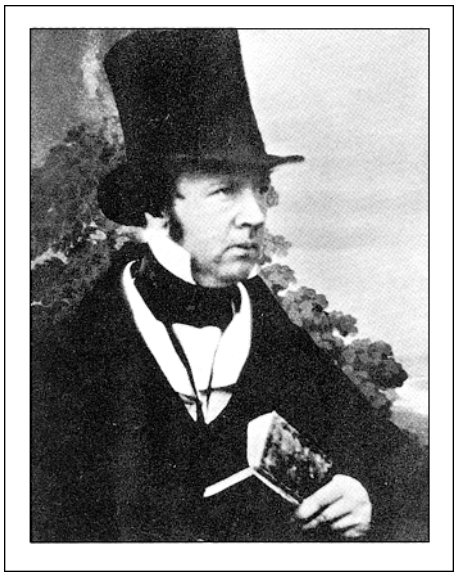
P07: Dame Nature Becomes the Drawing Mistress

The invention of images on paper

WC 4062

Sometime in 1834, William Henry Fox Talbot discovered that an image could be formed by the action of light alone on a sheet of paper impregnated with silver nitrate. This seems to have been his own discovery because he was unaware of the work done 30 or so years before by young Tom Wedgewood. However, like Wedgewood, he also found that left exposed to light, the sheet of paper turned black all over and the image was lost.



William Henry Fox Talbot, 1844.

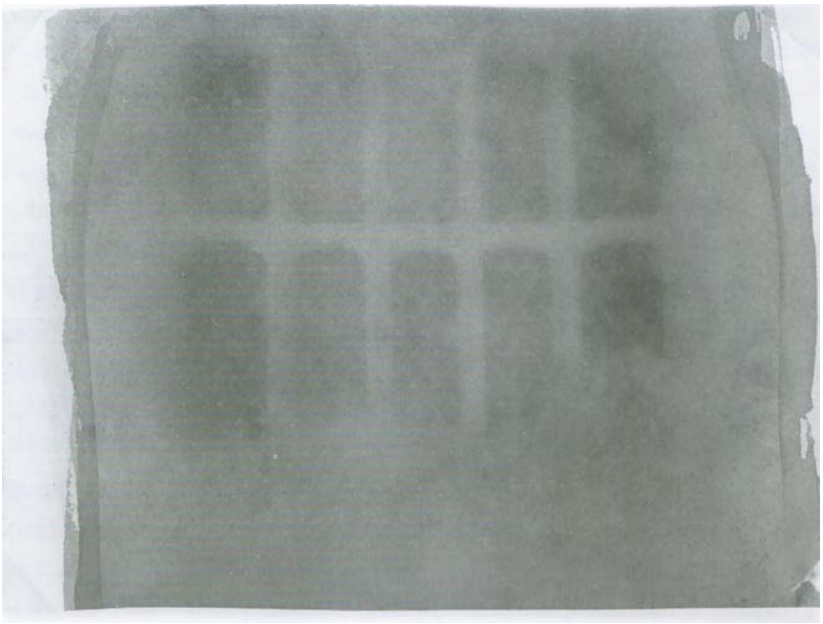
He also found, like others had done before this, that silver nitrate was too slow. He then began soaking paper in sodium chloride (common salt), allowing it to dry and then coating it with silver nitrate. Although the paper overall darkened at much the same rate as with silver nitrate alone, the edges darkened more rapidly, suggesting to the young experimenter that the concentration of sodium chloride might be a factor. When he used a lower concentration of salt, Fox Talbot found the paper darkened more rapidly and uniformly while higher concentrations appeared to retard the reaction.

So, by February 1835, this 34 year old brilliant mathematician and one-time Member of Parliament not only had the means of sensitising paper to the effects of sunlight but also had discovered what Wedgewood and others before him had failed to find, a method of rendering the image permanent. By washing the image in salt solution, the image was, as we say, "fixed"….

Of course, Tom Wedgewood had made successful images on paper before his death in 1805 but, regrettably for the history of photography, he did not know or had failed to see the significance of the 18th Century discoveries by the Swedish chemist, Carl Wilhelm Scheele that light reduces silver salts to metallic silver and further — and crucial to subsequent experiments with photography — that ammonia dissolves silver salts but not its elemental form. In other words, no one had put two and two together and realised that ammonia could be used to wash away the unexposed parts of an image but would leave the darkened parts untouched, thus rendering the image permanent.

A photogram of lace made by Fox Talbot in the 1840s.

