

Walter Bentley Woodbury 1834-1885

and the history of his Woodburytype process

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The Woodburytype was the most accurate and perfect ink-reproduction process in the history of photography. Acknowledging this fact, textbooks tend to reduce its history to a sparse sentence: "Walter Woodbury invented the process in 1864." But the story of its invention is a little more complicated than this terse statement would imply, as I hope to demonstrate...

But first, a few details about the inventor.

W.B. Woodbury was born in Manchester, England, on 26 June 1834. He was the eldest of five children born to John Woodbury, an early advocate of the Early Closing Movement, which championed reduced working hours in order that the lower classes could pursue adult education and healthy recreations.

His father died during Walter's childhood, who was subsequently reared by his maternal grandfather, Walter Bentley, from whom his Christian names were taken.

Grandfather Walter Bentley's great passion was natural history and he was a close friend of John James Audubon (1785-1851), the American naturalist and bird painter. One of Bentley's prized possessions was the skeleton of an elephant, named 'Chunie', which he willed to the Royal College of Surgeons. But there is no record that the gift was received with alacrity or pleasure. Among Walter Bentley's other interests were scientific pursuits of all kinds. He is credited with first adapting the kaleidoscope to fabric pattern designing, and among his dabblings he experimented with the new medium of photography.

It was from his grandfather, therefore, that Walter B. Woodbury gained his first enthusiasm for mechanical and chemical experiments, and in particular for the wet-plate process, which was introduced in 1851 when Walter was 17 years old. Even before this year, one of Walter's boyhood pleasures had been the making of cameras obscura from discarded cigar boxes and spectacle lenses.

On leaving school young Walter Woodbury was articled to a civil engineer in Manchester's Patent Office - an experience which was to perform a double function in

years to come. In the immediate future, the engineering gave him a manual skill by which he would avoid starvation; in later years he was to become familiar with the patent offices through his own specifications and inventions.

But a patent office must have seemed a dull life for an intelligent, ambitious lad - particularly when measured against newspaper accounts of adventures and fortunes which were to be picked up in the Australian gold fields. During the year 1851 English newspapers were full of breathless reports of the Melbourne gold rush.

The following year, at the age of 18, Walter bought cradles, tents, picks, spades and revolvers, and set sail for the Colonies, alone but independent. He was alone only in the sense that he travelled without accompanying friends and relatives. The ship was undoubtedly crowded with emigrants, also enamoured by the prospects of a fresh start in a new country - and by the dream of gold fortunes. Between 1850 and 1870 the total population of Australia increased fourfold, from less than 1/2 million to nearly 2 millions. Unfortunately, Walter arrived in Australia a year too late; the Melbourne diggings were already being abandoned. After several months of unsuccessfully looking for employment, Walter's meager capital had been reduced to a meagre sum indeed. Like a true *aficionado*, he spent the two-thirds of his remaining cash on a camera - about the most useless thing he could buy, since he could not afford any chemicals or materials for actually taking photographs.

For the next two or three years Walter Woodbury survived only by tenacity and hard work, putting his hands to any job that was offered. During these lean years he was cooking, driving a mule team to the failing mines, acting as surveyor's labourer, building shacks for new immigrants, hanging paper and many other similar low-skilled, low-paid jobs.

But change was imminent, not only for Walter but for the whole of southern Australia. In 1851 (the year before Walter set sail for the Colonies) New South Wales, Victoria, South Australia and Tasmania were invited to draft their own constitutions as self-governing colonies. The constitutions were accepted and legalised by Act of Parliament in 1855. Self-government was followed by expansion into more of the continent, which necessitated a rapid growth of public services. Walter became a draughtsman in the engineering department of the waterworks of Melbourne. At last he had the time and the money to follow his enthusiasm for photography. All his spare time was occupied in mastering the wet-plate process and taking photographs of the construction of the waterworks and other buildings in Melbourne. In 1854 Woodbury was awarded the prize medal for photography in the Australian Colonies.

When the Government work was brought to a conclusion, Walter determined to be a professional photographer. But after six years he had become disenchanted with Australian life and wished to travel again. He planned a photographic expedition, beginning with Java, and intending to follow with Singapore, China, Japan, and Manilla. In fact, Walter did not get further than his first stop - Java - and found enough work to keep him busy for five years. During the year 1858 Walter Woodbury made hundreds of stereoscopic views of tropical scenery by the wet collodion process. His work was patronised by the Sultan, the Emperor and by the European officials on the island. Woodbury was quickly assimilated into Javanese life and prospered accordingly.

In 1859 Walter made the long and tedious sea voyage from Java to England - and sold a large set of his stereo-photographs to Negretti and Zambra, an important photographic publisher/distributor. With the publication of this series of stereoscopic views Walter Woodbury's name first became known to the photographic world. His views were considered extraordinary since they were the first photographs "showing the beauties of tropical scenery ever introduced to this country". (1) This was a considerable photographic coup for the young photographer. Henry Negretti (1818-c.1879) and Joseph Zambra (1822-?), although Italian born, founded a company in London in 1850 which developed into one of the most active and diversified photographic firms of any period. Their activities included: several studios, in London and at the Crystal Palace, for carte-de-visite and cabinet portrait photography; manufacturers of every kind of photographic equipment and device, as well as magic and phantasmagoria lanterns; official photographers to the Crystal Palace Company; publishers and distributors of portrait and topographical photographs by many of the best know workers of the day (including Francis Frith); Negretti became the first person to take photographs of London from the air (in a specially fitted balloon); and it is even claimed that the firm supplied shepherds, complete with dogs, to Patagonia.

Now with powerful backers, a respected name and increased capital, Walter Woodbury returned to Java in 1860 and established a photographic business. Although his enterprise was successful, he was forced to give up after a few years because of failing health. Woodbury returned to England in 1863 and settled in his native town of Manchester. By this date Walter was married although it is not clear whether his new wife Mary was Javanese, an English women living in Java or whether he had married during his brief return to England in 1859.

Walter Woodbury does not seem to have continued his personal photography with any great commitment after his return home. Within a year of settling in England he had conceived the first ideas of the process now known by his name: Woodburytype. The remainder of his life was concerned chiefly with perfecting the process, combating the

many difficulties that arose in the way before the process became really practical, and attempting to simplify the initial specification in order that the process would become practical for the individual photographer. "More than twenty times during the progress of the invention difficulties that seemed insurmountable had almost caused its inventor to give up in despair. The wonderful truth of surface necessary..., the perfect glass-like character required in the paper, and many other points which are now happily surmounted, all required much hard fighting to get over." (2)

During the years 1864 to 1884 Walter Bentley Woodbury obtained twenty odd patents, most of which were adaptations and improvements on his first -British patent Nr.2338 of 1864. The most important of these improvements occurred in 1879, and was considered so significant that Woodbury gave it a new name: Stannotype. Meanwhile he was busy on other inventions, and his patents also covered such devices as a camera for aerial photography from unmanned balloons, sensitised films, improvements in optical lanterns, stereoscopes, and other apparatus. He was a generous contributor to photographic and science periodicals and he edited and published Treasure Spots of the World, 1875.

As we will see, these are merely a few of Woodbury's activities during the last 20 years of his life. Never a very healthy, robust man, the constant business worries and the struggles involved in perfecting and marketing his invention, caused a complete physical breakdown.

Early in 1885 "The Woodbury Fund" was instigated by his fellow photographers with the object of soliciting subscriptions from colleagues and acquaintances which would give his family support during his illness. In May of that year, Walter Woodbury had a serious relapse and was compelled to entirely relinquish business of all kinds. The final meeting of the Woodbury Fund Committee was held on 2 July 1885 under the Chairmanship of James Glaisher. The treasurer reported that a total of 316 pounds 15 shillings had been received, a considerable portion of which had been used to carry Mr. Woodbury over the last 3 month's serious illness. The balance was forwarded to him. The committee concluded its work by noting with satisfaction that "his health and strength were now greatly restored, enabling him to recommence with fresh vigour prosecution (to successful issue, it is hoped) of some inventions in hand, one of which was made the subject of a patent during his illness." (3) Incidentally the cash donation represented a considerable amount of money in those days, when 40 percent of the population lived within 1 pound per week.

The Committees' optimism concerning Woodbury's health was short-lived. Three months later, on Friday 4 September 1885, Walter Woodbury travelled to Margate, on

the south coast of England, from his London home ("Java House," South Norwood) with his two youngest children, daughters Fayence and Mayence. Having found lodgings he "partook of tea" and went early to bed, at 8 pm - all were tired after their journey. For some time past it was Woodbury's habit to have a dose of opium before bed in order to facilitate sleep. That Friday evening he took his usual dose, telling his children he "was very tired and wanted a good sleep, and that if they did not make a noise and wake him too early in the morning he would take them for a donkey ride." The next morning the children crept quietly out of the house and did not return until between 11 am and midday. They could not wake their father and so they called the landlady. Walter B. Woodbury was found to be dead.

An inquest was held on the following Monday. Witnesses were called who testified that the deceased had been in the habit of taking laudanum, and that there was no reason to suppose that he contemplated suicide. The medical evidence was to the effect that in the case of a man of Mr. Woodbury's temperament and in his weak state of health, a dose of the drug which would do him no harm at home might prove fatal after a fatiguing journey. With so few hard facts, and the absence of any statement of intent by Woodbury, the jury returned the only possible verdict: the deceased died from an overdose of opium, self-administered, but whether accidentally or otherwise, there was no sufficient evidence to prove. Woodbury was described as a taciturn man, a "brain-worker," of eccentric habits, who would often cover his desk with unintelligible scrawls. By the deathbed, he had left a last note: a few words in French ending in *Pas les femmes*, a sentence in English ("My most intimate friends will quite understand") followed by indecipherable hieroglyphics.

