BRIDGING THE GAP BETWEEN THE MUNCH ROOM DISPLAY AND THE CONSERVATION NARRATIVE: A DECISION-MAKING MODEL

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ABSTRACT Since the second half of the 20th century, public museums have witnessed a steady increase in expectations for implementing transparent conservation and preservation strategies for their art collections, balanced with requirements for display and accessibility. Despite their permanent museum status, historical painting collections are not necessarily static as they continue to evolve over time and in tandem with current views and changes in perception. This phenomenon is reflected in the National Museum of Art's collection of 57 Munch paintings, which has a collective display tradition in terms of the Munch Room. The following study addresses the challenges in designing a viable conservation decision-making model for an anachronistically displayed collection of paintings. In terms of conservation, the focus is on the non-original restoration varnish layers. Research methods include the creation of an updated survey of the 57 paintings and builds on two previous non-invasive scientific studies, which revealed that three-quarters of the Munch collection had been varnished by the museum. A proposed decision-making design, based on contemporary art models, incorporates an extra visual overview of each painting's historical trajectory. The theoretical framework of 'object itineraries' was adopted to both interpret and map the shifts in the core display of paintings between 1909 and 2019. This approach helped to highlight the recurring historical patterns related to the application of non-original restoration varnishes and physical damages. Likewise, changes in the painting's iconic status and shifts in popularity in terms of display context and demand (exhibitions and loans) are more easily discernible. Finally, the study accommodates the changing role of the institution's decision-makers and stakeholders over the past 110 years and presents a useful format for the management of change in historic collections.

Introduction

The aim of this study was to design a suitable conservation decision-making model for a single artist collection with a heterogenous character.[1] The investigation encompassed 57 paintings by Edvard Munch (1863–1944) belonging to the Norwegian National Museum of Art (NM).[2] Emphasis was placed on visual mapping of the conservation histories and movement of each painting within the context of the collective display traditions of the Munch Room. The conservation focus is on the issue of non-original restoration varnish layers. The research methods consisted of a two-step process. The first step includes the creation of an updated survey of the varnishes applied to paintings in the NM Munch collection. This overview is derived from a fusion of earlier research studies and their associated findings.[3] It combines the recently acquired scientific data generated from two non-invasive diagnostic surface examination techniques – portable Fourier transform infrared spectroscopy (pFTIR) and optical coherence tomography (OCT). These results are assessed in the context of both the display and conservation histories of the paintings and of the group. The second step is the design for a decision-making model. The overall format is based on existing conservation
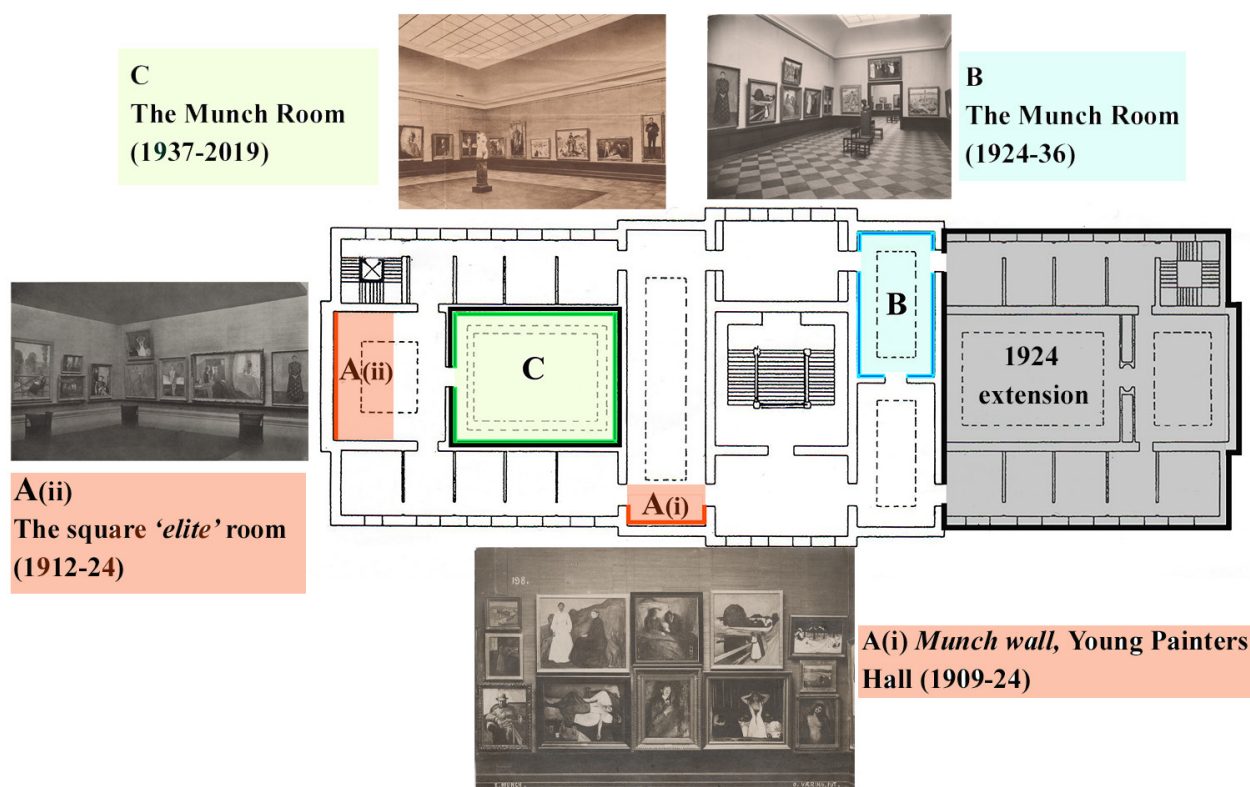
Figure 1 Overview of the Munch Room's four phases and locations, 2nd floor plan, National Gallery (1909–2019). A(i) The Munch wall, Young Painters' Hall (1909–1924), A(ii) The square 'elite' room (1912–1924), B The Munch Room (1924–1936), C The Munch Room (1937–2019).

decision-making models for contemporary art but incorporates a workflow framework specifically tailored for the Munch collection. The model was tested with four Munch paintings (henceforth referred to as 'test paintings'), chosen according to their different acquisition timeframes, varnish history and iconic status.

