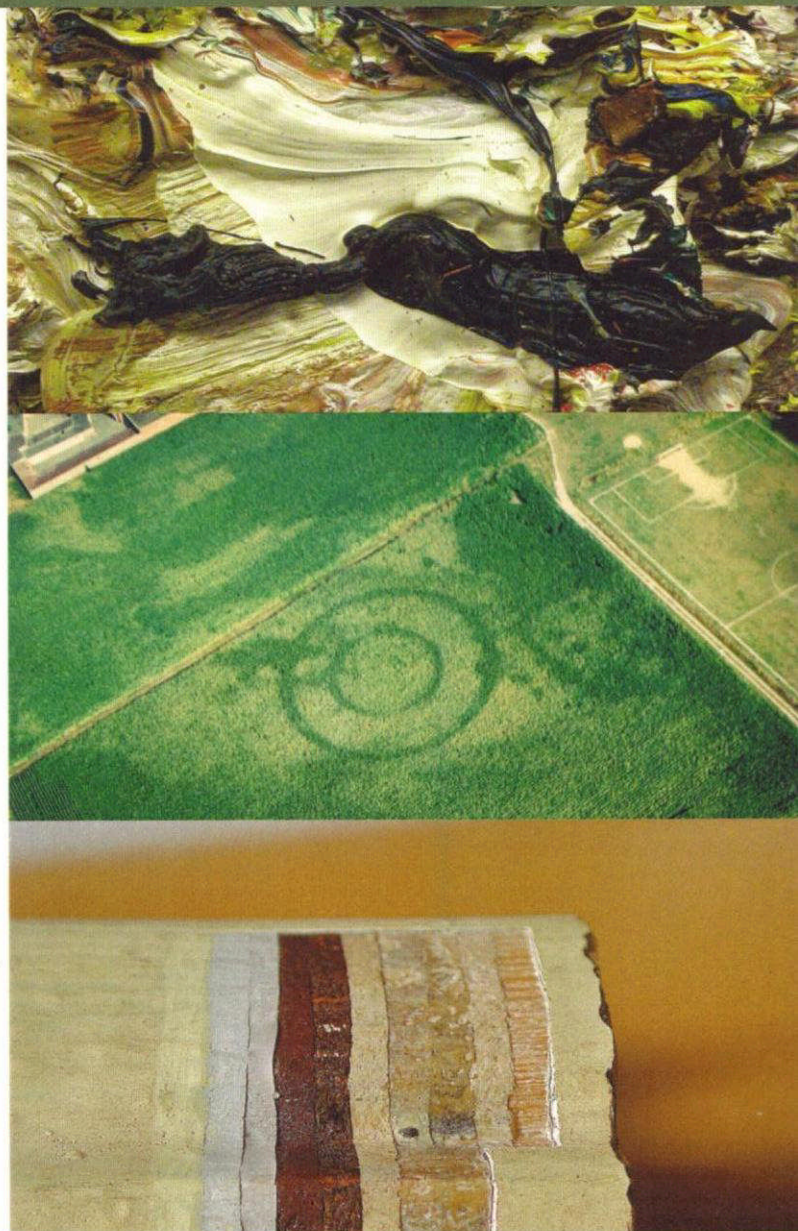




MARJAN BUYLE (ED.)