The following Saturday, 12 September 1885, Woodbury's coffin was transported by train from Margate to London Bridge Station, arriving about 2 pm, and carried on to Cannon Street where it was met at 2:25 pm by the cortege, consisting of the hearse with four horse drawn coaches, containing the family - Mary, his son Walter, and the two daughters - and a few intimate friends. The coffin was lowered into the grave in Abney Park cemetery a little after 3 pm. At the graveside was gathered a large number of photographers, including George Smith, W. B. Bottom, Leon Warnerke and H. N. King. The service was brief, and as the weather was cold and grey, the crowd soon dispersed. Walter Woodbury's grave is within 40 or 50 yards of those of G. Wharton Simpson (4) and H. Baden Pritchard (5) - both intimate friends of the deceased - and lies close to the cemetery wall.

It is important that the name of Walter B. Woodbury should not be confused with Walter E. Woodbury, his son. Although Walter E. followed his father into a photographic career it was not with the same single-minded purpose and consistency, and his name

was not such a respected one, at least among the editors of the British photographic press. He led a chequered, unstable life and it is difficult to pin down his aims or even reconstruct an accurate resume of his career. Helmut Gernsheim does not mention his name in The History of Photography. This paucity of information has led students to believe that there was only one Woodbury, and hence the common attribution of the son's work to the father's name. I have found no evidence to suggest that Walter E. was a practising photographer - but he was undoubtedly a prolific writer on photographic topics. He was well-known throughout the 1890s, in both Europe and America, for his contributions. We do know that he was in Germany at the time of the rise of gelatine printing-out paper, and is credited with the coining of the word "Aristotype". In fact, he wrote the first manual on this new paper: The gelatino-chloride of silver printing-out process, London 1891. During the same year was published another technical manual with which he was involved. He was translator with Henry Snowdon Ward, of: Bromide paper. Instructions for contact printing and enlarging, by E. A. Just, first published in Vienna in 1890. There were merely two of his many photographic books, including: The encyclopaedia of photography (London 1981); Aristotypes of how to make them (New York 1893); and Photographic Amusements (New York 1896).

Incidentally, his first book - The encyclopaedia of photography - was not favourably received by the technical photographic press. The British Journal of Photography (6) was critical, and supercilious: "Mr. Woodbury says in his preface that in subsequent numbers the chief aim will be the accurate character of the information, and that the illustrations are all *very carefully* prepared by himself. It is a matter of regret for Mr. Woodbury's own reputation that his aim did not also extend to the present part or number, for we feel quite certain that in after years, when he comes to have more intimate knowledge of some of the topics on which he writes... he will feel sorry that such was ever associated with his name." Having picked out several examples of illustrations and items of information for sarcastic demolition, the Journal continued: "We are sorry, for the sake of a young author, that he has got rather badly at sea...but with care, attention, and the acquiring of some knowledge of his subject before he writes, we shall hope for improvement."

These were not mere pompous quibblings by the reviewers. Woodbury's Encyclopaedia of Photography contains a large number of careless errors in its sixty-four pages. In addition, much of the text was lifted, without credit, from other sources. A notable example is his chapter on "Wide Angle" which contains an abstract of Dr. Clarence E. Woodman's tabular investigations which were first published in the New York The Photographic Times of 1855 and used without the slightest acknowledgment of source or author. It is interesting that Woodbury's book was issued as "Part 1" -

presumably further editions were intended but, as far as I know, never materialised.

The British Journal of Photography, in spite of its criticism of Woodbury's book and his shortcomings as an accurate journalist, published an article by him only two months later - "The Printing Process of the Future" (18 September 1891) in which he extolled the virtues of gelatino-chloride printing out papers over the rapidly dying albumen process.

The Photographic Times obviously held no grudge against Walter E. for his purloining of their original material - he was invited to become the magazine's editor two years after the encyclopaedia's publication, in 1893. Based in New York, Walter E. Woodbury announced that the "journal is to be increased in size, and prize competitions are to be instituted." During his career in America, Woodbury also edited the American Annual of Photography for the Scovill and Adams Company; "was with the Velox Company", but in what capacity is not known; and wrote an article for Camera Notes, volume 1, Number 1 (July 1897) called "Is the latest process of color photography genuine?", and attempted to "counter balance the hysterical nonsense that has been published in the sensational papers." Incidentally, the article contained a small half-tone of an Alfred Stieglitz photograph.

The later years of Walter's life are empty of details. By 1905, the date of his death, he had been outside the photographic business for several years and was acting as assistant editor of a daily paper in Panama. During July of this year he contracted a fever from which he died.

Although the name of Walter E. Woodbury was well-known in photographic circles in Europe, Britain and the U.S.A. his contributions to the medium were slight compared to those of his father. The impression that is created by the few details of his life which are reported is that he was an unstable, restless individual, talented but uncommitted, without his father's tenacity or dedication. His name is mentioned only to separate father from son, and to emphasise the fact that in any discussion on Woodbury, care should be taken to indicate that the subject is either Walter B. (father) or Walter E. (son).

The remainder of this report deals solely with Walter B. Woodbury, and his contributions to photography after his return to England from Java in 1863.

Beginnings of the Woodburytype process:

As already mentioned, Walter B. Woodbury returned to England from Java in 1863 after 12 years' absence and took up residence in his native town of Manchester.

In 1864 while experimenting with carbon printing, he conceived the first idea for the process which now bears his name. From this date, Woodbury spent all his time, and money, perfecting the process. By September 1864 (7) Walter was ready to patent his ideas for photo-relief printing which produced permanent copies of photographs. The first working details of the process which were available to photographers appeared in a letter to The British Journal of Photography, 17 March 1865. As this correspondence from Woodbury neatly summarises the technique and the result of the process in a much more understandable language than the patent application, it is worth quoting it in full:

I beg to submit to your notice an entirely new method of photographic press printing, which, although in the specimens sent is not as perfect as might be wished, still promises the greatest success. You will see that it is entirely different from any press photographs that have hitherto appeared, in the fact of its appearance being exactly the same as an ordinary silver or carbon print, and not possessing any grain or stipple. This, I think, is likely to prove a more simple and efficient method than any hitherto brought before the public. I will, therefore, give you a brief outline of the method of proceeding by which the accompanying pictures have been produced.

A copper mould is obtained by exposing a sheet of bichromated gelatine behind a negative, and exposing to parallel rays of light; then washing away the undissolved portions and taking an electrotype cast in copper. This mould is then backed with gutta-percha and placed in a suitable press, having a sheet of plate glass, with strong springs, let into the back. Having greased the mould, a transparent mixture of gelatine, water and suitable colour is warmed, and a small quantity is poured on the centre of the mould. A sheet of paper is then laid on it, and the lid of the press bolted down. This, by exercising a steady pressure, squeezes all the superfluous colour out at the side; and on opening the press, the picture is taken off the mould, and in that state is in relief, which, however, dries down to be very slightly so.

The operation is remarkably quick. By having three presses, and, after setting one, then going on with the others, the picture in the first will have set; and by continuing this, as many as 200 may be easily turned out in one hour. The expense also is very trifling, as all the extra gelatine and colour squeezed out may be used over again. The principal things necessary to success are - the most exact surface of the mould, which, if bent in the slightest degree, would produce an uneven proportion to produce the necessary depth in the picture.

I hope to be able to send you better specimens and complete details of the process in a few days. It is a curious fact that having in the earlier stage of my experiments, shown a rough specimen by this process to a friend of Mr. Swan's, he acquainted me with the fact that that gentleman had also had a similar idea to myself; but as he learned that I had patented the process, he did not proceed with it. Still, as the idea of the thing occurred to him, independently of any information from me, credit is equally due to that gentleman.

Walter Woodbury.

The editors of the magazine added a footnote: "We look forward with much interest to the working details of Mr. Woodbury's extremely promising process. The specimens he has forwarded us cannot be distinguished from ordinary silver or carbon prints taken directly from the negative, except by a slight indistinctiveness of outline, which may, however, not be a defect inseparable from the process. There is no perceptible grain whatever, and the deposit seems to be as fine as reduced silver."

Woodbury's acknowledgment to (Sir) Joseph Wilson Swan in his letter is significant for two reasons. First, both Woodbury's and Swans' processes were based on the same photographic phenomenon with an identical source, as we will discuss later. Second, both men were working towards the same end - the large scale production of *permanent* prints. These facts began a controversy between the two workers which increased in bitterness throughout the year 1865. The controversy was further aggravated by the voice of John Pouncy, a photographer in Dorchester, who appears to have been the first to actually produce carbon prints (in gum) from photographic negatives. So a three-way battle developed: Swan vs. Pouncy, Swan vs. Woodbury, and Pouncy and Swan vs. Woodbury. The resultant tangle of accusations, claims and counter points are impossible to unravel but the point must be made that the Woodburytype did not have a quiet, smooth birth. As so often happens in photography, and in any other field, ideas that are 'in the air' condense in perhaps slightly different ways in the minds of several men simultaneously, even though all the requirements for the successful solution to the problem at hand had been long known. As this was true in the very introduction of photography, so it was evident in the large-scale production of permanent prints.

