

# GLASS PLATE NEGATIVES AT THE NATIONAL MUSEUM OF CAMBODIA: PAST, PRESENT AND FUTURE CARE OF THE COLLECTION

**Debra Parry**

The National Museum of Cambodia holds a collection of 3500 glass plate negatives, as well as a large collection of photographs. The glass plates date from the early 20th century and the images on the plates include museum objects, as well as street and temple scenes, Angkor temples, and dance positions. Therefore the glass plates hold important cultural and historical information. The plates were stored for many years in unsuitable conditions; stacked on top of each other and with no environmental controls. The age of the plates, the unsuitable storage and the tropical environment has led to the plates been in varying stages of deterioration.

A project was organised by Australian Business Volunteers to undertake the conservation of these glass plate negatives. Previous projects at the museum had carried out some preservation work on the glass plates, however a full condition assessment and cleaning had not been done. Therefore photographic conservators Debra Parry and Jane Hinwood worked on assignment at the Museum, on behalf of Australian Business Volunteers. The goal of the project was to assess the condition of the glass plate negative collection, train the Museum staff in the appropriate treatment, and carry out this treatment. As with all the projects of Australian Business Volunteers, the aim was not to simply do the required treatment but to train the local staff. The purpose was to enable the museum staff to undertake the required preservation work to ensure the collection is correctly stored and maintained, so that this important collection of early 20<sup>th</sup> century photographs is preserved for the future.

## INTRODUCTION

---

The National Museum of Cambodia holds an unequalled collection of Khmer art including stone statues and carvings, and bronze, wood and ceramic objects (Samen 2008). The Museum also holds a collection of 3,500 silver gelatine bromide glass plate negatives, as well as around 20,000 photographic prints and negatives. These images were taken by photographers working for the Ecole Francaise d'Extreme Orient (French School of the Far East). Based on inventories, the glass plates date from 1900 to 1948. The images on the plates include dance positions, street and temple scenes, and Angkor temples, as well as Museum objects. The plates hold

important cultural and historical information, much of which has been lost from other sources.

Australian Business Volunteers (ABV) is a non-government, not for profit development agency that delivers programs across the Asia Pacific region. The mission of ABV is to “contribute to growth in developing communities through the transfer of knowledge and workplace skills using volunteer expertise” (ABV 2010). In 2010 the National Museum of Cambodia requested volunteers through ABV for a project on the “Conservation of Historical Photographs”. Photographic conservators Debra Parry and Jane Hinwood were selected by ABV to carry out this assignment for one month each at the National Museum of Cambodia.

## THE PAST

### Glass Plate Negatives – background

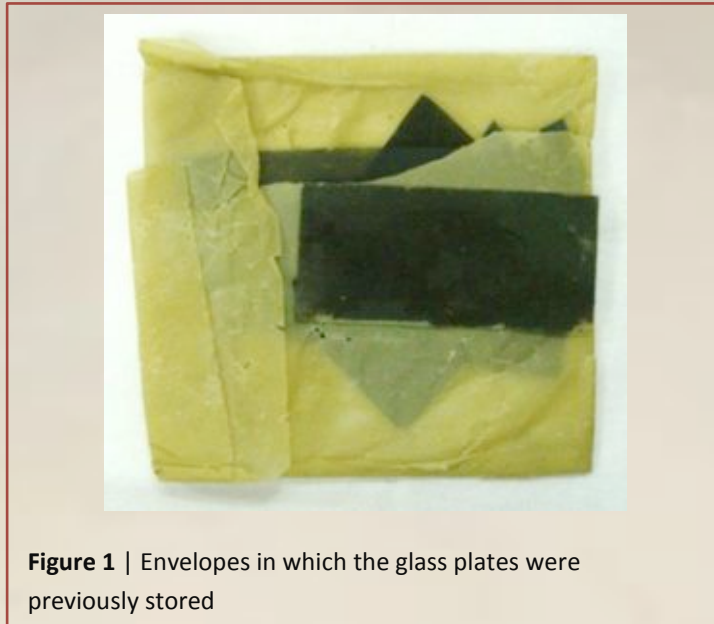
Glass was first used as a photographic base in 1847 (Lavédrine 2003), but it was not until the 1870s that silver bromide gelatine was used (Osterman 2007).

Gelatine plates continued to be used extensively into the 1930's (McCabe 1991a). Although glass is generally considered an inert material, it is fragile and brittle and becomes more brittle with age (Eastman Kodak 1985). Glass can suffer from cracking and breakage, and may degrade, which can leave white deposits on the surface (Lavédrine 2003). The emulsion can also deteriorate, as well as flake and delaminate (Wagner 1989).

