

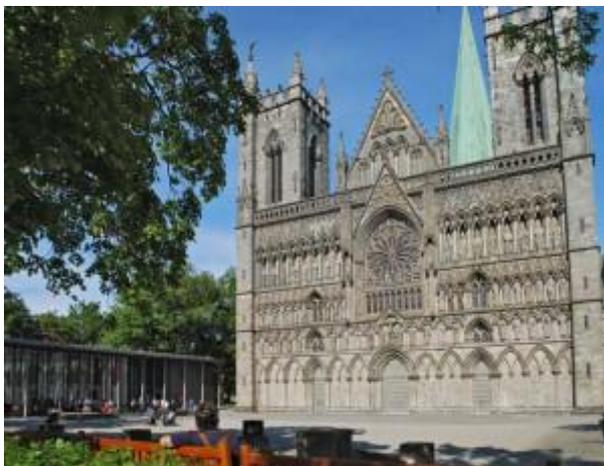


## Selected works undertaken with various institutions *prior* to the establishment of Per Storemyr Archaeology & Conservation Services in 2010

Over the years I have worked for several institutions and directed or taken part in about 100 consultancy and research projects within conservation of monuments and sites, and archaeology. In this note selected projects in Norway, Switzerland and Egypt, as well as EU-projects are presented (1990s-2010). Most links will lead you to documents on my website - [www.per-storemyr.net](http://www.per-storemyr.net)

### Norway

#### Nidaros cathedral (Trondheim).



For more than 25 years Europe's northernmost medieval cathedral has been at the heart of my interests. My PhD formed the basis for the restoration plan that I developed with Director Øivind Lunde of the Restoration Workshop in 1998.

The first phase of this restoration was completed in 2010. I have also been involved in many other investigations, ranging from building archaeology and weathering phenomena to conservation concepts and organisation of restoration work.

- Institution: Restoration Workshop of Nidaros Cathedral ([NDR](#)), Expert-Center for Conservation of Monuments and Sites (ECD)
- Roles: Project director, investigator
- Client: NDR
- Key report: Restaureringsplan for Nidarosdomen 1999-2019 ([PDF 3.8 MB](#))
- Key publication: Fra "Luftangrep" til klimaendring: Forvitring på Nidarosdomen i historisk og politisk kontekst [with English abstract] ([PDF 3,7 MB](#))

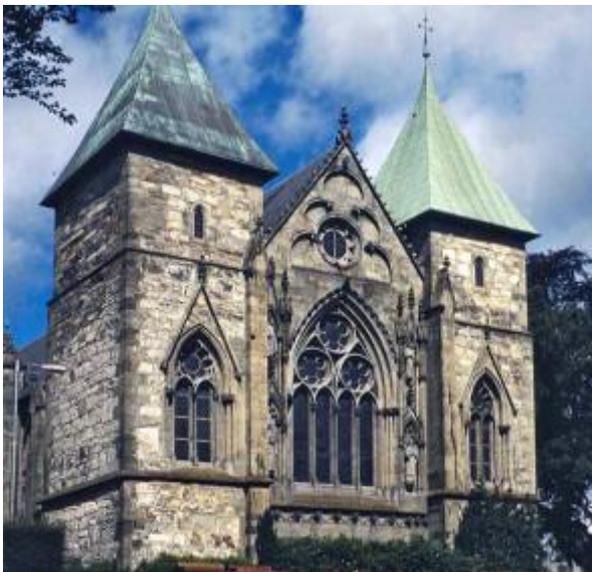
## Archbishop's palace (Trondheim)



The early 17th century mural paintings in the Regalia room of the Archbishop's palace are some of the finest in Norway. In 1996 I initiated a project to elucidate their heavy weathering and undertake conservation measures, in cooperation with [conservator Andreas Franz](#). We could show that water infiltration, soluble salts, a warm indoor climate, static problems and poor previous restorations were responsible for most damages. Conservation was carried out in 2000-2001 (and again recently) and detailed climate and damage monitoring since then has shown a significant drop in weathering rate.

- Institution: NDR, ECD
- Roles: Project director, investigator
- Client: NDR
- Reports: Conservation of Mural Paintings in the Regalia Room ([PDF 4,1 MB](#)); Conservation Measures and Monitoring of Salt Weathering 2001-2002 ([PDF 4,6 MB](#))

## Stavanger cathedral



A major restoration of the Gothic choir at Stavanger cathedral was carried out by the Restoration Workshop of Nidaros Cathedral and other institutions in the late 1990s.

My tasks were mapping of materials and decay phenomena, as well as compiling, writing and editing the final documentation report, which was also published as a CD-ROM.

This major mapping work initiated the production of a long range of thematic maps of various buildings and archaeological sites/landscapes, which still continues (see [thematic maps](#)).

