings and material insights that would not have been conjured otherwise. Through my practice, in coming to know the photochemical processes of my historical subjects, in striving to *see what she saw*, I have relearned a history of photography. The process of sensitising, coating, exposing, making and retouching has provided a form of research in itself. Seeing, holding and handling all became sites of knowledge production. Through making and research, and through making-as-research, I have come to know the early history of photography anew.

In the case of Elizabeth Fulhame, practice took my research in directions where the archive could not. It has long been established that Fulhame was a protophotographer (Schaaf 1992a; Batchen 1999; Wilder 2008; A. Morrison-Low 2018). But in returning to her once more through art practice, three key findings were reached. First, through a practice-led inquiry of reenactment, I now know that the results of her quest to reproduce 'cloths of gold, silver' (Fulhame 1794, ix) were profoundly visual, moving across a range of chemical colours. In reenacting Fulhame's work, the light that once displayed its full colour spectrum to early pioneers of protophotography has represented itself once more. In a research encounter in which I have had to contend with the invisibility of Fulhame's chemical experiments, my practice has given a visual form to her contribution to photography. Second, this engagement with the materiality of Fulhame's process led me to reframe her published output. In learning by doing, by understanding Fulhame's historical and material processes first-hand, I came to rethink *An Essay on Combustion* as a *creative* work. In the preface to the book she writes:

> Some time after this period, I found the invention was applicable to painting, and would also contribute to facilitate the study of geography: for I have applied it to some maps, the rivers of

[140] *Sun Pictures Then and Now: Talbot and His Legacy* (Photo London and Kraus Jr. 2018) included Cornelia Parker and Hiroshi Sugimoto's work alongside Talbot's. See Parker's *Fox Talbot's Articles of Glass (tagged decanters)*, 2017 and Sugimoto's, *Talbotized 012*, 2013.

> which I represented in silver, and the cities in gold. The rivers appearing, as it were, in silver streams, have a most pleasing effect on the sight, and relieve the eye of that painful search for the course, and origin, of rivers, the minutest branches of which can be splendidly represented in this way (Fulhame 1794, iv).

I had read these words before, of course. But it was in the bodily, haptic and sensory encounter with Fulhame in practice – the coating of silk cuttings – that I came to really understand the creativity of the process described. This was not 'just' a chemical experiment, but one that had a creative and visual output. Third, this re-reading of *An Essay on Combustion* prompted by practice led me to appreciate her work as an invitation to her readers to engage in creative reenactment itself. In one passage, for example, she informs the reader that 'most of the experiments may be performed in the open air' (Fulhame 1794, xviii). Later, in a section recounting how she 'stemmed the boisterous tide' of male criticism, she describes her work as a 'beacon to future mariners' (Fulhame 1794, xx). In other words, she was presenting her work as something that could be repeated, reenacted. This reframing of her book seems so obvious to me now, but it was only reached in the course of my practice. This in turn led me to consider the possibility that others might have taken up her invitation to reenact, that she might have shared samples of her material output, and that some surviving traces might even remain of these works. This last point became all the more tangible one afternoon late in the course of this study when, after taking the rolled-up sheet of silk from my cupboard, I noticed that flecks of silver and pools of pink lilac and grey were still visible to the eye, several years on. The work had not faded completely, its visual quality remained.

My findings (from my cupboard) were in turn inflected back onto the archive, where I returned with a renewed sense of purpose and direction. The visuality of my practice led me to return to her writing and see that she was indeed captivated by the material and visual qualities of her experiment. They led me to discover, for example, that Fulhame's maps travelled as far as Geneva. They also enabled me to speculate that these maps may still exist today.

