

Platinum and Early Photography

SOME ASPECTS OF THE EVOLUTION OF THE PLATINOTYPE

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The Johnson Matthey Group

The stability of platinum was well known, and the light sensitivity of some of its salts had been studied, long before a practical photographic process was available. Early photographic prints based upon silver salts lacked permanence, however, so alternatives were sought and eventually a much improved process using platinum was evolved. These platinotype prints became very popular around the turn of this century but the non-availability of platinum for this application during the First World War resulted in the virtual disappearance of the process from commercial photography. This article considers some of the work and just a few of the many people who contributed to the success of the platinum printing process which, fortunately, is still practised by a small number of creative enthusiasts.

Just over one hundred years ago in 1883 Captain William de Wiveleslie Abney, (1843–1920) rendered a considerable service to photographers throughout the English speaking world by publishing in the journal of the Photographic Society—later to become the Royal Photographic Society of Great Britain—a translation of an award winning dissertation by two Austrian army officers, Captain Josef Pizzighelli and Baron Arthur von Hübl (1).

Their booklet “Die Platinotypie” had been published in Austria in the previous year and because of the theoretical and practical importance of the subject the Photographic Society obtained the English copyright (2). The

When “Die Platinotypie” was first published in Vienna it included an original platinotype frontispiece, measuring 4×4.5 inches, produced from a negative taken by the court photographer Victor Angerer (4). In addition to the English translation serialised in *The Photographic Journal*, and reprinted three years later as a brochure (5), the dissertation was also translated into French and published in Paris in 1883 (6); unfortunately it appears that none of these versions included the platinotype frontispiece reproduced here



Austrians first gave a very brief survey of some of the early work on the light sensitive properties of some platinum salts. They then went on to describe the use of these salts in photography, including their own notable contribution to the advancement of platinum printing, because

“by our researches we hope to have brought within the reach both of the amateur and the professional photographer a process of reproduction which, in our opinion, as regards the phenomena of printing as well as the artistic effect of the results, is a most important one.” (3)

Their work was both important and timely and

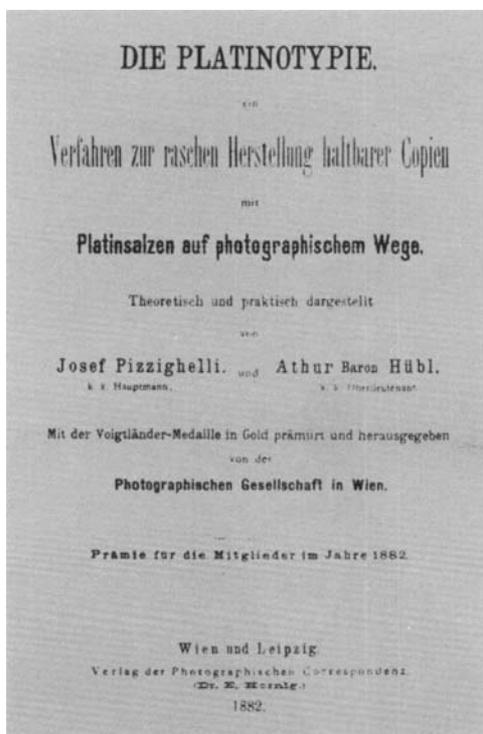
“it was undoubtedly due to the publication of this translation that platinotype printing was very much popularised. In proof of the accuracy of this opinion, every following photographic exhibition showed an increasing number of exhibits in platinotype.” (1)

However the key person in the development of the processes they described was William Willis, junior, of Bromley, Kent, England.

By 1883 photography had already passed through many stages of increasingly successful

development and utilisation; and although the word photography had been used only since 1839 the action of light, or more correctly radiant energy, upon specific metal salts had been observed several decades earlier. While it is neither practical nor necessary to give here a full account of all the work that contributed to this progress it is perhaps worth noting some of the more significant observations and experiments, particularly those carried out by workers who also aided the growth in the knowledge of platinum.