In the spring of 1839 Mungo Ponton observed that potassium bichromate spread on paper is light sensitive. Those areas of the soaked paper which were exposed to light were hardened, while those unaffected by the light were still soft. The image was 'fixed' by simply washing the paper, when the unhardened areas were dissolved away, leaving a permanent image.

The next important step was introduced by William Henry Fox Talbot who (working on the indications of experiments by Edmond Becquerel) found that substances such as gelatine, gum and starch acquired the same light sensitive properties when mixed with potassium bichromate. Although Talbot applied this fact to his photoglyphic engraving, it was left to Alphonse Louis Poitevin to see its use in the production of permanent prints. He mixed powdered carbon (one of the most permanent substances in nature) in bichromated gelatine, spread it on to paper, exposed it to light under a negative, and washed the paper to dissolve away the unexposed and unhardened areas of carbonated gelatine, leaving the image behind. This process was patented in August 1855 although the results were unsatisfactory in regard to their lack of half tones, the image comprising deep blacks and paper-base whites, and suitable therefore only for copying line drawings.

John Pouncy aimed to perfect Poitevin's process and produce full scale tones from a photographic negative. By 1858 he had produced imperfect, but better, results which were shown at the Photographic Society of London in April of that year. He could not patent his improvements since the basic *modus operandi* was covered by Poitevin's patent of 1855.

Meanwhile several other workers, in both France and England, were also attempting to solve the same problem. One of the most brilliant and indefatigable was Joseph Swan. He had been experimenting with pigment printing from the moment that Poitevin's patent lapsed in December 1858. (8) Swan's final solution made carbon printing practicable for every photographer. He introduced a ready-made carbon tissue which consisted of a film of gelatine in which was incorporated finely powdered carbon. The tissue was supplied in three contrast grades and in three colours, and was sensitised (with potassium bichromate) by the photographer before use. The tissue was exposed under a negative and attached to a temporary paper support and soaked in hot water. This allowed the original backing paper of the tissue to be stripped away, the soluble gelatine was dissolved, and the image appeared. When dry it was transferred to its final support. Full working details of Swan's carbon process can be found in technical manuals and reports in contemporaneous journals. But these brief remarks will indicate that although they differ in working methods both Woodbury's and Swan's processes were based on identical principles. In truth, neither men should have allowed their championing of their own process to develop into such a bitter verbal battle since both were merely using another's discoveries, and each was equally valid and applicable for different reasons.

The advantages of the Woodburytype were that the prints were machine-made and were therefore cheaper to produce than hand-made carbon prints. Woodburytypes

were therefore better suited to book illustration. On the other hand, Swan's carbon prints could be made in much larger sizes and were therefore better suited for art reproductions to hang on walls, in the home or at exhibitions. This separation of goals would indicate that the squabble over priorities between Swan and Woodbury was petty and insubstantial. However, the issue was muddied by the fact that in July 1865 Swan adapted his process to produce a mechanical form of carbon printing, called photomezzotint. A carbon print was electrotyped to produce a copper mould in which pigmented gelatine reliefs were cast. This was so similar to Woodbury's process that conflict was assured. Walter B. Woodbury saw the financial dangers that could result from having two such similar processes operating simultaneously and sensibly suggested to Swan that they should form a partnership to exploit both inventions. The deal was not concluded. But by a strange twist of fate both processes were eventually acquired by the same company (the Photo Relief Company) and later operated by the Woodbury Permanent Photographic Printing Company.

These facts will serve to set the scene for the introduction of the Woodburytype process. As Swan once remarked: "There are no inventions without a pedigree." Parenthetically, this is a convenient place to mention the fact that Woodbury's method of making a mould from the gelatin relief, either in lead or in electroplated gutta percha, was also a development of an already existing technique. For many years botanical illustrations had been produced by impressing natural objects, such as leaves or fish scales, into metal or gutta percha and printing from the resulting moulds. This process was called Nature Printing - in itself an important precursor to Woodburytypes. Space does not permit a detailed history of this printing technique and the interested reader is referred to an exceptionally well-researched paper on Nature Printing: Typographia Naturalis, by Roderick Cave and Geoffrey Wakeman (Brewhouse Press, 1967).

Suffice to say that no single aspect of the Woodburytype paper was "new"; it was a brilliant synthesis of known facts and techniques. However, once Woodbury had grasped the implications of this synthesis for photographic use, patents were obtained in rapid succession, and filed as soon as an improvement was perfected. Only six months after his first patent for photo-relief printing Woodbury filed a patent for "An improved method of producing or obtaining by the aid of photography surfaces in 'relievo' and 'intaglio' upon aluminous, vitreous, metallic, or other suitable materials." The patent was filed on 23 March 1865, and the full text can be read in The British Journal of Photography of 12 May 1865, pp. 247-8. Seemingly to avoid any controversy over the fact that his patent mentioned previously known processes, Woodbury ended his specification by admitting: "... I would remark in conclusion that I am aware that the production of a 'first mould' having a raised and depressed surface in gelatine as a transcript of a photographic negative has been previously made, but the

result has not hitherto been practically successful. I, therefore, do not claim the general principle of producing the transcript of the negative in bichromatised gelatine, but I claim its application in the manner hereinbefore described to effect the object hereinbefore mentioned."

Here is the bone of contention, stated as simply as possible: since neither Woodbury nor Swan could claim priority to the *principles* of permanent printing in bichromatised gelatine, who was the first to *apply* the process to multiple printing in pigmented gelatine on paper from one mould? Perhaps the question can never be answered with any clarity since so much of our information comes from assumptions and accusations without first hand documents. Woodbury claimed that a mutual friend had told him that Swan did not intend to continue his experiments since he learned that Woodbury had already patented them. Swan said that the same friend gave him to understand that this process "*was not included* in Mr. Woodbury's patent," (9) and anyway "I have never, for one moment, entertained the idea of abandoning the process."

Woodbury counterclaimed that in an interview with Mr. Swan early in March (1865) "I explained the whole working detail of my process; therefore I am not surprised that the specimens ... by him ... should have such great similarity to my own. At the same interview I distinctly understood from Mr. Swan that since the publication of my process he had not moved any further in the matter. Had Mr. Swan published his ideas at a prior date to mine he might lay some claim to the discovery; but as it is I regard the invention as entirely my own."

Such aggressiveness in pursuing his process does not mesh with the independent report on both Woodbury's and Swan's inventions by G. Wharton Simpson (probably the anonymous "friend" previously referred to). (10) "Thus", he concluded, "the same idea had occurred to two gentlemen independently," which seems fair enough. However, leaning towards Swan's process, Simpson continued: "Mr. Woodbury did not ... regard the principle as capable of very successful application, whilst Mr. Swan regards it as of the utmost importance, and capable of the most valuable development." It is intriguing to speculate whether in fact Woodbury did not have plans for pushing his process into a commercial product at this stage, and whether he would indeed have continued with the idea if he had not entered into an invigorating competition with Swan.

It was in February 1865 that Woodbury proposed to Swan that they should work out the printing process jointly, and that he would travel to Newcastle (Swan's home) to discuss the matter. The meeting took place on 28 February. They exchanged methods of operating and Woodbury offered Swan one-half of his interest in the patent. Swan replied that he should first like to see a copy of Woodbury's specification since Simpson

had indicated that the patent did not include details of a new system of printing. Woodbury did not have a copy with him and promised (according to Swan) to forward the specification on his return to Manchester. It was never sent. Swan said: "The inference I drew from Mr. Woodbury's failure in sending the provisional specification was that he did not wish me to see it." Accordingly Swan sent Woodbury a letter: "I could not feel at liberty to join you in maintaining the patent without first being satisfied that the new system of printing is clearly set forth in your provisional specification as a principal subject of the patent, and not an after-thought grafted on originally different ideas. As the matter now stands, being ignorant of what your provisional specification consists, and yet required to decide as to the proposal of partnership, I do not hesitate to decline it."

In fact, Woodbury's provisional patent did *not* give details of the new printing process, and Swan therefore concluded that Woodbury only thought of the printing applications of the process *after* Simpson had published an account of Swan's method. The point that really made Swan furious was Woodbury's suggestion that Swan could only make good prints by the process after he had been told Woodbury's method. Swan fumed: "... my difficulty is now to deny the implied accusation with sufficient emphasis. I find it hard to restrain the indignant expression of my belief that Mr. Woodbury well knows its injustice, and only makes it in order to break the force of an opposite accusation, which his consciousness of having appropriated some of my ideas leads him to anticipate... I believe my method of operating to be in every particular superior to his."

Obviously, Woodbury could not allow these remarks to go unchallenged. After refuting the idea that his printing process was "grafted on to originally different ideas", by stating that the gelatine on paper printing process was *implied*, Woodbury takes on a pained, injured tone of voice: "The fact that Mr. Swan being an independent inventor with myself I have never attempted to deny... On hearing that my ideas had been participated in by another, my first impulse was to share my right with that person, although an entire stranger... In making this proposition I was actuated entirely by unselfish and honourable motives, my wish being that he should have equal benefit with myself, and when there (Swan's home in Newcastle) I explained to him everything that I had done in the most open manner, but was treated in return with a certain amount of distrust that I had not expected... I was also struck with his persistency in trying to make me acknowledge that he was the original inventor, and that the process should be named Swan and Woodbury's process, to neither of which I could give my consent, and the latter of which I thought not in good taste, as I had already patented the process. As I did not at once forward my specification to Mr. Swan, he seems to have formed the idea that I did not wish him to see it. The real fact was, that after the openness and candour with which I had treated him, his seeming distrust of myself rather cooled the

desire I formed to do what I thought was right. I therefore wrote asking him for his share of the patent fees, which immediately caused him to decline proceeding in the matter."