Variations in environmental conditions cause glass plates negatives to undergo physical changes, which can show as a crystalline or slippery deposit on the non-image side of the plate (McCabe 1991b). Nizette and Norris (1993) described

potassium salts, which were used in the manufacture of glass, reacting in a humid environment and forming potassium carbonates on the glass surface on the non-image side. On the image side the potassium carbonates caused the emulsion to lift from the

surface. Tests carried out by the US National Archives and Records Administration showed that deposits on the surface of 19<sup>th</sup> century glass contained silicon. The glass itself was the only source of silicon (McCabe 1991b). Such deposits on the surface, from materials used in the manufacture of glass, show that the glass is chemically unstable and is deteriorating.



**Figure 1** | Envelopes in which the glass plates were previously stored



**Figure 2** | Envelope showing adhesive

The glass plate negatives at the National Museum are in varying stages of deterioration. For many years the glass plates were stored in unsuitable conditions, in original boxes in wooden cupboards. For most of the time the plates have been stored in a room with no environmental control in a tropical climate where the average daily temperature is 28°C to 34°C and relative humidity ranges from 70% to above 80%. These environmental conditions are not conducive to the preservation of glass plates.

Up until 1994 most of the plates from the National Museum were in individual glassine enclosures which were adhered together along the edges (see Figures 1 and 2). The plates were stacked on top of each other. Plates stored next to each other can stick together under high humidity (Gillet *et al* 1986), and these plates have been in conditions of high humidity. A few plates were stuck

to each other, and some were adhered to the glassine envelope. Gann (2010) found that negatives stacked in storage begin to silver along the edges or along the seams of envelopes. This is the case for the majority of the plates in the Museum's collection. Almost all the plates viewed had silver mirroring along the edges.

Silver mirroring is a natural deterioration process that is inherent in photographs containing silver and is most commonly seen in silver gelatine developing out prints and negatives.

Direct contact of the emulsion with poor quality materials such as adhesives and paper products contribute to the occurrence of silver mirroring (Gann 2010). Oxidising agents from these materials as well as from paints, varnishes and

pollutants, can cause oxidising of the silver and fading of the image (Gillet *et al* 1986). Silver ions are produced and these can transform to silver sulphide through reduction processes at the surface (Gann 2010). This silver sulphide can turn negatives brown-yellow (see Figure 3), or there may be brown-yellow spots across the plate (Gillet *et al* 1986).

Some of the glass plates have a varnish layer over the emulsion. Varnish can show up like tide lines or flow marks (McCabe 1991b). Glass plates produced before 1890 are more likely to have a varnish than plates produced later. The collection at the Museum dates from after 1890, however some of the plates do have a varnish. The varnish layer can yellow and stain or

become embrittled (Wagner 1989) or it can decompose and become sticky and peel off (Gillet *et al* 1986). The plates seen at the Museum did not have these problems, but the varnish showed different colours depending on the light (see Figure 4).

### Previous preservation work

In 1992 photographic conservator Mark Nizette worked on the photographic collection at the Museum. He trained five staff in handling and washing of the plates and 2,300 plates were washed in a solution of Kodak Photo-Flo and water (Nizette 1992). The process used was to remove the plates from their bags, wash in the Photo-Flo solution, allow to air dry for 30 to 45 minutes, before returning the plates to

their original bags. The old packaging was re-used until the number and size of all the plates could be determined and new packaging materials obtained (Nizette 1992).

The purpose of the washing treatment was to remove dirt from the plates so they could be printed from, and to allow for a more detailed assessment of the condition of the glass plate. The aim was also to teach the Museum staff about handling and basic

treatment of glass plates (Nizette 1992). It was proposed to make prints from the glass plate negatives but only 200 were done due to a lack of equipment and facilities (Nizette 1992). In 1994-95 French conservators wrapped each plate in four-flap