The Munch Room and collection history

The Munch paintings were acquired by the museum over a period of 79 years (1891–1970) and represent the first public collection of the artist's earlier and mid-career masterpieces (1881–1920) including important motifs from his series of paintings known as the *Frieze of Life*.[4] Furthermore, many of the paintings are Munch's first painted versions of reused iconic motifs, which give them added art historical significance. These include *The Sick Child* (Woll M 130), *The Scream* (Woll M 333), *Madonna* (Woll M 366) and *The Dance of Life* (Woll M 464).[5] Since 1909, highlights from the Munch collection have been displayed as a specific group and in 1937 they were allocated a permanent exhibition space known as the Munch Room in the former National Gallery of Art (NG) building.[6] Traditionally, the Munch Room has consisted of a typical core (18–20 works) of Munch's most representative motifs from the collection. Display variations have been dependent on the director and/or curatorial staff. Additional disruptions to the core display, caused by either exhibition, loans

or conservation requirements, have resulted in the temporary display of other motifs from the remaining Munch paintings in storage. In 2019, the NG building closed its doors to the public and the collections were moved to a new museum building which opened on 11 June 2022.

It was not until the appointment of the first director, Jens Thiis (1908–1941) that the Munch paintings gained prominence as a specific group in terms of display.[7] From June 1909, Thiis was consistent in his promotion of Munch and the collective display of his works in the museum.[8] Historically, their collective display can be categorised into four phases (A(i), A(ii), B, and C), which run parallel to the various extensions and refurbishments made to the NG building (Figure 1).

During the first phase (1909–1924), the majority of the newly acquired paintings were initially displayed together on one wall (Munch wall) in the Young Painters' Hall (Figure 1, A(i)).[9] As the collection increased, the Munch display became split between the Munch wall and the south wall of the square 'elite' room (1912–1924) (Figure 1, A(ii)).[10] However, in 1924, the Munch collection was reunited in one room (Figure 1, B). This was possible due to the completion of the much-needed north extension and the general refurbishment of the galleries.[11] Nevertheless, Thiis was not satisfied and continued to lobby for a grander and more exclusive exhibition space for Munch's paintings.[12] In 1937, the south courtyard was converted into exhibition spaces with a large room dedicated to Munch on the second floor (Figure 1, C). At present, no systemised study exists of the Munch Room's development and shifts in the core display of paintings between 1909 and

2019. Historically, there have only been three disruptions to the 1937 room from its establishment to its closure in 2019: the first was linked to the evacuation of the paintings between 1940 and 1946 to safeguard them from physical danger during WWII;[13] the second was in 2005, when the existence of the Munch Room as a concept came under threat with a controversial rehanging;[14] and the third was in conjunction with the 150-year Munch anniversary exhibition (2013) which involved a recreation of Munch's *Frieze of Life* display.[15] Despite these disruptions and its dismantling with the closure of the NG, the NM has continued to uphold the historic display legacy by recreating the Munch Room in the new purpose-built museum.[16] Moreover, the curatorial display approach has shifted slightly compared to the traditions of the past 110 years: seven paintings depicting motifs from Munch's *Frieze of Life* are now regarded as the more permanent/core section of the newly recreated Munch Room. In addition to the revised selection of 18 paintings displayed in the Munch Room, an extra 13 Munch paintings are displayed across seven rooms alongside paintings contemporary to Munch.

A group case study approach

Until now, a discrepancy has existed between the art historical display legacy of the Munch Room and approaches to conservation. Despite the tradition of a group display, the paintings have never been assessed collectively in terms of conservation issues. Historically, only six of the 57 paintings have been investigated by previous conservators, and all as individual case studies.[17] Furthermore, there exists only one varnish overview of the NM Munch collection, which is incomplete in terms of methodology.[18] This overview is based solely on the interpretation of 49 conservation reports and contemporary written sources and does not include any visual or scientific methods of investigation. Therefore, there was a need for an integrative decision-making model for the Munch collection that would address these shortcomings. The aim was to find a solution to the current mismatch between the soloist approach focusing on conservation decisions for each work versus art historical regard for the collection as an ensemble, bringing both aspects into alignment. In addition, the new model should facilitate the need to redress the balance in appearance of a collection comprised of paintings in a disparate state due to past uncoordinated and, arguably, inappropriate varnish interventions.[19]

Decision-making models: background

Conservation decision-making is embedded in the 'paradigmatic triangle model' of art history (conservation) science and conservation practice.[20] There exists a twin interest and dialogue between ethical codes and principles pertaining to the permanence of artworks (in terms of preservation) and those of change in artworks.[21] This often involves compromise decisions. Attitudes towards dealing with change in cultural heritage can be placed on a sliding scale from preservation (the desire to slow down change) to embracing change as an inevitable feature (in its most extreme form 'curated decay'). However, change, or the 'management of change',[22] represents not only the chemical- and biological-induced alterations in an artefact (processes of material degradation) – it equally embodies physical changes related to its social and historical context intertwined with changes in meaning.[23]

Since the second half of the 20th century, public museums have witnessed a steady increase in public expectations for implementing transparent conservation and preservation strategies for their art collections, balanced with requirements for display and accessibility.[24] This perspective is outlined by Muñoz Viñas who proposes the principles of 'intersubjectivity' and 'semantic sustainability' insofar as decisions should be considered by a broader audience in terms of the current and future meaning of artefacts.[25]

In contemporary art conservation, challenges faced with installations have led to a more inclusive process with growing attention being paid to the wishes of other stakeholders in relation to those of the custodian.[26] However, identifying the role and interaction of the stakeholders in conservation decision-making requires clarity to avoid unnecessary conflict, especially when priorities differ between conservation practice and the stakeholders' values.[27] Together, these developments have encouraged conservation professionals to reflect more critically on their design and choice of suitable decision-making models for complex artefacts. There exists a recent body of research that has focused specifically on the decision-making challenges posed by contemporary art.[28] However, the applicability of the models and approaches developed for contemporary art has yet to be tested properly for more traditional and historical collections, such as the Munch collection.[29]

Methods

Updated varnish survey of the NM Munch collection

Renewed interest in the conservation of the NM Munch collection was prompted by unanswered questions regarding the museum's past controversial varnishing practices.[30] New research into the non-original restoration varnishes[31] provided valuable information for the creation of a revised and updated varnish survey of the entire collection. This updated survey was undertaken prior to the design of the decision-making model and was necessary as background for the model's structure and workflow design. Furthermore, the model needed to be tested using examples from the collection.

The updated varnish survey was based on the systemised visual examination of 56 paintings undertaken between January 2018 and June 2021 (Table I).[32] This
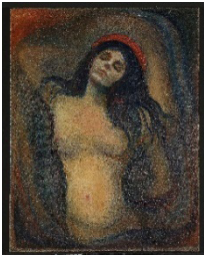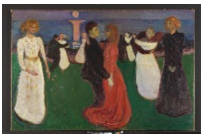
Table I The systemised visual examination of 56 paintings undertaken between January 2018 and June 2021.