It was left to Swan to have the last word, and he countered with a tightly-organised array of facts, the implications of which are important, if true. Swan pointed out that Woodbury's patent only mentions transparencies and casts, *not* prints in the common acceptance of that word. Woodbury did not mention coloured gelatine and paper which are essential and important ingredients in the printing process, but only porcelain, glass, metal and plaster. As Swan so clearly states: "Nothing can be clearer than this. Mr. Woodbury did not originally intend his patent to apply to the printing process, or he would undoubtedly, at first, have named the essential materials required in it... The idea of making the patent apply to the printing process was unquestionably an afterthought; for how can it be supposed that with the printing idea then in his mind, and with the intention of patenting that idea, he should omit to mention the coloured gelatine and paper, which are indispensable in carrying it out?"

A good question.

But Swan had other, equally strong, points to make: "...what I communicated to Mr. Woodbury was of much greater value than what he communicated to me. I was more open and candid with Mr. Woodbury than he was with me; and as to distrust, why the only distrust I manifested was asking to see the specification, which would not have been taken to imply any distrust if the specification had been what it was said to be. I affirm, and can prove by witnesses, that Mr. Woodbury acknowledged that I was the original inventor of the printing process, and that he consented to name the process 'Swan and Woodbury's.' It required no persistency to obtain this acknowledgment. It was my right and Mr. Woodbury then made no objection. The proposal to name the process 'Swan and Woodbury's' was made on the assumption of the correctness of Mr. Woodbury's statement that the printing process was included in his patent. Had I then known the real state of the case I should not for one moment have thought of allowing my name to be associated with his in the matter. I did not decline to join Mr. Woodbury on account of his asking for money, notwithstanding that his request was quite at variance with previous arrangement and ordinary business procedure, and was, indeed, according to Mr. Woodbury's confession, made after his 'desire to do right' 'had cooled,' and with a view to induce to decline to co-operate with him. I had, as I have stated, stronger reasons than this for declining his proposal.

Mr. Woodbury states that his motive in making proposals to me was a desire to do right. I am sorry to have to think otherwise; but, knowing more than is before the public,

I am unable to take this view of his conduct, and can only account for it on the supposition that he was actuated by a desire to secure himself in the undisputed possession of something which he wished to claim but felt he had a bad title to."

Swan ended the letter by stating "correspondence like this is exceedingly distasteful to me." The editors refused to allow the verbal battle to continue in their pages and said "We shall not offer an opinion on the merits of the question, but simply leave our readers to form their own judgment from the evidence which has now been laid before them."

In retrospect it would have been a great help if the witnesses at the Swan-Woodbury meeting had come forward and corroborated one version of the facts. Also, what was the extra evidence alluded to by Swan in his final letter? On the published evidence only two possible judgments can be made: 1) both men thought of the idea of printing pigmented gelatine on paper by the bichromate process separately and simultaneously, or: 2) Woodbury did not associate the ideas in his original patent specification with the printing process until he heard of Swan's experiments. Frankly, the latter seems more reasonable.

Inevitably, there was no chance of collaboration after this heated exchange. Each exploited his invention along different paths.

Less than one year after the controversy disappeared from the Journal's pages, Swan introduced his version of the process commercially at his Newcastle factory. (11) Swan's process was an instant business success, he sold the rights for Scotland to T. and R. Annan; for Germany to Hanfstaengl; for France and Belgium to Adolphe Braun. Swan's own company made carbon prints for English customers until the patent rights for Britain were purchased by the Autotype Printing and Publishing Company, London, in 1868.

It is important to state that the Autotype productions were not photomezzotints (the mechanical form of carbon printing so similar to Woodburytypes) but handmade carbon photographs. In spite of the fact that carbon prints were much more expensive than Woodburytypes many books were illustrated by Swan's process. Interestingly enough, the first such book was by George Wharton Simpson. (12)

It is also interesting that the first public demonstration of the Woodburytype process was held at the home of G.W. Simpson, in mid-August 1865. The demonstration was attended by the editors of the leading British photographic journals, as well as by a dozen other observers "distinguished in connection with photography, art and science."

The gentlemen were suitably impressed even though Woodbury was demonstrating with improvised apparatus, since his press, due to "a misunderstanding", did not arrive in time for the meeting. The public, too, had an opportunity to study Woodbury's results since transparencies on opal glass were exhibited in August/September of 1865 at the North London Exhibition, and moulds plus prints were shown at the Agricultural Hall.

The reason for Woodbury stressing the use of his process to images in porcelain is clarified by the reviewer's remarks on the subject in The Photographic Journal; "Another application of the same principle, and that to which we believe Mr. Woodbury, at the outset of his experiments, attached the most importance [an interesting remark in the light of the Swan controversy: author], is the production of transparencies in porcelain, the image being produced by the various degrees of relief, and, consequently, in semi-transparent material, in degrees of transparency or opacity... In a conversation, a day or two ago, with Mr. Adams, of the firm of Edwards and Son, of Dalehall Potteries, we learn that the production of such transparencies is an important branch of their manufactures, a large market for such articles being found on the Continent." (13) The writer remarked that a photographic, as opposed to hand, operation in the manufacture of these transparencies would greatly reduce their cost.

Sometime between August and October 1865, Walter E. Woodbury moved home from Brooklands, near Manchester, to "a pretty villa in one of the most beautiful districts in Surrey" about 12 miles south-west of London. It was here that most of the improvements and adaptations to the original process were carried out. At this time the process was called Woodbury's Photo-Relievo or Photo-Relief process, or Woodbury's Relief-Printing Process. Gradually these names were condensed to Woodbury's Process and eventually Woodburytypes.

Meanwhile Walter B. Woodbury was also experimenting with the stereoscope, which had first begun to interest him seriously during the production of his Java views but which remained with him throughout his life. By 1865 he had taken up a suggestion of Professor Piazza Smyth's that the normal focal length of stereo-viewer lenses were too long. Woodbury agreed, and made several other adaptations to his viewer which delighted photographic journalists who had visited his home. One remarked: "Viewed in this instrument... the pictures assumed a magnitude, with an appearance of reality, which would altogether fail to be conveyed by an ordinary stereoscope." Basically, Woodbury had reduced the standard focal length of the lenses from 6 inches to 3 1/2 inches and added a lever which adjusted the distance between the lenses. This fact is mentioned here only to emphasise that Woodbury was always working on ideas and adaptations of existing processes and equipment simultaneously with his work on the photo-relief printing technique.

From now on the developments in the history of the Woodburytype process are matters of slight modifications, business successes, promotional talks at societies, exhibitions of work and dabblings in other photographic matters as a hobby from the photo-relief printing process. His private or family life is never mentioned, nor are the names of his offspring (except Walter E., probably the eldest son) although the Woodbury's had at least three children.

One such demonstration of the Woodburytype process was held at the London Photographic Society meeting in December 1865: Woodbury called his talk "On Photo-Relief Printing". This would have been a very interesting meeting apart from the Woodburytype demonstration. The room was full of photographic and scientific celebrities who had made special journeys to London for the meeting. The Chairman was James Glaisher who was already famous for his balloon ascents, particularly one in 1862 when the aeronauts ascended seven miles. Glaisher fainted, but his partner, Coxwell, saved them both by gripping the valve string with his teeth, his hands being numb and powerless. Undeterred, Glaisher was later to make over 30 ascents for scientific purposes: as well as a photographer, he was renowned for his work in meteorology, astronomy and mathematics. The year before this Woodburytype demonstration, Glaisher had proposed the idea of "a British Museum of Portraits", and was responsible for collecting and delivering over 200 large carbon prints to the South Kensington Museum (now the Victoria and Albert) as a beginning of the scheme.

Another luminary at the meeting was John Jabez Edwin Mayall, who arrived in England from Philadelphia in 1847, and had become famous for his carte-de-visite portraits (he introduced the carte album into England in 1860) and his studies of the Royal Family. At this meeting three younger Mayalls (Joseph P., John Jr., and Edwin) were elected members of the Society. Another new member was Nelson K. Cherrill who was later to be renowned for his collaborations with H.P. Robinson and for his own combination photographs. A special guest at the Society was Edward Anthony, of New York, who exhibited specimens of his photography on porcelain paper and contributed to the discussions.

Woodbury made a number of prints by his process at the meeting while Jabez Hughes gave a running commentary. The report of the demonstration indicated the illustrious viewers' bafflement: "Some conversation on the subject subsequently ensued, from which it was very evident that... some members did not seem to properly comprehend the principles on which the process was based." (14)

The writers of a contemporary photo-journal thought the process exceedingly simple - in

principle. Having avoided the earlier controversy over the origins of the process ("invented simultaneously by Mr. Woodbury and Mr. Swan") they remarked: "The principle involved in the photo-relievo system, when once comprehended, seems as simple as Columbus's egg experiment; and the only surprise is, that it had never suggested itself before to those who had been experimenting with bichromated gelatine exposed to the action of light." (15)

Prophetically, the editorial stated: "In cases where a large number of copies of a photograph are required - as for instance, for book illustration - it threatens to drive the ordinary silver printing processes out of a field which had only recently begun to be cultivated."