Like Wedgewood, Fox Talbot experimented making what we call "photograms", that is the images of leaves, pieces of lace and feathers, sandwiching them between a sheet of glass on top of a sheet of sensitised paper. Once he found he could render them permanent, he then turned his attention to making more sensitive paper so he could capture images in a *camera obscura.* Talbot had a local carpenter make him a series of very small cameras — his wife called them his "mousetraps" — with which he made a number of pictures of his house, Lacock Abbey, in 1835. Because he did not know that Niépce had made a successful photograph of his house, Le Gras, almost a decade earlier, he mistakenly claimed that his home *"the first that was ever known to have drawn its own picture"*[1]. One of these mousetrap pictures is held in the Science Museum in London and is the *second oldest* photograph in existence.



Henry Fox Talbot, The Latticed Window, Lacock Abbey, seen from the inside c. Summer 1835

This of course is a negative, albeit on paper. Unlike the later Daguerreotype, this of course meant that a positive could be obtained simply by placing it on top of another sheet of sensitised paper and exposing the sandwich to light.

[1] Quotation and photo from http://thispublicaddress.com/tPA4/archives/photo_history/hf_talbot/

Fox Talbot - The Latticed Window at Lacock Abbey, 1835.

This is a print taken later from the earliest surviving negative. Below is a modern photograph by Anthony Jones of the same window[2].

As for the negative itself, it did later fade somewhat so that Talbot wrote a note along side it, *Latticed window (with the camera obscura) August 1835. When first made, the squares of glass, about 200 in number, could be counted with help of a lens.*

William Henry Fox Talbot, photogenic drawing, 1840.

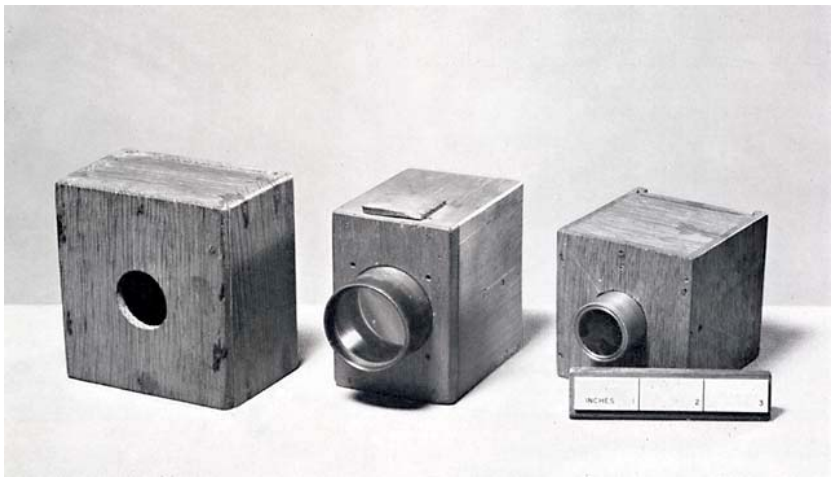
The photographs Talbot made with his mousetraps were really too small to be of much use and, for several years he turned his attention elsewhere. However, when Arago announced on 7 January 1839 that Louis Daguerre had succeeded in making permanent images in a *camera obscura*, Talbot was spurred into action in case Daguerre's method stole his thunder and so sent notes to both Arago and Biot in Paris saying that he could prove prior invention. Of course the methods devised by the two men were different and Talbot need not have

[2] http://www.ajphoto.info/pages/archive.html

panicked. However, he went ahead with publishing his findings, and on 25 January 1839 exhibited a number of what he called *photogenic drawings* at the Royal Institution. These included photograms of an insect's wing, pieces of lace, and much as Niépce had done, a copy of an engraving. And, with others, the photograph of the *Lattice Window* was also shown to the public for the first time. I don't know if a positive of this particular picture was displayed, but the list did included some positives made from their initial negatives, the first reference to the negative-positive process we all know so well. That same evening, Michael Faraday commented that

> *No human hand has hitherto traced such lines as these drawing display; and what man may hereafter do, now that Dame Nature has become his drawing mistress, it is impossible to predict*[3].

Faraday, famous for his studies in electricity, would have been thrilled to know the role photography would play in the production of electronic circuit boards and later, the computer chip!



Talbot's cameras

The same images were shown again, at the Royal society on 31 January 1839 when Talbot himself presented a paper *Some Account of the Art of Photogenic Drawing, or the process by which natural objects may be made to delineate themselves without the aid of the artist's pencil.* Talbot commented at that time that he first heard of Wedgewood's experiments only after he had made his own.