These investigations were undertaken in a continued dialogue with other artists. Rosemary Mayer and Karla Black, for example, work *with* the after-lives of their artworks and their impermanence. As Wade notes: 'her [Mayer's] work wasn't always designed to last. Her diaries and letters attest to the difficulties of making unmarketable art without a reliable source of income, and her abiding sense of exclusion from the art establishment.' (F. Wade 2022). In a fascinating overview of maintenance and cleaning in the preservation of scientific enquiry, Werrett (2018) draws attention to the neglected labour of servants, and the mundane yet vital role of polishing, cleaning, rubbing and wiping. In one 1776 record, servants are instructed to draw the blinds at certain intervals in the day to 'keep the sun off the furnishings' (Werrett 2018, 94).

Similar findings were reached in the reenactments with Mary Somerville's method in Chapter II. Like Fulhame, Somerville's protophotographic outputs were unknown to me and presumed nonextant: anthotypes are known not to last. Practice provided a method of giving form to her experiments and an appreciation of their colour and visuality. Reenacting Somerville's methods also pushed me to question

what photography is, and what it can be. Her photochemical experiments were revealed to me to be much closer to contemporary abstract art photography than a more traditionally understood historical photographic object could ever be. They are 'made rather than taken' (Batchen 2022, 62). This is cameraless photography. As Barnes notes, 'cameraless images offer an alternative, experimental, radical and often revelatory form of vision' (Barnes 2018, 7). Indeed, the radicality of Somerville is clear having reenacted her methods: as artists today turn increasingly to sustainable practices, the Somerville I now know feels profoundly contemporary in her interests and concerns, speaking across time. I also found that my reenactments of her 1835 experiments had more in common visually with the 'white' geometric abstractions of Kazimir Malevich or the abstract colour interactions of Josef Albers than any representational photographic image I might have initially been in search of.[141] Malevich and Albers, both influenced by mathematics and each pioneering figures in their own fields, are suitable company for Somerville given her own scientific relationship to colour and light.

The photographs I made, though fundamentally different in inquiry, also hold similar aesthetics to contemporary artists working with abstract photography today. Hiroshi Sugimoto's exploration of colour, Newton and light in his work *Opticks* is particularly resonant with my project (Sugimoto 2018). His visual encounter with light is an attempt to capture what he calls 'pigments' leading to a 'new kind of painting' (Sugimoto 2018) [142]. Photographic artist Garry Fabian Miller's work is similar in form: like Sugimoto's *Opticks*, it is profoundly photographic, a capturing of a colour field through light on a photosensitive surface.[143] Most often his photography is abstract, cameraless, and brilliant in colour. Some months after I started working with Somerville's anthotypes in 2022, I attended a lecture by Miller in which he reflected on the fact that the darkroom materials that made his career are now becoming obsolete (Fabian Miller 2022).[144] Through necessity, Miller has turned to dyes to produce colour, a process he describes as having a 'direct relationship to nature, with photography as the vehicle'. As I listened to Miller, I reflected on the existence of Somerville's 1845 notebook held upstairs in the very same building, in the Weston Library. I considered the way in which she was – before the invention of colour photography – offering a way to rethink the future of photography as a more ecologically sustainable artform.

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[141] Kazimir Malevich, *Suprematist Composition: White on White*, Oil on Canvas 1918 (Malevich 1918) and Josef Albers, *White Line Square VII*, Lithograph, 1966 (J. Albers 1966). Also see (J. Albers 2013).

[142] The connections between Sugimoto's work and my own run deeper still: Somerville studied Newton in her youth and was a close scientific friend to one of the figures who disproved Newton's theory of light – Thomas Young (the other being Augustin Fresnel (1788-1827) in France). In May of 1801, Young developed the idea for the 'double-slit experiment' which demonstrated the interference of light waves. This contradicted Newton who had suggested light consisted of particles. Though many were late to adopt Young's thinking (e.g. Brougham and Brewster), Somerville championed Young. Validated in 1873, she wrote of 'Brougham's intemperate article on the undulatory theory of light, a discovery which has immortalized the name of Dr. Young' (M. Somerville and Somerville 1873, 274). It is significant that a woman denied an education was thinking ahead of her male peers. For protophotography, it is of greater significance still to acknowledge that Somerville held an advanced knowledge of the principles of light before figures like Brougham, and Brewster (a scientist publishing on the polarisation on light), who have both been celebrated as key figures in early photography in Scotland.