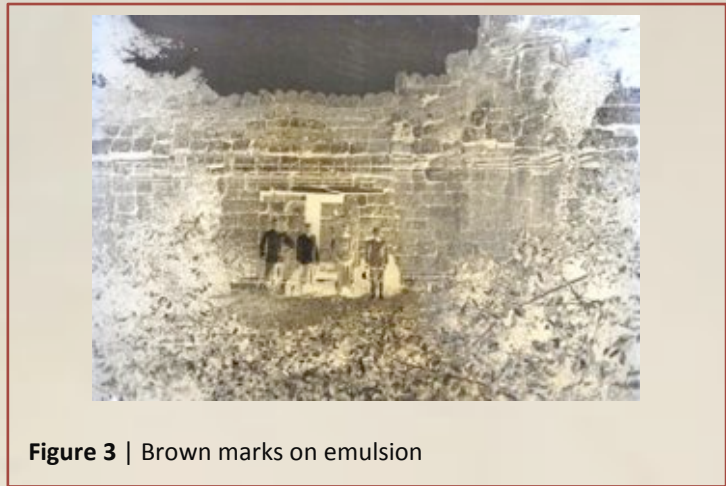


Figure 3 | Brown marks on emulsion



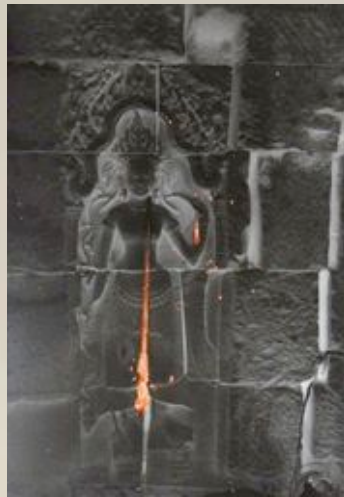
Figure 4 | Varnish on emulsion

paper enclosures and packed them into boxes (Stanbury 2009) with between five and fifteen plates in each box.

Peter Stanbury worked at the Museum on an ABV assignment in 2009. At this time the boxes containing the glass plates were stored in a cupboard, stacked horizontally on top of each other. Stanbury organised to have the cupboard turned on its side so that the plates were vertical (Stanbury 2009). He instructed the staff in filling out a basic condition assessment table. Many of the plates had white crystalline powder on the surface of the non-image side, and Stanbury organised the staff to brush the white powder off the plates.

## THE PRESENT

ABV works on the principle that training in practical work skills is the best form of aid. The purpose of ABV assignments is not to send volunteers to do the work, as this only has a short term benefit. For long term preservation of the photographic collection it is necessary for the staff of the Museum to have an understanding of photographic preservation and to be able to carry out conservation treatment and care once the volunteer has left. The aim of the assignment for “Conservation of Historical Photographs” was to



**Figure 5** | Mark on plate from chemical spill

train the Museum staff in handling and conservation of the glass plates. Many of the glass plates had deteriorated or were broken due to unsuitable storage and handling.

Deterioration and marks on the glass plates can also be due to poor processing or incomplete rinsing when plates are

developed. Yellowing or fading of the image can occur due to residual salts from the fixing bath being too old or poor rinsing of the plate during processing. Staining of the emulsion can be caused by chemical residues left after processing (Nizette & Norris 1993). A number of the marks on the plates appeared to have been caused by processing problems. There were plates which were yellowish-brown across the whole plates, and some were yellow-brown on part of the emulsion. Other plates were spotted across the emulsion. A few had reddish marks, which appeared to be from chemical spills (see Figures 5 and 6).

## Assessment and Preparation

Cold storage is the preferred option for storage of glass plate negatives. For gelatine plates a storage temperature between 10 and 16°C, and a relative humidity between 30 and 45% is recommended (Gillet *et al* 1986). Storage at the appropriate



**Figure 6** | Mark on plate, likely from processing chemical

temperature and relative humidity will extend the life of glass plates. Even at a temperature of 20°C, controlling the relative humidity can provide substantial improvement in the preservation of many photographic materials. Relative humidity is the most important factor relating to the long term preservation of photographic materials (McCabe 1991a).

The optimal environmental parameters cannot be obtained at the Museum, which only has an air-conditioner to provide any sort of control of the environment. For about ten years or so an environmental control system kept the relative humidity in the photographic storage room at a suitable level, but it no longer functions and there are no funds to repair it. At this stage, control of the relative humidity is not an option for the National Museum of Cambodia, as there are not the financial resources available to do this.

All of the photographic collection of the Museum has been moved into one room, the only one in the Museum with an air-conditioner. This air-conditioner has been running continuously since July 2009 (Stanbury 2009) and is set to 18°C. The relative humidity in the storage room is around 50% and it is likely it would be higher in the wet season. The air-conditioner is not ideal but at least the temperature is controlled, and an air-conditioner can be repaired or replaced if it breaks down.

The Museum was built in 1917 and is a beautiful building. However, it was not built with suitable storage in mind, especially for the tropical climate. The floor is made from wooden boards with gaps between them, and therefore the room gets very dirty. The photographic storage room is on the first



**Figure 7** | Photograph storage room at the National Museum of Cambodia

floor of the Museum and has cupboards around all its walls for storage of the glass plate negatives, photographic prints and old Museum records (see Figure 7). There is one window in the room and the wooden cupboard containing the glass plate negatives is against this wall, half covering the window. Part of this wall backs

on to the stairwell and the other part is an outer wall. Two large glass fronted cabinets contain polypropylene folders with polyester sleeves. These hold the original Museum records, along with negatives and photographic prints related to Museum objects. Another two wooden cupboards hold photographs adhered to card.

