

'History is my material'

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ABSTRACT

The deep layering and symbolic materials of Kiefer's paintings explore the relationship between past and present, 'the link between man and man ... the key to ourselves' (Power 2005). Unconventional materials and techniques have caused fast physical alteration of Kiefer's paintings, with further changes anticipated. Whilst physical transformation of the paintings is consciously exploited by the artist to embody his discussion of time and memory, the paintings' continued uncurbed change is not desirable. Predicting and establishing acceptable boundaries for change in Kiefer's paintings, through discussion with the artist and the works' custodians, is key to ensuring that their visual legibility, and hence the cultural importance, is not lost. The conservation priorities for Kiefer's paintings are presented based on collaborative research.

PHILOSOPHY AND IDEOLOGY

Anselm Kiefer is amongst the most renowned painters of the postmodern art world. Born in 1945, Kiefer studied fine art under Joseph Beuys at the Staatliche Akademie der Bildenden Künste, Karlsruhe. Following travel in Europe, his provocative *Occupations* series, exploring collective memories of war, brought him public attention during the 1960s. His work is acclaimed as having 'the strength to face up to all dramas and tragedies ... and transcend them' (Power 2005).

Kiefer's practice remains culturally important in post-war Germany. Kiefer wrote, 'History is my material' – for the artist, history is not static, but represented as impermanent and subjective: through the complex layering of his painted surfaces, his country's past manifests itself directly in work such as *Unternehmen Seelöwe* (1975), and more obliquely with references to Jewish mysticism banned under Nazi rule, or images of Berlin's Tempelhof airport. His subjects encourage the viewer to form their own interpretation of a shared history (Kiefer 2011b).

METHODOLOGY

This project was undertaken to understand what changes can be predicted in Kiefer's paintings, through the technical examination of 30 paintings, assessing their materials and condition (Table 1). It focused on paintings from the last decade at Tate, White Cube, London and Guggenheim, Bilbao. Samples were examined using optical microscopy to distinguish the layer structure and the artist's technique and palette. Elemental analysis of inorganic materials was conducted using scanning electron microscopy (SEM/EDX)¹ and organic analysis using Fourier transform infrared spectroscopy (FTIR).² Canvas yarns were identified using transmitted light microscopy.³ Additional information came from conservation reports, materials held at White Cube and discussion with professional installers of Kiefer's work.

MATERIALS AND SYMBOLOLOGY

The inspiration for Kiefer's eclectic choice of materials ranges from the wartime poems of Ingeborg Bachmann to alchemical treatises and found objects (Table 2–3). Kiefer uses the alchemical belief that some substances



Figure 1
Antonin Artaud *Heliogabalus*, panel join crack.
© Amy Griffin

have an intrinsic energy, created where materials evoke narrative associations beyond their physical presence, to explain his attraction to them (Roberts 1994). Bricks, ash and lead are described as ‘sparks’, metaphors for the bombed home of his childhood, of burning and war or of the timeless depth of the sea (Kiefer 2011a).

These unconventional materials are the most vulnerable elements from a conservation perspective. This is due to a painting’s construction – for example, a canvas was not designed to support a brick wall and a satellite dish, as in *Spracher der Vögel* (1988–2011) – and the artist’s penchant for symbolic materials that are unstable. Independent and unpredictable metamorphosis of Kiefer’s materials is a key process by which he seeks to release their narrative energy. Change is encouraged by heating, wetting, shaking or exposing the paintings to the elements. Through harnessing change as a tool, the preconceived ideas of the artist are transcended. Similarly for the viewer, these works challenge established thinking and propose new ways of understanding their subjects. Although it is important that these materials visually demonstrate transformation, change rarely ceases when the painting is considered finished, thus making the works perpetually unstable.

Trends in different materials and processes have developed over Kiefer’s career. The introduction of new symbolic materials often derives from Kiefer’s physical and literary travels, or his place of work: sunflowers were grown in Barjac, Kiefer’s French studio from 1993–2008, or following his interest in the alchemist Fulcanelli, the crystalline by-product of electrolysis was applied to his canvases.

Beneath the symbolic layers, the lower layers (support, ground and paint) conversely serve a functional purpose. For this basic construction, Kiefer has utilised a standard technique over the last decade with little alteration. This distinction is important as it demonstrates that different series of work will exhibit common behaviours due to a shared underlying structure.

BASIC PAINTING CONSTRUCTION

For the support, Kiefer favours medium-weight coarse jute with pronounced tooth and plain weave. The support is surprisingly light, considering the weight of subsequent paint layers and sculptural additions. The jute is stretched onto simple wood strainers made using 6×4 cm timber for the outer members. These are butt joined at the corners and finger joined between the outer members and the crossbars. Wooden strainers keep these works lighter than a solid support, and allow access to the front and back of the painting. This aids Kiefer’s technique of heating and cooling the paint to produce the characteristic deep cracking. For very large works, steel plates are screwed across the join of four to six strainers to hold them together before painting.⁴ In some cases, multiple strainers remain permanently fixed together at the request of the studio, whilst in others they are separated for transport (Figure 1) (Velasco 2011).