[143] A comprehensive overview of his abstract works can be found at the Ingleby Gallery, Edinburgh: https://www.inglebygallery.com/artists/51-garry-fabian-miller/works/

[144] The production of cibachrome – a dye destruction positive-to-positive photographic paper used by Miller and many others artists – was stopped in 2011. His abstract cameraless photographic prints made in the darkroom are now impossible to produce.

My project of locating Somerville in the history of photography through practice has been realised in a current (at the time of writing) exhibition of my work held in Cherbourg in France (Le Point du Jour 2024). The show is an exploration of how 'the invention of colour in photography resonates in current artistic creation' (Le Point du Jour 2024). My work is exhibited alongside other contemporary artists and lesser-known pioneers of nineteenth-century early photography (**B:232-238**). My artwork takes the form of photographic reenactments of Somerville's colour anthotypes. To make it, I applied essences of beetroot juice, red cabbage and turmeric, strained through cotton, to paper with a foam brush. After exposure to the rays of the sun, I was left with prints of cyan, magenta and yellow. In the exhibition, these have been placed in a display case with an accompanying page from Somerville's 1845 notebook demarcating the thresholds of the spectrum of light. Thrillingly, the curator has positioned my works alongside a facsimile of protophotographer Hippolyte Bayard's (1801–1887) photosensitive experiments with light. This is significant. In both the exhibition and the gallery's supporting text, Somerville is brought into conversation with other protophotographic thinkers. A new history of the medium has been offered with Somerville at its centre, prompted by my practice. Through archival research and photographic art practice, my inquiry into Mary Somerville's contributions to early photography is realised.

In the case of Elizabeth Johnston Hall, my art practice was concerned with understanding and exploring the subjectivity of the sitter. Through a process of retouching in art practice, I negotiated the absences of the archive by reenacting the making of the calotype paper negative. In doing so I was able to address my research questions in new ways, with outcomes that my prior research in the archive could not have yielded. When my sitter Catherine did not recognise herself in the developing bath, I became acutely aware of the many selves that can be rendered in the making of the calotype. As Dana Macfarlane notes, 'the production of different versions of the self is a significant feature of this originary moment in the history of photography' (MacFarlane 2018, 64). This was identified in the very inception of the calotype in late 1843 when a concerned David Brewster, writing to Talbot, observed: 'I have been very much struck with the different calotypes of the same person. In many of them, where the sitter was steady, - the family likeness is scarcely preserved. Does this arise from the camera? (Stevenson 1999, 64).

I came to this realisation not through Brewster, however, but through my art practice and Catherine, my subject. The experience of making of the calotype photograph was crucial here. Through the labour-intensive process, I gained a heightened awareness of the importance of sunlight to the making of the calotype image and the sitters' sense that through the long exposure a kind of distancing or lack of self-recognition occurs. This in turn led me to reevaluate the reading of Johnston Hall I had already come to know so well through Benjamin: perhaps she was looking away not from the camera but from the rays of the sun that were facing directly into her eyes? Again, as in the case with Somerville, practice led me back to the archive with a renewed sense of purpose. With new knowledge of the sitter's experience of the calotype process derived from practice, I searched in the archive for other images of Johnston Hall created by Adamson and Hill. Once located, I was able to read them differently, in ways that refused the Benjamin reading.

This thesis has stretched the study of photography in Scotland to include figures and forms that have been omitted in dominant narratives. It has been guided by practice, by feminist research methods, and by haptic encounters across archive and studio. Through retouching, I have borne witness to the emergence of a different history of women and photography. One that is now within my grasp. Her grasp.