Woodbury was obviously aware of the value of his process for book illustration, and throughout 1866 worked hard at the invention of an automatic print making machine which would reduce the cost of preparing thousands of Woodburytypes by hand. As a 'trial run' at quantity printing, Woodbury's Photo-Relievo Company at Manchester had prepared 7,000 specimens of one photograph to be issued with copies of The British Journal of Photography - but they were never distributed for the reasons stated in the following letter from David Winstanley (Manager of the Photo-Relievo company) to the magazine Photographic Notes:

Mr. Woodbury is now actively engaged in the construction of a machine to supercede hand labour in the production of photo-relievo pictures. The machine is in a very advanced condition, and is a really beautiful piece of work. By its work Mr. Woodbury has every confidence that he will be able to produce prints equal in quality to the very best which have been thus far obtained by the process, and, what is more, they will be all perfectly uniform, so that each one will be a specimen in itself. Upwards of 7,000 have been done by hand labours for presentation with your contemporary, The British Journal of Photography. They are very fair specimens of the process, and have now been lying on our hands many weeks, because Mr. Woodbury is so strongly convinced of the superiority of machine prints, that he has decided that the Journal shall be supplied with them. We have made several reliefs from the negative of yourself, now in our possession, and we can produce the whole of your prints in one week from now, if you must have them without delay. I would strongly advise, however, that you wait for the month or six weeks required for the completion of the machine, if you can, as you will thereby be enabled to present your readers not only with a permanent portrait, but also -with a highly creditable example of photo-mechanical printing. (16)

By the middle of January 1867 the automatic machine was in operation and working satisfactorily, (17) producing prints at the rate of 120 an hour. (18)

Incidentally, it is interesting to note that while Woodbury was working on his printing machine, his manager was patenting an invention of his own. The idea was to produce basso- and alto-relief representations of the human head and body by photography. David Winstanley thought it was "the only process yet introduced for producing photo-sculpture, properly so called." The relief could be made in silver, bronze or other metal as well as in sealing wax. Walter E. Woodbury was also busy inventing new adaptations of old processes. One idea with which he experimented in the early months of 1867 was stripping the image from a glass plate. The image was first coated with albumen before crude collodion was poured on top to form a layer of sufficient thickness. When dry it was cut round the edge with a sharp knife, placed in water for an hour or two, and the film left the glass in a thin flexible sheet. Woodbury saw several practical advantages to the idea. It would reduce the weight and bulk of glass necessitated on a photographer's field trip: "were it not for the weight of a large quantity of glass, which must necessarily be an accompaniment of a trip of any duration, one's labours would be light indeed." For dry plate workers he proposed stripping the film before taking the photograph "so that in making a journey we may carry prepared films enough for a hundred pictures, with the weight and bulk of four glass plates." Also, the stripped negative meant that the photographer could print from either side, a useful point, "most photo-engraving processes requiring a reversed negative." Lastly, Woodbury felt that "the saving in cost of glass and room necessary to store a large quantity of negatives will, I think, amply repay the extra trouble in coating with collodion, stripping, etc. independent of any other advantages." Woodbury did not advise the use of gelatine for stripping purposes "as it is so much affected by change of atmosphere." This stripping technique was not new; it had been proposed by Dr. Vogel in a letter to the Photographic News a few months earlier (as Woodbury acknowledged), but Woodbury claimed to have solved the practical method of operating the process.

The problems of stripping gelatine were experienced by Woodbury early in 1867 while working the Woodburytype process in Paris with Robert S. Bingham.

Bingham was an important and influential photographer, and would have been a good ally when negotiating a contract for the French patent rights to the Woodbury process. He had begun his career in photography in the early 1840s, and was chemical assistant to Professor Faraday at the Royal Institution when the daguerreotype process was announced. His interest in the new medium was instant and long lasting. He improved the sensitivity of daguerreotype plates and published a photographic manual Photogenic Manipulation, in 1848. Later, he settled in Paris where he became a

successful and widely admired photographer, particularly noted for his portraiture and his pictures of the Paris Exhibition of 1885.

Woodbury's successes in France during that year were encouraging and satisfying. At the Paris Universal Exhibition Walter Woodbury was awarded a silver medal for his printing process (so was Joseph Swan). Although Woodbury's display was meager - one frame containing several small, 4X3 inch portraits - it seems likely that they so impressed one company that they acquired the Woodburytype patent rights for France at the price of 150,000 francs (then about 6,000 pounds, a considerable fortune). The new patent right holders were Goupil et Cie of Paris.

Perhaps it is not idle speculation to suggest that Bingham played a significant part in this deal. He was now conversant with the Woodbury process, and was a Goupil author. In 1858 he had made 86 photographs of paintings by Paul Delaroche which were published by Goupil et Cie under the title Oeuvre de Paul Delaroche.

But I cannot leave the Paris Universal Exhibition without mention of another exhibitor of portraits: Julia Margaret Cameron, who won an honourable mention, in spite of the Journal's critic: "She exhibits a considerable number of 'heads', done in her peculiar manner. As photographs nobody has ever presumed to admire them, and, I think, as artistic productions they are to much of the 'attempt but not the deed' to deserve commendation." (19)

Woodbury wrote a paper for the Photographic Society of France about his process, and Bingham exhibited specimens of prints, some of which "were of larger dimensions than were usually seen."

It is true that Woodburytypes were small in size up to this date. But Woodbury had been busy building a larger press. A note on terminology is in order. The "press" that needed to be increased in size before bigger prints could be made was not that in which the prints were produced but the hydraulic press in which the metal plates were impressed with the image. Now Woodbury could make 8x10 inch prints, and no doubt this was the size presented to the Photographic Society of France (from negatives by Bingham).

During 1868 the Goupil company practised the Woodburytype process on a large scale in their factory in Asniere, a suburb of Paris. It quickly became the world's leading Woodburytype production plant (for the most part reproductions of paintings). The work was usually of small size and sent into the market place, at the rate of 500,000 per year, to compete with ordinary photographs. The Woodburytypes were merely marked, and

known, as "photoglyptiques". Goupil's productions were so successful partly due to the fact that the company had no competition. Woodburytypes were not being produced in England. This seemingly surprising fact is explained by the knowledge that the British rights to the process had been purchased, early in 1868, by another French company, Disderi and Co. Reportedly, a French capitalist financed the venture to the amount of 40,000 pounds. Disderi was managing director of the new company, with its establishment at one of his London portrait studios at Hereford Square, South Kensington.(20) After a few months, Disderi disappeared (with the money?) and the firm went into liquidation.(21)

So in January 1869, a new Photo Relief Company was formed, on a limited liability basis, which acquired both the patent rights and the premises vacated by Disderi, and British production of Woodburytypes began in earnest. Whatever Woodbury's private feelings about the unsavoury Disderi enterprise he would not comment on the matter in public, except to acknowledge "its (the process') unfortunate career in a business point of view."

Throughout this year Woodbury was busy refining and improving the process, writing articles for the technical press (careful to give due credit to previous experimenters with bichromated gelatine) and demonstrating the results to photographic societies. He was also looking for ways to extend the business and practical applications of the process. By October, he had succeeded in making Woodburytypes on glass for use in lantern projectors and stereoscopic viewers. By all accounts these transparencies surpassed in technical quality anything capable by the normal silver printing process, whether on a collodion or silver surface.

In 1870 the American rights to the Woodbury process were acquired by John Carbutt of Philadelphia, after a visit by Woodbury - and the British rights again changed hands if not its name. The British patent was sold at the Auction Mart in June by order of Court of Chancery.(22) It was purchased on behalf of a new company, by Vincent Brooks, "a metropolitan lithographer of eminence," who continued to run the firm from its Disderi premises until the 1890s. From this date, the Woodburytype was widely used for book and magazine illustration. There were too many to mention here, but a good example, and one of the first such productions, was the Woodbury Gallery of Nature and Art, (23) published monthly, each number of which contained three printed photographs with explanatory text. The subjects of the prints were "reproductions of paintings, drawings, engravings, portraits and scenes from nature".

If the British production of Woodburytypes was booming, the French production had taken a heavy set back. Asnieres was the scene of a great deal of fighting under the

Commune, with many houses in ruins and a larger number heavily shell-damaged. M. Rousselon (manager of Goupil's photoglyptique or Woodburytype plant) was drafted during the Franco-Prussian war and commanded a company of *Francs-tireurs*, "sad turbulent, mutinous fellows." Twenty-four shells did in fact explode in Goupil's studios but only smashed about 150 negatives "although their immense stock lay, as usual, upon the shelves round the gallery of the building." During the Commune the terrace upon which the printing frames were usually spread was occupied by a *mitrailleuse* which raked the opposite bank of the river. Rousselon was taken prisoner by the communists, his hands tied behind him, and he was about to be placed against the firing squad wall when help arrived and he was rescued. "I heard this tale from his own lips", said the Journal's correspondent. Rousselon returned to the Asnieres factory and continued his firm's production of photoglyptiques and made several improvements to the Woodburytype process. By 1872 business was booming again in Asnieres.

