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Mapping the Antarctic: Photography, Colour and the Scientific Expedition in Public Exhibition.

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The history of photographic technologies intersects with the work of early 1900s scientific expeditions in reconfiguring the Antarctic, documenting a region previously envisioned as an 'atemporal white space' (Yusoff 2010, p.55). Expedition records included cinematography and photography in an experimental practice which supplemented established modes of documentation: sketches, watercolours, cartography, and journal entries. The potential of cinematographic technologies for scientific study, however, was not severed from entertainment as geography and sensationalism were already linked in popular exhibition (Doane 2002; Dixon 2007). A fragmented view of the Antarctic interior formed from sections of film and still images, which offered a specifically photographic expression of the temporality and movement of the landscape, from the diffusion of flashlight as a transient yet visible trace of inhabitation to the shifting morphology of its floes and the disorientating effects of mirages and blizzards. An analysis of Antarctic expedition records, which were contemporary to the emergence of cinema and early colour processes for stills photography, tracks a shift in a historical field of vision; the mapping of this landscape and its temporality - stasis and transience – is entangled with cinematographic technologies in which colour plays a part. The indexicality of each image registers a spatial and temporal coordinate (that camera, at that time and that place), which in the context of film forms a central paradox of modernity: the series of still images that belie the cinematic illusion of movement as a permanent record of a fleeting moment thrown back in to motion (Doane 2002). The film in performance typifies this paradox by interlacing the immediacy of the ephemeral, its gestures, expressions and shifting patterns of a delicate shadow, with the stasis and imprint of the photographic image as 'change mummified' (Bazin 1967, pp.9-18; Rosen 2001). The framing of each image, in its material and composition, then, marks the cultural inscription of the landscape, a mediated view. Colour - from the actinic lenses that mediate the explorers' perceptions of the environment to the transient effects of light refracted by ice at sunrise and sunset – link the temporality of the landscape with the historical, technological and cultural mapping of the Antarctic.

Polar Expedition Photography

The early 1900s saw an escalation in the use of photographic technologies to record the work of geographical expeditions (Ryan 1997, p.193; Dixon 2007, pp.59-81). The Royal Geographical Society founded their photographic collection in 1884 as a resource for education and the promotion of the work of exploration to a public audience, which included expeditions into the uninhabited and undocumented Antarctic interior. The use of photography to record the work of polar expeditions can be tracked through black-and-white images of the Norwegian Arctic expeditions led by Fridjof Nansen (1893-97) to those produced on Carsten

Borchgrevnik's British Antarctic Expedition 1898- 1900 and Robert F Scott's Discovery Expedition 1901-04, which saw the first aerial photography taken by Shackleton as he was raised 750feet above the ground by a balloon. Ernest Shackleton's subsequent British Antarctic Expedition 1907-09 saw the continuation of these practices, each photograph recording an image, but also acting as a spatial and temporal coordinate (that time and place) in mapping the landscape. Photographic materials also registered the physical effects of environment as glass plate negatives were susceptible to condensation which formed 'unsightly' imprints on images that were 'completely ruined by wave-like markings' (Ponting 1921, p.170). The decisions of the cameraman in framing each view of the Antarctic were mediated by the interactions of technology and the environment, the availability of light, extreme temperatures in an amorphous region of frozen seas, floors that collapse into crevasses and in which ice formations named 'castles' and 'bastions' fall; in the work of scientific exploration, culture, the photographic and the environment intersect in mapping a landscape for public exhibition. In recognition of the educational and economic value of visual records, subsequent expeditions recruited professional photographers. R F Scott employed the camera artist Herbert G Ponting for his 1910-13 South Pole expedition, a decision that was followed by the travel writer Frank Hurley's work for Douglas Mawson's 1911-14 and Shackleton's 1914-16 journey to Antarctica.[1] Photography and film in public exhibition facilitated the assuagement of debts accrued by Polar expeditions: notably Amundsen, Mawson, Shackleton and then Ponting and Hurley gave illustrated lectures.[2] The black- and- white images were presented as a pictorial record consisting of lantern slides alongside reels of film in which certain subjects were coloured using tinting and toning, whilst other details were highlighted having been painted by hand.