Thought was given to moving the cupboard with the glass plates so that it would sit on an internal wall, but there was not space and the cupboards on the interior walls were too long to be placed on the wall which was partly external. On top of one cupboard were files containing more recent Museum records. Some glass plates were in polystyrene boxes on the top of a set of drawers as they did not fit in the cupboard with the rest of the glass plates. These were removed from the polystyrene box and placed into an archival corrugated board box. They were then stored in one of the glass fronted cupboards.

On top of one cupboard were a few archival boxes which contained photographs, and these proved to be very dirty. These boxes contained photographs of Cambodia, India and Thailand. The Cambodian photographs had not been catalogued. Due to the extensive ingrained dirt on these boxes the photographs were removed and placed in new boxes. Space was then made in the cupboard to take these boxes as items get very dirty when not in a cupboard.

In one of the cupboards, as well as the albums containing Museum records, were old computer parts, training videos and the like. These were taking up space in the cupboards and were removed to allow photographs to be placed into the cupboard. Also in the cupboard were microfilm of the Museum's palm leaf manuscript collection and more recent photos and negatives tied up in plastic bags. These were not adequately packaged or labelled.

In a drawer were the original boxes that the glass plates came in (see Figure 8). This was very useful as it showed the plates to be silver gelatine bromide, and the date as 1904. Another drawer contained about 30 broken glass plates, as well as miscellaneous other items such as cracked glass plates, plates adhered together, a few cellulose nitrate negatives, and some prints.

One Museum staff member works in the room on a part-time basis, carrying out cataloguing of the photographs. Other staff use the room intermittently for inventory purposes and to use the camera stand. When staff are in the room the temperature on the air-conditioner is set to 22 or 23°C as the staff find it too cold to work in the room otherwise. Though this is not ideal for the photographic materials, the staff do need to feel comfortable working in the room. A comfortable temperature for people is 21 to 25°C (Lavédrine 2003). When the treatment work was being carried out on the glass plates the temperature was set to 23°C, for around five to six hours per day, five days per week.

The first task was to clean the room and set up a work space. There was a large table set up in the room where the staff had worked with Peter Stanbury. Some supplies and condition assessment tables were

left from his time at the Museum in 2009. The table was cleaned up and necessary supplies sought before treatment work on the glass plate negatives could begin. Conservation materials cannot be accessed in Cambodia and supplies such as ethanol and solvent dispensers were borrowed from other laboratories in the Museum, which have been set up and supplied by the Getty Foundation and Ecolé Francaise d'Extreme Orient. The only materials specifically for photographic preservation were what I had taken over in my suitcase, which included photographic storage paper/tissue, museum mount board and archival boxes.

## STAFF TRAINING

The Museum's objectives for this assignment were to identify suitable treatment for deteriorating glass plate negatives, and to treat mould, scratches, blemishes and adhering glassine on emulsion and to train the Museum staff in conservation treatment. There was an expectation that broken glass plates could be repaired in a similar way to the repair of ceramics. Also there may have been an expectation that deterioration on glass plates could be reversed. Staff were somewhat disenchanted to find that only cleaning would be carried out, as they found this rather tedious.

Valverde (2003) found that conservation in Mexico had focused on archaeology, architecture and monument preservation. Even though there is an important photographic legacy in that country, minimal work had been done to preserve it. At the National Museum of Cambodia there has been a similar focus on architectural and monument preservation with the stone, metal and ceramic laboratories being the main conservation focus and

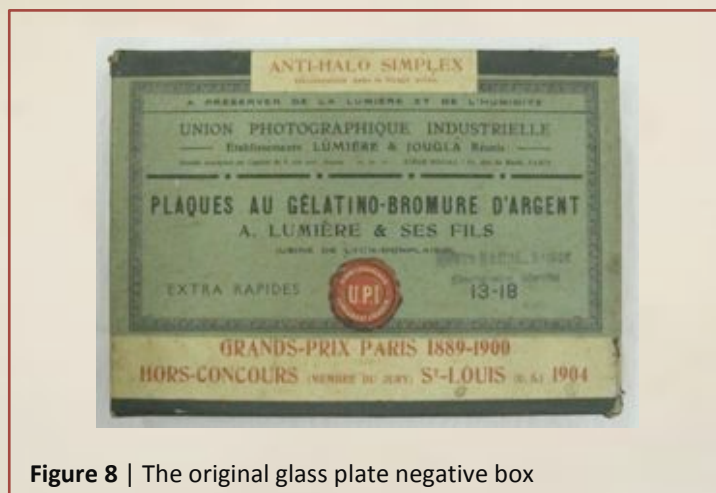


Figure 8 | The original glass plate negative box

having the best laboratory setups. The stone, metal and ceramic conservation laboratories all have trained and skilled managers. Positions in these laboratories appear to be the most sought after.