Again, success in France spelled problems in Britain. In 1872, the Woodbury patent was due for renewal. But by an oversight the patent was left unattended and, in theory, reverted to the public domain. "How, or in what manner, the blunder was allowed to be made through which the patent quietly breathed its last while its foster parents thought it had a further lease of life we need not here pause to relate. The emotions of those interested when they discovered that the patent had lapsed, and was beyond even the resuscitating powers of the hundred pound's fee, may readily be conceived." (24)

Of course Walter B. Woodbury was well out of this turmoil since he had relinquished interest in the business side of his process when he had sold the British rights to Disderi four years earlier. Amid much public speculation, and private gossip, the Photo Relief Company retained the patent right against all opposition and seemingly inevitable legal problems. If the allowed lapse of the patent is odd, then the reason for its retention by the Company is ironic. As we have seen, there was considerable controversy between Woodbury and Swan since they both claimed the first publication of the printing process. By chance, the Photo-Relief Company also held Swan's patent. The Woodburytype process was held to be covered by Swan's photo-mezzotint patent which had not yet expired. Strange as it may seem, this means that if Woodbury had grasped the full implications of his printing process at the time of writing the patent specification (which, contrary to his own assertions, he obviously had not) then the patent would have lapsed. Also, Swan's violent reaction against Woodbury's claims eventually saved the Photo Relief Company from liquidation.

Walter B. Woodbury was aloof from all this business wheeling and dealing, both mentally and physically. He was now staying in Munich from where he sent little photographic tit-bits to the photographic press. A typical piece informed readers how to

produce graduated backgrounds to portraits. It was, said Woodbury "a very simple method adopted by me when in Batavia some thirteen years ago." The method consisted of an ordinary painted background, rather dark in tone, in front of which was hung a sheet of muslin which could be made to rise and fall gradually during exposure. "By raising the blind slower or quicker all tints and gradations could be obtained, and of a much more delicate nature than any painted background could give." (25)

Woodbury could also rise up in defence of his own process, writing smarting criticism of any writer's opinions which differed from his own. One such clash occurred when Thomas Sutton wrote a series of articles - on the Helio type process (26), the Woodbury process as practiced by Goupil's, and a comparison of both processes. Sutton may have been mistaken or misled in minor points but Woodbury was overly fierce in his reaction. He accused Sutton of "doing a little in the Rip Van Winkle line - at least one would imagine so to judge from his antiquated description of my process as it was worked some years ago." He then explained how Sutton's criticism of the Woodbury type process no longer held true with improvements in the method of making prints. Finally he tackled Sutton's taste in pictures: "We all know that our old friend [sic] Mr. Sutton has always advocated anything that did not resemble a photograph on albumenised paper, but unfortunately the public having taken a liking to the photograph will not have anything that does not resemble it closely palmed on them... and all the voluminous writing of Mr. Sutton - let him use up all the ink in Redon (27) - will not swerve the public taste; therefore, I am glad my process produces prints exactly resembling photographs, which has been my aim throughout, and which no collograph ever can do. Those who want photographs will not take lithographs, or something resembling them." (28)

It has been stated that Woodbury was no longer involved in the day to day business applications of his process at the Photo-Relief Company headquarters in London. But this is not to suggest that he was inactive in improving the process, or even aloof from the Company's works. His exact status with the firm remains a mystery but one fact is sure: when a new modification was introduced, when samples of new techniques were promoted, when rebuttals of the process were in order, it was Walter Woodbury himself who wrote to the photographic press. For example when the Hereford Lodge establishment produced seven thousand carte-de-visite prints (of the Shah) in one day, it was Woodbury who proudly announced the fact. He added that if the paper had cut up a shade wider the number produced by the same amount of work would have been eight thousand.

Meanwhile, examples of Woodbury types were being exhibited at photographic societies, provincial exhibitions and international shows. In the Vienna Exhibition of

1873 a Woodburytype display was mounted, but unfortunately not many viewers were aware of the fact. For some inexplicable reason the Woodburytypes were not only separated from the main exhibit but were in a different building altogether, in dwellings for workmen!

At this time Woodbury was busy in adopting, modifying and improving two types of lantern slide projects: the stereopticon and the sciopticon.

The stereopticon, as its unwieldy name implies, was merely a projector with duplex lamphouse/optical systems. The two images were thrown at the same portion of the screen, in register, but separately. By gradually turning off the light of one burner simultaneously with the turning on of the other, one picture gradually dissolved into another. The burners were oxyhydrogen limelights which needed efficient ventilation systems and the constant attention of a trained operator. Woodbury's invention consisted of technical improvements, designed mainly to render the stereopticon more compact, economical and convenient in use. His specification for these improvements was published in January 1873 (29) under the joint authorship of Walter B. Woodbury and A.G. Bushby. Bushby remains an unknown figure, and it is possible that he was the mechanical engineer who turned Woodbury's concepts into practical reality.

The sciopticon was a lantern projector of novel design. It was invented by Mr. Marcy of Philadelphia, where the apparatus was first seen by Woodbury on his visit to John Carbutt two or three years previously. The word 'sciopticon' is typical of the Victorian's love for Greek ideas, and its derivation means 'a shadow' and 'to see'. The sciopticon differed from the standard British lanterns, then in use, in several ways. Its principal advantages were its small bulk, and its use of a paraffin burner, placed horizontally, rather than the common oil lantern or the troublesome oxygen gas instruments. Walter Woodbury was intrigued by the improvements in the sciopticon over the standard British projectors and introduced them to England, having of course made a few personal modifications. He published The Sciopticon Manual "containing full directions for using the new drawing room lantern, together with a variety of experiments that can be performed with the same." A feature of the sciopticon which particularly intrigued Woodbury was its open-topped slide carrier which, he said, is "admirably adapted for all sorts of chemical experiments, as well as for showing live animals, such as larvae of gnats, shrimps, small fish, etc., thus spreading out an evening's entertainment where the number of slides is not great." (30) For this purpose he recommended the making of a small tank, made by mounting two plates of glass over a strip of rubber, about 1/2 inch thick.

Presumably, Woodbury had received enough money from the patent rights of his

process that he could have retired. Certainly, few of his modifications and inventions seemed to produce a financial return. Yet he was constantly and energetically involved in so many aspects of photography. He was an active member of the Photographic Society of London (31) and was a member of its Council during 1874 - along with William Abney, William England, J.H. Dallmeyer, Jabez Hughes, Francis Bedford, H.P. Robinson, Oscar Rejlander and others. He was also exploring a new process of making copy negatives (direct from the original plate) in the permanent medium of plumbago, a black lead. Said Woodbury: "Black-lead, a substance hitherto only associated with fire-grates and stoves, is about to play an important part in photography, and will soon be one of the most useful articles the photographer possesses." (32)

That was an exaggeration; the technique was never widely employed. It was natural, however, that Woodbury would be interested since the production of permanent negatives in a light stable substance would be analogous to his own permanent print process. In essence the plumbago process was a gum-bichromate technique on glass, except that the plumbago was added after exposure, and not mixed with the gum before coating. The plumbago negative technique was first introduced by Messrs. Geymet and Alker, of Paris, in the autumn of 1873, but only received attention when M. Obernetter of Munich received a gold medal from the Vienna Society for his work. Even after Woodbury's enthusiastic championing of the idea, photographers in general were apathetic.

But apathy was not appropriate for Woodbury's next major concern: a volume of photographs and texts, titled Treasure Spots of the World. (33) "This elegant work" contained 28 Woodburytypes from negatives by J. Stuart, S. Thompson, William England, John Thomson, Adolphe Braun, Shepherd, and others, as well as by Woodbury himself. Each illustration was accompanied by letterpress. The purpose of the work was "to place before the public a selection of the most celebrated of the world's beauties and wonders, which being all pictures, the unerring sun's work, are necessarily true to the places they represent without any flattery." Woodbury's own photographic contribution was a river scene in Java (accompanied by an enthusiastic article on tropical scenery by Alfred R. Wallace, the naturalist). Woodbury also wrote the texts to: Interior of the Mosque at Cardova; Colossal Figures at Singa Sarie, Java; Niagara River in Winter; Amsterdam; Colonnade in Delhi; and the Rock of Gibraltar. He contemplated issuing yearly a similar collection, remarking: "The endless choice of earth's beautiful scenery will enable us, should the present volume receive the esteem of the public, to present a yearly collection of the camera's choicest renderings." The public was apathetic, and no more volumes were published. It is interesting to note the name of John Thomson in the list of contributors. Two of his photographs were reproduced in Treasure Spots of the World; of Bangkok, Siam, and of Amoy Harbour,

China. These were, in a sense, trials for his major book, Street Life in London, published two years later, with 36 Woodburytype illustrations.

Walter Woodbury was not the only promoter of his process, now really getting into its stride as a useful, and beautiful, method of book illustration. W.E. Batho gave an important lecture on the process to the West Riding of Yorkshire Photographic Society in April 1875. He began by saying: "The process I am about to describe is one which it is my firm conclusion is destined to play a most important part in the future of photography. As a discovery it will rank in importance next to that of the collodion process, and will link the name of Woodbury with those of our greatest discoverers." He concluded with the words: "My object is accomplished if I have turned attention to the most valuable process not in general use - a process destined to mark a new era in our art." (34)

Another champion of the Woodburytype was David Winstanley, Woodbury's manager in the early days of the process, and his helper in devising a machine for the automatic production of rilievo prints. Between June and August 1875, Winstanley wrote a four part explanation of the Woodbury process for The British Journal of Photography, drawn from his own notebook during his collaboration with the inventor and more detailed instructions in the practical working of the process than had yet appeared in print. It is a superb example of how-to-do-it writing, clear and concise, and full of valuable advice. (35) After explaining the essential steps in the process, Winstanley gave a list of possible problems with the cause and remedy, followed by a list of practical applications of the process apart from the production of prints. As Winstanley admiringly puts it: "With a breadth of grasp almost, if not quite, unique amongst the inventors of photography Mr. Woodbury has applied his process to divers purposes in a manner the neatness and felicity of which are suggestive of a mind in which the genuine lamp of genius burns."