HET ONZICHTBARE RESTAUREREN RESTAURER L'INVISIBLE

BRK - APROA / ONROEREND ERFGOED STUDIEDAGEN
JOURNÉES D'ÉTUDE APROA - BRK / ONROEREND ERFGOED



PRESERVING HIDDEN AND FORGOTTEN MURAL PAINTINGS ABOVE THE VAULT IN CHURCHES IN SWEDEN | ANNA HENNINGSSON



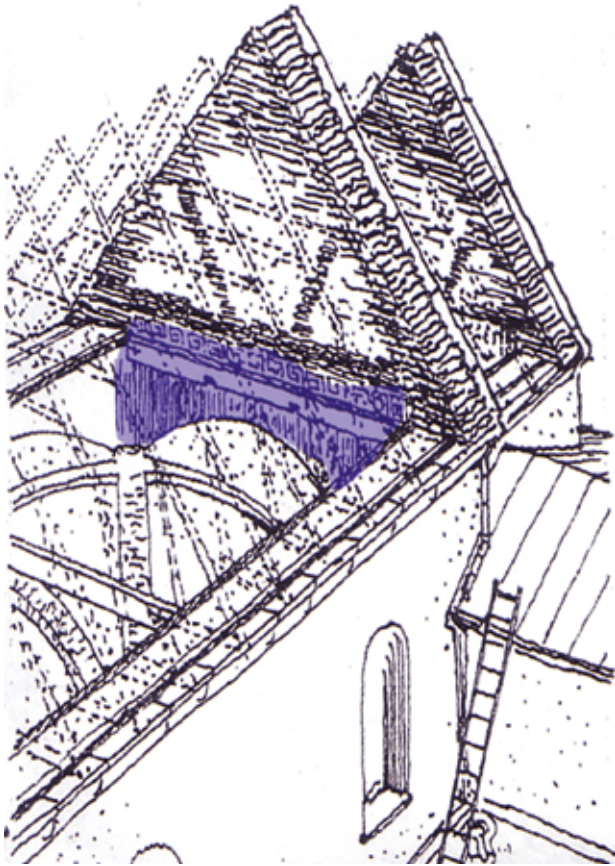
Part of the Romanesque murals above the choir vault in Fornåsa church in the county Östergötland, Sweden (photo A. Henningsson)

Technological investigations can reveal new and hidden facts about mural paintings. This paper presents a project that for the first time investigates painting technique and used material of mural paintings from the 11th -12th century located in church attics in the county of Östergötland in Sweden. The project has been initiated to increase the awareness and knowledge sharing about these particular mural paintings. First the approaches, challenges and used methods for these specific murals will be presented. This is followed by an examination of the painting technology used in one of the project cases; the Romanesque mural paintings on the nave loft of Fornåsa church. Finally this paper elaborates on opportunities of knowledge sharing and different aspects regarding accessibility to these objects.

BACKGROUND

Original and well preserved mural paintings from the period between 1150 and 1250 are rarely found in Swedish churches. Murals from this period have over the years been more or less affected by building alterations and conserva-

tion treatments. We often find them recovered from lime wash and partly retouched. Sometimes these murals have been detached and taken from their context to museums or storages. Consequently, traces from the execution process and original materials are very hard to find. Early medieval mural paintings located above vaults (in the attics) in some Swedish churches are special cases. These murals were hidden and forgotten for almost 600 years until approximately 1900 when they were rediscovered in connection with roof reconstructions. They were given their current location due to extensive alterations in the building structure during the 15th century. The original medieval plane beam roofs were replaced by brick vaults and the walls and vaults in the church rooms were painted with gothic mural paintings. Interventions such as lime washing, recovering, cleaning or retouching have never been carried out on these objects. Therefore they offer a certain opportunity to investigate early medieval painting technology and materials used in Swedish mural paintings.



The drawing shows where the murals are located in the church attics (the colored area): drawing from Fornåsa parish archive by A. Philip in 1953

THE INVESTIGATION OF MURAL PAINTINGS IN THE ATTICS IN ÖSTERGÖTLAND

In Sweden, murals above church vaults can be found in the region around Stockholm and in the southern parts of the country. In the county of Östergötland, 200 km south of Stockholm, mural paintings above the vaults can be found in eight different churches. In the beginning of the 1950s an art historical research and stylistic characterization was carried out ^[1]. After that little attention has been given to these murals and their context. Most of them are only accessible for visitors through special guided tours. During the period 2009-2011 a project was initiated to document and investigate the painting technology used in four of the eight murals in Östergötland ^[2]. The project aims to provide and share knowledge on how painting technological studies can contribute to make the hidden stories of murals visible and accessible.