[1] Frank Hurley (1885- 1962) was photographer and travel writer for Douglas Mawson's Australasian Antarctic Expedition 1911 – 1914 and then Ernest Shackleton's Imperial Trans-Antarctic Expedition 1914-16. Hurley's polar expedition films include Home of the Blizzard (c.1916), *South, Sir Ernest Shackleton's* Glorious Epic of the Antarctic (1919), In the Grip of the Polar Pack Ice (c.1920). Ponting (1870-1935) was a travel writer and photographer having previously exhibited his work from journeys through California and Japan. Ponting's re-edits of his film footage from the Terra Nova expedition included With Captain Scott, R.N., to the South Pole (parts one and two in 1911 and 1912), The Great White Silence (1924) and *90° South* (1933). In addition to Ponting's pictorial work, his experiments with photography included flashlight photography, telephoto lenses, cinematography and colour photography using Autochromes. Ponting's stills photography relied on glass plate negatives which he processed in the Antarctic; he experimented with composite images and colour dyes supplied by Kodak to present lantern slide lectures in the Winter Base Hut. The work by other expedition members, Scott, Debenham, Levick and Bowers included photographs taken on rolls of film. Levick's studies of Adélie penguins, were occasionally out of focus yet purposeful in documenting their habits and movement around the ocean and shoreline.

[2] Commercial manufacturers of lantern slides, such as Newton & Co (1851-1953) offered lecture sets for purchase or hire on topics including Fridjof Nansen's Arctic Expedition 1893-97 and Roald Amundsen's Arctic expeditions.

The lantern slides of Roald Amundsen's Norwegian National Antarctic Expedition 1910-12 include a photograph taken by Olav Bjaaland at the South Pole: the explorers stand with hats in hand looking up at the Norwegian flag – 'the colours of our country' (Amundsen 2001, p.141) – a composition in which the gaze of the viewer is orientated toward the hand-painted colours of the flag enacting the demarcation of nation and territory (Kløver 2009, p.6).[3]

Colour and Expedition Photography

Colour, although not a central focus of polar exploration can be tracked throughout expedition journals, sketches and watercolours. Whilst the bright hues of a flag could signal the location of a store, many of the references to colour cite the effects of light refracted by ice. Ponting remarks on 'the snow [that] sparkled underfoot with myriad brilliants. When one donned the indispensable non-actinic goggles to guard against snow-blindness, the brilliants immediately became gems of every conceivable hue' (Ponting 1921: 194). The photographer remarks on the perception and registration of colour as mediated by the effects of lenses, whilst an excess of light is linked to snow blindness: from the green and red hues of the Aurora Australis through to the months of darkness that characterise the polar winter and the mirages that threaten disorientate, the interactions of expedition members and the environment are marked by a vulnerability which is both physiological and cognitive.[4]

Records of the polar environment and the landscapes that were visualised in public exhibition are threaded with the spectacular aspects of the region, such as the colour effects of light on the ice at sunrise and sunset. In his observations of Spring following 'three months of continual darkness, almost constant blizzards, and detention in a crowded building' for winter, Herbert Ponting remarks on 'a soft ethereal twilight, which fell from blue, and pink, and lilac skies, prevailed for several hours before and after noon' (1921, p.153). Similar comments occur in the journals of Amundsen, Scott, Wilson and Hurley. Colour manifested in the hues of lunar corona and parasalena that had been sketched by Wilson on the Discovery expedition (1901-04) and the Aurora, which in the Northern hemisphere had been subject of the meteorologist George Simpson's doctoral studies prior to his work in the Antarctic (1910-13) as linked to the temporality of the landscape, its uneven days and its seasons. The use of photography enabled an accurate likeness of the landscape to be recorded

[3] Kløver's introduction for exhibition catalogue of Cold Recall – Reflections of a Polar Explorer at the Fram Museum in Oslo narrates the slides in chronological order according to the journey of the Norwegian National Antarctic Expedition 1910-12. The exhibition included lantern slides which were printed on 'Imperial ("special") Lantern Plates made by The Imperial Dry Plate Co., Ltd., Cricklewood, London NW and Lantern Plate Rapid Series, Paget Prize Plate Company Ltd.