It is interesting to see, looking back, how the established Arts still had photography in thrall: for example, referring to the negative-positive process, Talbot wrote:

> *If the picture so obtained is first preserved so as to bear sunshine, it may be afterwards itself employed as an object to be copied, and by means of this second process, the lights and shadows are brought back to their original disposition. In this way we have indeed to contend with the imperfections arising from the two processes instead of one, but I believe this will be found merely a difficulty of manipulation. I propose to employ this for the*

[3] quoted in Gernsheim, H: *The Origins of Photography*, Thames & Hudson, 1982, p. 55

purpose more particularly of multiplying at small expense copies of rare or unique engravings.

Unlike Niépce, Talbot did not wax his negatives and it was left up to Sir John Hershel to suggest this to him, which he did on 12 February. Even with this advance, Hershel was still not impressed with the quality of the "drawing". When he first saw daguerreotypes, he commented to Arago: *This is amazing. Talbot's drawings are childish compared with these.*

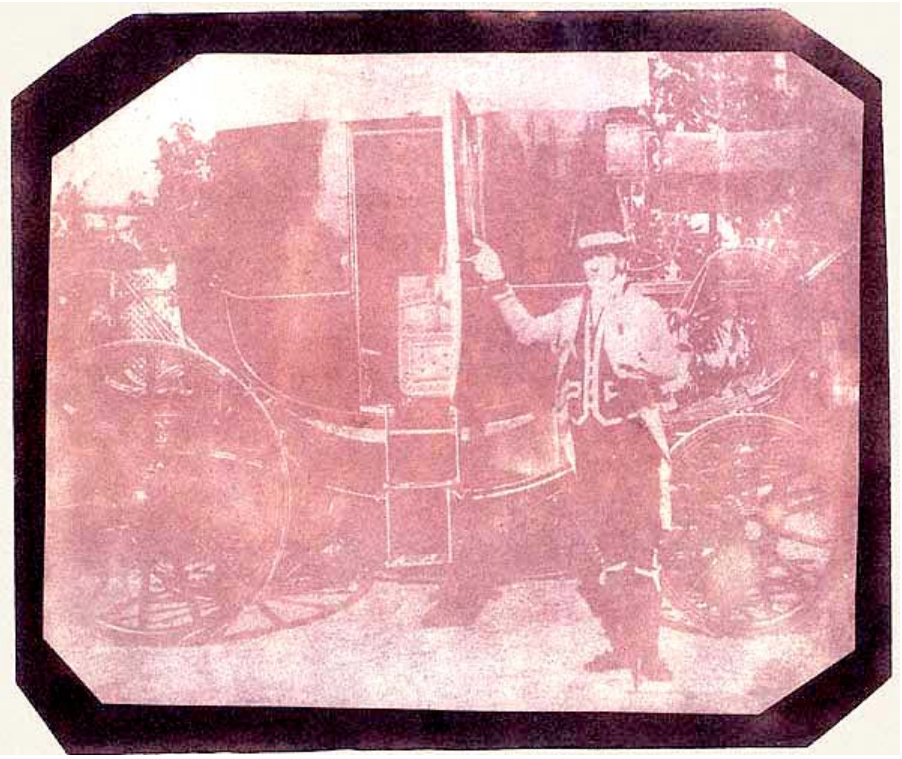
Sir John was not alone in being unimpressed by Talbot's photogenic drawings: in general, the public were in no way as impressed as they were by the images released by Daguerre in France and even the Royal Society published only an abstract, not the full version of Talbot's *Some Account of the Art of Photogenic Drawing* even though he was by that time a Fellow of the Society. Consequently, Talbot published the *Account* privately as a 13-page brochure which, as it happens, is the world's first separate publication on photography.

In 1841, Talbot announced an improved version of photogenic drawing which he called the *calotype*[4] which, like Daguerre before him, he patented. This was the result of experiments in speeding up the photogenic drawing process which included specially constructed cameras larger than the little mousetraps, the use of achromatic lens, and most importantly, the lesson learned from — as often seems to be the way with new inventions — a happy accident. Talbot, intending to use a batch of paper which had previously failed to produce an image, began to re-sensitise it using gallo-nitrate of silver. Much to his surprise, images appeared on the paper. This was on 20th or 21st of September, 1840, a date which should be tattooed on every photographer's memory because this was the day on which the *latent image* and its *development* was discovered.