Kiefer’s paintings are primed with a white matte ground. FTIR analysis distinguished the use of three different materials over the range of paintings examined: an acrylic emulsion, a polyvinyl acetate and a styrenated acrylic,



Figure 2
The Heart of the Fog, finger marks. © Amy Griffin

all containing titanium white extended with calcium carbonate and talc. This suggests that Kiefer's studio uses a variety of commercial primers. The detection of styrenated acrylic and unusually large calcium peaks in FTIR analysis is indicative of low-quality artist or household paint.

Following the ground, the main body of the surface is built up using a dense putty. This is manually shaped, before being repeatedly heated and cooled using industrial air heaters to initiate cracks (Figure 2). Documentary accounts state this putty is made from an extensive range of materials, but for the paintings studied it seems not the commonly recorded earth, oils and clay. All samples were found to contain calcium carbonate, bound in a drying oil and natural resin or oleic acid.⁵ In *Die berühmten Orden der Nacht* (1997), *Nur mit Wind, mit Zeit und mit Klang* (1997) and *Das Sonnenschiff* (1984–95) shiny silver particles were observed, which correlated with peaks for Si in EDX. Putty layers are visually distinguishable from the subsequent paint layers (both are applied wet-in-wet), appearing translucent and unpigmented in cross section. The results suggest that the putty is studio produced, does not contain pigment and that Kiefer is consistent with the materials used.⁶

Kiefer's palette is unusual but not wholly unconventional. Statements by the artist such as, 'I don't use conventional colour. I don't even use paint' were not corroborated in this research (Wright 2007). The surface material is a combination of oil paint (commercial or studio-made) and acrylic paint, into which objects such as straw and sunflower seeds are mixed. Visual examination showed that the paint layers are predominantly black and white, of a thick, buttery consistency and applied from the tube with brushes, or by hand. There is no evidence of wrinkling in thick passages, suggesting a large quantity of fast drying components or extender has been added. In all cases, the paint layers were well adhered to the putty, but often still slightly soft.

UNIQUE MATERIALS

Kiefer's upper layers contain his materials of transformation; these include materials as diverse as large lead sculptures, electrolysed and hung from the stretcher; fragile organic materials such as dried asparagus; copper acetate crystals formed by mixing PVA⁷ and the crystal slurry from his electrolysis tanks made by mixing the slurry from his electrolysis tanks with PVA⁷, then evaporating the moisture with industrial air heaters (Hale 2011a).

CHANGE BEYOND THE STUDIO

Once the work has left the studio, it must be transported, installed and viewed, and in spite of this, retain its fundamental texture and image. Like many artists, Kiefer expresses conflicting opinions regarding his works' longevity. The idea that his paintings' continued alteration over time may shock prospective collectors appears to please Kiefer, but his current response to conservation indicates that not all changes are desirable (Kiefer 2011a). The interpretation of culture and philosophy held in his work is dependent on both the transformative materials he employs and the long-term legibility of its surface as the artist intended, a balance



Figure 3
Tempelhof, partially detached crystalline layer.
© Amy Griffin

which Kiefer accepts is difficult: ‘When I decide to interrupt the process of permanent transformation, which in my case never ends, I rely on the principle that there comes a moment when things have to stop and the ongoing work has to become a product ... encompassing two different realities: the reality of the finished painting, and I have determined it, and the reality of its method of production’ (Kiefer 2011b).

In his 1982 interview at Tate, Kiefer requested a ‘natural ageing of the work’. However, Kiefer accepts a painting as a finished product when it leaves the studio, voicing the desire ‘to fix something’ in order to keep it unchanging (Kiefer 2011c). He acknowledges, ‘my works are very fragile ... if you put them in the wrong circumstances they lose their power completely’, affirming that paintings will be void if they become so far removed from the original surface that they can no longer express their intent alone or in conversation with other works (Kiefer 2011c). Kiefer’s detachment from individual pieces, allowing him to produce multiple paintings and then abandon them, sometimes to be re-worked years later, is a key part of his practice. However, those entrusted with the preservation of his paintings must equally value all works in their care. For future generations to ‘bring back to life the figures frozen in the artwork’ – to understand the cultural discourse Kiefer’s work offers, the point at which process ends, and the work requires interventive and preventive conservation to slow further change, needs to be clearly established (Kiefer 2011b).

CONDITION AND PREDICTED CHANGE

Study of Kiefer’s materials and techniques suggests that significant alterations to his works will occur, changing their appearance and compromising their stability. The artist’s use of traditional strainers and canvas provides insufficient support; the canvases are commonly deformed and lack tension, resulting in continuing creep in the material and bulging along the bottom edges over time. The additional weight of the applied layers exacerbates this trait, as do changes in temperature and relative humidity.

The eventual failure of the canvas due to loads induced by heavy sculptural additions is predictable, and the difficulty of reattaching sculptures during installation poses an immediate risk of damage. In some paintings, lead sculptures were too heavy to be supported by the canvas alone, and hanging systems required modification for exhibition. In commercial galleries, new hanging systems have been required for safety reasons (Davidge 2011).