[4] Ponting's photograph – Ice Blink – shows a type of mirage which could inform navigation through a frozen sea; a white space on the horizon is the effect of the reflection of light from an expanse of ice to avoid.

quickly in comparison to the duration of a sketch. Each image formed a coordinate in the demarcation of a territory which was beset by change, from the shifting morphology of the glacial planes to the 'Brilliant gleams of vivid orange +green+ pink +silver in the curved slips of cloud' that pass the volcanic Mount Erebus (Wilson, 8 August 1911, MS.234/3). The myriad hues noted by Ponting, however, were not readily recorded by his photographic plates, the registration of a 'natural colour' image proving a topic for experimentation.

Experiments with 'natural colour' processes, which were deemed unsuccessful or lost, can be tracked throughout expedition records from notes regarding Reginald Koettlitz's colour still photographs on the Discovery expedition 1901-1904 to Herbert G Ponting's Autochromes on Scott's fated British Antarctic Expedition 1910-13. Aubrey Jones has written that Koettlitz's missing colour photographs 'would have made a wonderful addition to Dr Wilson's superb sketches' (Jones 2011: p.163) in visualizing the hues of sunsets, the midnight sun and cloud effects. Reports in The Times and the Daily Mail prior to the departure of Scott's South Pole Expedition, cite Ponting's preparations toward 'securing good colour records' of the Antarctic using Autochromes, an early glass plate photographic process (Daily Mail, 31 May 1910; The Times Saturday 28 May 1910, p.8). Ponting's Autochromes, which are of sunsets, are held at the National Gallery of Australia, Canberra **(figure 1)**. Scott's journal entry for 25 April 1911 notes that 'Ponting has taken some coloured pictures, but the result is not very satisfactory and the plates are much spotted' (Scott 2006, p.178), which Ponting hypothesises as the effect of travel through the extreme temperatures of the tropics on route to Antarctica. The educational potential of Ponting's work was to enable explorer-lecturers to 'not only tell about the zoology of the far South, but by means of photographs and films he would also be able to show the nature of the animal life there' (Ponting 1921, p.166, emphasis as in original text). An array of cameras and multiple exposures were also intended to ascertain the height and movement of the Aurora Australis (BJP 1910) and yet Edward Wilson, as Chief of Scientific Staff, comments that specific photographic plates for registering an image of the Aurora had not yielded results 'when exposed to even the very brilliant displays. The light of the aurora is monochromatic and yellow +has no active rays in it worth mentioning' (Wilson 28 April 1911, MS.234/3). Notes and sketches record experiments with photography as a mode of scientific study and simultaneously trace a facet in the history of technologies themselves, which Wilson's written account of the expedition entangles with observations on colour and movement:

> calm all day and at noon we had for three hours the finest colours imaginable all over the sky. Out all afternoon making sketches at temp -13˚. Painting the remainder of the day. This evening we had one of the finest aurora I have ever seen. Very brilliant curtains + moving very rapidly – colour lemon green + wherever the movement was most rapid the edges advancing – and the lower borders were crimson red (Wilson 28 April 1911, MS.234/3 Journal).