USED METHODS AND INVESTIGATION APPROACH

In this project the following methods were used:

- rectified photography
- visual examination material analysis
- comparing the findings with written sources such as *Schedula diversarum artium*, Theophilus Presbyter

DOCUMENTATION BY RECTIFIED PHOTOS

The location of murals in narrow attics, partly hidden by brick vaults and roof construction makes it difficult to capture an overview of the murals through a camera lens. In some churches permanent scaffolding above the vault has been set up for visitors. From these scaffoldings the observer looks down at the murals from a bird's eye view as opposed to the original way of perceiving these paintings. Additionally, the built in wooden scaffoldings only allows the visitor study the paintings close by rather than from a distance which would give an better understanding of the scenes and iconographical context.



Result of photographing at site without rectification: parts of the painting scenes are shadowed by the vault, roof construction and the permanent scaffolding (photos A. Henningsson)



The photographer's ability to move is very restricted. The absence of regular floor excludes the use of a tripod. It is not possible to keep the same distance between camera and wall since the upper parts of the vaults are partly shadowing the motives. The only way to get an overview photo of these paintings is to apply digital photogrammetry. The result of the rectification is a true to scale photomap. The initial single part images of the painting are shot with a digital mid-format camera. These single images taken from different distances and angles include a lot of perspective distortions. The distances in the murals have to be measured by a reflector-less electronic tachometer to enable a rectification of perspective distortions. The rectified single pictures were finally assembled to an overview photo in the scales 1:5, 1:10 and 1:25. ^[3].



Photographing at site for creation of scale true photo base maps (photo A. Henningsson)



Rectified photo base map in scale 1:15 of the murals on the east wall in Skönberga church, Östergötland (photo Fokus Leipzig GmbH)

VISUAL EXAMINATION

The rectified photo plans were the base maps for all documentation during the examination of painting technique. The rectified photographs enable a study of the paintings details and contents from a frontal view without perspective distortions. The initial examinations focused on the registration of traces from the execution process. By using frontal and raking lightning with a color temperature of 5400 K, traces from the creation process could be revealed. The findings were documented with high resolution photography. With support from observations in ultraviolet light, character and technological evidences in the paint layers were found. By using a portable microscope with a magnification up to 200x at the site, a micro examination of the surface character and layer stratigraphy was accomplished. The locations of these painting technological findings were mapped to the rectified base map photographs. The visual examination resulted in a photo catalogue over the technological findings from the execution process of each mural.

MATERIAL ANALYSES

The result from the visual examination defined the need and possibilities of further investigations at site or by sampling. An investigation strategy for analyses was developed with the ambition to be highly restricted in the sampling and focus on a minimum set of samples. The aim is to analyze the used materials on site as thoroughly as possible and apply non-invasive techniques ^[4]. Good results were quickly obtained in the visual examination by observing the different layers and surface characteristics at site through a portable USB-microscope with extension for UV-light.

RESULTS FROM THE CASE STUDY: ROMANESQUE MURAL ON THE NAVE LOFT OF FORNÅSA CHURCH

The Romanesque wall painting above the gothic vaults in Fornåsa Church in the county of Östergötland is one of the most interesting remains of early medieval wall paintings in Sweden ^[5]. Above the vaults, on the loft of the nave, three scenes from the Passion of Christ are depicted. Above the choir vault you find a further 10 m² of traces from a wall painting program ^[6] dating back to the 12th century. The only way to reach the choir loft is by scaffolding and passing an opening in the roof. In 1892 the parish began to discuss replacing the roof and build a church tower. In 1900 the restoration started and the tower was built in the location of the former entrance ^[7]. The roof was replaced and the western vault in the church was rebuilt to become higher ^[8]. During this work the Romanesque murals were found ^[9]. The painting on the nave loft is accessible for visitors only on request.