Painting	Mastic	Dammar	Beckers[i]	Ceronis[ii]	Laropal K-80	MS2A	MS2B	Varnished	Unvarnished
(1) Woll M 17 *From Vestre Aker* (1881)		x						x	
(2) Woll M 75 *Thorvald Thorgersen* (1882)								x	
(3) Woll M 80 *Andreas Reading* (1882–1883)					x			x	
(4) Woll M 98 *Study of a Head* (1893)						x		x	
(5) Woll M 104 *Around the Paraffin Lamp* (1883)					x			x	
(6) Woll M 113 *Inger in Black* (1884)		x		x				x	
(7) Woll M 126 *Jørgen Sørensen* (1885)					x			x	
(8) Woll M 130 *The Sick Child* (1885–1886)				x				x	
(9) Woll M 133 *Self-portrait* (1886)								x	
(10) Woll M 144 *Betzy Nilsen* (1887)					x			x	
(11) Woll M 148 *Flowery Meadow at Veierland* (1887)					x			x	
(12) Woll M 173 *Spring* (1889)								x	
(13) Woll M 174 *Hans Jæger* (1889)	x							x	
(14) Woll M 192 *Night in St. Cloud* (1890)		x						x	
(15) Woll M 224 *Night in Nice* (1891)								x	
(16) Woll M 232 *Rue Lafayette* (1891)			x		x			x	
(17) Woll M 266 *The Kiss* (1892)					x			x	
(18) Woll M 274 *Moonlight by the Mediterranean* (1892)									x
(19) Woll M 284 *Melancholy* (1892)					x			x	

Painting	Mastic	Dammar	Beckers[i]	Ceronis[ii]	Laropal K-80	MS2A	MS2B	Varnished	Unvarnished
(20) Woll M 294 *Inger in Black & Violet* (1892)	x							x	
(21) Woll M 322 *Moonlight* (1893)								x	
(22) Woll M 329 *Death in the Sickroom* (1893)									x
(23) Woll M 333 *The Scream* (1893)									x
(24) Woll M 340 *Ragnhild Bäckström* (1894)									x
(25) Woll M 343 *Julius Meier-Graefe* (1894)		x	x		x			x	
(26) Woll M 347 *Puberty* (1894)	x				x			x	
(27) Woll M 348 *The Day After* (1894)	x							x	
(28) Woll M 358 *Bathing Boys* (1894)									x
(29) Woll M 366 *Madonna* (1894/-1895)						x		x	
(30) Woll M 378 *Ashes* (1895)	x				x			x	
(31) Woll M 381 *Moonlight* (1895)									x
(32) Woll M 382 *Self-portrait with Cigarette* (1895)									x
(33) Woll M 387 *Young Woman Washing Herself* (1896)							x	x	
(34) Woll M 388 *Parisian Model* (1896)					x			x	
(35) Woll M 404 *Mother and Daughter* (1897)					x		x	x	
(36) Woll M 439 *House with Red Virginia Creeper* (1898–1899)					x			x	
(37) Woll M 445 *Winter in the Woods* (1899)								x	
(38) Woll M 457 *Aase Nørregaard* (1899)									x

Painting	Mastic	Dammar	Beckers[i]	Ceronis[ii]	Laropal K-80	MS2A	MS2B	Varnished	Unvarnished
(39) Woll M 458 *Aase and Harald Nørregaard* (1899)								x	
(40) Woll M 464 *The Dance of Life* (1899–1900)								x	
(41) Woll M 477 *White Night* (1900–1901)								x	
(42) Woll M 483 *The Girls on the Bridge* (1901)	x							x	
(43) Woll M 495 *The Fairy-tale Forest* (1901–1902)									x
(44) Woll M 514 *Two Nudes* (1902–1903)									x
(45) Woll M 549: *On the Veranda* (1902)								x	
(46) Woll M 578 *Frenchman Marcel Archinard* (1904)					x			x	
(47) Woll M 649 *Self-portrait* (1905)									x
(48) Woll M 698 *Mrs. Schwarz* (1906)					x			x	
(49) Woll M 1083 *Seated Nude* (1913)								x	
(50) Woll M 1126 *Winter on the Fjord* (1915)			x					x	
(51) Woll 1158 *Midsummer* (1915)			x					x	
(52) Woll M 1195 *Man in the Cabbage Field* (1916)			x					x	
(53) Woll M 1256 *Thorvald Løchen* (1918)					x			x	
(54) Woll M 1284 *Bathing Men* (1918)									x
(55) Woll M 1296 *Self-portrait with the Spanish Flu* (1919)					x			x	
(56) Woll M 1341 *Autumn Ploughing* (1919)			x		x			x	
(57) Woll M 1361 *Workers Returning Home* (1920)									x
TOTAL	6	4	6	2	19	2	2	**44**	**13**

Table II Test paintings showing an example of the combined data sourced from archives, conservation dossiers, physical examinations, microscopy, UV, pFTIR and OCT.