In the year 1763 Dr. William Lewis, one of the earliest researchers on platinum and the author of a book containing the first authoritative and comprehensive work on the history and properties of platinum (7), repeated and extended work carried out many years earlier by Johann Heinrich Schulze (1687–1744) who in 1727, when professor of medicine at the University of Altdorf near Nuremberg, published his discovery that a particular silver salt was sensitive to light. When Lewis died in 1781 his notebooks relating to this work were bought by the potter Josiah Wedgwood. At the same time Alexander Chisholm, who had been



When their dissertation was published Captain Josef Pizzighelli (1849–1912) was head of the army photographic department in Vienna. Although he was transferred shortly afterwards he continued with his work to improve platinum printing paper. He retired from the army in 1895, with the rank of colonel and moved to Florence where he became president of the Society Fotografica Italiana. At the time Baron Arthur von Hübl (1853–1932) was an artillery officer studying chemistry at the technical college in Vienna, where Josef Maria Eder (1855–1944) gave lectures in photochemistry. Hübl later became a field marshal and head of the Austrian Military Geographical Institute.

Lewis's assistant since about 1750, entered service with Wedgwood as chemical assistant and tutor to his fourth son Thomas. As is well known, in 1802 Thomas Wedgwood, together with Humphry Davy, published a method of reproducing drawings on glass with silver nitrate or chloride. This was a major contribution to the advance of photography and it seems very probable that Wedgwood would have known of the earlier work by Schulze, with Lewis providing the link.

In the meantime, in 1776, Torbern Olof Bergman (1735–1784) professor of chemistry at the University of Uppsala, and perhaps best known to readers of this journal for proposing the name platinum for the element previously known as platina (8), discovered the light sensitivity of silver sulphate and oxalate (9).

Light Sensitive Platinum Salts

A number of people were now investigating photochemical reactions, including the German pharmacist and chemist Adolph Ferdinand Gehlen, who also conducted detailed experiments on mercury-platinum alloys during the Chenevix/Wollaston controversy over the nature of palladium. The first reference to the light sensitivity of the compounds of platinum, and of uranium occurred in a summary of Gehlen's experiments published in 1804 (10).

Adolph Ferdinand Gehlen 1775–1815

A notable contributor to chemistry, Gehlen held the chair of chemistry at the Munich Academy of Sciences from 1807 until his death from arsenic poisoning in 1815. During the period 1803 to 1810 he edited the journal *Neues Allgemeines Journal der Chemie*, later *Journal für Chemie und Physik* then *Journal für Chemie, Physik, und Mineralogie*. It was in the first of these titles that he published an account of his investigations on the decomposition by light of metal chlorides, including platinum chloride dissolved in a mixture of ether and alcohol. This is the first known report of the light sensitivity of a platinum salt

As well as being greatly involved in the investigation of the catalytic properties of platinum the celebrated chemist Johann Wolfgang Döbereiner (1780–1849) was also engaged in photochemical researches. In 1826 he reduced platinum chloride from its solution by the action of light, and two years later he described the light sensitivity of platinum chloride in an alcoholic solution, and of sodium platinum chloride mixed with alcohol and caustic potash. His observation of the light sensitivity of ferric oxalate was later to contribute significantly to the development of platinum printing for he appreciated that platinum chloride together with oxalic acid forms metallic platinum in light. Additionally he reported that the brown solution of ammoniac of iridium is light sensitive when mixed with oxalic acid (11).

In the summer of 1832, Sir John F. W. Herschel (1792–1871), made public remarkable facts that he had observed "nearly two years ago". In a letter to Dr. Daubeny, read before the British Association at Oxford on June 22, 1832, Herschel reported that if a solution of platinum with



aqua regia had the excess acid neutralised with lime and was then cleared by filtration, no significant precipitation took place when additional lime water was added provided the mixture was made and kept in the dark. However, when it was exposed to sunlight, or even cloudy daylight, a copious white or pale yellow precipitate formed. This reaction was confined to the violet end of the spectrum and could be prevented by shielding the solution with red or yellow liquid filters (12).

It is well-known that Herschel enquired into many branches of science, and it has been reported that his chemical experiments with platinum commenced when he came across an old crucible of platinum salts left behind by Sir William Herschel, his father (13). However, despite the significance of his work with platinum the son's greatest contribution to photography was probably the introduction of hyposulphite of soda as the first practical agent for fixing photographic images.