Observations of colour append the sketches, notes and photographs recorded by expedition members including Scott, Wilson, Ponting and Cherry-Garrard. Scientific and photographic experimentation continued to intersect on later expeditions. The script for Douglas Mawson's Australian Antarctic Expedition (1911-14)

refers to the use of tri-colour photography as a supplement to the complexity of sketching the numerous hues of a Holothurian Catch.[5] Whilst black-and-white photography could document the contents of each haul - as many as one hundred species drawn from depths of the sea - a 'natural colour' photograph had the potential to compensate for the fading of colours otherwise incurred by the preservation process:

> tri-colour photography proved of great value to the zoologist, for, instead of laboriously hand-painting them, he was able to take map-shot colour photos of the animals as they were caught. A colour record of the animals is important as the colours fade in the pickle (Mawson, Lecture Script 1915, Douglas Mawson Centre, 169AAE).

Photography enabled detailed visual notes to be gathered rapidly in freezing temperatures and provided illustrative materials for public lectures. Mawson's remarks on colour photography indicate the technology as a topic of interest alongside the research findings. For Ponting's work, although dissatisfied with the Autochrome plates, he experimented with colouring the black-and-white lantern slides produced in Antarctica. As Wilson recalls in his journal, 'I painted all night, but on lantern slides for Ponting who wanted me to try with some special colours he had got from Kodak – but they were not easy to manage' (23 April 1911: MS 900/3). The lantern slides were among those shown in the Winter Base Hut, whilst those exhibited on Ponting's return to London were later coloured by Raines &Co. Wilson's sketches and notes offer a further point of reference in relation to photography and colour as he writes that 'Ponting and I should exhibit together, an arrangement I like, especially if the exhibition comes off when we all return […] If Ponting thinks that the colour in my things would in the least help his beautiful photos, then I should like them to be shown' (Wilson 19th October 1911). A combination of 'note sketches', watercolours and black-and-white photographs then could be curated to indicate the colours of the sunset, sunrise and meteorological phenomena that were not directly visible in many of Ponting's images. On this level, the work of the polar expeditions tracks a cultural and historical mapping of intersections between scientific and popular interest.

Wilson's Notes on Colour.

The detailed entries in Wilson's journal, in certain instances, coincide in time and date with his sketches as well as the written accounts and photographs of other expedition members, each correlation offering another perspective and coordinate in the complex spatial and temporal map of the Antarctic. The attention to line and form which characterise Wilson's pencil drawings of geographical features are a mode of orientation with potential for the geological research undertaken by other members of the expedition. Wilson refers to a practice whereby he 'copied pictures of Beardmore Glacier Mntns from Shackleton's books. Also read Wilde's account of the journey up the glacier' (Wilson, Journals, 21 September 1911) consulting the work of previous expeditions in the continued mapping of the Antarctic interior through his own drawings made from direct observation. The privileging of line and form in Wilson's scientific work concurs with his reading of

[5] Douglas Mawson, New York Lecture Script (1915), Mawson Centre, South Australian Museum, Mawson Papers 169AAE. Holothurian Catch, IMGP0169.