The significance of this discovery is profoundly important for the history of photography from this point onwards. It is so important that — along with how to *fix* an image — Talbot's discovery of the development of the latent image, in the minds of many historians, should qualify him to be named as the father of photography rather than Niépce whose bitumen-based photograph, although technically a photograph, was not made in the way all modern photographs have been produced. Essentially, what Talbot found was that a short exposure to light is sufficient to produce chemical changes which, although invisible at the time, can be made visible by the action of other chemicals. In his case, the "gallo-nitrate of silver" with which he was attempting to revitalise the sheets of exposed paper contained gallic acid, a chemical obtained from oak-galls and which for centuries had formed the basis of permanent black writing ink but which, for decades to

[4] from the Greek Greek kalos=beautiful and tupos=impression

come, became the first photographic *developer*. This acted upon the latent image, reducing the affected silver compound to black metallic silver. Because a latent image can be produced in a much shorter exposure than can a visible image leaving light alone to do the trick, much of the inconvenience (and for a sitter, the discomfort) of earlier methods was reduced. Of course, the photographer then had to spend time in the darkroom developing the image but that was a small price to pay: from that point on, exposure times were not only shorter but the level of light required to produce an image was also reduced so that photographs in much lower light levels were then possible. The history of photography from 1840 on then becomes a history of improvements rather than of new inventions.
With his new, larger cameras and his improved technique, Talbot produced a number of photographs which are now in the Gernsheim collection in the University of Texas. One of the best known of these, a photograph of a footman posed in front of a coach belonging to Talbot's mother, bears the inscription in Talbot's handwriting: *1840. Done in 3minutes.* From the colour of the image it is clear it had been fixed using Talbot's earlier technique of washing it with sodium chloride solution which, as with the photogenic drawing (1840) shown above, produces this magenta-ish tone. Other calotypes, those of a yellow-brown colour were fixed using potassium iodide.



Henry Fox Talbot: The Coachman, 1840 Calotype.

The calotype process was not an uncomplicated business. Gernsheim[5] outlines it thus:

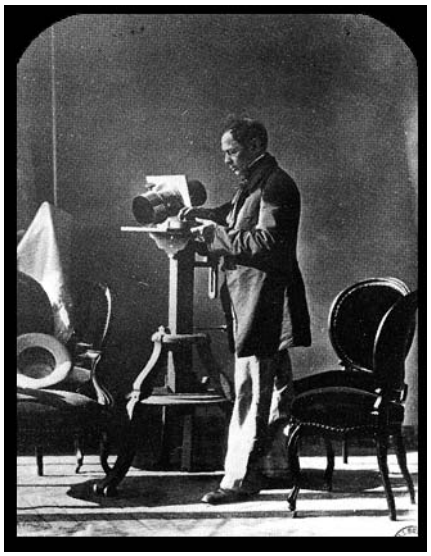
….good-quality writing paper was coated successively with solutions of nitrate of silver and iodide of potassium, forming silver iodide. The iodised paper was then rendered more sensitive by brushing it over with solutions of gallic acid and nitrate of silver, and exposed in the camera while still slightly moist or in a dry state. After exposure the latent image was developed with a further application of gallo-nitrate of silver solution and became visible when the paper was warmed by the fire for one or two

[5] op. cit. p 60

minutes. Finally, the picture was fixed with a solution of bromide of potassium, which Talbot later abandoned in favour of hyposulphite of soda, the only fixing substance which actually dissolves away the unchanged silver.

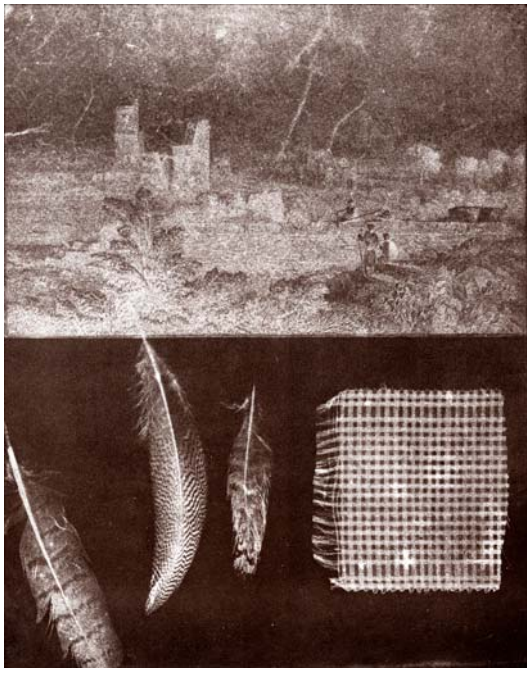
The role of gallic acid in this process needs one comment: its use as a photographic reagent was not Talbot's discovery but that of Rev JB Reade some time previously. To his credit, Talbot had the wit to realise its potential as well as the courtesy to acknowledge Reade's contribution.