After the discovery the wall paintings became partly concealed again as a new beam was added in a roof stabilization process in 1900. Fifty-four years later the murals were completely visible again as this beam was removed. In the 1950s art historians studied the wall paintings above the vaults in the nave and the choir vault. An extensive stylistic study was carried out in the fifties by Borelius ^[10]. Explorations of painting techniques and used material were for the first time initiated in year 2003.



The Romanesque mural painting on the east wall on the attic of the nave in Fornåsa church, Östergötland (photo Fokus Leipzig GmbH)



Photo from Fornåsa parish archive showing the beam in the roof construction that was added in 1900 and hiding parts of the murals until 1954 as it became removed



Fornåsa church during reconstruction of the roof in 1900 (photo Fornåsa parish archive)

SCENES AND MOTIVE

Above the vaults, in the loft of the nave, three scenes from the Passion of Christ are depicted⁽¹¹⁾. The capture of Christ, Christ on the cross and the women by the sepulcher cover an area of 12 m² on the upper eastern wall of the nave above the tribun arch. The three scenes are depicted on a blue background and a palmette border frames the upper part of the painting. The mural is stylistically dated to the last quarter of the 12th century⁽¹²⁾.



Drawing of the scenes on eastern wall of the nave, by Sörling in 1955

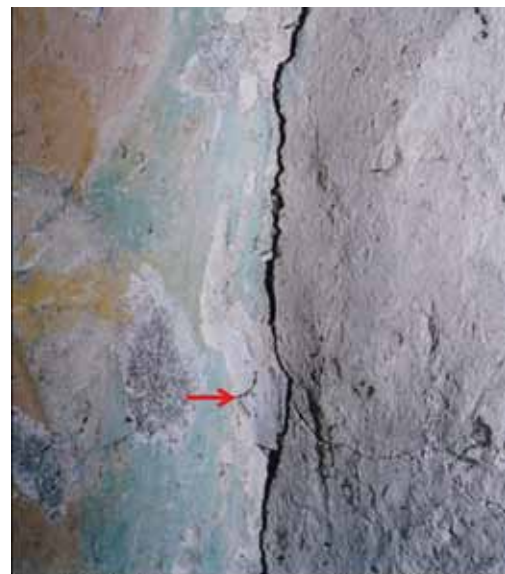
SUPPORT AND PLASTER

The arriccio is applied on a support of masonry consisting of an uneven, untreated variety of Orthoceratite limestone from the villages around Fornåsa. Through lacunas in the 2 mm thick intonaco an arriccio of 8 mm can be seen. A 1 mm thick lime wash layer is applied to the arriccio. Visual examination and comparison of the stratigraphy of the plaster layers revealed that unlike the east wall, the south and north wall did never have an intonaco. Thus all three walls share the same type of arriccio with a richly added 1 mm lime wash. The absence of traces from an intonaco layer on the south and north walls indicate that there was no intention to paint these walls in the same technique as the east wall. The observation of the rounded plaster bridge in the corner to the east wall proves that the arriccio of the three walls were executed at the same time. The intonaco is carefully smoothed with a metal trowel which has left regular marks in the plaster surface sized 1x4 cm. Evidence of the plaster being added in patches was not observed. On the intonaco a thin and partly pastos lime ground is added. The first layer of paint was added as the lime ground was still moist.