Ruskin's The Elements of Drawing as the aesthetic of an objective practice. However, Wilson's 'note sketches', which were made from direct observation and annotated with references to colour, are interspersed with 'memory sketches' and ideas for pictorial compositions, indicating a dualistic purpose to his work. A map of the landscape unfolds in fragments over the pages of the sketch book; the delineation of the horizon is interlaced with a sense of the explorer's fascination with the 'small differences of shade [and] colour which make up all the contours of a place like this' (Wilson, Lecture Notes 1910-11, MS1225/3). Wilson's notes record the fleeting effects of colour and light at sunrise and sunset and those found in lunar corona and paraselana are linked to artifice - wondrous yet unreliable - distractions in a view of a landscape 'which is gone as you look at it [and] which you will never see again. Cloud. Sunset lights" (Wilson, Lecture Notes 1910-11, MS1225/3). The written descriptions of chromatic effects indicate the technical and physical limitations encountered in low temperatures 'as regards colour one can do nothing out of doors. Chalks are possible but impracticable', as his hands froze and recovered 'again and again and at last produced an untidy and dirty but truthful rough sketch with notes scribbled all over it' to facilitate the reproduction of a coloured image (Wilson, Lecture Notes 1910-13, MS1225/3). Scott's journals recall a lecture given by Wilson in the Winter Base Hut regarding the purpose and practicalities of sketching, 'explaining his methods of rough sketch and written colour record, and explained its suitability to this climate as opposed to colour chalks' through to a call to accuracy that is wary of 'meaningless lines – every line should be from observation' which he differentiates from the framework of cultural and subjective interpretations found in pictorial compositions which were completed as watercolours in the Winter Base Hut (Scott, Journals 1910-13, p.208).[6] Wilson's paintings include colour illustrations of Antarctic wildlife and those representations intended for public exhibition. However, the sketches, like photographs, register the physical effects of the environment forming a material record of the expedition: each document a palimpsest of scratches, watermarks and detritus in the demarcation of an image. Wilson's acknowledgment that expedition records are mediated by the technologies and the environment in which they are made extends to the effects of the colour temperature of light cast by an acetylene lamp in the Winter Base Hut. Artificial light alters the appearance of his water colours 'In looking at them you must remember they were all done by artificial light - acetylene and so they look queer by daylight – the blues and yellows are apt to go wrong' (Wilson 27 October 1911). Wilson's work on a watercolour of Paraselena was recorded by Ponting's black-and-white photograph, taken by flashlight on 20th May 1911 (Wilson, MS.234/3), the Windsor and Newton paint set close to the acetylene lamp. The architecture and lighting of the hut can be refigured and the painting identified from the photograph, a process which could make apparent the hues of the watercolour as Wilson visualised them: a moment of subjective perception and of colours that are susceptible to the Antarctic environment and vagaries of memory. The configuration of sketches, notes, photographs and texts traces a cultural and technological inscription of

[6] Lectures and lantern slide shows given in the Winter Base Hut were intended to facilitate discussion about the methods and findings of different scientific projects – meteorology, zoology, geology - amongst members of the expedition, but also to provide some level of entertainment.

geographical location, an archaeology of media and of the past lives of others. The material trace of the expedition intersects with its representations; the dissipation of flashlight into darkness making visible the instant that the image is taken and offering a way to imagine the discontinuity of photographic time.

Expedition Photography in Public Exhibition.

Ponting's account of taking the photograph titled 'Castle Berg in Winter' on 4th June 1911 (**figure 2**), remarks on the use of flash photography to continue his practice in months of darkness that characterise the polar winter (Ponting 1922, p.318). The camera artist's initial references to the Castle Berg in the summer of 1911 (**figure 3**) describe an adjunct arched cave which 'framed an enchanting view of Erebus' (1922, p.318). In his written account of the expedition, The Great White South (1921), a month prior to his flashlight photographs, Ponting recalls the sound of the Arch Berg creaking in a gradual movement toward its collapse leaving the 'Castle Berg' to stand alone (Ponting 1921, pp.136 -137). The combination of Ponting's stills photography and notes tracks the morphology of ice as it alters and the continuation of photographic experiments which shape a representation of the landscape. Ponting outlines a use of flashlight photography which was contrived to highlight certain aspects of the Castle Berg: 'I took out my camera and fired two flashes of eight grammes [sic] of powder, about one hundred feet distant from the part of the berg I desired fully lighted, and one flash for the part I desired to be more or less in shadow' (Ponting 1921, p.137; Ponting 1922, p.318). The photographer's observations intersect with those of Scott, who recalls his initial misperception of the source of the light: 'Ponting has been out to the bergs photographing by flashlight. As I passed south of the Island with its whole mass between myself and the photographer I saw the flash of magnesium light,* having all the appearance of lightning' (Scott 2006, p.213). The coincidence of the two records – Ponting's notes on the artificial light of the magnesium flash which Scott misreads as lightning – forms a beguiling coordinate in the historiographic and cultural configuration of a landscape which tracks the tenuous inhabitation of the expedition in an unfamiliar environment. The instant in which artificial light is reflected from the surface of the ice inscribes an ethereal image in photosensitive materials of the glass plate negative, a technological and cultural interpretation of the Castle Berg which proffers the temporality of photographic and nature as spectacle. The naming of the 'Castle Berg', which is later referred to as 'Jack Frost's Castle' for the entertainment form of a Cinema Lecture, utilises a cultural referent to facilitate the orientation of the viewer.