Although Herschel is remembered principally as an astronomer and as such was involved in examining improved optical glass produced in platinum containers by Michael Faraday, he was also a very skilled investigator of photochemical reactions. In 1844, when Robert Hunt (1807–1887) published his "Researches on Light"—claimed to be the first history of photography—he acknowledged the generous assistance that he had received throughout his enquiries from Herschel (14). At the time Hunt was Secretary to the Royal Cornwall Polytechnic Society, and one of the leading photographers of the day. Later he returned to London where he held a number of important appointments, including the Chair of Experimental Physics at the Royal School of Mines, and he was one of the distinguished scientists who in 1879 proposed George Matthey for election as a Fellow of the Royal Society. Hunt was probably the first person to try to utilise the light sensitivity of platinum salts to produce a paper printing process and in his book—where he used the term PLATINOTYPES—he described his early experiments, many of which were to serve as the basis

of study by later workers. However neither his work with platinum nor that of Herschel resulted in a workable process.

Platinum Toning

As early as 1840 gold had been used for toning camera-produced images, greatly enhancing their appearance and also improving their permanence (15). Possessing somewhat similar properties it is not surprising that in time platinum was also considered for this purpose. As far as is known the Frenchman Ernest de Caranza was the first to publish a method of toning positive photographs with platinum, this being in February 1856. His work was reported in several journals (16) and just weeks later on April 21st a letter from Edward C. Cortis describing an alternative process appeared in the *Journal of the Photographic Society*, of London.

During the late 1850s and 1860s platinum images toned by processes the same as or similar to that of Caranza were being produced by many workers. Only two of these will be considered here. First, Charles John Burnett (1820–1907) a Scot who belonged to one of the oldest families in Aberdeenshire, although he was described on patent applications as a gentleman of 21 Ainslie Place, Edinburgh, the city where he spent much of his early life. Secondly Robert Sellon Sellon (1832–1877) a military engineer who served for most of his life in India.

Burnett is credited with being the first person to exhibit prints produced using platinum, this being at the British Association meeting held in Aberdeen in 1859. A newspaper report of the final day of the meeting, Wednesday 21st September, from Section B—Chemical Science, President Dr. Daubeny, records that

"Mr. C. J. Burnett showed some specimens illustrating the use of platinum in photography."
(17)

Evidently an enthusiastic experimenter, Burnett was described as "one of the sub-discoverers in the art whose names would be imperishable in the annals of photography" (18) and, indeed, several of his contributions are still

recorded in the standard text on the history of photography (19). For a period he was also a prolific writer to the photographic journals, submitting both articles and letters to the editors. In doing so he engaged in a certain amount of argument and disagreement as to what he had discovered, and where and when his work had been reported or exhibited. Certainly in 1859 he was writing authoritatively on the toning of prints with platinum and palladium (20), while he considered that "the salts of rhodium, iridium and ruthenium, also deserve trial in this way" (21). It is apparent that Burnett was one of the leading contributors to the advancement of the use of platinum group metals in photography. However, until an exhaustive study can be made of his life and work it is perhaps sufficient to quote an assessment from a book written much nearer the time by two recognised authorities on photography:

"It is difficult to know exactly what merit is to be assigned to Burnett; his papers are very numerous, and it is not easy to distinguish actual experiments from mere suggestions. However, it is quite evident that in 1857 he had endeavoured to tone silver prints with platinum and showed prints so toned in 1855. This fact gives him priority over Caranza, although his paper, not having been published until 1857, somewhat militates against this claim. Anyway his uranium experiments developed with platinum, taking the date at 1859, when they were published, although they are stated to have been produced in 1857, and shown in the same year, gives him priority over De Luynes and St. Victor. . . .

"Lastly, as the proposer of, if he did not actually use, the platinous salts, both for silver toning and developing prints in uranium, Burnett merits considerable kudos. It is, indeed, remarkable how near he came to discovering a really practical platinum process, namely, the Willis' platinum in the bath process. Burnett used ammonio-ferric oxalate, and fixed the ammonio oxalate; and he knew that platinum salts acted as developers of paper so prepared. If only, instead of wandering off into experiments with nearly every known and unknown salt, he had stuck to and perfected this one process, it cannot be doubted that the present platinotype process must have been forestalled for many years." (22)

Not only did Burnett "wander off into experiments", he also left Scotland for many years to undertake sheep farming in Australia.