Archives

List of Archives consulted in this project (listed alphabetically)

American Philosophical Society (Philadelphia, Pennsylvania)

Archives De L'Académie des Sciences (Paris, France)

Bibliothèque de L'Institut de France (Paris, France)

Bibliothèque De L'Académie Nationale de Médecine (Paris, France)

Bodleian Libraries (Oxford, England)

Boston Public Library (Boston, Massachusetts)

British Library Manuscripts (London, England)

British Pathé (online)

Capital Collections, Edinburgh Libraries and Museums and Galleries (Edinburgh, Scotland)

Dickinson College Archives & Special Collections (Carlisle, Pennsylvania)

Girton College Archives and Special Collections (Cambridge, Scotland)

Historic Environment Scotland (Edinburgh, Scotland)

LUX Moving Image (online)

National Galleries of Scotland (Edinburgh, Scotland)

National Library of Scotland, Special Collections (Edinburgh, Scotland)

National Library of Scotland, Maps Division (Edinburgh, Scotland)

National Museum of Scotland (Edinburgh, Scotland)

National Portrait Gallery (London, England)

National Records of Scotland (Edinburgh, Scotland)

Natural History Museum Library and Archives (London, England)

Newhaven Heritage Centre (Edinburgh, Scotland)

National Media Museum (Bradford, England)

New York Public Library (New York, New York)

Royal Institution (London, England)

Royal Irish Academy (Dublin, Ireland)

Royal Observatory Edinburgh (Scotland)

Royal Society Library (London, England)

Science History Institute (Philadelphia, Pennsylvania)

Science Museum Group Collection (London, England)

Scottish Post Office Directories (Edinburgh, Scotland)

Scottish National Portrait Gallery (Edinburgh, Scotland)

Somerville College Archives & Special Collections (Oxford, England)

St John's College Library and Archives (Cambridge, England)

The Art Institute of Chicago (Chicago, Illinois)

The Stationers Company Archive (London, England)

The Edinburgh University Library Special Collections & Museums (Edinburgh, Scotland)

University of St Andrews Libraries and Museums (St Andrews, Scotland)

University of Glasgow Archives and Special Collections (Glasgow, Scotland)

Victoria and Albert Archives (London, England)

V&A Wedgwood Collection (Stoke-on-Trent, England)

Wellcome Collection (London, England)

Image Credits (Part A)

Page 11 (**B:11**)

Cropped detail of faded salt print with lilac cast. Website description: 'Calotype depicting Miss Melville Adamson, positive calotype, part of an album of calotype photographs compiled by Dr John Adamson'
Museum reference: T.1942.1.1.18
Collection: National Museum of Scotland

Page 14 (**B:21**)

Cropped detail of faded salt print with lilac cast. Website description: 'Blank page, previously holding cut-out silhouette, from a scrapbook of calotype photographs compiled by Dr John Adamson'
Museum reference: T.1942.1.2.45.2
Collection: National Museum of Scotland

Page 25 (**B:27**)

Cropped detail of faded salt print with lilac cast. Website description: 'Calotype depicting a woman, from a scrapbook of calotype photographs compiled by Dr John Adamson', 1842
Museum Reference; T.1942.1.2.5.2
Collection: National Museum of Scotland

Page 52 (**B:99**)

Cropped detail of faded salt print with lilac cast. Website description: 'Calotype depicting a woman in a plaid dress, from a scrapbook of calotype photographs compiled by Dr John Adamson'.
Museum reference: T.1942.1.2.7.2
Collection: National Museum of Scotland

Page 78 (**B:167**)

Cropped detail of faded salt print with lilac cast. Website description: 'Calotype depicting a woman, from a scrapbook of calotype photographs compiled by Dr John Adamson', 1842
Museum reference: T.1942.1.2.45.1
Collection: National Museum of Scotland

Page 102 (**B:221**)

Cropped detail of faded salt print with lilac cast. Website description: 'Calotype depicting a woman, from a scrapbook of calotype photographs compiled by Dr John Adamson'
Museum reference: T.1942.1.2.7.1
Collection: National Museum of Scotland

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