In reviewing an exhibition of Ponting's work at the Free Trade Hall, the 'unquestionably great' advances in photography in the years prior to the expedition are noted (MCLGA 1913, p.6). The review draws attention to a camera artist who had 'had time to study effects which, with us, are evanescent' from the movement of 'bird flying athwart the pathway of light in the sky' to the decay of an ice berg (MCLGA 1913, p.6). The review gestures toward an urban public more familiar with snowfall for which 'its pollution soon follows its arrival' (MCLGA 1913, p.6).

> But it is in the great masses that the finest effects are visible. Castle Burg, as one of the icebergs was named, was an object of especial study, for it was only a mile from the hut,

> having been frozen into the ice. Huge bastions of mediaeval type rise skyward, and the play of light on their flanks is well suggested while again No.117, an iceberg off Cape Evans, is admirable, and a weathered iceberg (No.121) is interesting. Rare and curious and, withal beautiful, is the picture of the Terra Nova in McMurdo Sound, taken on a calm day, and showing an iceberg in the last throes of dissolution, just as one off Cape Royds shows one in its early stages. Eighty miles away, the high peaks of the Western Mountains of Victoria Land are clearly visible, a fine demonstration of the purity of the atmosphere. (MCLGA 1913, p.6).

The connection of sensationalism and geography (Dixon 2007) persists in Ponting's work as the spectacle of landscape and photographic technologies (Gunning 1986). In the image of the 'Castle Berg in Winter', the diffusion of flashlight into darkness is the intricate marking of the photographic instant in a technological and culturally mediated space; a paradox which is implicit in the photographic as a permanent record of transience (Rosen 2001; Doane 2002) - artificial light as the fleeting inhabitation of space – is interlaced with the disconnectedness of the viewer from the time of its making.

Cinema Lectures: Still and Moving Images.

Herbert G Ponting's work for the British Antarctic Expedition 1910-13 incorporated cinematography and still photographs. The camera negatives of the Terra Nova expedition were initially processed by Ponting in the Antarctic and returned to the UK in separate consignments to be screened in two parts under the title With Captain Scott R.N., to the South Pole (1911 and 1912).[7] Ponting subsequently re-edited his film footage of the expedition across an initial twenty-year period leaving numerous prints in circulation including The Great White Silence (1924), which was coloured (tinting, toning, hand painting) and formed the focus of the British Film Institute National Archive's 2010 digital colour restoration. Ponting's 1933 revision, 90º South, was both technological and textual, with the addition of synchronised sound and newly commissioned material. Cinematography provided an apt record of animal behaviours (Ponting 1921, p.207), evidencing the sawing - not biting – motion of the Weddell Seal in carving channels through the ice; observations that Ponting then anthropomorphised for popular entertainment. In exhibition, the reels of film were screened in combination with lantern slides. Ponting's letters to the Royal Geographical Society in 1917 indicate a performance of With Captain Scott to the Antarctic in which 'images, both moving and still can be projected at their best. The lecture lasts for two hours, and it is continuous series of pictures throughout. Many beautiful pictures will be presented for the first time, in addition to the main scenes that were originally

[7] Sections of the black-and-white film footage of Roald Amundsens Sydpolsferd (1910-1912) were coloured using tinting and toning, but screened after Ponting's 1911-12 exhibition of With Captain Scott RN to the South Pole (BJP 1910: 417-8; BJP 1912: 645-6).