Whether he continued his interest in photography during this period, or later in life when he returned to Aberdeenshire is not known.

An Explanation of the Contribution from India

A short list of people who had worked on the indirect production of platinum images, by treating silver prints obtained in the normal way with solutions of platinum, was given in "Die Platinotypie" and supported by references. Two of these occurred in 1864 in the same issue of *The Photographic News*, a weekly journal that recorded progress in photography, and the first item reads, in part:

"We have before us a very interesting series of prints, illustrating a series of experiments undertaken to test the value of several other easily reducible metals, besides gold. The metals used were platinum, rhodium and iridium alone, and combined with each other, and with gold. The experiments were undertaken by Captain Sellon, whose residence in India prevents the ready reference we should have desired to enable us to state many particulars at present unexplained. The form of salt used in each instance was a sodiochloride of the metal, so prepared for convenient exportation . . ." (23).

By this time British army engineers in India were including photographic apparatus among their scientific equipment (24). In addition, the first photographic society in India had been founded in Bombay in 1854 and an early issue of a journal produced by this society contained a communication from London reporting that

"M. Ernest de Caranza has communicated to the Academy of Sciences at Paris a novel method, or rather a novel application of a chemical substance in the toning of positive photographs, namely the chloride of platinum. He states that the colours produced by a bath containing this substance are most beautiful." (25)

It seems reasonable to suppose that this information would have become known to those in Bombay who were interested in photography. One of the first objectives of the Photographic Society of Bombay was to attempt to overcome the difficulty of obtaining pure chemicals (26). It may therefore seem surprising that in such a situation Sellon was able to experiment with the production of platinum photographic images. However, it is now suggested that close family

links would have enabled him to overcome his relative isolation from other workers in Europe, and would have provided him with the materials he required.

When Percival Norton Johnson, the founder of the firm that later became Johnson Matthey, required additional capital to support his gold refining business he was able to obtain a substantial sum from a brother-in-law, William Richard Baker Smith, who thus gained not only a financial interest but also the right to introduce his sons into the business. William R. B. Smith was a naval officer who had served with great distinction in the Napoleonic Wars and in 1847, on being nominated the heir of a maternal aunt, Sophia Sellon, he and his family assumed his mother's maiden name. By his second marriage he had eleven children and his three oldest sons by this union, Richard Edward Gore, Percival and Robert Sellon all served in India. However, it seems that the only soldier in India with the surname Sellon to rise above the rank of lieutenant was Robert Sellon Sellon, who was in India between 1852 and 1877, initially as an officer in the Bombay Corps of Engineering. He spent much of his time in public works and held the rank of captain during the period from 1858 to 1870 (27). A daughter recalled that her father was "one of the pioneers of wet plate photography" and that some 70 years after his death "his pictures after all these years show very little fading" (28). There can be no doubt that he was the Captain Sellon experimenting with the use of platinum salts for photographic purposes.

Meanwhile in London Commander William R. B. Sellon had introduced his fourth son Frederick into the business, but this young man died shortly afterwards, in 1850. The following year his place was taken by the next son, John Scudamore Sellon, who in 1860 became a partner in Johnson Matthey which by then had been involved with the platinum metals for almost half a century.

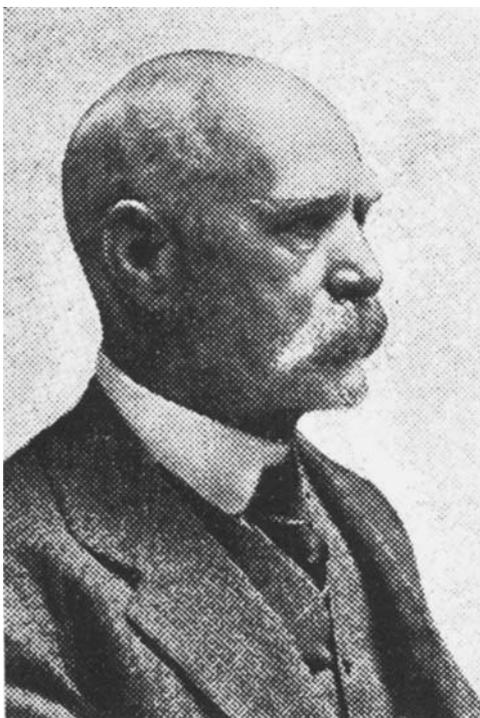
In July 1855 Robert Sellon Sellon was married in Karachi to Harriet, a daughter of Captain Thomas A. Souter, and four years later Robert's brother John Scudamore Sellon