During transport and installation, the paintings underwent vibration and shock. The impacting of loose supports against the strainer caused delamination of poorly adhered sections of paint (Figure 3). Whilst Kiefer consistently disregards small-scale losses as making no difference to the overall aesthetic, the accumulation of minor damages will eventually greatly impact the work’s surface (Albano 1998). In the long term, stretcher bar cracks and deformation in the paint will also result (Hackney 2004). Softness of the paints and their incomplete drying gives them their characteristic “painterly” smell and makes surfaces vulnerable to indentation and imbibing of dirt. A gradual degradation and the obscuring of surface subtleties can be



Figure 4

Large loss observed on arrival of the work for the *Il Mistero delle Cattedrali* exhibition. © Christina Young

Figure 5

Crystals deliquescing in high relative humidity. © White Cube

predicted from the accumulation of surface dirt; this is evident now and will continue.

The interfacial interaction between the dominant layers of putty and ground can be considered comparable to behaviour between an acrylic (BA/MMA) ground and an oil paint layer. Research has shown these materials to be of a similar flexibility when the oil film is young, but with age, oxidation of the oil layer will increase in stiffness disproportionately to the acrylic. In this case the putty's high solid content can be expected to make it inherently stiff even when the film is young (Young 2006). The implication of this is a continuation of what has already been intentionally created on the surface: the flexibility of the underlying ground will cause failure and possible loss in the stiffer and more brittle upper layers of putty. Additionally, future cracking and losses would continue to propagate in the upper layers and may also cause failure in the priming layer.

Organic additions to the works are very vulnerable; disinfestation, for spider beetle in *Lasst tausend Blumen Blühen* (2000), and *Stegobium peniceum* and *Ptinus fur* beetle in *Das Sonnenschiff* (1984–95), has been necessary. In *Das Sonnenschiff* the resulting fragility of the already brittle asparagus has made the painting too fragile to exhibit (Guggenheim Museum Bilbao, Smithen 2002). Dislodging of large sections of poorly adhered material is common and Kiefer has specified at Tate, the Guggenheim Bilbao and White Cube that conservators should replace the materials in a similar configuration or substitute them with new pieces, which are provided by the studio (Perry 2001). In 2012, deliquescence of the crystals in one of Kiefer's paintings displayed in raised relative humidity conditions began to cause temporary alteration of the work's surface (Figure 5).

CONSERVATION AND CULTURAL SIGNIFICANCE

Although change is inevitable, the speed at which it occurs can be controlled. Unlike works by other artists, a certain amount of damage or change has to be accepted to allow the paintings to travel and be exhibited. The conservator's role is to manage change in order to preserve the work's narrative and aesthetic. Kiefer clearly does not object to conservation, provided it does not interfere with his production. With the artist's consent, both structural interventions and superficial treatments have been conducted, and Kiefer has removed the areas where strainer joins became visible after dismantling *The Heart of the Fog* (1997) for transport (Smithen 2002, Hale 2011b).

Historical treatments to stabilise the work have included cotton tape slings to support protruding wires, backboards and patches (Tate 2009). More extensive treatments to provide additional support for the paintings' sculptural elements have been undertaken at White Cube, with Kiefer's consent, on *Von den Verlorenen gerührt, die der Glaube nicht trug, erwachen die Trommeln im Fluss* (2005) and *Salz, Merkur, Sulfur* (2011). Here holes were cut into the sculptures and the painting to accommodate hanging bolts. Such collaboration can be considered similar to a 'studio' modification. It is not common for conservation to take such interventive action, but in these cases the modification has prolonged the life of the painting and made it safe to exhibit.

Consolidation of flaking, loose paint and blind cleavage is commonplace. During treatment of *The Heart of the Fog* (1997) and *Palmsonntag* (2006) large chunks of paint, which were partially detached but too stiff to mould back into place, were treated with balled and heat-set films of adhesive (Tate 2009). Overall losses were greatly reduced by planned installation procedures, modified lifting equipment and minimal handling of the painting.

Paintings for the exhibition *Il Mistero delle Cattedrali* (2011) sustained extensive losses to their crystalline layer during transportation from Croissy to White Cube (Figure 4) (Hale 2011a). Minimal movement and a controlled environment to prevent high relative humidity causing deliquescence are clearly essential.

In cases where the extreme fragility of a material threatens to alter the reading of the painting, the proposal that synthetic replicas could be used in place of a real object, as with the desiccated sunflowers made from caste resin in *Dat rosa miel apibus* (2010–11), could be explored (Kiefer 2011b). Further research to establish the degree to which stabilising a 'transitional material' would not preclude its symbolic function would assist future decisions for vulnerable, fragile elements.

Whilst his materials may be ephemeral, it would be incorrect to consider a work's intention as ephemeral. The use of transformation allows Kiefer to push the boundaries of painterly technique, and his discourse around memory and history is inextricably linked to the materials he uses. Inevitably though, unmanaged change will obscure the work's legibility and cultural significance.