Among the applications, Winstanley mentions Woodburytypes on glass. No press is needed since the ink is poured onto the intaglio, the glass placed on the ink, and pressed down with the finger tips, "it being particularly pleasing to see a pool of ink flash into an exquisite picture under the simple pressure of the hand." Also, the intaglio mould itself can be heated to redness over a Bunsen burner and pressed into contact with wood, scorching into the surface a 'photographic' image. The intaglio can also be used as part of a glass mould, producing a half tone image in the bottle, or whatever, when viewed by transmitted light. But the adaptation of the process about which a good deal has been mentioned is the production of half tone watermarks. Woodbury noticed that under pressure paper acquires a degree of transparency which it did not previously possess. It occurred to him to roll a relief with paper on its surface through the press,

resulting in a picture in half-tone as a water-mark.

Far more exciting in terms of aesthetic appeal was Woodbury's experiments in early 1875 which led to the Chromo-Woodburytype. This was not a new process but the combination of two printing techniques - chromolithography and Woodburytype - in order to produce permanent coloured photo-relievo prints. Even this combination of the process was not new; it had formed the subject of a patent several years earlier. Woodbury's contribution to the idea was to master the subtleties of the working process and refining them to the utmost simplicity. First a normal chromolithograph was printed onto the base, comprising a few plain tints corresponding in colour and position to the areas required to give a natural tint to the photograph. The Woodburytype is then made on thin glass and the chromolithograph is then stripped away leaving a colour-tinted Woodburytype. The technique was variously known as 'stenochromy' or 'photochromy' as well as 'chromo-Woodburytype'. The principal exponent of these coloured prints was Leon Vidal, who achieved two relevant patents, in 23 December 1872 and 12 March 1874.

Vidal mentioned the Woodburytype as being applicable to his process in both patents, and in January 1877 set up an ateliers for the production of photochromic prints by means of the Woodburytype technique. As was becoming typical Walter Woodbury was scornful of Vidal's claim to be early in the field when he stated his experiments began "as far back as December 1873." Vidal, asserted Woodbury, was "eight years - an age in photographic invention - behind the times," since his own interest in the subject began in 1865. It is a mystery why Woodbury claimed that Vidal was only 8 years behind him. It could have been 13 years. Woodbury claimed to have produced "the first combination of photography with chromolithography" in 1860 - but this was for glass transparencies, and before the days of the Woodburytype process. Eight years before 1873 would take us back to 1865, the year in which Woodbury was working out the process which bears his name. It is reasonable to assume that many trial efforts (usually on glass, since one of the earliest problems was to find a paper with a smooth enough surface to receive the relief impression) would be lying around the workshop, on all sorts of coloured materials. Certainly it would seem odd if he had *not* noticed the effect of a coloured backing to a Woodburytype. It is significant perhaps that one of the illustrations in Treasure Spots of the World, a view of Tintern Abbey, had been printed on paper with a bluish tint, giving it the appearance of a moonlight scene. Woodbury claimed that he considered patenting the idea of colouring the back of a photo-relievo print in 1866 but "knowing that such methods had already been used" he was not enthusiastic. However, he did pursue some experiments at the end of 1866 and the beginning of 1867 but ran into practical difficulties and the idea was abandoned. It was not pursued again until 1874 (coincident with Vidal's experiments) when Woodbury

"tried to interest several chromolithographers in the matter, but all I found was that each experiment would cost me some 10 pounds or more to have the multi-coloured underprints made, and not having a number of 10 pounds at my disposal caused a fresh abandonment." At the beginning of 1875 Woodbury had a visit from Otto Radde, of Hamburg, who offered to combine his skill as a lithographer with the photo-relief process. This was the opportunity for which Woodbury was waiting, "someone who, on his side, was equally interested with myself in the matter." The first result of the collaboration was a little picture called 'Devonshire Cottage'. This chromo-Woodburytype or photochrom depicted a rustic cottage surrounded by trees and shrubs, all in natural colours - green foliage, blue sky, stone-coloured walls, red bricks and flower pots etc. The print resembled a small painting in oils, accentuated by the fact that its base was linen, like a finely woven canvas. It was first exhibited at a Technical Meeting of the South London Photographic Society in October/November 1875. The print, and its process, were presented by the editors of The British Journal of Photography as Woodbury was out of the country. A big future seemed in store for the combination process, particularly as the cost of each print was less than two pence, if many pictures were required from the same negative.

The introduction of the process was hindered by the fact that Woodbury had left England for the winter of 1875 and the greater part of 1876. This is the first specific mention of Woodbury's failing health which would grow progressively worse until his death nine years later. On this occasion he toured Spain and Italy - and returned to making pictures with a camera rather than print facsimiles from other people's negatives. Typically, he would not be burdened with a wet-collodion outfit, with its accompanying paraphernalia of glass plates and darkroom tent, or even with the new, prepared dry plates. Even these would have added considerably to the weight and bulk of his luggage, and might have been ruined during custom's inspection. He did not even carry a tripod. Making full use of the latest in emulsion and equipment developments, as befits an inventor in the field, he packed a small orange glass bottle with dry collodion emulsion pellicles and a portable camera. When he arrived at his destinations, he bought a few glass plates, and a little ether and alcohol. His dried emulsion immediately dissolved in a mixture of these chemicals and was ready to pour over the glass plate. When dry, the plate could be exposed in the camera immediately or after a lapse of several weeks. Woodbury's resourcefulness was also evident when he ran out of glass plates. Investing a few pence in common gelatine and note-paper he stripped the exposed and developed emulsion from the glass leaving the plates for recoating and exposure. The stripped emulsions were replaced on glass after his return home. This delicate process was accomplished so successfully that Woodbury did not lose or damage a single negative.

Woodbury made 140 negatives in this manner during his tour. He had not lost his artistic touch in the intervening years of technical work. 120 of the pictures had already used for commercial purposes by October 1876.

It is not known whether or not Woodbury passed through Asnieres on his way to Spain and Italy. If he did, he would have been impressed at the quality and quantity of Goupil's Woodburytype output. By late 1875 Goupil had ten Woodbury presses at work, producing mammoth editions for book illustrations as well as for sale as single prints.

Woodbury was obviously refreshed from his year's absence from business and worked frantically at new ideas during 1877. He was busy developing the photochrom process for commercial use, he wrote an article for the Journal on mounting photographs, (36) and devised a portable and highly ingenious camera, for which he obtained a patent, and which was exhibited at the Photographic Society. But perhaps his most remarkable achievement of the year was his balloon camera, for which he was again awarded a patent. (37)

The object of the camera was the taking of photographs from a captive balloon for military purposes. The mechanisms of shutter and plate advancement were operated electrically by wires reaching from the balloon to the ground interwoven with the rope holding the balloon in place. Four photographs could be taken with each ascent of the balloon. The camera consisted of a rectangular wooden box inside a circular case, with a hole in the base through which the camera's lens was aimed. The case was fitted with a rudder, as a stabilising influence, and was attached by wires to an eight-foot diameter balloon. Both the revolving sector shutter and the drum, containing four glass plates, were spring driven and were actuated by electro magnets connected to the ground wires. (38)

This ingenious device for making aerial photographs did not have immediate applications, and was therefore quickly forgotten. The idea was revived in 1900 by Professor Cailletat, of the Institute of France, who carried out experiments at Toulon with a war balloon and camera. Like Woodbury's method, Cailletat's idea was to operate the shutter and plate-changing mechanism by electricity from the ground. He claimed that photographs could be obtained over an area of country six miles square every detail of which was so accurately shown that the pictures would be invaluable in war time. (39)

In 1878 the Photo Relief Company relinquished the making of Woodburytypes, which was taken up by a new firm: the Woodbury Permanent Photographic Printing Company. (40) One of the first commissions of the Woodburytypes' new parent

company was to produce large quantities of prints for a new magazine The Theatre, which began publication in August of that year. Until it folded in the late 1890s, each issue of The Theatre contained two Woodburytypes depicting famous stage personalities. By this time the photo-relievo process had become a mass-production concern. At the Woodbury Permanent Photographic Printing Company seven hand-presses were mounted on a revolving table and the printers were able to produce 30,000 cartes-de-visite size reproductions per day. (41) The new Woodbury Company was situated "in a remote corner of Ealing, where the suburban villas come to an end, and the meadowland slopes away to the green hills about Harrow and Pinner." (42)

The building, at Kent Gardens, was originally a rich villa or perhaps a hotel - with many large spacious rooms and ample grounds in which were built printing sheds, studios, developing rooms etc. The Woodbury Permanent Printing Company employed around 60 workers by 1882, under the managing directorship of George C. Whitfield. (43) Apart from book illustrations and cartes, the company produced all sorts of advertisements and showcards, executed in thousands, production of lantern slides by the Woodburytype process (mainly during the winter months), exhibition enlargements and portraits of candidates for election agents.