| Painting details	Acqui-sition date	Documentation of restoration and/ or artist's varnish layer(s)	pFTIR cMain observations	OCT Main observations & layer thickness (μm)	Summary of varnish type(s) present
Woll M 130 *The Sick Child* 1885/6 oil on canvas (120 × 118.5 cm)	1931	**1) 1885/6:** Artist's varnish (pine resin). **2) 1931:** Cleaned & restored when acquired – no conservation record (Willoch 1937). **2) 1954:** Partial restoration varnish (Le Franc, Ceronis) applied to glossy/saturated areas.		Transparent, scattering layer over thick varnish drips.	Complex surface. Locally distributed artist's varnish matted down with an upper restoration varnish.
Woll M 224 *Night in Nice* 1891 oil on canvas (48 × 54 cm)	1891	**1) Pre-WWII:** Natural resin restoration varnish layer. **2) 1983:** Synthetic Laropal-K80 (grade 9) applied over the earlier restoration varnish.	Typical bands for oil medium/ natural resin varnish. No peaks for synthetic (Laropal K80) varnish layer detected.	Only one varnish layer present (4–17 μm).	Only one restoration (natural resin) varnish layer confirmed. Possibly applied while painting still framed. No evidence of upper Laropal-K80 layer.
Woll M 366 *Madonna* 1894 oil on canvas (90.5 × 70.5 cm)	1909	**1) 1909:** Natural resin restoration varnish layer. **2) 1968:** Synthetic MS2A restoration varnish layer.		2 varnish layers found in most of the spots. Total of 3 transparent layers in the figure.	2 restoration varnish layers present over whole surface. Evidence of locally applied artist's varnish layer underneath restoration varnishes. This is concentrated in contours of the figure.
Woll 464 *The Dance of Life* 1899–1900 oil on canvas (125 × 191 cm)	1910	**1) 1958:** Partial restoration varnish applied to glossy/ saturated areas.		Evidence of localised drips & patches of added oil binder. Some of these oil skins are covered by an upper scattering layer. Semi-transparent paint layers.	Complex surface with evidence of a matting restoration varnish applied over Munch's original surface finishes.
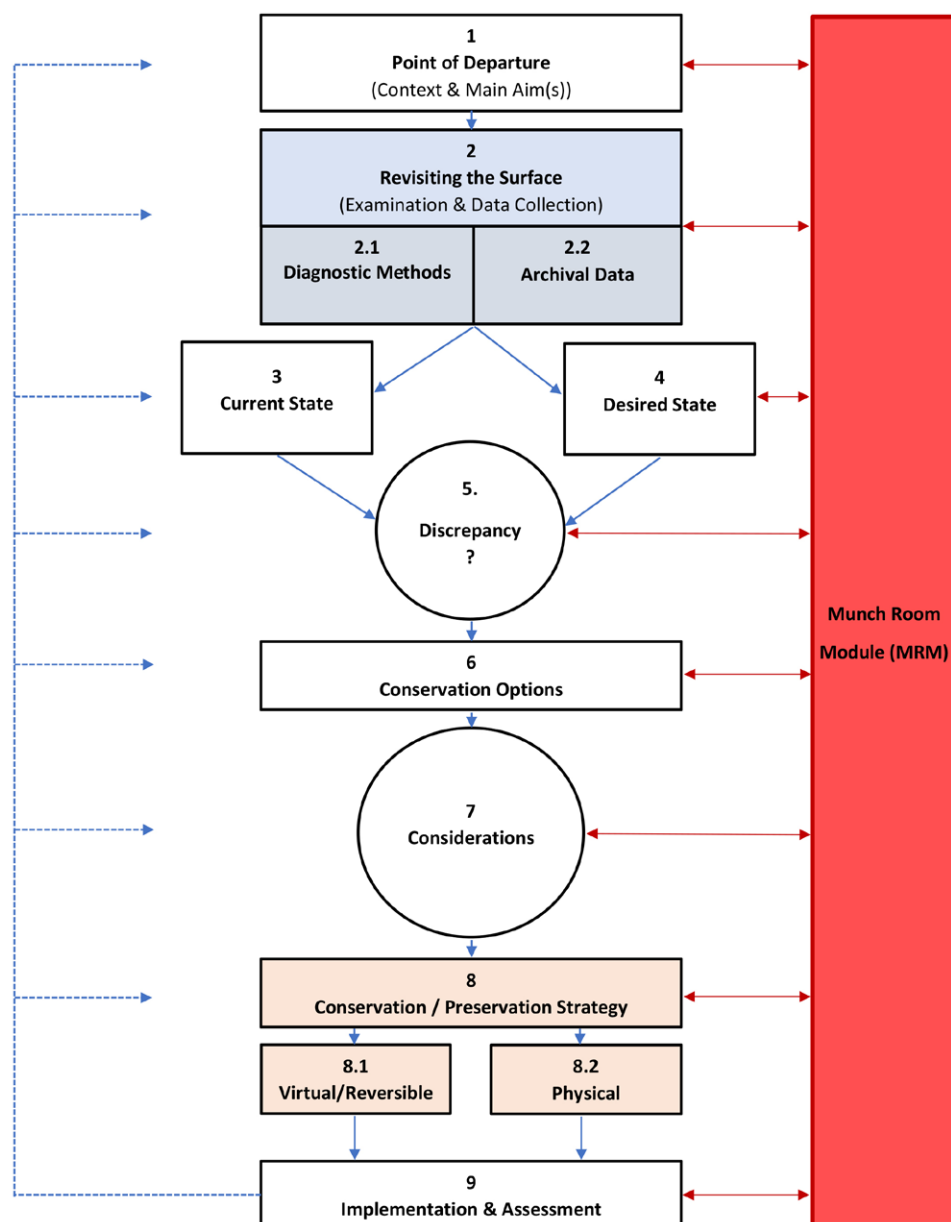
Figure 2 Flowchart showing the Munch conservation decision-making model.

was supplemented by a comprehensive overview of relevant archival sources, studio recipe books, 57 conservation dossiers and surviving historic varnish resin samples.[33] Additional scientific results obtained from two non-invasive diagnostic studies were also incorporated; these included the testing of pFTIR used to identify the varnish resins on three paintings.[34] Findings from optical coherence tomography (OCT), tested on 13 paintings,[35] were employed for the layer identification, distribution and thickness of the varnishes. The following four test paintings were chosen: *Night in Nice* (Woll M 224) as the first Munch acquisition to the collection, *The Sick Child* for its documented use of an artist's varnish, *Madonna* for its restoration history and iconic status, and *The Dance of Life* as one of the central paintings in the *Frieze of Life* (Table II).

A total of 44 out of 57 paintings were found to have at least one varnish layer and 13 were left unvarnished. Seven different varnish types and mixtures were also documented including mastic, dammar, Wilhelm Becker's matt *tavel* varnish,[36] Laropal K 80, MS2A, MS2B and Lefranc Bourgeois' Ceronis[37] picture varnish. Chemically, this only represents three main classes of varnish resins: two natural (mastic and dammar) and one synthetic (ketone).[38] One type of varnish was applied to 26 paintings, whereas six paintings have two different varnish resin types and only one painting has three (Woll M 340). The original surfaces of four paintings were matted down locally with the Ceronis wax-varnish paste. According to the conservation reports, all 44 paintings appear to have been either varnished or revarnished by the NM.
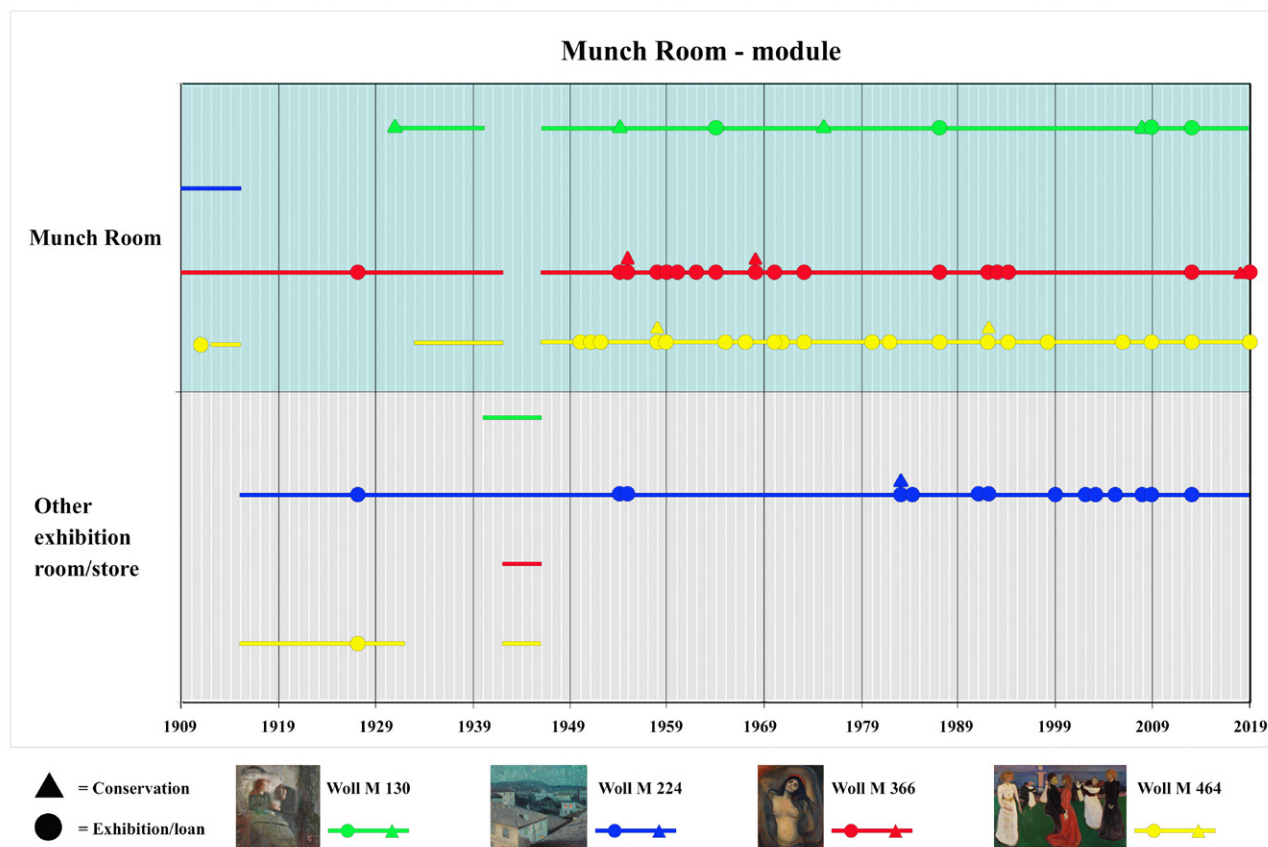
Figure 3 Munch Room module with the four test paintings' trajectories plotted.