Hippolyte Bayard and Direct Positives on Paper



Hippolyte Barard, self portrait, Collodion image.

Less than a month after Arago announced Daguerre's invention in January, 1839 a young Frenchman named Hippolyte Bayard began to experiment with photography. A year younger than Fox Talbot in England, Bayard followed a very similar course with his experiments but all the evidence points to his being entirely independent. Unlike Talbot, however, Bayard concentrated on the one-step direct positive rather than the lengthier process of the calotype in which a negative was made in the camera and later positives taken from it.



Within a couple of months, the young civil servant in the Ministry of Finance in Paris had produced images which he judged good enough to show to both the famous physicist, Biot, and to Arago. Perhaps Arago wanted to protect his protégé, Daguerre and persuaded Bayard not to announce his invention? Whatever happened, Bayard did not make his invention better known until 24th June 1839 when he hung 30 of his images in a large frame at an exhibition in the rooms of an auctioneer who was raising money for the victims of an earthquake in Martinique.

Hyppolyte Bayard feathers 1839 direct positive

This, of course was not one of the great learned academies, but nonetheless the images attracted attention. A Paris newspaper, *Le Moniteur*, reported the exhibition, saying:

> *….if they do not reproduce the colours of objects, if they leave something to desire in the matter of perspective, they indicate at least that the reflecting operation invented by M. Bayard should be susceptible to rapid improvement, and people are already astonished at the truth of the reduced forms, presented in a subdued light, by the objects transferred to the paper*[6].

Thanks to Arago's conflict of interest in promoting Daguerre's invention, Bayard's successes were overlooked and while Daguerre was successful in obtaining a grant from the Government with which to buy a better camera, Bayard's requests for attention and assistance fell on deaf ears.

Hippolyte Bayard: The Drowned Man
direct positive self portrait

Perhaps in protest, on 18 October 1840, Bayard posed himself, naked, as a corpse drowned — one assumes — in bureaucratic indifference. What remained unpublished and unrecognised was that Bayard actually discovered the development of the latent image independently of Fox Talbot, although in his case, he used mercury vapour to bring out the image hidden in the exposed silver chloride within the paper base. Following the presentation to the Royal Society on 14 March 1839 by Sir John Herschel of a paper extolling the advantages of *hypo*, sodium hyposulphite, Bayard enthusiastically began to use this, the chemical still in use today. As it happened, his little exhibition of 30 of his photographs in the auctioneer's rooms was also the world's first *public* photographic exhibition. And, if we are to credit him with all his innovations, we would have to acknowledge that he seems to have been the first photographer to produce a male nude — although not quite Full Monty — done from life!

Bayard however, did not go totally unrecognised. The Académie des Beaux Arts twice petitioned the Government to reward him and in 1842, the Société d'Encouragement pour l'Industrie National awarded him a prize of 3,000 francs. Bayard became a founder member of the Société Francaise de Photographie of which he was the Secretary from 1865 to 1881.

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6 Quoted in Gernsheim, op cit, p 63.

Later in his career as a photographer, Bayard abandoned his own direct positive method and adopted Fox Talbot's calotype negative/positive method. He was a genuine experimenter and tried his hand at all the new methods as they were introduced so that by the time he died in 1887, he was one of the most prolific and respected of French photographers. Although he produced photographs by later, improved techniques, probably his best-loved images are from his earlier years, especially his calotype landscapes of the windmills of Monmartre.

Hippolyte Bayard: La Galette, 1843 Calotype

Perhaps because the traditional arts — painting and drawing — were "direct positives", the emphasis in this, the mid-19th Century was on making a likeness in which the tones were as in Nature, not on an intervening negative. People also feared the loss of detail which occurred when a positive print was made from a paper negative in which the texture of the paper obscured some of the finer aspects of the image. On the other hand, the texture of the paper did confer some "artistic" quality to the final image, a feature which was picked up and enjoyed by later photographers seeking to emulate "fine art".

Sir John Herschel

Sir John Herschel, the son of the famous astronomer, made significant contributions to photography, although some of his ideas, freely given, were later patented by Fox Talbot. Among Herschel's contributions[7] were:

- He led the way in stressing that achromic lenses were imperative if a sharp focus were to be obtained and that the field of focus must be flat, not curved as some lenses projected.