At this point a brief note should be inserted on a misconception about the Woodburytype process which is promulgated by the title of the company: *Woodbury Permanent Photographic Printing*.

Contrary to popular belief a Woodburytype is not necessarily permanent. Sometimes the pigments employed in the process were fugitive. This was particularly true when the printer attempted to match the roseate or warm colours of an albumen photograph - pigments of an evanescent character were introduced. A Woodburytype image is only as permanent as the stability of the pigment in the gelatine. Carbon Woodburytypes were the best, but less stable pigments often faded when exposed to strong light, producing disagreeable yellow tints in the highlight areas.

Between 1864 and 1879 the Woodbury process underwent continuous improvements and adaptations, but in the latter year such an important modification was designed that it was given a new name: the Stannotype.

The need was for a modification of the Woodburytype which could be made by the average photographer. Up to this time, the process was confined to a few large companies which could invest a considerable amount of cash in the necessary plant, particularly the hydraulic press. Many attempts had been made to find some way around this bulky, expensive piece of hardware, but all were unsuccessful. It was

Walter B. Woodbury himself who eventually mastered the problem, obtaining a patent for the Stannotype (from *stannum*, Latin, tin) in September 1879. Woodbury announced the workings of the process to the Photographic Society of France the following May, and was fully described in The Photographic Journal the same month. A gelatine relief was made in the previous manner with the difference that the original image is a positive, not a negative. The gelatine is therefore in reverse relief. The mould is then run through the cylinder of a rolling press while it is in contact with a sheet of tin foil. The back of the mould is then electro-plated with copper which provides rigidity. Pigmented gelatine prints can be cast from this tin mould in exactly the same way as from the lead mould.

Stannotypes were equal in quality to Woodburytypes, and in one respect at least they were considered superior. A prominent feature of the Woodburytype, and one of its identifying characteristics, is the appearance of relief in the shadow areas. Stannotypes, however, are "scarcely distinguishable from albumenised paper, so perfect is their surface when finished." (44)

The new process was hailed as a great step forward in that it enabled any photographer, professional or amateur, to produce editions of permanent prints from his own negatives without expensive and elaborate machinery; Woodbury was awarded the Progress Medal of the Royal Photographic Society (1883) for the stannotype process; the materials used were readily available and inexpensive; at least 400 impressions could be taken from the same Stannotype mould - yet in spite of all the predictions that this was the process of the future, stannotypes were rarely made. The failure of the process was not due to Woodbury's fierce control of his patent. For a relatively small fee any photographer could buy all the materials and equipment, including the right of using them and full instructions on methods. By 1889 the stannotype process was being worked commercially by only half a dozen photographers in the whole of Great Britain. (45)

In 1891 a final improvement was made in the Woodburytype process. Up to this date, the final print was mounted by hand onto the paper, along with its paper support. This obviously produced an elevated image. In the last modification the trimmed Woodburytype was transferred to the page and the backing paper peeled away, leaving a coloured gelatine relief so thin that it appeared to have been printed directly onto the page. This improvement was called Woodburygravure - a misleading name.

Woodburygravure notwithstanding, the process was dying, giving way to collotype and other photo-mechanical methods which allowed the image to be printed at the same time as the text. In spite of the articles which continued to be published on both

Woodburytype and Stannotype; in spite of the Woodbury company's move to larger premises from Ealing to Hackney; in spite of the opening of a Woodbury Gallery at 37 New Bond Street, London; in spite of the issuing of a Woodbury-Reproductions of Old and Modern Masters picture gallery (price 1 shilling) in 1900 - the Woodburytype was dying rapidly.

On the 24 April 1896 The British Journal of Photography could make the bitter-sweet comment: "... and Woodburytype, beautiful process though it be, is as likely to secure increased adoption as daguerreotype is of being revived tomorrow."

Perhaps happily, Walter Bentley Woodbury was not alive to witness the slow death of the process which bears his name. In 1885 the Woodburytype had reached the peak of its popularity and the inventor's name was internationally known and respected. Like most inventors Woodbury did not retire with a fortune. His income was largely used to finance new inventions, many of which are not relevant in this context. In addition to patents in photo-mechanical printing, his inventions and improvements relate to actinometers, kaleidoscopes, barometers and hygrometers. There was even a patent for musical railway signals. In a more photographic vein, Woodbury was a pioneer in the use of electric light in the studio (1866), in the creation of micro-photo-sculptures (1867), in the clever taking of spirit photographs (1873), in the idea of luminous photographs (1883), and in the replacement of glass-plates with film (1885).

Walter Bentley Woodbury is a unique figure in the history of photography. He seemed to overflow with ideas and inventions in a never-ending flood which not only engulfed all areas of photography but spread beyond the medium. As one obituary states: "Such a man could never have lived long enough."

Footnotes and References:

1. The British Journal of Photography, 18 September 1885, p. 596.
2. Ibid.
3. The British Journal of Photography, 10 July 1885, p. 438.
4. George Wharton Simpson (1825 - 80) was a prominent photographer and chemist. He was editor of the Photographic News and the Year Book of Photography, from 1860 to 1880. He published several books on the technical aspects of photography and was a regular contributor to the photographic and scientific press.
5. H. Baden Pritchard, F.C.S., was Editor of The Year-Book of Photography and Hon. Secretary of the Photographic Society of Great Britain. He was a prolific contributor to the photographic press. He was editor of Modern dry plates; or emulsion photography by J.M. Eder, London 1881, and author of several important books including: The Photographic Studios of Europe, London 1882, and About photography and

photographers, London 1883.

6. The British Journal of Photography, 11 July 1890, p. 442.
7. Patent obtained 23 September 1864.
8. Poitevin's English patent lapsed through failure to pay the renewal fee. See Illustrated London News, 22 January 1859, p. 33.
9. The British Journal of Photography, 7 April 1865. In this same letter, Swan described his process as "Photo-mezzotint" for the first time.
10. "A New System of Printing", G. Wharton Simpson, Photographic News, 14 October, 1864.
11. The first large edition was a reproduction of D.O. Hill's painting - the formation of the Free Church of Scotland, 1843, which had just been completed. The painting was photographed by Thomas Annon and photomezzo-prints were issued in three sizes in editions of 1,000 each.
12. On the production of photographs in pigments, containing historical notes on carbon printing, and practical details of Swan's Patent Carbon Process. George Wharton Simpson, London, 1867.
13. The Photographic Journal, 15 September 1865, p. 153.
14. The British Journal of Photography, 15 December 1865, p. 634.
15. The British Journal of Photography, 29 December 1865, editorial.
16. Letter dated 18 December 1866.
17. This machine was described by Woodbury in The British Journal of Photography, 29 March 1867, ps. 148-9.
18. The Photographic Journal, 1866 p. 133.
19. The British Journal of Photography, 6 September 1867, p. 422.
20. The History of Photography, Helmut Gernsheim, p. 341.
21. The Photographic News, 1868, p. 267. No satisfactory explanation could be given as to the whereabouts of the money.
22. The British Journal of Photography, 17 June 1870, p. 286.
23. Published by Sampson Low, Son, and Marston. Crown quarto. 1871.
24. The British Journal of Photography, 16 August 1872, pp. 383-4.
25. The British Journal of Photography, 25 October 1872, p. 507.
26. A modified collotype process invented by Ernest Edwards and commercially practised by him at the Heliotype Company at Kilburn. See The British Journal of Photography, 25 October 1872, p. 507.
27. Thomas Sutton was living in Redon, France.
28. The British Journal of Photography, 6 December 1872. p. 579.
29. The British Journal of Photography, 3 January 1873, p. 5.
30. The Sciopicon Manual, Greenhithe, 1873.
31. Its name was changed to the Royal Photographic Society of Great Britain in 1894.
32. The Photographic Journal, "My Experiences in Producing Negatives in Plumbago",

W. B. Woodbury, 27 May 1874, p. 63.

33. Published by Messrs. Ward, Lock, and Tyler. London, 1875. Price: 1 guinea.

34. Reported in The British Journal of Photography, 30 April, 1875, pp. 209-10.

35. For reasons of space and continuity, I have not attempted to describe the Woodburytype process in detail in this paper. I would recommend Winstanley's article for those interested in the practical working of the process. Or see: "Woodbury Printing". J.D. Geddes. London 1896. No. 4 of six lectures on "Photography with the bichromate salts". Delivered on 28 April 1896 at the Royal Photographic Society.

36. The British Journal of Photography, 15 June, 1877, p. 282.

37. No. 1,647 of 1877.

38. Woodbury's balloon camera is now in the collection of the Science Museum, London.

39. The British Journal of Photography, 9 March 1900, p. 147.

40. See the advertisement in the second edition of Gaston Tissandier's History of Photography, London 1878.

41. The Photographic Studios of Europe, H. Baden Pritchard, London, 1882, p. 100.

42. *Ibid.*, p. 96.

43. George C. Whitfield was also a respected photographer, and partner in the firm of Messrs. Lock and Whitfield. In 1876, Whitfield produced a book of portraits entitled Men of Mark, containing 36 portraits of famous men reproduced in Woodburytype. This was the first of a series of volumes with the same title.

44. The British Journal of Photography, 21 May 1880, p. 242.

45. The British Journal of Photography, 5 July 1889, p. 438.