The Munch conservation decision-making model

Design format

The design of the Munch conservation decision-making model combines elements borrowed from contemporary art models with background information provided from the revised varnish survey. The design format is based on the recently revised flow diagram for contemporary art, hereafter referred to as the Köln model (Figure 2).[39] This formed the model's initial backbone and necessary adjustments were made to incorporate various institutional and collective requirements. Hence, the Munch Room features as an integral part of the process, assisting contextualisation of the group's identity and the mapping of similarities and differences within the group.

Theoretical background

The systematic processing of each individual painting in context to the whole group and the Munch Room through a conservation decision-making model required a theoretical framework for the interpretation of the various historical trajectories. In this case, a theoretical approach, developed by Joyce and Gillespie, of 'object itineraries' was chosen. Essentially, its perspective builds on the theory of object biographies by 'tracing the paths along which things live' in terms of the their interactions over time.[40] For the Munch collection, this facilitated representation of the broader narratives connected to each painting in the various decision-making steps. It helped to evaluate the material and non-material factors to be considered, in line with the institution's past, present and future display policies, both for individual paintings and as a group.

The Munch Room module (MRM)

Today's ever-increasing abundance of visual imagery, characterised by our reliance on (digital) images, influenced the inclusion of the additional Munch Room module (MRM) in the overall design of the model (Figure 3). The aim was to explore the benefits of visually mapping the various movements and itineraries of each painting over time. The MRM therefore runs vertically as a parallel parameter for each painting and interacts with the various decision-making steps. Historical knowledge of an artefact's past will help to shape future conservation management[41] and, with the Munch paintings, there is an additional and intertwined art historical and collective aspect to the decision-making process.[42] This is apparent with the more iconic motifs. Initially, certain paintings may have acquired more active historic itineraries through exhibition loans, leading to an increase in iconic status, as in the case of *The Scream*.[43] Tracing the movements of key works from Munch's *Frieze of Life*, in and out of the permanent

display of the Munch Room, could also play an important role in the conservator's evaluation of the paintings as a group. For example, having had a permanent exhibition status within the Munch Room, some paintings, such as *The Dance of Life* and *Death in the Sick Room* (Woll M 329), may have received little or no conservation treatments due to lack of accessibility. Similarly, the frequency of exhibition loans for certain paintings might have impacted the occurrence and types of treatments and preventive measures undertaken during specific timeframes.

The MRM is essentially a fusion of two recent conceptual tools applied to contemporary art conservation which have been modified for this study. Firstly, design elements are borrowed from Stigter's 'slide rule' behaviour index[44] for the visualisation of the movements of each Munch painting as they shift status and display, in and out of the Munch Room (Fig. 3). Stigter employs a 3-zone slide rule system (contained, installed and performed) to illustrate the timeline analysis for behavioural shifts present in contemporary artworks. This successfully allows museum professionals to visually map active processes within complex artworks when addressing decision-making options. The MRM employs a similar visual concept but instead uses a 2-zone chart to trace the paths of each painting through time. Each Munch painting is colour coded and plotted according to its specific display history represented by the horizontal lines. The multiple stacked timelines essentially reveal the movements of each painting (if any) between the Munch Room core display and other exhibition rooms or storage.

The second source of inspiration is taken from Lawson and Marçal's *Map of Interactions*, a visual tool created for the documentation and conservation of performance art.[45] This documentation tool is used to examine the institutional lifecycle of artworks regarding changes in context and the mapping of new biographical paths. The notion of visually representing the institutional interactions of an artwork over time is also included in the MRM. These types of visual timelines can often be difficult to extract from the confusion of dropdown menus in traditional collection management databases. In the MRM, a conservation treatment (such as varnishing) and/or a short-term exhibition loan activity for each painting can be plotted along the horizontal timeline of a painting according to the relevant date. A triangular marker is used to depict a conservation treatment and a circle for a loan (Figure 3).

The integration of a visual element into the decision-making model helps to simultaneously trace and map the unique display trajectories for each Munch painting parallel to shifts in status, demand (exhibition loans) and conservation history. As with the slide rule system and the *Map of Interactions*, the MRM addresses the option for process-based decision-making[46] in addition to more traditional object-based considerations. The four 'test paintings' from the collection were plotted to assess the suitability of the model's workflow (Figure 3 and Table II).

Point of departure: Step 1

The starting point of the model begins with the same format as outlined in the Köln model, step 1 (Figure 2), and consists of a presentation of the initial aim(s) in the context of the current circumstances and relevance to the various stakeholders and custodians. The NM's 2020–2025 strategic vision incorporates ethical core values of inclusion, increased accessibility and openness,[47] therefore the requirements from a wider audience are an important part of the equation. Decision-making questions need to address the balance between the requirements of the stakeholders (the public and the ministry of culture) and the guardians (museum curators and conservators). In the case of the four test paintings, the initial aims and questions that concern the identification, overview and future of the non-original varnish layers applied are presented. These can be assessed in the context of past and current display traditions plotted in the parallel MRM (Figure 3).