[7] This is a synopsis of the list made by Gernsheim, op. cit, p 81.

- It was he who introduced the terms we use today, *negative* and *positive*, although Rochette had written *l'effet positif* on the back of one of Bayard's images on 2 November 1839.
- Herschel also described a method of obtaining a direct positive before Bayard described his;
- He also invented the *ambrotype*, which we will deal with soon, by demonstrating that a negative laid on a piece of black glass appeared positive in reflected light;
- He experimented with making photographs on glass rather than on paper;
- He demonstrated that silver bromide was much faster than the other halides then being used by people such as Talbot, Bayard and even Daguerre;
- Herschel also succeeded in making a colour photograph, of the spectrum itself, but could not fix it.

- In 1842 he invented the *blueprint* (which he called *cyanotype* because the Prussian Blue colour is achieved by combining salts of iron and cyanide. *A*lthough too slow for other photographs, this "photogenic drawing" process using different chemicals proved ideally cheap and fast for reproducing building plans. In a way, this was the first *photocopying process*.

Sir John Herschel:
Peacock Feathers, 1845 cyanotype

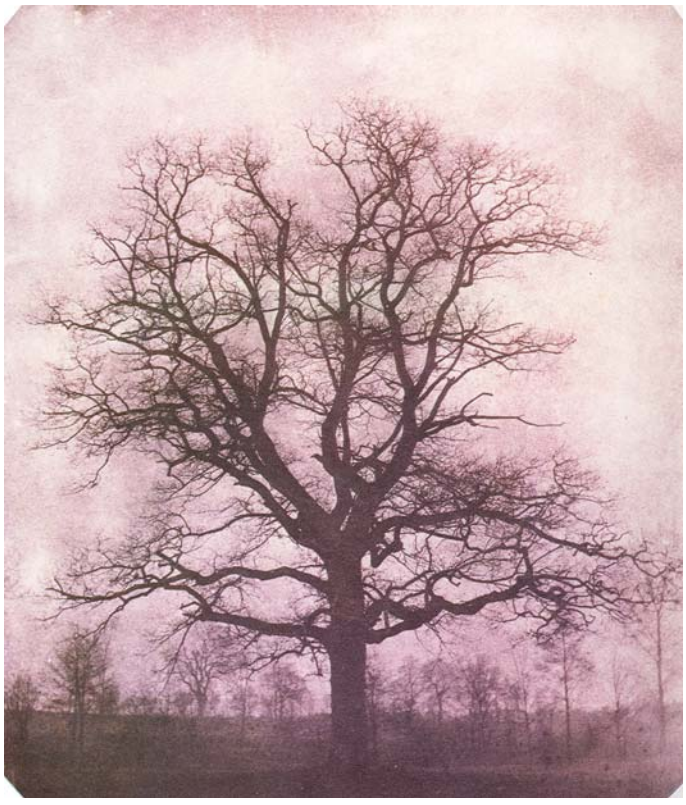
The progress of photography in England

Even though Fox Talbot contributed much to the progress of photography, in England he became part of the problem which caused innovation there to lapse behind other interested countries. Just as Daguerre's patent inhibited experimentation, so too Talbot's patent stood in the way of experimentation and improvement of his calotype process. It was not only that he charged a £20 fee for a licence, he also prohibited the exhibition, publication or sale of calotypes — later called Talbotypes by analogy with Daguerreotypes — made by the licencee. Furthermore, it seems whenever anyone, including Sir John Herschel, told him of any new ideas or discoveries they had made, he rushed off and included them in his patent.

So, for example, in 1841 his patent included *inter alia* the use of iodised paper despite the fact it was already in commercial production; gallic acid as an "accelerator" (developer) even though the Rev. Reade had been the first to use it back in 1839 and Herschel had discussed this with Talbot in a letter in the same year. In 1843, Talbot included the use of hypo — actually Herschel's idea — and a method for enlarging images which had been discovered by Wolcott 3 months prior to Talbot's patent. And in 1849, Talbot legally appropriated the discovery of the Ambrotype process (first described by Herschel in 1840) and the use of albumen on glass, a technique invented by Niépce de Saint-Victor the year before and made freely available to the world.

William Henry Fox Talbot:
Talbot's daughters in the garden,
Calotype 1842.

The great historian Hemut Gernsheim — on whom I have relied so heavily for this, the first part of this course — argues that Talbot acted in this rather unethical way, not from a need for financial gain but because he wanted recognition. Daguerre had won fame and fortune from his exploitation of photography, maybe Talbot wanted a little of the same?