married Harriet's sister Fanny Maria, in London. Thus it is suggested that the probability of regular communications between the two brothers, one a major supplier of the platinum metals in London and the other a potential user in India, was increased. Indeed it is evident that the ties between these two branches of the family were maintained for, in time, one of Robert's sons and two of John's were to become directors of Johnson Matthey. In addition another of Robert's sons, Ernest Marmaduke Sellon became a director of Johnson Matthey & Company Incorporated, a small platinum marketing company established in New York in July 1919.

The Work of William Willis

Using toning processes it was possible to apply platinum photographic images to glass or porcelain, where they could be fixed by a lead containing flux, but platinum toning never found any general photographic application. Indeed, no practical platinum printing process was available until the efforts of William Willis, junior, came to fruition. The elder son of a well-known engraver who had originated the aniline process used for copying engineering drawings (29), Willis worked as an engineer before moving into banking. He left the bank to work with his father on a new photographic silver process known as Alsthetype, but finding that the silver process was not permanent he determined to find a metal that would be stable under all conditions, and eventually selected platinum (30).

Many difficulties had to be overcome, but in 1873 he received his first patent for the invention of "Improvements in Photo-Chemical Printing" (31). This involved the application of solutions of simple or compound salts of platinum, iridium or gold to the surface of paper, wood or other materials suitable for printing photographic images on. In this original process three coating operations were carried out, the first using a solution of chloroplatinate or chloro-platinite of sodium. When this was dry the next coating, preferably the nitrate of silver, was applied and this was



William Willis

1841-1923

In addition to his photochemical patents between 1888 and 1905 Willis shared seven patents relating to other inventions with Mr. W. H. Smith, the works manager of his factory at Penge. These included a lamp for producing a particularly bright light for photographic purposes and airtight containers for storing sensitised platinum photographic papers, for these were degraded in a moist atmosphere. Willis was attracted to scientific work of any description, at one time particularly the spectrographic analysis of metal and mineral samples collected by friends he had made during visits to the U.S.A. In addition his scientific knowledge was available to his two local hospitals both of which obtained their first X-ray apparatus because of his appreciation of their usefulness

Mr. Willis was engaged in perfecting the platinotype process, and hoped before long to have something new to lay before the Society.

Paper manufactured by the Platinotype Company was marketed in the U.S.A. by Willis and Clements of Philadelphia but other organisations on both sides of the Atlantic also started to produce their own variety of platinum printing papers. However, Willis continued with his researches and two further patents relating to improvements in his process followed in 1887 (34, 35).

Platinum prints were superior in so many respects to those produced by other processes. When correctly developed, and adequately cleared and washed the prints remained in good condition unless the paper support was burnt or physically damaged. The texture of this support could be selected to contribute to the overall appearance of the picture, thus beautiful art papers as well as vellums and fine tissues were employed. Of course, there was no emulsion to mask this texture as the image consisted solely of platinum metal. Additionally the use of platinum enabled a very wide range of tones to be reproduced on the positive print, including the most delicate gradations recorded on the negative, while by varying the components of

followed by a final coating with a solution of ferric oxalate, or tartrate. Once dry the material was ready for exposure through a photographic negative, then the image was developed in a solution of potassium or ammonium oxalate. The picture was next rinsed in dilute acid, washed, immersed in a solution of hyposulphite of soda and again washed. This platinotype process was long and complicated, but was the subject of constant development and in 1878 and 1880 Willis received further patents for inventions that both simplified and improved on the original process (32, 33).