Plaster analyses of the arriccio and intonaco reveal that the used plasters have a hydraulic character. This partly depends on the clay containing burned limestone. The hydraulic properties of the mortars are further enhanced by the presence of alum shale.⁽¹³⁾



Through lacunas in the 2 mm thick intonaco an arriccio of 8 mm can be seen. Further a 1 mm thick lime wash layer is applied to the arriccio (photo A. Henningsson)



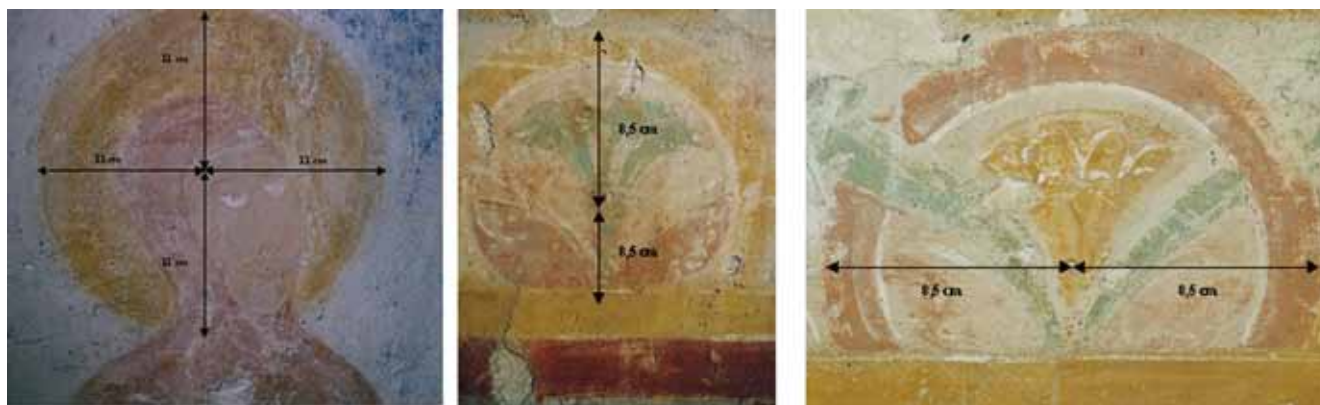
East wall

South wall

The plaster edge in the connection between the east and the south wall. The rounded corner to the east wall proves that the arriccio of the three walls were executed at the same time. The absence of traces from an intonaco layer on the



The surface character of the intonaco: traces after tool marks from the smoothing process of the intonaco (photo A. Henningsson)



Measurement of distance from compass points to the outside of the circles showed that exact repeated distances have been applied (photo A. Henningsson)

COMPOSITION OF THE WALL PAINTING

Only a few evidences from controlling the geometry of the composition could be established in this case. Evidences for a preparatory drawing, sinopia or snapped lines was not found in Fornåsa church. Rich findings of compass points set in the moist intonaco lime ground were found. This shows that the geometrical elements in the palmette board, as well as the heads and nimbus of the three women were executed with the aid of an indirect compass^[14]. The absence of incisions excludes the use of a direct compass. The heads of the figures and the half circles in the palmette board have a consistent distance from the compass point to the outline of the circle.

STRATIGRAPHY OF THE PAINT LAYERS

The blue background of the painting is created on a grey preparatory layer – a veneda. Analyses of the blue pigment reveal that natural Ultramarine was used. The green and the yellow robes of the women are made in two layers. The pigment in the green robe is Atacamite or Paratacamite applied to a layer of green and yellow (the ground layers have not been analyzed)^[15]. Other used pigments were ochre and lime. The modeling ground layers used for the robes of the three

women are rare to find. Negative signs of modeling layers in some robes these are partly visible in magnification. The remaining of a white outline of the robes has been observed. The modeling effects of the angel's robe are well preserved in comparison with the robes of the three women. The highlights in white have a pastos appearance and are applied on the pink shadows in the robe.

BINDERS

The identification of binding media carried out by FT-IR could neither establish nor indicate the presence of any organic binders in the samples. The viewing of the painting with UV-light as well as the examination of paint layer with microspore with extension for UV-light at site could not find any indication for organic substances that by sampling would reveal more central information in this case. The observed findings in UV-light and the significant character of hydraulic mortar in all plaster layers in combination with the state of preservation of the paint layers, lead to the conclusion that the today preserved paint layers are bound in fresco technique.