Revisiting the surface: Step 2

In step 2, the conservation history of the painting is assessed with the renewed visual examination of the surface provided by information supplied from the updated varnish survey (Table I). In contrast to the Köln model, this part has been further divided into two sub-steps: step 2.1, diagnostic methods (with an emphasis on a non-invasive approach) and step 2.2, archival data.

In the case of the four Munch paintings tested, pFTIR and OCT were used as the initial non-invasive 'screening methods' for the identification of the varnishes present. Individual and collective assessments can be made according to a painting's history in terms of (1) the presence of non-original restoration varnish layers and/or (2) evidence of original surface finishes (i.e. Munch's use of localised varnish to saturate certain passages of paint). This section allows for a preliminary non-invasive and non-destructive overview of the varnishes present in the 57 paintings. Furthermore, it facilitates a clear assessment of each painting's current state with reference to its historical narrative and past.

Current state: Step 3

From the information gathered in steps 2, 2.1 and 2.2, a painting's current physical state (condition) is summarised according to the information provided in the varnish survey (Table I) and the recommended checklists as outlined in the Köln model.[48] The focus is on the authenticity of the existing surface varnish(es) present.

Figure 4 *The Sick Child*: UVA photograph showing the green fluorescence of the original varnish streaks running down the surface in the main figure (2019, Nasjonalmuseet).

Desired state: Step 4

Step 4 also follows the guidelines and recommendations from the Köln model and requires a critical and contextual review of the NM's past restoration varnishing practices. At this stage, arguments for the desired state for each painting are presented by both the stakeholders and custodians. Linked to the MRM, the decision makers establish four key questions to be critically assessed alongside historical context and the removal of non-original restoration varnish layer(s). The identity and meaning of each of the 57 paintings within the group in terms of their historical trajectories is explored in relation to these key questions.

- How controversial was the restoration varnish layer(s) in context to its time of application?
- To what extent has the restoration varnish layer(s) altered the visual effect of the painting?
- What is known about the original state of Munch's painted surface underneath the restoration varnish layer(s)?
- What are the historical shifts in meaning over time regarding the restoration varnish layer(s)?

Discrepancy: Step 5

In terms of the Munch collection, the overarching question is whether a non-original restoration varnish should be removed. The present physical condition of each painting noted in step 3 is weighed against the arguments regarding the desired state of the varnished surface discussed in step 4. The decision-making uses the following core values as recommended by the Köln model:

- Authenticity
- Aesthetic and artistic values
- Historicity
- Functionality
- Artist's intent and anticipation of potential future development/changes

These core values would be defined and debated among the group of stakeholders and decision-makers involved. For example, the question of authenticity refers to the current varnish or surface finish, either as part of Munch's painting process or from later restoration. The aesthetic and artistic values might deal with the overall visual effects of each painting in terms of saturation of colours and the effects of

surface gloss. The historicity of the varnish layer(s) can also be loaded with valuable meaning as noted in step 4. Which story (varnish layer) to preserve and which to remove? In addition, the functionality of a restoration varnish may have lost its optical properties through degradation and discoloration. The varnish dichotomy is central to the final decision-making process and planning of future conservation/preservation options, and remains interlinked with the group display aspect in terms of the Munch Room and the artist's surface effects.

Conservation options: Step 6

In this section, conservation options can be developed for each individual painting, for the whole collection or sections of the group. However, each option will remain intertwined with the collection in terms of the Munch Room display. The main aim of step 6 is to establish realistic and ethical options that address the varnish issue. These are dependent on a painting's current condition, documented in step 3, balanced with a casuistry approach to conservation,[49] as advocated in the Köln model. The following options are listed below:

1. No action
2. No action with dissemination
3. Partial removal of restoration varnish layer(s) – selective cleaning
4. Complete removal of restoration varnish layer(s)

Option 2, 'No action with dissemination', can be achieved through the visible presentation of the varnish layers and historical context to the public using technical means and without intervening in the object. For example, Munch's original varnish streaks running down the surface of *The Sick Child* (witnessed at the Autumn Exhibition, Oslo in 1886) have lost their gloss over time and become further matted down through past restoration. However, the original varnish streaks are still clearly visible in the UVA photograph (Figure 4). Option 3, 'Partial removal of restoration varnish layer(s) – selective cleaning', can present a more complex treatment given the practical challenges of separating chemically similar layers through cleaning.

Considerations: Step 7

In step 7, the four conservation options proposed in step 6 are critically evaluated by the decision-makers. The following assessment criteria, used in the Köln model, can also be incorporated into the Munch model:

- Aesthetic and artistic values
- Authenticity
- Historicity
- Functionality
- Financial limitations
- Technical limitations
- Restoration/conservation ethics

Conservation/preservation strategy: Step 8

In contrast to the Köln model, step 8 is subdivided into two sections, 8.1 and 8.2, which relate to the choice of either a virtual simulation (varnish removal)[50] or a physical conservation approach, or a combination of both.

Implementation and assessment: Step 9

The final step follows the recommendations of the Köln model in terms of both the monitoring and assessment of the chosen strategy. The flow diagram also provides routes for the revision of any difficulties or uncertainties represented by the set of blue arrows (Figure 2).

Discussion

The integration of the MRM essentially acts as a useful conceptual tool that facilitates analysis and visualisation of the timeline of paintings. Despite their permanent museum status, historical painting collections are not necessarily static as they continue to evolve over time in conjunction with current views and changes in perception.[51] In this study, the MRM is used to demonstrate the potential of tracing the interlinking historical trajectories of the four paintings within the context of their conservation issues. It ensures the possibility of simultaneously tracing the display sequences of the various paintings in tandem with their conservation histories for each decision-making step. However, the MRM visual timeline remains a prototype with limitations. The current format cannot include the whole collection on one visual map and requires customised improvements to incorporate all the 57 paintings. Although originating as a standalone idea, the concept of the MRM presents a design that can be further developed to function as an interactive digital tool incorporating even more comparative data.[52]

Plotting both the conservation and exhibition/loan data for each of the four test paintings in the MRM produces an important comparative visual data overview which can be relevant for decision-making (Figure 3). All four paintings have at least one record of conservation treatment: for example, four documented treatments were carried out on *The Sick Child* at regular intervals between 1931 and 2019. This indicates a fragile paint surface with a history of recurring conservation issues.[53] The fragility of the paint surface might also be an explanation for the painting's limited post-WWII exhibition/loan activity compared to that

Figure 5 Recreation of the Munch Room in the new museum building showing the end wall (2022, Nasjonalmuseet).