shown.'[8] The curation of images and text into a lecture utilises practices similar to those photographic effects that can later be found in Ponting's films: from the sequencing of lantern slides and moving images that Ponting likens to time lapse photography – a shorthand for the duration of change such as that used to show a gull chick hatching – to the manipulation of auditorium lights and sequences that 'must be run slower than usual' for dramatic effect (Ponting, Cinema Lecture, MS-papers-1225, p.40 and p.16; Watkins, 2018). The status of a photograph as copy leaves numerous prints in circulation, the glass plate negative of 'Castle Berg in Winter' recurring as a lantern slide in collections at the Royal Geographical Society (Ponting S0023361) and the Scott Polar Research Institute (Ponting LS/00/7/7), each of these copies has been coloured using a blue tone and yellow tint. The yellow hue recurs in another photograph taken by flashlight, that of Clissold and Atkinson 'Taking in the fish-trap -45F' (Ponting, RGS S00232273) in which strokes of colour, painted by hand, evoke the light cast from a lamp embedded in the ice. The set of lantern slides held at the Royal Geographical Society in London were purchased from Ponting's estate in 1936, the year following his death. Ponting's photographs 'the negatives and everything appertaining to them' (Ponting 29 July 1929; 8 January 1930) were managed by Fred Gent, a former representative of the Gaumont film company. Ponting's lantern slides, like those of Frank Hurley were coloured by Raines and Co., signalling a practical connection in their work (Dixon 2007, p.66).[9] A copy of Hurley's 'The Night Watchman' (RGS, LS/ James/52), which was photographed on the deck of the Endurance, utilises yellow dye to demarcate the lit interior of the ship in contrast to the blue tone associated with nightfall. The points of connection in production underscore a common approach to colour that differentiates artificial and

[8] Ponting, Letter to Mr R. Hinks, Royal Geographical Society (7 December 1917), MS 964/10/6; Ponting, Cinema Lecture, MS-papers-1225. The duration of the lecture noted in Ponting's letter to the Royal Geographical Society (1917) corresponds with 'cinema lecture' script, which is held in the National Library of New Zealand's Alexander Turnbull Library. The script, which is undated, was accessioned to the collection in the 1960s; although its title aligns with that of the 1911–12 screenings, it relates the fate of the expedition, news of which was not confirmed until 1913. Ponting, who purchased the film negatives from the Gaumont Company in 1914, is noted as copyright holder of the cinema lecture script (MS-papers-1225). The organisation of still and moving images in the Cinema Lecture script is not identical to and yet underpins the form of The Great White Silence (1924).

[9] Hurley, Diaries, 28 July 1918. Hurley initially coloured some of his own film materials. Connections between the two photographers can tracked through Hurley's attendance at Ponting's lectures in London and subsequent purchased a set of 80 slides of Scott's expedition with lecture rights for Australasia. On the 3rd August 1918 Ponting accompanied Hurley to Fenchurch Street Station as he departed for Tilbury Docks. It is useful to note Fred Gent's role in negotiating for Ponting and Mawson, for whom Hurley had been the expedition photographer, in their London exhibitions.

natural light, the spatial and temporal demarcation of the inhabitation of a region, which binds the indexicality of the photographic with other levels of visual and cultural signification.