- Institution: NDR
- Role: Investigator
- Clients: Stavanger municipality and the [Directorate for Cultural Heritage](#)
- Report: Restaurering av Stavangerkoret 1997-1999. ([PDF 11,2 MB](#))
- Publication: Restaurering av koret i Stavanger domkirke. De ytre fasadene 1997-1999. *Foreningen til norske fortidsminnesmerkers bevaring, årbok*, 63-74.

## Soapstone portals in Bergen



Bergen has many medieval and later portals made from soapstone. The rainy climate in the city as well as (previous) air pollution have generally been considered the most important causes of the heavy weathering of some of the portals.

However, studies of three portals in the late 1990s showed that air pollution were of much less importance than rusting iron cramps, poor previous restorations and, in particular, architectural designs that facilitate water infiltration and, thus, salt weathering.

- Institution: NDR
- Role: Investigator
- Client: Bergen municipality
- Report: Forvitring av klebersteinsportaler i Bergen ([PDF 4.2 MB](#))

## Medieval stone quarries near Trondheim



A significant old stone quarry landscape in Norway is located at Øysanden, about 15 km south of Trondheim. It was a centre for production of soapstone and soft greenschist during the medieval building boom. In the 1990s there were problems in obtaining good stone for the restoration of Nidaros cathedral and thus archaeological and geological investigations of the old quarries were started. The studies concluded that it was not possible to revitalise the quarries, but also that they were highly significant archaeological sites. Since then work has been ongoing. (Photo by Nina Lundberg)

- Institution: NDR
- Roles: Project director, investigator
- Client: NDR
- Publications: Attempt at reopening Klungen medieval soapstone quarry for modern use ([PDF 3 MB](#)). Arkeologien til Nidarosdomens middelaldersteinbrudd ([PDF 2,8 MB](#))

## Switzerland

### Museggmauer (Lucerne)



Museggmauer, or the City Wall of Lucerne, is currently (2010) under restoration. In 2005-2006 I was responsible for mapping of damages and risk analysis of the whole 870 m long medieval wall with its nine towers. The analysis formed the basis for the conservation concept now implemented. For the mapping of such a large monument a Geographical Information System (GIS) based on a measured survey by photogrammetry was developed. This system allowed the mapping and presentation of numerous interdependent themes, and also quantification of damages, which was used for risk assessment and the setting of priorities for conservation. Moreover, the GIS was used by other collaborators, e.g. for mapping and presentation of valuable fauna on the wall (birds' nests).

- Institution: Expert Center for Conservation of Monuments and Sites (ECD), Conservation Science Consulting ([CSC](#))
- Roles: Project director, investigator
- Client: [Stiftung zur Erhaltung der Museggmauer](#)
- Report: Schäden und Gefährdung der Museggmauer in Luzern ([PDF 14.2 MB](#))
- Publication: GIS in der Untersuchung von historischen Bauten ( [PDF 0,5 MB](#) )

### Dreilinden estate (Lucerne)



The Dreilinden estate constitute three stone buildings forming part of a late 19th century English landscape park in Lucerne. The condition of the façades has since long been poor, in particular since the local Molasse sandstone used develops thick scales at exposed locations. The buildings were completely mapped in terms of materials and weathering in 2009 and a conservation concept drawn up according to a risk analysis. Also in this case maps were produced using GIS, which proved time-consuming, but very useful since damages could easily be quantified and thus applied for setting priorities for conservation.

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- Institution: CSC
- Roles: Project director, investigator
- Client: City Administration of Lucerne
- Report: Storemyr, P. & Bläuer C. (2009): LU-Luzern, Dreilinden. Musikkonservatorium. Zustand, Gefährdung und Erhaltung. *Report* R.0091.01, Conservation Science Consulting Sàrl, Fribourg (CH), 122 p.
- Publication: Knocking off fragments of damaged stone as a preventive measure? The case of rusticated masonry at the Dreilinden estate in Lucerne ([PDF 3,5 MB](#))

## Medieval church at Zell (Canton Zurich)



The small church at Zell in canton Zurich comprises a chapel entirely decorated with medieval murals. They provide an exemplary case for misguided, previous intervention: The murals were sealed with wax in the late 1950s and electric heating was simultaneously installed to improve comfort. Only 20 years later large parts of the murals were gone due to salt crystallisation in the warm indoor climate. As soon as the heating was turned off in the early 1980s weathering rates dropped dramatically. Together with Atelier Andreas Franz, our task was to aid in developing a conservation and maintenance concept. Conservation was undertaken in 2002-2005.