The study of Kiefer's work shows that despite precautionary measures, the probability of damage and losses is very high. However, the comparable behaviour of his paintings suggests that, with the collaboration of museums, galleries and private collectors, a program of remedial and preventive conservation can be initiated to preserve these works for posterity.

CONCLUSION

This research has provided a focused investigation into Kiefer's materials and techniques. It has established the common use of a jute support, an industrial acrylic ground, artist grade oil and acrylic paints, and studio-made chalk putty.

In order to balance the integrity, cultural history and accessibility of the work, preventive conservation is needed for all the paintings studied. A greater understanding of Kiefer's inconsistent opinion regarding the future of his paintings has been achieved and may assist with a methodology for further decisions when the artist is not available for consultation. Documented conservation treatments have clarified that the decision to allow uncurbed change in his work would be an incorrect interpretation of the artist's intent.

Due to the inherent tendency of Kiefer's material to alter over time, conservation procedures have to concede that a degree of change is a crucial aspect of the work. However, unnecessary loss and damage should be prevented to minimise the risk of drastic alteration. The management

of change would benefit from collaboration between galleries, museums and Kiefer's studio to achieve a shared body of knowledge regarding the paintings' materials, conservation and exhibition.

Continued discussion with the artist is essential as the concept of the work changes and new materials are introduced. Through an active approach to the paintings' conservation we can hope to avoid these works becoming too fragile or too deteriorated to exhibit publically.

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NOTES

- ¹ Hitachi model 14000 EM, Kings College, London.
- ² Thermo scientific Nicolet iN10 MX microscope with a diamond cell, Tate, London.
- ³ Analysis undertaken at The British Library, London.
- ⁴ The use of multiple strainers is requirement because of the fabric's limited width in the weft direction.
- ⁵ Spectra from the FTIR were difficult to interpret because of the dominance of the chalk peak.
- ⁶ Empirical testing of putty manufactured by the authors demonstrated that to achieve a similar consistency and colour, a dark toned shellac and a heat-bodied oil would be needed, possibly with the addition of a PVAc.
- ⁷ The crystals were recreated by the authors empirically based on the known content of the slurry.

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Table 1

List of paintings examined

Painting	Date	Owner	Date/Location of examination	Method of examination	Aspects examined	Dimensions (cm)
<i>Nebelland hab ich gesehen, Nebelherz hab ich gegessen (für Ingeborg Bachmann)/(The Heart of the Fog)</i>	1997	White Cube	1/11/11 White Cube stores	CASE STUDY PAINTING*	All, during installation	600 x 800
<i>Samson</i>	2011	White Cube	7/10/11 White Cube, Bermondsey	CASE STUDY PAINTING*	All, during installation	190 x 230
<i>The Fertile Crescent</i>	2009	White Cube	19/10/11 White Cube, stores	CASE STUDY PAINTING*	All panels recto, panel 2 verso.	310 x 760
<i>The Fertile Crescent (2)</i>	2009	White Cube	3/11/11 White Cube, stores	CASE STUDY PAINTING*	Panels 1,6,7,8 verso and recto.	475 x 950
<i>Zweistromland</i>	1995	Guggenheim, Bilbao	8/11/11 Guggenheim, Bilbao	CASE STUDY PAINTING*	All, during installation	416 x 710
<i>Die berühmten Orden der Nacht</i>	1997	Guggenheim, Bilbao	11/11/11 Guggenheim Bilbao	CASE STUDY PAINTING*	All, during installation	510 x 500
<i>Salz, Merkur, Sulfur</i>	2011	White Cube	17/11/11 White Cube stores	Examination of the painting in the stores. Examination of the lead boat before and after conservation, samples taken from crystals on its surface. Examination of the proposed hanging modifications and gallery files	All	380 x 560
<i>Pietà</i>	2010	White Cube	24/10/11 White Cube stores	Examination of the painting in its frame, static and in motion. Samples taken and set. Examined gallery files	All, i	191 x 380
<i>Opus Magnum</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display. Sample of paint taken	All	-
'Flower painting II' – title to be confirmed	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display. Sample of paint taken	All	-
<i>Blütpumpe</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display	All	-
'Lead book' - title to be confirmed	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display. Sample of fabric taken	All	280 x 500
<i>Wuntall</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display. Sample of fabric taken	All	-
<i>Der Tod und das Mädchen</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display	All	-
<i>Il Mistero delle Cattedrali (1)</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display. Sample of fabric taken	All	330 x 760
<i>Blutacker</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display	All	-
<i>Il Mistero delle Cattedrali (3)</i>	2011	White Cube	25/11/11 White Cube, Bermondsey	Examined briefly in gallery stores and on display	All	380 x 380
<i>Sprache der Vögel</i>		White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	380 x 450
<i>Tempelhof</i>		White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	380 x 760
<i>Die Freimaurer</i>	2011	White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	-
<i>Antonin Artaud Heliogabalus</i>	2011	White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	330 x 760
<i>Das rosa miel apibus</i>	2011	White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	330 x 1710