The library is the department that looks after the photographic collection and the head of the library has no conservation training. Staff in the library have tended to end up there from other parts of the Museum, and it was not necessarily their department

of choice. Although some training of the library staff had been carried out by Nizette (1992) these staff were no longer in the library department. Stanbury had trained staff in 2009 in the handling and basic cleaning of the glass plates (brushing off the white powder from the non-image surface) and one of these staff was still on the project.

Mantilla and Mascareño (2011) found that much of the damage to collections is caused by improper



Figure 9 | Silver mirroring across plate



Figure 10 | Fingerprint on emulsion

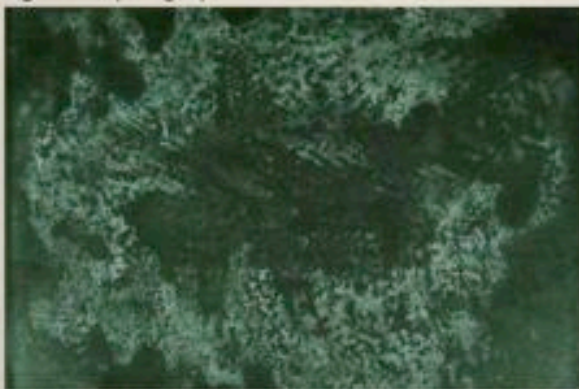


Figure 11 | Dull, opaque surface due to glass deterioration

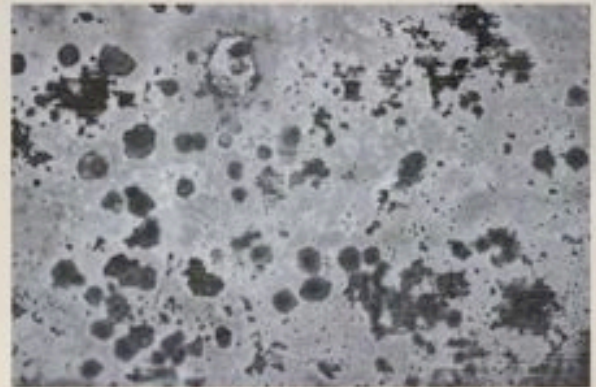


Figure 12 | Close up of glass deterioration

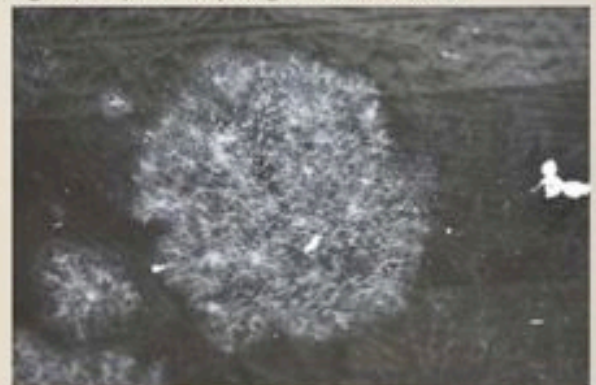


Figure 13 | Mould growth on glass plate



Figure 14 | Spotted emulsion

handling by staff. Therefore before beginning the treatment training was given to the staff on how to handle the glass plate negatives. Because of the language barrier this was illustrated by a Microsoft PowerPoint presentation showing photographs of the techniques necessary for handling and cleaning, as well as by performing a practical demonstration. Other presentations were given on photographic types and on types of deterioration that can occur on glass plate negatives. There was much interest in this and staff from the other conservation laboratories also attended these presentations.

## Condition Assessment and Conservation Treatment

The plates were in varying stages of deterioration, and had dirt and staining on both sides. The majority of the plates had some degree of silver mirroring on the emulsion (see Figure 9). The majority had silver mirroring on the edges. Fingerprints were on both the emulsion and the glass sides of the plates; on the emulsion side, fingerprints appeared to be etched into the emulsion (see Figure 10). On the non-image side the fingerprints were able to be removed. Also on the non-image side there was mould growing on some of the plates. This was able to be removed with ethanol and water. On the plates that were viewed there did not appear to be any mould growth on the emulsion side. Some plates were spotted across the emulsion, or had brown, yellow or red marks on the emulsion. However, the main deterioration was of the glass itself, with a dull, opaque surface where the white crystalline powder had been (see Figures 11 and 12).

Unused plates were found and these showed the same white crystalline deterioration on the non-emulsion side of the plate. These plates were still wrapped together in the original black paper. As they were not individually wrapped many of them were adhered to each other.

Various methods of cleaning plates have been described. McCabe (1991b) tried a number of solutions to clean the non-image side, including

acetone, acidic and alkaline solutions, alcohol, and water. Test results were inconclusive, and as a result McCabe used only water to clean the non-image side. Gillet *et al* (1986) recommended cleaning with ethyl alcohol or with water and a wetting agent. Eastman Kodak (1985) recommended cleaning with water and a hypo (sodium thiosulfate) solution before washing in Kodak Photo-Flo solution. Nizette (1992) had carried out cleaning with Kodak Photo-Flo.