- Institution: ECD
- Client: Cantonal cultural heritage authorities, Zurich
- Roles: Project director, investigator
- Report: Storemyr, P. & Franz, A. (2002): Die Wandmalereien des Turmchores, Reformierte Kirche, Zell (ZH): Schadensgeschichte, Verwitterungsprozesse und Konservierungskonzept. *Bericht*, No. 2002.041, Expert-Center für Denkmalpflege, Zürich, 80 p.
- Publication: Briefly described in: Schäden erzählen Geschichte. Interpretation von Verwitterungsphänomenen im historischen Kontext des Denkmals ([PDF 1,5 MB](#))

## Egypt

### Widan el-Faras project



Widan et-Faras is an Old Kingdom quarry landscape in the Northern Faiyum Desert, famous for its 12 km long paved quarry road, which is the oldest paved road in the world. My tasks were survey and mapping, geological investigations and interpretation of quarrying techniques, as well as risk assessments since the area is heavily used for modern quarrying. We could show that the quarries were exploited on a campaign basis for a few pyramid temple constructions and that the area must have had a long tradition of quarrying prior to the Old Kingdom. Based on our work, the quarries are part of Egyptian efforts at nominating the Northern Faiyum as a World Heritage Site.

- Lead institution: [University College London](#) (Elizabeth Bloxam)
- Role: Co-director, investigator
- Report: Widan el-Faras Ancient Quarry Landscape, Northern Faiyum Desert, Egypt: Site Description, Historical Significance and Current Destruction ([PDF 2,6 MB](#))
- Publication: Old Kingdom Basalt Quarrying Activities at Widan El-Faras, Northern Faiyum Desert. [Further information](#)

### Chephren's quarry project



Chephren's Quarry was a key remote quarry in the Old Kingdom, providing bluish gneiss for vessels and statues. No less than 700 small boulder quarries, as well as ramps, wells and settlement remains are spread out over a flat desert area covering almost 100 square km. On mapping all these quarries, using GPS and GIS, we were able to discover interesting spatial relationships, for example between stone tools used in the quarrying and the availability of "tool rocks". Threatened by one of the world's largest irrigation projects (the Tushka project), work also included assessing risks and suggesting core areas for conservation.

- Lead institution: [University of Liverpool](#) (Ian Shaw)
- Role: Investigator
- Report: Chephren's Quarry, Upper Egypt: Archaeological registration and mapping of ancient quarry sites. ([PDF 0,6 MB](#))
- Key publication: GPS and GIS Methodology in the Mapping of Chephren's Quarry, Upper Egypt: A Significant Tool for Documentation and Interpretation of the Site. [Further information](#)

## Gebel Gulab and Gebel Tingar project



Situated at Gharb (West) Aswan, Gebel Gulab and Gebel Tingar provided silicified sandstone for small obelisks and statues, especially in the New Kingdom. On surveying the area, we discovered that this quarrying is only the tip of the iceberg; it rested on the traditions of grinding stone procurement that goes back all the way to the Late Palaeolithic. Further back, the district was used for procurement of stone tools as early as the Acheulean. The area, covering 50 square km, was also important for hunting and rock art creation; the latter stretching 9000 years back in time (to the Epipalaeolithic). Our GIS-based survey also included modern infrastructure for the purpose of risk assessment and conservation planning.

- Lead institution: [University College London](#) (Elizabeth Bloxam)
- Role: Co-director, investigator
- Key report: Characterisation of complex quarry landscapes: an example from the West Bank quarries, Aswan. ([PDF 20,2 MB](#))
- Key publications: A Prehistoric Geometric Rock Art Landscape by the First Nile Cataract. [Further information](#); Prehistoric geometric rock art at Gharb Aswan, Upper Egypt. [Abstract and further information](#); The Geology and Archaeology of the Ancient Silicified Sandstone Quarries at Gebel Gulab and Gebel Tingar, Aswan, Egypt ([PDF 0,5 MB](#))

## North Kharga Oasis Survey (NKOS)



The aim of [NKOS](#) is to investigate the evident archaeological remains in the northern area of the Kharga Oasis, which lies some 175 km west of Luxor in the Western Desert. The survey has now been going on for almost 10 years.

During one of the seasons (2007) my task was surveying, with a focus on overview geology and ancient quarries. Formerly unknown quarries were found; of interest is a probable Neolithic grinding stone quarry.

- Lead institution: [American University in Cairo](#) (Salima Ikram)
- Role: Investigator
- Key pPublication: Storemyr, P. (2014): A prehistoric grinding stone quarry in the Egyptian Sahara. In: Selsing, L. (ed.), Seen through a millstone. *AmS-Skrifter* 24 (Stavanger: Museum of Archaeology, University of Stavanger), 67-82. [PDF at Academia.edu](#).

## Belgian Archaeological Mission to el-Hosh



Between Gebel el-Silsila and Edfu, on the west bank of the Nile lies el-Hosh, which hosts one of the most important Epipalaeolithic rock art locations in Egypt. The area has been under investigation for many years and from 2009 season my task has been to make an overview map of the area's rock art sites (using GPS, satellite images and topographic maps).