PROCESS FOR CREATION OF PAINT LAYERS

The observation on site by microscope combined with material analyses reveal that the following process for applying the paint layer on the plaster was undertaken:

1. the grounds, the flesh tone and the robes were applied al fresco. This is demonstrated by the intensive and powerful appearance of the painting as well as the condition of this layer
2. a completion of the painting on freshly spread plaster was probably not possible due to the significant hydraulic character of the mortar and plaster in limestone masonry^[16]
3. details in flesh tone and modeling effects have probably been applied by adding an organic binder. The investigation to prove presence of organic binders in the samples did not reveal a



The modeling highlights of the angel's robe are well preserved and have a pastos appearance (photo A. Henningsson)

unison result. The use of a moderate hydraulic plaster on a limestone masonry in combination with the state of preservation of this fragmentary upper layer do not exclude that organic binder have been used in the upper paint layer as the last step in the creation process of the fine details.

The observed findings and properties of the used materials resulted in the conclusion that the painting in Fornåsa church mainly contains layers of paint applied with fresco techniques. This shows that the Fornåsa case serves the technical definition of lime painting well ⁽¹⁷⁾. In this part of Sweden it has been presumed for a long time that medieval mural paintings are mainly made in secco technique ⁽¹⁸⁾.

KNOWLEDGE SHARING AND PRESENTATION

Painting technological evidences such as used materials, either regional or imported as well as which layer was added first or last on a moist or dry plaster around 800 years ago, is not exclusively of interest to experts. However, it is a challenge to convey this to the broader public. During the site investigation the project team arranged presentations to the locals at site.

The painting technological findings can give new dimensions to the hidden paintings in the attics to the community. Through the simple visualization of large printed photos of toll marks, layers and used materials, it was possible to present a story about the creation of the painting. A pedagogic reconstruction of the creation process was visualized by using real materials integrated with an information board to accompany the photos. All this information was accessible to visitors in the church porch.

To share and present the same information and evidences to cultural heritage professionals requires more advanced methodology. Within this subject a pilot study was carried out by applying GIS-based software for knowledge sharing to professionals. The advantage is that the geographical information, the overview photos including macro and micro photos can be stored in one corresponding platform and achieve high accessibility ⁽¹⁹⁾.

OUTLOOK AND POSSIBILITIES FOR THE FUTURE

It is of highest interest to initiate a second phase in this project to examine the remaining four sites with murals in the attics in Östergötland. Then comparative studies of eight churches in the region targeting painting techniques and the artist's creation processes would be possible. This would enable a presentation of the murals as an entirety. Hopefully this would open up to collaborations with art historians in order to update the art and iconographical studies from the 1950s.



An example of an information board at site that enabled a presentation and a knowledge transfer about the hidden information of retrieved investigation results at Fornåsa church (photo A. Henningsson)



The pedagogic reconstruction of the painting technique and execution process using real materials and integrated in the information board (photo A. Henningsson)

The state of preservation of the murals is good and future maintenance has to be of a preventive character. A minimum of direct conservation measurements should be strived for. The aim should be to keep the murals as authentic as possible without adding any conservation materials to the original substrate. This would also enable ongoing examination of untreated material in the future.

The maintenance focus should ensure that visitors cannot come in direct contact with the paintings as the case is today in some churches. Beyond this there is a need to establish routines for a sensitive monitoring of for example the condition of the roof, as well as the usage of suitable isolation material on the upper side of the vaults where the sensitive murals are located. In the cases where lighting of the paintings is available it is important to customize the lighting so that it does not affect the painting. The attic in Fornåsa church is only accessible to visitors on demand and a first step in raising awareness can be to produce information to the guides in the parish such as leaflets about the painting's value and the restriction for visitors. An increased awareness of the murals and their hidden stories can hopefully bring new understanding of the value of these unique paintings.