In 1881 William Willis was awarded the Progress Medal by the Photographic Society for his invention of the platinotype process. The medal was received on his behalf by Herbert Bowyer Berkeley (1851-1891) one of the senior employees of the Platinotype Company, the firm founded by Willis to manufacture platinum papers for the photographic trade. In thanking the Photographic Society, Berkeley, an excellent photographer who made many significant contributions to the subject, stated that



The factory of the Platinotype Company at Penge was regarded as a model one, in the sense that no scientific or technical means were neglected and no expense spared in making the materials as perfect as was humanly possible. Before a roll of photographic paper was released from the factory it was tested by exposing a sample through one of a number of standard negatives. The sepia print reproduced here, showing the painting entitled "Souvenir de Mortefontaine" by the French artist Corot, is believed to be one such test print. It was given to Arthur J. Webb when he was employed as William Willis's private research assistant and remained in the possession of his family until 1980 when it was presented to Johnson Matthey. The sepia paper, with its beautiful warm, brown tone was discovered by accident and involved the presence of mercury, although attempts were made to keep the process secret (Size of photograph $15\frac{1}{2} \times 12$ inches)

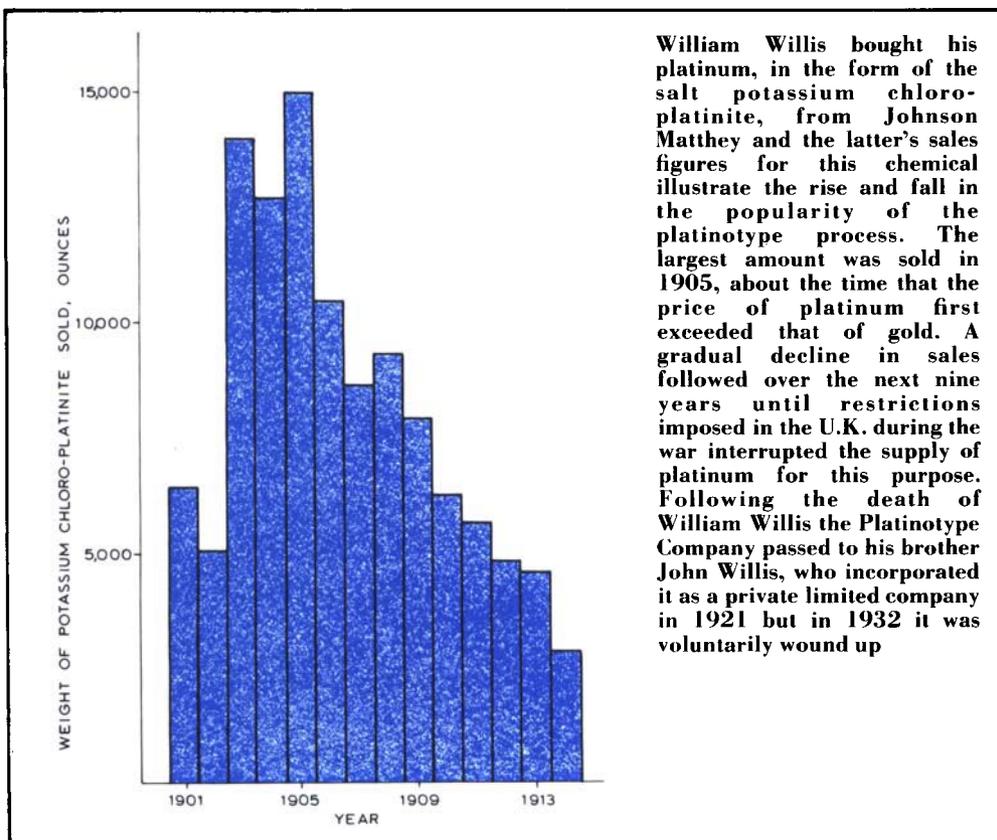
the sensitiser and the developer the grey colours characteristic of platinotype prints could be varied from a harsh black through to browns, or even red.

The Platinotype Company bought its platinum from Johnson Matthey in the form of the salt potassium chloro-platinate and Johnson Matthey's figures for the early part of this century show that sales of this salt reached a peak of 14,965 oz in 1905 (36); it is perhaps significant that it was at about this time that the price of platinum first exceeded that of gold. In addition, the decline in the popularity of the platinotype process was due, in part, to the worthwhile improvements that had been made

in other photographic processes and in the quality of the materials available.

Later Willis responded by introducing a silver-platinum Satista process (37) and a palladium process but neither achieved the success of the platinotype.