Painting	Date	Owner	Date/Location of examination	Method of examination	Aspects examined	Dimensions (cm)
<i>Il Mistero delle Cattedrali (2)</i>	2011	White Cube	12/12/11 White Cube, Bermondsey	Examined briefly on display	Recto	-
<i>Das Sonnenschiff</i>	1984-95	Guggenheim Bilbao	9/11/11 Guggenheim Bilbao	Examined conservation files and painting in gallery stores. Samples provided by Guggenheim Bilbao	All	330 x 560
<i>Nur mit Wind, mit Zeit und mit Klang</i>	1997	Guggenheim Bilbao	9/11/11 Guggenheim Bilbao	Examined conservation files only, sample provided by Guggenheim Bilbao	-	430 x 940
<i>Urd Werdand Skuld II</i>	1980	Bilbao Fine Arts Museum	9/11/11 on display Bilbao Fine Arts Museum	Examined painting briefly in the Gallery	Recto	330 x 185
<i>Sefer Hechaloth</i>	2002	CAC Malaga	9/11/11 on display Bilbao Fine Arts Museum	Examined transport report and painting briefly in Gallery	Recto	381 x 280
<i>Man Under a Pyramid</i>	1996	Tate Galleries	14/12/11 Tate stores	Examined conservation report and painting	Recto	350 x 530
<i>Laßt tausend Blumen blühen</i>	2000	Tate Galleries	17/10/11	Examined conservation report only	-	380 x 280
<i>Palmsonntag</i>	2006	Tate Galleries	17/10/11	Examined conservation report only	-	installation
<i>Lilith</i>	1987-9	Tate Galleries	17/10/11	Examined conservation report only	-	381 x 561
<i>Cette Obscure Clarté Qui Tombe des Étoiles</i>	1999	Tate Galleries	20/11/11	Examined conservation report only	-	470 x 400

* In-depth investigation of all case study paintings was carried out whilst static and during installation or transport. This was visually recorded using digital photography and video. Analytical microscopy and elemental analysis was carried out on samples taken using SEM/EDX and FTIR.

Table 2

Selected published or recorded accounts of Kiefer's materials and techniques

	Description	Painting /Date	Date/context	Reference
PRIMER	'The primer is called "muresko" (trans: is a trade name) a paint normally known as "kunstharz/dispersion" (trans: synthetic resin dispersion), and used to paint walls, which are exposed to the weather'	<i>Parsifal III and IV</i> , 1973	1982, conservation technician interview	Calvoressi, R. 1982. <i>Questionnaire sent to Paul Maenz, Kiefer's technician RE: Parsifal series held at Tate</i> , ed. P. Maenz. London: Tate Britain.
	'White emulsion paint and perhaps some PVA medium'	<i>Laßt tausend Blumen blühen</i> , 2000	2001, conservation artist's interview	Perry, R. 2001. <i>Questionnaire RE: Lasst tausend Blumen Blühen</i> . London: Tate Galleries.
	pn(BA/MMA) acrylic emulsion copolymer with calcium carbonate extender and titanium white pigment	<i>Palette</i> 1981 <i>Man under a Pyramid</i> , 1996	2010, organic analysis 2011, organic analysis	Ormsby, B. 2010. FTIR analysis: <i>Palette</i> , Anselm Kiefer. London: Tate Conservation Department. Ormsby, B. 2011. FTIR analysis: <i>Man Under a Pyramid</i> , Anselm Kiefer, ed. J. Townsend. London: Tate Conservation Department.
	linseed oil medium with calcium carbonate	<i>Laßt tausend Blumen blühen</i> , 2000	2004, organic analysis	Ormsby, B. 2004. FTIR, Py-GCMS and EDX analysis: <i>Let a Thousand Flowers Bloom (Lasst tausend Blumen Blühen)</i> , ed. T. Learner et al. London: Tate Conservation Department.
PUTTY	'It is an impasto emulsion which Kiefer makes himself, almost like a light putty, with oil and shellac and clay'	<i>Laßt tausend Blumen blühen</i> , 2000	2001, conservation artist's interview	Perry, R. 2001. <i>Questionnaire RE: Lasst tausend Blumen Blühen</i> . London: Tate Galleries.
	'a medium which the artist described as an emulsion "mayonnaise" made of linseed oil, pigment, filler and water, with intermediate glazes of shellac'	<i>Lilith</i> , 1987	1989, conservation artist's interview	Dunluce, A. 1989. Report on <i>Lilith</i> by Anselm Kiefer. London: Tate Galleries.
	'ash...shellac, mud, sand and oil'	<i>The Heart of the Fog</i> , 1997	2011, description of artist's technique	Hale, T. 2011. <i>Sow's ears and silk purses: Maintaining the art works of Anselm Kiefer</i> . London: White Cube.
	'shellac, fine oils, sand, earth, ash'	<i>The Heart of the Fog</i> , 1997	2011, description of artist's technique	Hale, T. 2011. <i>Sow's ears and silk purses: Maintaining the art works of Anselm Kiefer</i> . London: White Cube.
	'thickly applied commercial stucco, enriched with linseed oil and polymer emulsion, using trowels or large brushes. In many areas he may have purposely added animal skin glue to induce cracks in the paint surface, which added to the layering effect'	<i>Lott's Wife</i> , 1989	1990, description of the artist's technique	Bé, K. 1990. <i>Lot's wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .
	'ash ... is mixed with a base layer of shellac, mud, sand and oil. This does not emulsify and bind together like commercial paint does, but is intended from the outset to dry and crack'	<i>The Heart of the Fog</i> , 1997	2011, description of artist's technique	Hale, T. 2011. <i>Sow's ears and silk purses: Maintaining the art works of Anselm Kiefer</i> . London: White Cube.
	shellac with low traces of calcium carbonate and titanium white	<i>Laßt tausend Blumen blühen</i> , 2000	2004, organic analysis	Ormsby, B. 2004. FTIR, Py-GCMS and EDX analysis: <i>Let a Thousand Flowers Bloom (Lasst tausend Blumen Blühen)</i> , ed. T. Learner et al. London: Tate Conservation Department.
	calcium carbonate with a drying oil, natural resin or oleic acid	<i>Man under a Pyramid</i> , 1996	2011, organic analysis	Ormsby, B. 2011. FTIR analysis: <i>Man Under a Pyramid</i> , Anselm Kiefer, ed. J. Townsend. London: Tate Conservation Department.
Paint (general)	'Kiefer overlaid the montages using different materials, primarily acrylic paint and shellac, and thereby gave the faces a nostalgic sepia tone'	<i>Wege der Weltweisheit</i> , 1982-93	2007, description of Kiefer's technique with woodcut works	Schmutz, J. 2007. <i>Historic sites of lead for The Women of the Revolution</i> . In <i>Anselm Kiefer, Wege der Weltweisheit/Die Frauen Der Revolution</i> , ed. K. Gallwitz, 69-71. Düsseldorf: R. Verlag.
	'paints and pigments he mixes himself'	<i>Laßt tausend Blumen blühen</i> , 2000	2001, artist conservation interview	Perry, R. 2001. <i>Questionnaire RE: Lasst tausend Blumen Blühen</i> . London: Tate Galleries.
	'I don't even use paint. I use substances'	-	2007, interview with the artist	Wright, K. 2007. <i>The Ruins of Barjac: Interview with Anselm Kiefer</i> . In <i>Anselm Kiefer</i> , ed. G. Celant, 445-447. Milan: Skira.