ACKNOWLEDGEMENT

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NOTEN

- (1) BORELIUS A., *Romanesque Mural Paintings in Östergötland*, ed. Aron Borelius, Linköping, 1956.
- (2) The project *Måleritekniska undersökningar av tidig medeltida muralmålningar i Östergötland*
- (3) The rectified photos were produced by Fokus Leipzig GmbH
- (4) In some cases a non-destructive method as a portable reflection spectrometer for pigment identification was used.
- (5) NISBETH A., *Bildernas predikan, medeltida kalkmålningar Sverige*, Värnamo, 1986, p. 43-47; SÖDERBERG B., *Svenska kyrkomålningar*, Stockholm, 1951, p. 12; BORELIUS A., *op. cit.*, p. 97 e.v.; LINDGREN M., *Kalkmålningar*, in *Signums svenska konsthistoria, Den romanska konsten*, bd.3, ed. Bokförlager Signum, Kristianstad, 1995, p. 299-335.
- (6) These programs contain scenes from the old testament: BORELIUS A., *op. cit.*, p. 100-102.
- (7) SCHMALENSEE K. von, *Fornåsa kyrka*, Norrköping, 23 mai 1953 (unpublished restoration report, Fornåsa kyrkoarkiv FKA), p. 2.
- (8) ERIKSSON G., *Fornåsa kyrka*, Fornåsa 1948-49 (unpublished restoration report, Fornåsa kyrkoarkiv FKA), p. 3.
- (9) BORELIUS A., *op. cit.*, p. 97.
- (10) *Ibidem*, p. 90 e.v.
- (11) The scenes are, from north: the capture of Christ, Christ on the cross and the women by the sepulcher.
- (12) BORELIUS A., *op. cit.*, p. 97; NISBETH A., *op. cit.*, p. 43-47.
- (13) Plaster materials for investigations by following methods: volumetric measurements by a calcimeter, FT-IR, thin sections and SEM-EDX were possible due to that materials have fallen off and were found on in the attic on upper side of the vaults. This relatively extensive material available for plaster analyses provided the starting point in the material characterization.
- (14) Compass point was set in the wet plaster and ground. A pencil was added and the circle was drawn from this point
- (15) The pigment identification was carried out by wet chemical test, FT-IR, SEM-EDX and in addition by XDR extension.
- (16) A lime stone masonry cannot act like a moist reservoir during the execution process and reach a retardation of the carbonation of the plaster layers. The reason is that the used limestone has a lower water capacity compared to sandstone and tuffa.
- (17) EMMENGER O. and KNOEPFLI A., *Wandmalereien bis zum Ende des Mittelalters*, in *Reclams Handbuch der künstlerischen Techniken*, Stuttgart, 1997, p. 61.
- (18) NISBETH A., *op. cit.*, p. 43.
- (19) HENNINGSSON A., *En undersökning av skador och måleriteknik ovanför valven i Fornåsa Kyrka*, in *Meddelelser om Konservering* (IIC Nordic Group journal), nr. 2, 2004, p.16-27; ID., *Dokumentationsprocesser och metoder inom Kalkmålerikonservering, Forsknings- och utvecklingsprojekt* (FoU), National Heritage Board Sweden. www.raa.se/cms/showdocument/documents/extern_webbplats/2011/mars/varia2011_3.pdf (chatched 2012-01-28).