The link between Willis and Johnson Matthey was not confined to the supply of platinum salts. Much of Willis's early fundamental research was undertaken in a laboratory built in the garden of his residence in Bromley, and here for a time he employed as his private chemist a man named Arthur James Webb. In 1905 Willis decided to move into the country to Brasted Chart, Kent, and not wishing to uproot



William Willis bought his platinum, in the form of the salt potassium chloro-platinite, from Johnson Matthey and the latter's sales figures for this chemical illustrate the rise and fall in the popularity of the platinotype process. The largest amount was sold in 1905, about the time that the price of platinum first exceeded that of gold. A gradual decline in sales followed over the next nine years until restrictions imposed in the U.K. during the war interrupted the supply of platinum for this purpose. Following the death of William Willis the Platinotype Company passed to his brother John Willis, who incorporated it as a private limited company in 1921 but in 1932 it was voluntarily wound up



For a time William Willis occupied South Hill House on Mason's Hill in Bromley, Kent and this building in the garden of the residence served as his private laboratory and workshop. The figure standing in the doorway is A. J. Webb. Reproduced from a platinotype print made in 1905

his young assistant, Willis introduced him to Johnson Matthey. Webb was an honours graduate of both Oxford and London Universities and had some three years experience with the chemistry of the platinum metals. As a result, Johnson Matthey was pleased to offer him employment and he soon made significant improvements in the platinum refinery at Hatton Garden.

By 1913 Johnson Matthey sales of potassium chloro-platinite were down to 4,544 oz. With the start of the First World War greatly increased demands were made on the chemical manufacturing industry and this led to an unprecedented use of platinum. Unfortunately it also put a temporary stop to the use of the metal for platinotype photography.

Towards Photographic Perfection with the Platinum Metals

When presenting the Progress Medal for the invention of the platinotype process the President of the Photographic Society said:

“The excellence of the results obtained by this process has been rendered evident by the specimens shown in our last two exhibitions, and in the very fine enlargements exhibited at the Society’s meeting in April, 1880. These mark a new era in photography . . . the quality of permanence has come to be regarded as one of the chief recommendations of the platinotype process, which in the hands of Mr. Willis has gradually progressed so far towards perfection that pure platinum-black . . . constitutes the sole ingredient left in the texture of the paper”. (38)

Despite the application of the newest technology, it must be accepted that the mechanical processes used to print this journal are incapable of reproducing the beautiful appearance of the best original platinotype photographic prints. For this reason, and with some regret, the platinotype prints illustrated here have been selected for their historic interest, rather than their aesthetic appeal. However, readers are most earnestly advised to visit one of the museums or libraries holding early platinotypes and there see for themselves the beautiful works of art that were being



This view of the interior of Willis’ private laboratory, with darkroom beyond, shows his assistant A. J. Webb preparing for the move to Brasted Chart. After Willis moved the house was no longer used as a private residence, and the site has since been redeveloped. The platinotype prints from which this illustration and the preceding one were prepared remain in the possession of the Webb Family and, as far as is known, they have not been published previously

produced by this process around the turn of the century by the leading photographers of the day; they are unlikely to be disappointed. Perhaps then they may wish to seek out some of the contemporary images that are now being produced in the platinum metals by a small number of photographic artists on both sides of the Atlantic. In the U.S.A. in particular, the use of the platinum metals for photographic prints is currently enjoying a modest revival (39).

Acknowledgements

The author has gained much background information from the standard texts on the histories of photography and of the platinum metals, principally the Epstein translation of J. M. Eder's "History of Photography", "The History of Photography" by H. Gernsheim and A. Gernsheim, and "A History of Platinum and its Allied Metals" by D. McDonald and L. B. Hunt, Johnson Matthey, London, 1982. Thanks are also due to the historians of photography and to the librarians, who contributed information. The platinotypes of the laboratory at South Hill House are reproduced by courtesy of Mr. R. S. Webb.

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The Johnson Matthey Collection

As a contribution to the revival of platinum printing Johnson Matthey Incorporated of Malvern, Pennsylvania are working with Tom Shillea of the Rochester Institute of Technology to improve the platinum group metal salts used for this photographic process. In addition they have assembled for exhibition a collection of some of the most outstanding examples of platinotypes produced throughout the years by noted American artists. Organisations interested in displaying this collection should communicate with Mr. J. H. Povey, Manager of Public Affairs at Johnson Matthey Inc., Malvern, Pennsylvania 19355-2196, U.S.A.