	Description	Painting /Date	Date/context	Reference
BLACK PAINT	'eisenoxyd Schwarz" (iron oxide black)	<i>Parsifal III and IV</i> , 1973	1982, conservation technician interview	Calvoressi, R.1982. <i>Questionnaire sent to Paul Maenz, Kiefer's technician RE: Parsifal series held at Tate</i> , ed. P. Maenz. London: Tate Britain.
	iron oxide pigment	<i>Laßt tausend Blumen blühen</i> , 2000	2004, inorganic and organic analysis	Ormsby, B. 2004. FTIR, Py-GCMS and EDX analysis: <i>Let a Thousand Flowers Bloom (Lasst tausend Blumen Blühen)</i> , ed. T. Learner et al. London: Tate Conservation Department.
	iron oxide pigment	<i>Man under a Pyramid</i> , 1996	2011, inorganic and organic analysis	Ormsby, B. 2011. FTIR analysis: <i>Man Under a Pyramid</i> , Anselm Kiefer, ed. J. Townsend. London: Tate Conservation Department.
	suggested carbon black	<i>Palmsonntag</i> 2006	2010, organic and inorganic analysis	Ormsby, B. 2010. FTIR analysis: <i>Palmsonntag</i> , Anselm Kiefer. London: Tate Conservation Department.
	suggested carbon black	<i>Palette</i> 1981	2010, organic analysis	Ormsby, B. 2010. FTIR analysis: <i>Palette</i> , Anselm Kiefer. London: Tate Conservation Department.
WHITE PAINT	Lead white and possible PVAc binder	<i>Palmsonntag</i> 2006	2010, organic and inorganic analysis	Ormsby, B. 2010. FTIR analysis: <i>Palmsonntag</i> , Anselm Kiefer. London: Tate Conservation Department.
	'Kiefer adds white emulsion paint – a water based medium – to dampen down sunflowers that are rendered in flammable oil-based shellac. This use of white and black allows for the coexistence of a dense blackness and ghostly apparitions'	<i>Die klugen Jungfrauen</i> , 1996	1997, description of artists' technique	Hyman, J. 1997. <i>Anselm Kiefer's recent work</i> . London: Tate Magazine
RED PAINT	'I don't use conventional colour. I don't even use paint. I use substances. What you see as red, for example, is rust, just rust'	-	2006, artist interview	Wright, K. 2007. The Ruins of Barjac: Interview with Anselm Kiefer. In <i>Anselm Kiefer</i> , ed. G. Celant, 445–447. Milan: Skira.
SHELLAC	'the shellac is normal commercial shellac'	<i>Laßt tausend Blumen blühen</i> , 2000	2001, artist conservation interview	Perry, R. 2001. Questionnaire RE: <i>Lasst tausend Blumen Blühen</i> . London: Tate Galleries.
	'normal commercial shellac'	<i>Laßt tausend Blumen blühen</i> , 2000	2001, artist conservation interview	Perry, R. 2001. Questionnaire RE: <i>Lasst tausend Blumen Blühen</i> . London: Tate Galleries.
	'He sometimes mixed it to 10 or more different varieties of yellows and selected the one he intuitively felt was the most appropriate for the picture he was working on'	-	1998, artist interview	Albano, A. 1998. Reflections on painting, alchemy, Nazism: Visiting with Anselm Kiefer. <i>Journal of the American Institute for Conservation</i> 37(3): 348–61.
TAR	'The extreme thickness of the matter is again covered with charcoal and black tar, and straw'	<i>Nuremberg</i> , 1981	2010, description of artist's technique	Péju, P. 2010. The solitary gesture. In <i>Anselm Kiefer, Unfruchtbare Landschaften. Works from the 60's</i> , ed. Y.L. Gallery. France: Imprimerie Chirat.
WALL PAPER STAIN	'A product called "leinölfirnis rein" (trans: pure linseed oil, boiled?)'	<i>Parsifal III and IV</i> , 1973	1982, conservation technician interview	Calvoressi, R.1982. <i>Questionnaire sent to Paul Maenz, Kiefer's technician RE: Parsifal series held at Tate</i> , ed. P. Maenz. London: Tate Britain.
PARTIC-ULATE LAYER	'a final particulate layer of dust, earth and ash, bound with an acrylic book binding adhesive'	<i>Lilith</i> , 1987	1989, artist conservation interview	Dunluce, A. 1989. Report on <i>Lilith</i> by Anselm Kiefer. London: Tate Galleries.
ASH	'While still wet, the entire surface was dusted with a thin coating of ash'	<i>Lott's Wife</i> , 1989	description of the artist's technique	Bé, K. 1990. <i>Lot's Wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .
STRAW	'In my painting I often mix the luminosity of straw with earth tones'	-	2011, artist's lecture	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.
LEAD PATINA	'he liked the oxidation of white on lead and often tried to induce it artificially with acid in selective areas when he did not want to wait six months or more for the look of the natural lead oxide'	-	1998, interview with the artist	Albano, A. 1998. Reflections on painting, alchemy, Nazism: Visiting with Anselm Kiefer. <i>Journal of the American Institute for Conservation</i> 37(3): 348–61.
	'The metal's surface was also stained with chemical-hydrochloric acid being a favourite agent of the artist'	<i>Lott's Wife</i> , 1989	description of the artist's technique	Bé, K. 1990. <i>Lot's Wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .
	iron rust baths for the lead ships	-	2007, interview with the artist	Wright, K. 2007. The Ruins of Barjac: Interview with Anselm Kiefer. In <i>Anselm Kiefer</i> , ed. G. Celant, 445–447. Milan: Skira.
	steel rust baths for the lead ships	-	2007, interview with the artist	Wright, K. 2007. The Ruins of Barjac: Interview with Anselm Kiefer. In <i>Anselm Kiefer</i> , ed. G. Celant, 445–447. Milan: Skira.
BURNING	'Kiefer intentionally burned the canvas with a blowtorch, creating amorously shaped voids'	<i>Lott's Wife</i> , 1989	description of the artist's technique	Bé, K. 1990. <i>Lot's Wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .
	(referring to his painting techniques) 'I can burn the painting'	-	2011, artists lecture	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.
	'I really do burn my paintings, I char the landscapes.'	-	2004, interview with the artist	Melis, R.A.F.D. 2004. <i>With history under his skin. In MERKABA, Anselm Kiefer, I sette Palazzi Celesti</i> , ed. H. Bicocca. Milano: edizioni charta.
ACID	(referring to his painting techniques) 'or lay it flat on the ground and pour diluted paint or acid over it'	-	2011, artists lecture	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.
CRYSTALLINE MATERIAL	'salt water slurry'	<i>Lott's Wife</i> , 1989	description of the artist's technique	Bé, K. 1990. <i>Lot's Wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .

	Description	Painting /Date	Date/context	Reference
CRYSTALLINE MATERIAL	'Anselm mixes the salt with a PVA wood glue and some water then slashes it on to the canvas it lays flat. He then puts industrial air heaters across the face of the canvas to evaporate the moisture out of the salt.'	-	2011, description of the artist's technique	Hale, T. December 2011. <i>private email correspondence</i> . London.
ELECTROLYSIS	'I can immerse the painting in an electrolytic bath, connecting it to an electric current'	-	2011, artists lecture	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.
	'If I do an electrolysed bath with copper on one side and lead on the other side, the copper is utilized and the copper goes through the photo sometimes because the copper is glued on lead'	-	2011, interview with the artist	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.
	'I made a wonderful green not long ago by using aluminium and lead as electrolytes. Once, I got a blue by adding some new combination of acids in the bath'	-	2007, interview with the artist	Wright, K. 2007. The Ruins of Barjac: Interview with Anselm Kiefer. In <i>Anselm Kiefer</i> , ed. G. Celant, 445–447. Milan: Skira.
	'Kiefer has been known to attach electrodes to paintings with a metallic content to cause colourful oxides to bloom'	-	2011, description of artist's technique	Hale, T. 2011. <i>Sow's ears and silk purses: Maintaining the art works of Anselm Kiefer</i> . London: White Cube.
	Copper and lead are ionised so it 'get's liquid'	-	2011, interview with the artist	Kiefer, A. 2011. <i>Il Mystero delle Cattedralli: Anselm Kiefer in Conversation with Tim Marlow</i> , Ed. T. Marlow. London: White Cube.
ADHESIVE	'special mixture of "kunstharz" (trans. Synthetic resin) and "Starkekleister" (trans: starch paste)'	<i>Parsifal III and IV</i> , 1973	1982, conservation technician interview	Calvoressi, R.1982. <i>Questionnaire sent to Paul Maenz, Kiefer's technician RE: Parsifal series held at Tate</i> , ed. P. Maenz. London: Tate Britain.
	'The fabric was then unstretched, flattened, (including the tacking edges), and fastened with a commercial polyurethane adhesive onto its lead-covered support'	<i>Lott's Wife</i> , 1989	description of the artist's technique	Bé, K. 1990. <i>Lot's Wife, 1989: When an artist uses unconventional materials</i> . A conservation tour [cited 5.12.2011]. Available from: www.clevelandart.org/exhibcef/consexhib/html/lots.html .
	Planatol BB superior (empty buckets of this adhesive can also be seen in Kiefer studio in Fiennes's film)	<i>Laßt tausend Blumen blühen</i> , 2000	2001, conservation artists interview	Perry, R. 2001. <i>Questionnaire RE: Lasst tausend Blumen Blühen</i> . London: Tate Galleries. Fiennes, S. 2010. <i>Over your Cities Grass will Grow, France</i> , 105'.
FAST AGEING	Kiefer ' uses a burning and cooling technique, applying terracotta over the canvas and heating and cooling it rapidly to create surface cracks'	-	2011, description of artist's technique	Hale, T. 2011. <i>Sow's ears and silk purses: Maintaining the art works of Anselm Kiefer</i> . London: White Cube.
NATURAL AGEING	(referring to his painting techniques) 'returning them to nature and exposing them to the elements'	-	2011, artist's lecture	Kiefer, A. 2011. <i>Anselm Kiefer au Collège du France</i> . Paris: Fayard.