William Henry Fox Talbot: Tree in winter, 1842 - calotype.

Whatever his failings, Talbot left some beautiful, early photographs, including these two which are among my personal favourites.

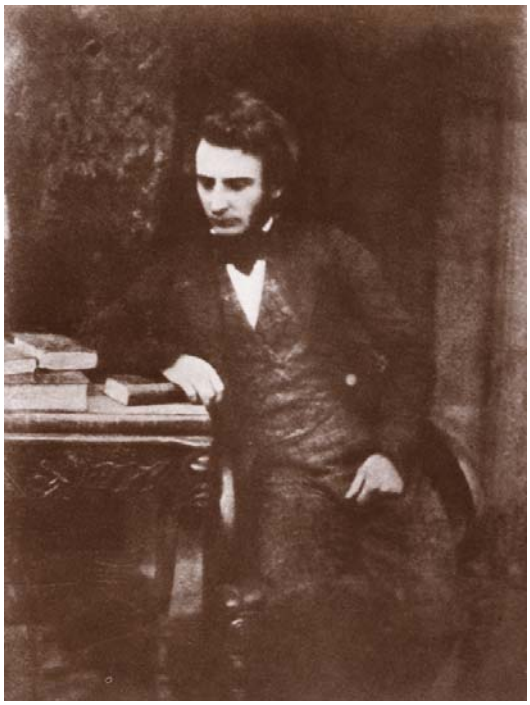
In the first, the little girls, their faces averted to avoid problems with long exposures, look like soft, gentle moths illuminating the otherwise rather gothic garden.

In the second Calotype, the bare tree in winter looks not so much cold as in mourning, the purplish-colour of the image reminiscent of Victorian mourning colours. The tracery of the branches bare of leaves has almost an anatomical feel to it…

But great though these pictures are, it was in Scotland, where Talbot's patent had no effect, that his process was brought to its greatest perfection and left for us a legacy of some of the greatest photos ever taken.

The paper image in Scotland

Scottish scientists, including Sir David Brewster and Dr. John Adamson at St. Andrew's University conducted some experiments in photography, Adamson producing the first calotype portrait in May, 1841. However, it was not John but his younger brother Robert Adamson who, along with David Octavius Hill, who made the photographs for which they— and Scotland — will be forever famous. Hill was a painter of romantic Scottish landscapes who sought out Robert Adamson to help him produce photographs from which he could later manufacture paintings. Adamson, on the other hand, was a farmer's son who would have liked to become an engineer but his health prevented it and so, his brother diverted him into photography.