For the treatment stage, plates were unwrapped from their four flap enclosure and both sides of the plates were visually assessed and the condition recorded on a table. Because of the language barrier and lack of conservation training the condition report was simplified so that boxes only needed to be ticked to record the condition. As the staff had a fairly limited knowledge of photographs, the different types of deterioration that were recorded on the condition assessment sheet were all photographed, so visually the staff knew what to record. Staff were shown how to make swabs and how to clean the glass. Cleaning of the non-image side took place with ethanol and deionised water mix (60% ethanol and 40% water – later the ethanol amount was reduced to 50% because the smell was affecting staff). A cotton swab was moistened with the ethanol and water, and was gently moved in a circular motion.

The mould, fingerprints, and some dirt were removed by this method. The marks from the deteriorated glass could not be removed. Once cleaned on the non-image side the plates were placed back into the four flap enclosures, even though some of these enclosures were stained, because there was no other photographic storage paper available.

A few plates had emulsion which was lifting off the plate. Albright (1997) had successfully re-adhered localised flaking and lifting emulsion with a range of materials including gelatine, methyl cellulose, and Acryloid B-72. However, no attempt was made to re-adhere the lifting emulsion on the Museum plates due to a lack of materials and time. Only a small number of plates had emulsion that was flaking or lifting from the surface so it was not considered to be a major issue.



## Treatment of Broken Plates

One drawer contained all the broken plates (see Figure 15) as well as a few other miscellaneous items such as photographs and cellulose nitrate negatives, and some plates that were not broken. The broken plates were not catalogued and were haphazardly stacked on top of each other. Some were in individual enclosures, while others were not. Broken pieces were scattered throughout the drawer. A number of the broken plates had pieces missing (see Figure 16). These plates required sorting and rehousing to better preserve them. The majority of the glass plate negatives were already in individual enclosures and in boxes, and were standing on their edge. However, such storage is not suitable for broken glass plates. It is recommended that plates with damaged emulsion, or that are broken are stored horizontally in seamless four flap enclosures (McCabe 1991b).

There was the expectation among the Museum staff that the broken plates would be repaired. Gillet (et al 1986) stated that a cyanacrylic adhesive with a refractive index resembling glass could be used, but the safety to the emulsion of such adhesives had not been proved. Because of the problems of reversibility, the difficulty of controlling the capillary action of liquids between glass sections, and the varying optical properties of adhesives, glass plates are not repaired (McCabe 1991b).

There are a number of ways to package broken plates, such as covering the broken plate with a larger plate of glass and taping the two pieces together (Keefe and Inch 1984), or sandwiching the broken plate between two pieces of glass, or sink mounting the plate with the mount cut to separate the broken pieces (McCabe 1991b). Wagner (2001) suggests that broken plates be

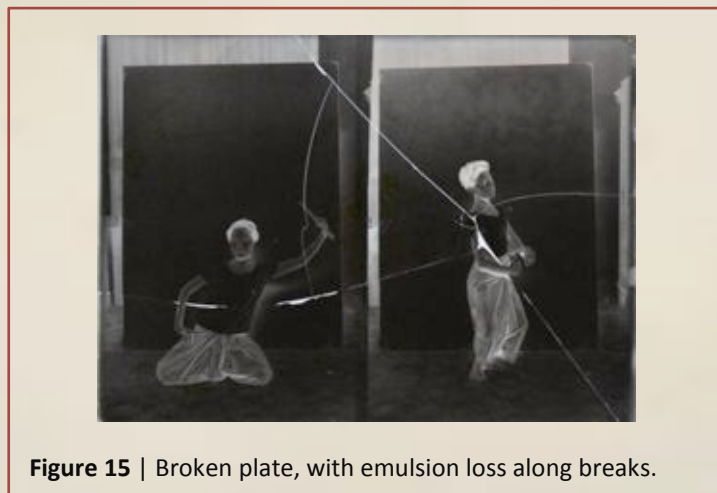
sandwiched between buffered board, and placed into a four flap enclosure.

The method used in this project was determined by the resources available. The broken plates were sandwiched between Museum mount boards and photo safe paper was used to make four flap enclosures. Some plates were sink-mounted but there was not enough mount board to sink mount all the broken plates. And there was not enough mount board available to allow the broken pieces to be mounted separately. The broken plates were sorted and packaged as best they could be with the limited resources available. They were individually wrapped, placed between boards, and stored in stacks of approximately five, in archival grey corrugated board boxes.