Table 3

Materials held at the White Cube used for the reworking of *The Heart of the Fog* (1997) in 2009, when Kiefer returned to add materials to the panel join cracks (Hale 2011b). The materials requested by the artist for this process are documented below:

Product	Manufacturer	Product	Manufacturer	Product	Manufacturer
Cadmium Orange Hue	Daler-Rowney 'Georgian oil'	Liquin Fine Detail	Winsor and Newton	Yellow Ochre	Winsor and Newton Artists Acrylic
Pthalo Green	Daler-Rowney 'Georgian oil'	Liquitex Gloss	Liquitex	Mars Black	Winsor and Newton Artists Acrylic
Cadmium Yellow Hue	Daler-Rowney 'Georgian oil'	Azobond Cyanoacrylate	-	Payne's Grey	Winsor and Newton Artists Acrylic
Ivory Black	Daler-Rowney 'Georgian oil'	Titanium White	A P Fitzpatrick (AB200)	Titanium White Acrylic	Winsor and Newton 'Galeria'
Yellow Ochre	Daler-Rowney 'system3 acrylics'	Colourful PVA adhesive	Colourful Arts, Sheffield	Raw Sienna	Daler-Rowney 'Georgian oil'
Sap Green	Daler-Rowney 'system3 acrylics'	Genuine White Marble dust	L. Corneissons	Burnt Umber	Daler-Rowney 'Georgian oil'
Staffordshire Sand	Specialist Aggregates	distilled turpentine	-	Pthalo Blue	Daler-Rowney 'Georgian oil'
Artists matt varnish	Winsor and Newton	Extra Heavy Gel Semi Gloss	Golden	Zinc White	Daler-Rowney 'Georgian oil'
Shellac Varnish Clear	C. Robinsons & Co.	Satin Varnish, acrylic medium	Winsor and Newton 'Galeria'	Alizarin Crimson	Daler-Rowney 'Georgian oil'
		Drying Linseed Oil	Winsor and Newton	Hookers Green	Daler-Rowney 'Georgian oil'
		Picture Varnish Matt	Talens	Artists Matt varnish	Winsor and Newton

White pots containing soft black paint, red paint and putty were also included in the materials, as was a tub of shellac and Jute fabric. These are presumed to have been brought by the artist from Barjac. Although unused, large paint brushes were also included.

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