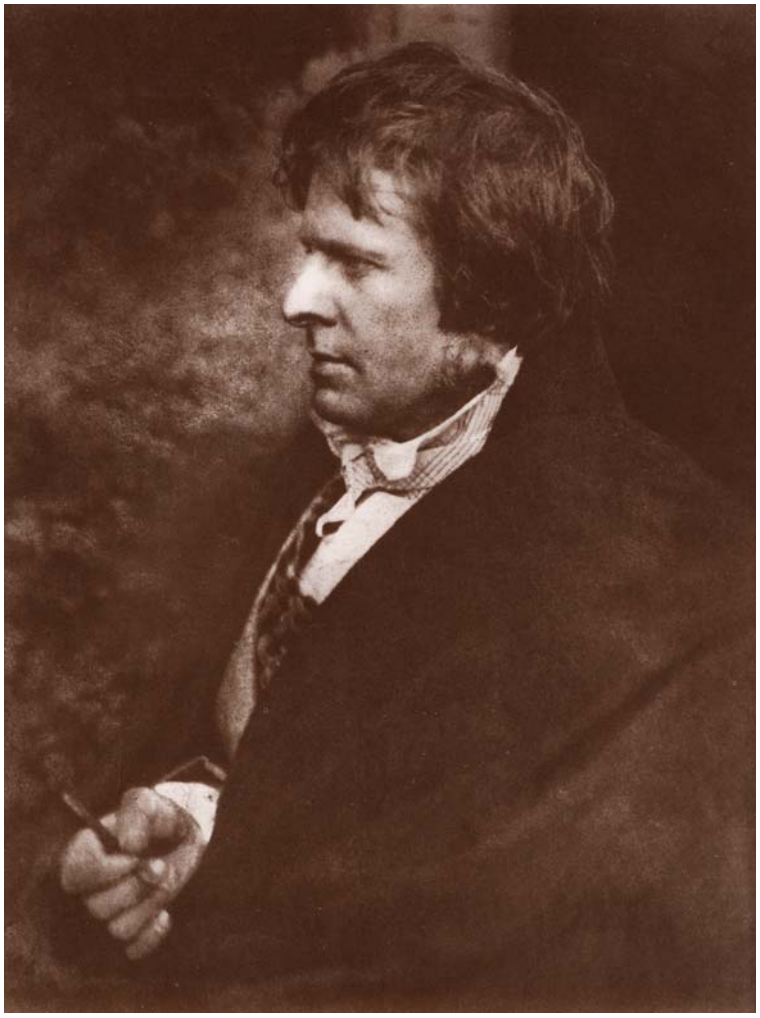


Robert Adamson:
Portrait of David Hill, 1843, calotype

It is generally thought that in their brief partnership, it was Hill who provided the artistic direction and Adamson the technological skills, but Adamson must have exerted some control over their collaboration because, after his death in 1848 at the age of 27, Hill's photographs declined into the kind of sentimental kitsch we these days associate with Victorian romantic art.

However, while Adamson was involved, their photographs were never sentimental and although posed for relatively long exposures, always appear spontaneous and almost "candid". Hill and Adamson together produced over 1800 excellent photographs during their 4½ year partnership. Two of my favourites are the *Fishwives at Newhaven* (calotype, 1845) — right — and the *Portrait of Robert Adamson,* which, although attributed solely to David Hill, to my eyes shows all the hallmarks of the photographs made by the two men in partnership.

In my opinion, this is one of the world's greatest portraits and certainly one of the greatest calotypes ever made. It integrates the texture and other qualities of the paper negative into the photograph, lending a kind of warm and soft, furry feel to the solid masculinity of this handsome young man.

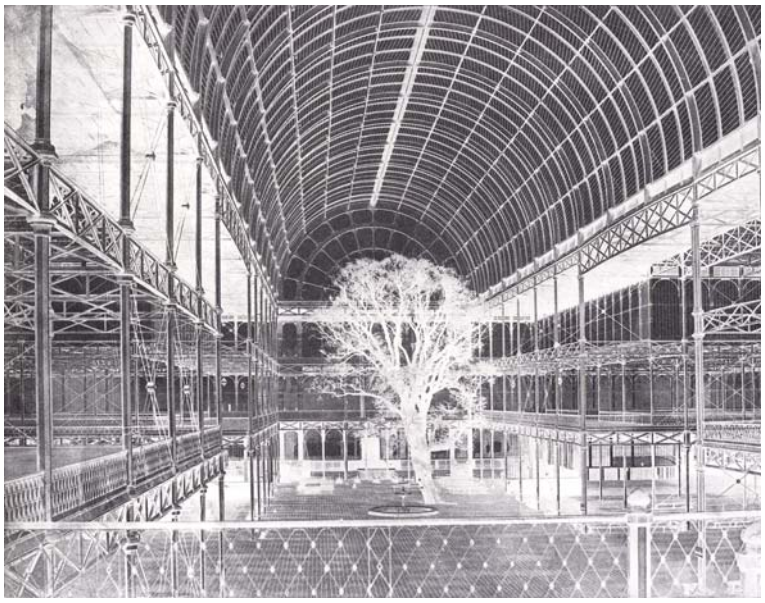


David Octavius Hill:
Portrait of Robert Adamson,
c. 1843, calotype

At another level — and I don't know if anyone else shares my view — this portrait of Robert Adamson reminds me of Mr Darcy, in the BBC tv production of *Pride and Prejudice.* But it would be unfair to the long-dead photographers to made too direct a comparison: this portrait stands alone, in its own right, as a masterpiece in the history of photography.

The decline and fall of the calotype

For many in England, asking for a licence from Fox Talbot amounted to recognising he had a right to *patent the sun*. Resentment at the restrictions he had placed on what had become a world-wide hobby as well as a flourishing industry, came to the boil when in 1851 at the Great Exhibition the English were able to see over 700 of the best photographs, made by several methods, from six nations around the world.



Coincidentally, it was in March of the same year — 1851 — that the English sculptor, Frederick Scott Archer made public his invention of the wet collodion process. Not only was this a vastly superior process but Scott Archer did not patent it and so it became the basis for photography for the next 30 years, spelling the end to both the daguerreotype and calotype eras.

Philip Henry Delamotte: interior Crystal Palace 1851-2 Positive print (below) from the waxed negative (left).