of *Madonna* and *The Dance of Life*. In contrast, the paintings *Night in Nice*, *Madonna* and *The Dance of Life* share a history of conservation treatments and varnishing corresponding with exhibition/loans.[54]

Both *The Sick Child* and *Madonna* have a similar exhibition history in terms of their permanent display in the Munch Room. They also both featured in Jens Thiis's earlier collective Munch display configurations (see Figure 1, A(i), A(ii) and B) in addition to the 1937 Munch Room.[55] In comparison, *The Dance of Life* only became part of the core display after its creation in 1937. Furthermore, the NM's first Munch acquisition in 1891, *Night in Nice*, was removed from the permanent and core Munch display as early as 1915. These variations are relevant for the discussions in step 1 concerning the conservation of non-original restoration varnish layers. A collective conservation decision would appear to be appropriate for varnished paintings with a history of permanent display, especially for the seven motifs from Munch's *Frieze of Life* that now hang together on the end wall of the newly recreated 2022 Munch Room. However, decisions made by the stakeholders and custodians might differ for *Night in Nice*, despite its recent inclusion after 107-year absence from the core Munch display.

The physical examination of the paint surfaces in steps 2, 2.1 and 2.2 helps to integrate all the relevant forms of information into the decision-making equation (visual, archival, imaging, and non-invasive diagnostic techniques).

The display concept of the Munch Room and the importance of physically examining the paint surfaces act as the two main prerequisites for the overall decision-making process. The model allows each painting's complex varnish history (presented in Table II**)** to be fused with data from the NM Munch collection's 110-year varnish history (1909–2019).[56] The result produces a more general, collective and comparative approach as demonstrated by the example of the four test paintings.

The Sick Child has a complex surface, heavily reworked by Munch, and includes residues of the artist's varnish (Table II).[57] There is both physical evidence (from OCT) and documentation of tampering with the original surface in terms of a locally applied restoration varnish.[58] In comparison, *Night in Nice* has a smoother surface topography and two documented restoration varnish layers (Table II). However, findings from earlier research using pFTIR and OCT could only confirm the presence of one natural resin layer, which suggests that there is a discrepancy in the written treatment documentation.[59] The first restoration varnish was also applied while the painting was still in its frame, in line with the early pre-WWII varnish traditions.[60]

Madonna is also documented as having two restoration varnish layers corresponding to the two major restorations of 1955 and 1968 (Table II and Fig. 3). However, three transparent layers were recorded in the boundaries between the face and hair and follow the outline underdrawings

detected with infrared reflectography. These can be interpreted as the presence of an original medium-rich glaze or artists' varnish applied as a saturated finish along the contours of the figure.[61] *The Dance of Life* shows documentary evidence and physical confirmation of Munch's partial varnishing, which was later modified through extensive restoration post-WWII (Table II).

The information generated from steps 1–2 can be carefully processed in steps 3–5 in terms of the historical varnish context of the collection. For example, the presence of a post-WWII varnish applied to *Night in Nice* whilst still in its frame is a relevant part of the NM's conservation history. This finding is an important physical documentation of the NM's earlier periodic restoration practices. Moreover, it demonstrates how a high-profile collection can act as an important historical marker for an institution's conservation development in terms of changing attitudes and practices.[62]

In the newly recreated Munch Room, the seven paintings that hang together – *The Kiss* (17), *Ashes* (30), *Madonna* (29), *The Dance of Life* (40), *The Scream* (23) *Death in the Sick Room* (22) and *Melancholy* (19) – form part of Munch's *Frieze of Life* series and represent some of the artist's main and iconic motifs (Table I and Figure 5).[63] Conservation decision-making in terms of the removal of non-original restoration varnishes will present challenges with regards to the consecutive display of these paintings. The OCT investigations of both *The Scream* and *The Dance of Life* confirmed evidence of Munch's own transparent surface finishes (varnish), which have been unevenly applied and have discoloured over time.[64] Furthermore, *The Scream* and *Death in the Sick Room* have comparatively matt surfaces due to their unrestored tempera paint surfaces. In *Madonna,* traces of the artist's own surface finishes lie masked beneath multiple and now discoloured restoration varnishes (Table II).

Steps 3–5 enable a critical review of the intertwined and layered narratives present in individual paint surfaces and across the NM Munch collection. Given the historical accusations of the NM's past 'controversial' varnishing practices,[65] questions concerning which story to document and which varnish layer to conserve for display can be more easily processed and in a transparent manner. Although individual paintings might appear straightforward in terms of varnish removal decisions on aesthetic grounds, this soloist approach might have consequences for the collective display of the Munch Room. The decision-making model therefore provides a workflow design rationale which can accommodate feasible, effective, *in-situ*, non-contact and non-invasive assessments across a complex group of historical paintings. As argued by both Muir and Streeton, adopting a set of paradigms in a methodological framework will guide any further collection of scientific data and help steer future conservation away from a purely clinical decision-making approach.[66] More importantly, it creates a platform for decision-making demands voiced by both the museum and other stakeholders. This allows for greater flexibility, echoing the advantages put forward for creating a bespoke conservation plan, tailor made to the needs of an institution and its public.[67] The final steps (6–9) still require implementation and will be presented in a forthcoming study.

Conclusion

The background to the decision-making plan was based on the collation of data provided from an updated varnish survey of the NM Munch collection. The model represents a fusion of requirements borrowed from existing conservation decision-making models for contemporary art. These have been adapted into a useful conceptual tool employed to process the multifaceted and complex nature of a historical collection of paintings. The Köln decision-making model for contemporary art conservation and preservation provided the backbone to the overall design. Although the Munch model has yet to be further implemented and tested, the proposed workflow design demonstrated that it is theoretically possible to expand models designed for contemporary art for use with historic objects. The model provides the first example of a systemised and comprehensive overview of the Munch Room's development in terms of shifts in the core display of paintings between 1909 and 2019. Nevertheless, the complexity of dealing with a whole collection and the display specificity of the Munch Room underlines the necessity to tailor existing models to the requirements and historical context of an institution. These two prerequisites influenced the fusion of an additional visual element to the model, the Munch Room module, which provides the decision-makers with a parallel display of each painting's historical trajectory. Recurring patterns related to non-original restoration varnishes and physical damages become more quickly discernible through the visual mapping. Changes in iconic status and shifts in popularity, in terms of display context and demand (exhibitions and loans), can also be processed quantitatively. In addition, the Munch Room module can be developed to incorporate other related forms of data associated with the movement of individual paintings over time (loans, exhibitions, conservation etc.).

The study also shows the importance of defining a theoretical framework for the model. Despite the NM Munch collection's anachronistic display traditions, the collection is in flux. Adopting a concept of 'object itineraries' helps to facilitate an understanding of the continued shifts, balance and relationships between the paintings and the group, and more specifically, a recognition of the changing role of the institution's decision-makers and stakeholders over the past 110 years. Finally, the flexibility of the design allows for the Munch model to be updated over time and duplicated for other similar single artist collections within and outside the institution.