The survey revealed several new Epipalaeolithic rock art locations. Their complex geometric motifs provide a link to the Gharb Aswan rock art some 70 km to the south.

- Lead institution: [Royal Museums of Art and History](#), Brussels (Dirk Huyge)
- Role: Investigator
- Publications:

Huyge, D. & Storemyr, P. (2013): Unique Geometric Rock Art at el-Hosh. *Ancient Egypt Magazine*, 13, 6, 24-30. More info at [www.ancientegyptmagazine.com](http://www.ancientegyptmagazine.com)

Huyge, D. & Storemyr, P. (2012): A 'masterpiece' of Epipalaeolithic geometric rock art from el-Hosh, Upper Egypt. *Sahara*, 24, 127-132. [Link to contents of the volume](#)

*Work in Egypt normally undertaken as field missions, in which I have participated as a freelance scientist, and between 2005 and 2008 within the [QuarryScapes project](#).*

## EU-projects

### QuarryScapes



“Conservation of Ancient Quarry Landscapes in the Eastern Mediterranean” ([QuarryScapes](#), 2005-2008) was a large project addressing the destruction of ancient quarries due to modern development. Researchers from Egypt, Jordan and Turkey cooperated with European and American experts on ancient quarries, with the aim of developing methodologies for survey, archaeological interpretation, value assessment, risk assessment and conservation. I initiated the project with colleagues Tom Heldal and Elizabeth Bloxam and my own work especially concentrated on survey and risk assessment in

Egypt, with case studies in Aswan, Chephren’s Quarry and the Northern Faiyum. Together with James Harrell I also developed a GIS-based atlas of ancient Egyptian quarries, with information on history, condition and threats.

- Coordinator: [Geological Survey of Norway](#) (Tom Heldal)
- Institution: As above
- Role: Work package leader, investigator
- Key reports: Risk assessment and monitoring of ancient Egyptian quarry landscapes ([PDF 12,8 MB](#)); Characterisation of complex quarry landscapes: an example from the West Bank quarries, Aswan ([PDF 20,2 MB](#))
- Key publications: Whatever Else Happened to the Ancient Egyptian Quarries? An Essay on Their Destiny in Modern Times ([PDF 4,1 MB](#)); Ancient Egyptian Quarries – An Illustrated Overview ([PDF 7,6 MB](#))

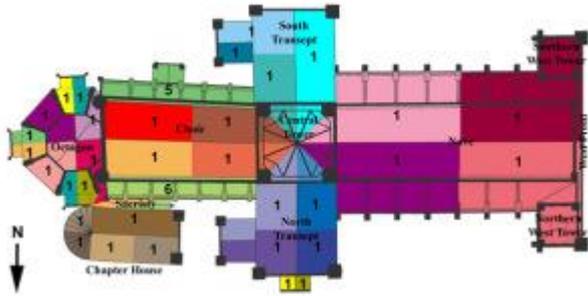
### Demotec



“Development of an Environmental Monitoring system for cultural heritage Through European Co-operation” (2001-2003) aimed to establish a network of experts and users to outline a common European observation system for comparative assessment of the state of preservation of cultural heritage. The Nemi basin in Colli Albani outside Rome was chosen as a case study landscape, and my work focused on condition, risk assessment and monitoring, especially related to historic buildings, ruins and mural paintings.

- Coordinator: [Norwegian Institute for Cultural Heritage Research](#) (Birgitte Skar)
- Institution: ECD
- Role: Project leader of the Swiss contribution, investigator
- Report: Monitoring and risk assessment of monuments and archaeological sites in the Nemi basin, Colli Albani, Italy ([PDF 6,2 MB](#))
- Publication: Monitoring von Monumenten und archäologischen Stätten ([PDF 0,6 MB](#))

## Nidaros Cathedral Restoration.



This Raphael-project (1999-2001) drew together European experts to aid in the planning of the major restoration of Nidaros cathedral, which commenced in 2000. I was responsible for several sub-projects, including selection of stone for conservation, weathering and consolidation of soapstone, water drainage issues, as well as problems related to indoor heating.

- Coordinator: [The restoration Workshop of Nidaros Cathedral](#) (Øivind Lunde)
- Institution: As above
- Role: Leader of several sub-projects, investigator
- Key reports: Thematic Mapping of Stonework at the South Facade of the Nidaros Cathedral Choir ([PDF 1,9 MB](#)); Water discharge systems and modelling of rain water discharge at Nidaros Cathedral ([PDF 7,3 MB](#)); Indoor climate and heating of Nidaros Cathedral: Proposal for a new heating system ([PDF 0,2 MB](#)); Weathering and Conservation of Soapstone and Greenschist Used at Nidaros Cathedral. Preliminary summary of results – a work document ([PDF 0,9 MB](#))