HET BEHOUD VAN VERBORGEN EN VERGETEN MUURSCHILDERINGEN BOVEN KERKGEWELVEN IN ZWEDEN

IN HET GEBIED ÖSTERGÖTLAND, 200 KM TEN ZUIDEN VAN STOCKHOLM, BEVINDEN ZICH TIEN VAN DE MEEST INTERESSANTE EN BEST BEWAARDE VROEGMIDDELEEUWSE MUURSCHILDERINGEN VAN ZWEDEN (1150-1250). IN DE 15^{DE} EEUW WERDEN DE MIDDELEEUWSE VLAKKE HOUTEN ZOLDERINGEN VERVANGEN DOOR STENEN GEWELVEN MET GOTISCHE MUURSCHILDERINGEN. GROTE DELEN VAN DE ROMAANSE MUURSCHILDERINGEN BLEVEN BEWAARD BOVEN DE GEWELVEN, OP DE KERKZOLDERS. ZE BLEVEN VERBORGEN TOT CA. 1900, DUS BIJNA 600 JAAR LANG, EN WERDEN IN HET VERLEDEN NOOIT GERESTAUREERD. ER WERD TOT NU TOE WEINIG AANDACHT BESTEED AAN DEZE MUURSCHILDERINGEN EN AAN HUN CONTEXT IN DE HUIDIGE GEBOUWENSTRUCTUUR. DEZE SCHILDERINGEN BIEDEN DE MOGELIJKHEID TOT EEN VERGELIJKENDE STUDIE VAN VROEGMIDDELEEUWSE SCHILDERTECHNIEN. DE PLAATS VAN DEZE SCHILDERINGEN, OP DE SMALLE ZOLDERRUIMTES, MAAKT HET FOTOGRAFEREN, HET OPMETEN EN HET ONDERZOEKEN MET NIET-DESTRUCTIEVE METHODES TOT EEN INTERESSANTE UITDAGING. ER LOOPT THANS EEN ONDERZOEKSPROJECT NAAR DE SCHILDERSTECHNIEK EN DE GEBRUIKTE MATERIALEN. BOVENDIEN WORDT GEZOCHT NAAR ONTSLUITINGSMOGELIJKHEDEN VAN DE ONDERZOEKSRÉSULTATEN VOOR EEN BREDER PUBLIEK.

COURS CONCERNE L'EXAMEN DE LA TECHNOLOGIE DES PEINTURES ET DES MATÉRIAUX UTILISÉS. EN OUTRE, LE PROJET ENVISAGE DES SOLUTIONS POUR RENDRE ACCESSIBLES LES RÉSULTATS DE CES ÉTUDES À UN PUBLIC PLUS LARGE.

LA CONSERVATION DE PEINTURES MURALES CACHÉES ET OUBLIÉES AU-DESSUS DE VOÛTES DANS DES ÉGLISES EN SUÈDE

DIX DES PLUS INTÉRESSANTES PEINTURES MURALES MÉDIÉVALES SUÉDOISES (1150-1250) SONT CONSERVÉES EN BON ÉTAT DANS LA RÉGION D'ÖSTERGÖTLAND, À 200 KM AU SUD DE STOCKHOLM. AU COURS DU XV^{ÈME} SIÈCLE, LES PLAFONDS EN BOIS ONT ÉTÉ REMPLACÉS PAR DES VOÛTES EN BRIQUES AVEC DES PEINTURES MURALES GOTHIQUES. DE GRANDES PARTIES DES PEINTURES MURALES ROMANES SONT ENCORE CONSERVÉES AU-DESSUS DE CES VOÛTES, DANS LES GRENIERS DES ÉGLISES. ELLES SONT RESTÉES INCONNUES PENDANT PRESQUE 600 ANS, JUSQUE VERS 1900 ET N'ONT JAMAIS ÉTÉ RESTAURÉES DANS LE PASSÉ. PEU D'ATTENTION A ÉTÉ ACCORDÉE À CES PEINTURES MURALES ET À LEUR CONTEXTE DANS LA STRUCTURE DU BÂTIMENT ACTUEL. CES PEINTURES OFFRENT UNE OPPORTUNITÉ INTÉRESSANTE POUR UNE ÉTUDE COMPARATIVE DES TECHNIQUES DES PREMIÈRES PEINTURES MÉDIÉVALES. LA PHOTOGRAPHIE, LE RELEVÉ ET L'ÉTUDE DE CES PEINTURES À L'AIDE DE MÉTHODES NON INVASIVE DANS CES GRENIERS ÉTROITS CONSTITUENT UN DÉFI INTÉRESSANT. UN PROJET EN