Acknowledgements

Notes

1. The umbrella definition of conservation used here accords with ICOM's terminology and encompasses preventive conservation, remedial conservation and restoration.
2. Hereafter referred to as NM Munch collection. The paintings formerly belonged to the National Gallery of Art (NG) which, on 1 July 2003, became part of the NM.
3. Ford 2021; Ford et al. 2019, 2021.
4. Skedsmo and Waaler 1998; Messel 2012.
5. The 'Woll M number' references given throughout the text refer to Gerd Woll's 4-volume catalogue raisonné of Munch paintings in private and public collections (Woll 2008).
6. Willoch 1937; Messel 2012.
7. Messel 2012, 2022.
8. Ford 2021.
9. In 1909, the NM's existing collection of 8 Munch paintings was supplemented with an extra 12 paintings (5 purchased with the Houens fund and 7 donated by Olav Schou). It increased again to a total of 23 with 3 more donations from Schou in 1910. The earliest photographic documentation from 1909 shows 15 works displayed on the Munch wall (Messel 2022).
10. It is difficult to ascertain as to when exactly Thiis split the paintings between the two rooms. However, the earliest surviving records, photographs taken in 1912 of both rooms, document 18 from a total of 24 paintings on display.
11. The earliest photographic documentation of the 1924 room dates from 1930 (*Dagbladet*, Tuesday 8 April 1930) and again it is difficult to get a complete overview of the whole display as the west wall is not visible. A 1932 photograph shows a similar display variation but with the inclusion of *The Dance of Life* above the door.
12. Messel 2012; Berman 2013.
13. Kongssund 2006.
14. Between February 2005 and June 2006, many of the paintings from the Munch Room that were loaned to an exhibition at MOMA, were replaced with artists other than Munch (Picasso, Matisse etc.): https://www.dagsavisen.no/kultur/2006/06/17/munch-salen-er-tilbake/https://www.aftenposten.no/kultur/i/z7vJ1/slik-blir-det-nye-nasjonalgalleriet.
15. For the 2013 exhibition, the Munch Room was used to recreate Munch's 1902 Berlin sequence of paintings forming his *Frieze of Life*, but only 6 of the NM's Munch paintings were featured: the remaining missing motifs were loaned-in, and the paintings were temporary reframed in special display cases for the exhibition period. See Guleng et al. 2013; Iranowska 2017.
16. Ustvedt and Yvenes 2022.
17. Plahter 1999; Aslaksby 2009, 2015; Plahter and Plahter 2015; Ford 2021.
18. Stein and Rød 2015.
19. Stein and Rød 2015.
20. Hummelen et al. 2008.
21. Ashley-Smith 2017.
22. Van de Vall et al. 2011; Hölling 2016.
23. Hummelen et al. 2008; Streeton 2017; Wharton 2018; Holtorf 2020.
24. Appelbaum 2010.
25. Muñoz Viñas 2005, 2020.
26. Laurenson 2004; Scholte and Wharton 2011.
27. Van Saaze 2013; Henderson and Nakamoto 2016; Henderson 2020.
28. Giebeler et al. 2021.
29. Tom 2019.
30. Ford 2021.
31. Ford et al. 2019, 2021.
32. The varnish survey is a summary of relevant data collected from a larger PhD study on the NM Munch collection by Thierry Ford (2018–2022). It is essentially comprised of the physical inspection of 56 paintings and conservation records and NM varnish-related archival material. The survey also includes the conservation reports made prior to the 1993 theft of the painting *Betzy Nilsen* (Woll M 144). All 56 paintings were taken out of their frames in the NG conservation studio and their surfaces examined with optical microscopy combined with ultraviolet light for the detection of resinous varnish coatings.
33. NM Archives: NMFK/NG-0007/E/L0002; for the historical resin samples see, NMFK/NG-malerikonserveringsarkiv.
34. Ford et al. 2019.
35. Ford et al. 2021.
36. Wilhelm Becker's (Stockholm) matt *tavel* varnish (*ceramatt/*matt *tavelfernissa*) was used on 6 paintings between March and May 1950. The Swedish picture varnish is a mixture of dammar and mastic with bleached beeswax in balsam turpentine (Becker 1955: 24; Becker 1965: 24).
37. LeFranc Bourgeois' Ceronis is a matt wax-varnish paste for paintings sold in 60 ml tubes. The exact content has not been chemically confirmed but, from undated sales catalogues, the varnish appears to be 28% wax (drying extract) dissolved in petroleum (unknown quantity). See Lefranc's Technical Guide for Oil Painting: Retouching Varnishes, Picture Varnishes. Available at: https://fliphtml5.com/mjoa/gfiy/basic (accessed 14 January 2022).
38. Laropal K 80, MS2A and MS2B are all low molecular weight ketone resin varnishes (Samet 1998)
39. Giebeler et al. 2021.
40. Joyce and Gillespie 2015.
41. Appelbaum 2010.
42. Ford 2021.
43. *The Scream* gained an increased international iconic status during the 1970s and was only loaned post-WWII. It travelled extensively to over 40 different exhibition venues between 1954 and 1993. After its return from the theft in 1994, it remained in the National Gallery until moving to the new building (24 August 2021).
44. Stigter 2017.
45. Lawson and Marçal 2021.
46. Stigter 2019.
47. https://www.nasjonalmuseet.no/om-nasjonalmuseet/styret-organisasjon-og-ansatte/nasjonalmuseets-strategi-2020-2025/ (accessed 20 March 2022).
48. Giebeler et al. 2021.
49. Van de Vall 2005; Marçal et al. 2013; Wharton 2018.
50. Kirchner et al. 2018.
51. Hölling 2016.
52. For example, the MRM timeline format could be adapted and developed digitally with specialised software developed for a KronoGraph and include all the extra data summarised in Table II (https://cambridge-intelligence.com/kronograph/).
53. Munch's second version of *The Sick Child* (Woll M 392) was initially given to the NM in 1909. In 1931, the painting was swapped with Munch's first version (Woll M 130). The first version is documented in this study. NM conservation dossier: NG.M.00839.
54. NM conservation dossiers: NG.M.00394, 00841 and 00941.
55. *The Sick Child* was evacuated between 1940 and 1946 and *Madonna*, between 1942 and 1946.
56. Ford 2021.
57. Aslaksby 2009.
58. Ford et al. 2021.

59. Ford et al. 2019, 2021.
60. Willoch 1937.
61. Ford et al. 2021.
62. Ford 2021.
63. Guleng 2022.
64. Ford et al. 2021.
65. Stein and Rød 2015; Ford 2021.
66. Muir 2009; Streeton 2017.
67. Ashley-Smith 2018.

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