Cherchi Usai's studies in silent cinema indicate thematic associations, such as the use of an amber tint to signal the instance 'a table lamp was turned on in a room' (Cherchi Usai 1991, pp.29-38), a note that correlates with Yumibe's comment that companies specialising in colouring glass slides often also worked on films (2013, p.26). In Ponting's The Great White Silence, the arrangement of colour tints and tones delineates areas associated with inhabitation - the ship, the Winter Base Hut and the fall of flash light – in sepia and yellow tones from those associated with the Antarctic wildlife which predominantly appear in a green hue. The colouring of Ponting's work relates to instructions scratched into sections of blank film which were attached to the images and film fragments.[10] For their digital colour conservation and restoration of The Great White Silence, the British Film Institute National Archive utilised the instructions and cross-referenced prints held at the Filmmuseum in Amsterdam and the La Cinémathèque de Toulouse. The notes include Ponting's name and interspersed with dates relating to different edits of his polar expedition footage, indicating his contribution to the chromatic score of the film (Watkins 2013). Colours are of course more complex than the instructions for a blue tone or pink tint: the specificity of each hue varies according to the formulae of the dye used and fading incurred by heat of the projector lamp. However, the photographer's earlier correspondence indicates a close attention to the use of colour. In preparing the colour plates for In Lotus Land – Japan, which was published in 1910 prior to the departure of Scott's expedition, Ponting refers to existing inks and papers: 'a rich warm brown […] as that is the colour I have adapted after years of experiments for all my colour work' as it differs from the 'chill effect of a cold black ink', noting that to offer 'the effect of real warm sunshine in a print largely adds to its value, but you cannot get it in a cold ink' (Ponting 17th April 1910 Macmillan Archive vol. CDXXVI Add Ms.55221). Of the images that Ponting selects to be printed in colour, many are of sunsets, moonlight and reflections in water. Ponting negotiates over existing colour materials and practices[11] – 'sunshine pictures are invariably printed in sepia at all photographic exhibitions' (Ponting 17th April 1910) – to convey sensuous aspects of light in the landscape.

Photographic experiments - flashlight, colour, moving images of Antarctic wildlife and their habits - which sought ways to document the scientific work of the expedition were also utilised in the lantern slides and films intended for public exhibition.[12] In these non-fiction expedition films, the cultural context of production

[10] Figure 6 offers an example of a colour instruction from The Great White Silence.

[11] *Penrose's Pictorial Annual, The Proc*ess Year Book, Vol.15, 1909-10, ed. William Gamble (London: Percy Lund·Humphries &Co., 1910). In his correspondence regarding a rich brown ink (1909), Ponting refers directly to the current volume, which includes short articles on Autochrome photography and colour.

[12] George Simpson's collection of lantern slides, which are held at the Scott Polar Research Institute, include tinted and toned reproductions of Ponting's still images for which the photographer held the rights.

informed a use of colour that was associated with entertainment. Colour, designed to be viewed sensuously (Yumibe 2012; Peterson 2014) was entangled with specifically photographic effects – superimposition, the dissolve, iris effects – to present technology and the work of geographical exploration as spectacle (Dixon 2006). In The Great White Silence still images of an ice cave **(figure 4; figure 5)** are intercut with sections of film which show 'the same cavern later that year' **(figure 6)**, the editing of which conveys the decay of the ice berg and of time passing. In this section, instructions scratched into a fragment of film appended to an image of the cavern indicate the use of a blue tone and pink tint, colours which coincide with Scott's descriptions:

> I had rarely seen anything more beautiful than this cave. It was really a sort of crevasse in a titled berg parallel to the original surface; the strata on either side had bent outwards; through the back the sky could be seen through a screen of beautiful icicles – it looked a royal purple, whether by contrast with the blue of the cavern or from optical illusion I do not know. Through the larger entrance could be seen, also partly through icicles, the ship, the Western Mountains, and a lilac sky; a wonderfully beautiful picture (Scott 1913 p.76).

Wilson's watercolour of a Cave Berg off Cape Evans, 5:30pm 1st September 1911 (SPRI N 528) is formed of pink and blue hues, the time and date specifying his observations **(figure 7)**. Colour and light form a spectacle in landscape and performance as subject matter and technology coalesce in a visual display. This is not to suggest a synthesis of different media sourced from geographically diverse archives into a text tailored to an audience contemporary to its digital restoration, but to find a way that the gaps and failures of its material life and the sensory implications of its performance be made apparent as they are entwined with meaning in the imagery and narration of the expedition. Expedition photography entangles an unstable combination (Dixon 2003, p.136) of scientific experimentation and popular entertainment through the discontinuity of a photographic instant and cinematic time

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