## Photographing Broken Plates

Because the broken plates had not been catalogued they were photographed so that what was there could easily be seen without having to open the packaging and handle the plates. There was no scanner available so the plates were photographed on a small lightbox using a

Nikon D90 camera with a Nikon 105mm F/2.8 macro lens. The lightbox had marks on the surface, but there was no other equipment so this had to be used. We are used to having equipment for digitising readily available but at the National Museum this is not the case and I had to make do with what was there. In such situations one has to adapt to suit the available resources.



**Figure 15** | Broken plate, with emulsion loss along breaks.

## Packaging of Negatives and Prints

In one cupboard there was a large collection of Kodak colour photographs, in the original small albums given when the photographs were developed, with the negative strips tucked into the back of the album. Groups of these albums were tied up in plastic bags. These were found to be a fairly recent collection of colour prints and negatives taken by a Japanese researcher. The Museum staff did not know anything about these photographs and there did not appear to be any written report to indicate the importance of this material. It is desirable to separate photographic prints from negatives (Lavédrine 2003). The ideal storage is to have like with like, so negatives should be stored separately from the prints. The photographs in the plastic bags were left in the original shop albums as there was no alternative packaging for them. Each album was labelled, and the negatives labelled by slipping a piece of photo-safe paper into the negative sleeve. The negatives and prints were then placed in separate archival boxes for storage.



**Figure 16** | Broken plate with missing glass and emulsion loss.

## ISSUES

In an assignment of a fairly short duration it always seems like there is not enough time to get everything done. The purpose of the assignment was to train the local staff in preservation procedures and conservation treatment, and two months would normally be sufficient time to do so, however, a number of factors limited the amount of training that could be provided. Generally there was only five hours a day or less to carry out the training and conservation work. Also staff were not always available for training and the practical conservation work as they still had to attend to other Museum

duties such as security. Other training courses were also happening at the time so when Jane Hinwood was undertaking her assignment staff were not available for a week as they were undertaking other training.

Of course working in another country will always have some issues with the language. This was especially so when explaining technical terms such as emulsion and types of deterioration. Fortunately one staff member had very good English and was helpful in explaining technical terms to other staff. However, the staff are not trained in conservation of photographic collections and have a limited understanding of photographs and their preservation. Therefore the different languages and the limited knowledge of staff meant that it took some time to explain certain technical issues.

One issue that was not anticipated was that the staff who were being taught photographic conservation did not have a great deal of interest in the area. The staff in the library section had been transferred there from

other sections and were not necessarily enthusiastic about working in the library, or in photographic conservation. Nizette found the staff to be enthusiastic and eager to care for the collection when he spent time at the Museum in 1992, but in this assignment the staff seemed somewhat less eager. Given the general lack of enthusiasm for treatment of the glass plates by the staff directed to do so, it might be more useful in the future to ask for staff to nominate if they are interested in learning about photographs and their conservation. If the staff given the training were interested in such work then a lot more cleaning of the glass plates would occur. Also

once the ABV volunteers left there would be more likelihood that staff would carry on and finish the project. As it is, the cleaning of the glass plates has not been completed.

## THE FUTURE

---

In this project, work was carried out to condition report and clean the glass plate negatives. With the non-image side clean, the plates are in a better condition for digitisation to be carried out. Discussions took place during the assignment on the possibility of digitising the glass plates as a means of preserving the information they contain. No equipment was available at the Museum to do this, but there was the possibility that other institutions in Phnom Penh could have the appropriate equipment, whether that be a camera and camera stand or a scanner.

Bertrand Porte, head of the Museum's Stone Conservation Laboratory, has been involved in the cataloguing of the collection and he is very keen to have the glass plates digitised. However, there is the question of whether the Museum's computer system is suitable for storing and providing access to the images. Lavédrine (2003) describes the ongoing hardware and software investment that is required for digital media where the problem of digital obsolescence is a major issue. Preservation of digital photographs is an ongoing process that requires keeping up to date with technology, and an ongoing financial commitment for data transfer to new systems and updating of information (Lavédrine 2003). There are many issues involved with making and maintaining digital images and these need to be considered and planned for, and financed. At this stage the Museum is unlikely to have the finances for long term digital preservation. One option is to make digital copies and then print these out as a means of preserving the photographic image.

The air-conditioner is currently running continuously at 18°C, but there is no control of relative humidity, which is one of the most important issues in preserving glass plate negatives. The ideal

would be to install an environmental control system for temperature and humidity, as was previously present, as this is the best method to preserve the glass plate negative collection. Whether this can be financed in the future is unknown.

## CONCLUSION

---

Australian Business Volunteers sponsored two assignments of one month each, to provide services to the National Museum of Cambodia. The aid approach always taken by ABV is to train the local staff in practical work skills, so the purpose of this assignment was to train the local Museum staff in the conservation treatment of the glass plate negative collection, as the plates were in varying stages of deterioration. The major types of deterioration found on the plates were silver mirroring along the edges, which almost every plate has, and deterioration of the glass, showing as white deposits on the surface – below which the glass surface is opaque and dull. Staff were trained in handling and in cleaning the non-image side of the plates, as well as being shown the different types of deterioration. Cleaning was begun on the 3,500 glass plates, but has not yet been completed. Resources are very limited therefore it is difficult to provide the optimum conditions for preservation of glass plate negatives. However, it is important to be practical and work with what is available to achieve the best results possible.

## BIBLIOGRAPHY

---

ALBRIGHT, GE (1997) "A Tentative Method for Consolidating Gelatine Dry Plates". In: Siegal, RE *Topics in Photographic Preservation 7*. American Institute for Conservation Photographic Materials Group: Washington DC.

AUSTRALIAN BUSINESS VOLUNTEERS (ABV) (2010) *2009:2010 Annual Report - ABV Australia Strengthening Business & Communities*. ABV: Canberra.

EATON, GT (1985) *Conservation of Photographs*. Eastman Kodak Company: Rochester NY.

GANN, L (2010) *Photographic Materials Conservation Chapter 3: Silver Mirroring*.

[online: [http://www.conservation-wiki.com/index.php?title=PMG\\_Chapter\\_3\\_Silver\\_Mirroring](http://www.conservation-wiki.com/index.php?title=PMG_Chapter_3_Silver_Mirroring) Accessed 06.05.2010]

GILLET, M, GARNIER, C and FLIEDER, F (1986) "Glass Plate Negatives Preservation and Restoration". *Restaurator* 7. 49-80.

KEEFE Jr, LE and INCH, D (1984) *The Life of a Photograph*, Butterworth Publishers: Woburn, USA.

LAVEDRINE, B (2003) *A Guide to the Preventive Conservation of Photograph Collections*. Getty Publications: Los Angeles, California.

MANTILLA, B and MASCARENO, G (2011) "Preservation of Photograph Collections in Tropical Climate". *International Preservation News, A Newsletter of the IFLA Core Activity on Preservation and Conservation* 54, August 2011. International Federation of Library Associations and Institutions: Paris.

MCCABE, C (1991a) "Glass Plate Negatives: The Importance of Relative Humidity in Storage" in *Sauvegarde et Conservation des Photographies, Dessins, Imprimés et Manuscrits. Actes des Journées Internationales d'Études de l'Arsag*, 30 Sept-4 Oct 1991, Paris. Association pour la Recherche Scientifique sur les Arts Graphiques: Paris. 36-44.

MCCABE, C (1991b) "Preservation of 19<sup>th</sup>-Century Negatives in the National Archives". *Journal of the American Institute of Conservation* 30. 41-73.

NIZETTE, M (1992) *Report of the Preservation of the Photographic Collection of the National Museum of Cambodia Phnom Penh*. Report prepared for the Cultural Relations Branch, Department of Foreign Affairs and Trade, Canberra, Australia.

NIZETTE, M and NORRIS, DH (1993) "Introduction to the Conservation of Photographs: workbook". Workshop provided at Queensland State Archives.

OSTERMAN, M (2007) "The Technical Evolution of Photography in the 19<sup>th</sup> century". In: Peres, MR (ed.)

*Focal Encyclopaedia of Photography Digital Imaging, Theory and Applications, History, and Science*, 4<sup>th</sup> edn. Elsevier: Amsterdam.

SAMEN, K (2008) *The New Guide to the National Museum Phnom Penh*, 3<sup>rd</sup> edn. Ministry of Culture and Fine Arts: Phnom Penh.

STANBURY, P (2009) "The Glass Plates in the National Museum of Cambodia". Report for Australian Business Volunteers, Canberra.

VALVERDE, MF (2003) "The Education of Photograph Conservators in Mexico", In: Bernier, B *Topics in Photographic Preservation* 10. American Institute for Conservation Photographic Materials Group: Washington DC.

WAGNER, SS (1989) "A Preliminary Study: Consolidation of Gelatine Glass Plate Negatives with Organosilanes". In: Siegal, RE *Topics in Photographic Preservation* 3. American Institute for Conservation Photographic Materials Group: Washington DC.

## AUTHOR BIOGRAPHY

**Debra Parry** completed a Master of Arts (Cultural Material Conservation) at the University of Melbourne in 2006. Since then she has done a number of short courses on conservation treatments including Conservation of Photographs, Indian Miniatures, and Thangkas. She is currently studying bookbinding and book repair at RMIT. Debra previously worked for Heritage Victoria, advising small museums on a range of preservation issues and practices. Debra has worked on assignment at the Balai Seni Lukis Negara (National Art Gallery of Malaysia) and recently at the National Museum of Cambodia. She is currently working as a conservator at the National Archives of Australia, Melbourne.

