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# Replacement of Natural Stone on the Royal Palace in Stockholm

## A Technical and Ethical Dilemma

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Andreas Heymowski

The Royal Palace in Stockholm is a huge, Baroque building, erected on the ruins of the partly mediaeval and partly Renaissance castle “Tre Kronor” (Three Crowns), after a devastating fire in 1697. The architect was Nicodemus Tessin the Younger (1654–1728), who modeled the new Palace after the Roman examples he had studied on his Grand Tour to Italy; Palazzo Farnese, Palazzo Chigi and others. It is a palace worthy of a sovereign Monarch, a leader of a great power (fig. 1).

Construction started immediately after the fire, but the early 17th century were rough times for Sweden. In a series of unsuccessful wars it lost most of its dominions across the Baltic Sea. The Palace was not completed until 1754. Ironically, a weakened King with a much reduced sovereignty was the first to move into a Palace, full of bombastic decorations glorifying His power.

### THE PRESENT STONE

The natural stone of the exterior decoration of the Palace is not the white Travertine Tessin had seen in Rome, but the Swedish Gotland Stone, a soft, initially grey, calcite (lime) bound sandstone from the isle of Gotland. Since the Middle Ages it has been very popular among architects and stone masons all around the Baltic Sea, because it is so easy to hew it into the finest and most intricate shapes.

The drawback of this softness is its poor resistance to weathering when placed in exposed positions outdoors. Tessin himself was aware of this weakness and ordered all stone for the façades to be drenched three times in linseed oil and then painted. However, this did not help in the long run, and very soon after the erection, protruding sculptural stone started cracking and falling down. All through the late 18th century and up to the middle of the 20th century, decayed stone decorations were taken down and replaced by identical, newly hewn pieces, always made from the same Gotland Stone.

A major conservation effort was made on the decayed Palace around the year 1900. A lot of stone was replaced. In fact, today it is sometimes hard to find parts of the stone that are original. A crucial decision, which unfortunately accelerated the process of decay, was made during this conservation: following that epoch's craze for genuine, natural materials, all paint was removed from all stone decorations.

### IDEOLOGICAL TWISTS AND TURNS

In Sweden the last decades of the 20th century mark a breach with this ancient tradition of stone replacement. Perhaps the year 1975 could be called a water-shed. The Council of Europe and its Committee on Monuments and Sites proclaimed 1975 the “European Conservation Year”.



1 *The Baroque Palace, serenely resting on its hilltop, is still the dominating symbolical and architectural landmark of central Stockholm (Photo A. Heymowski).*

In Sweden a surge of increased interest in our built cultural heritage lead to better legislation, new university courses and vocational courses in old building history and techniques.

Essentially this is something very positive but for the Royal Palace some of the consequences were not altogether favourable. I am here speaking about the very strong appreciation of the authentic material. In most cases this interest in the material authenticity aspect of the heritage has lead to a better understanding of the functioning of old buildings. It has also lead to refraining from the previous, extensive use of unsuitable modern materials in conservation (fig. 2).

But in the case of the Palace this wish to preserve the authentic material at any cost, lead to extensive conservation – with modern chemical substances – of decayed stone, instead of the traditional replacement. As a result, today the stone had disintegrated even further. In the process, Sweden's many skilled stone-masons became a more or less extinct species, due to lack of job opportunities within the country.

## TECHNICAL AND ETHICAL DILEMMAS

In the beginning of the 21st century it became apparent that mere conservation of the Palace's stone was not enough. In 2007 falling of pieces of the stone decorations had increased and it was mere luck that nobody was hurt when a big piece landed outside the gate, through which a horse-carriage with a visiting foreign ambassador had just left the Palace. After that incident we took the decision to put up strong nets on all façades where stone threatened to crack. They don't add to the beauty of the Palace, and they harm the stone even more, but the only realistic alternative to them would be to close the Palace and fence it off.

In 2007 we also started an extensive assessment of the façades, in particular of their stone. Every possible aspect; aesthetics, heritage value, architectural value, technology, ageing, etc., were thoroughly studied by a group of specialists and representatives of the owner (who, incidentally, is not the King, but the Swedish State, through its National Property Board). The group was headed by myself, in my capacity of Chief Architect of the Palace.

Our foremost concern was of course the Gotland Sandstone. There are also other kinds of stone on the façades, mainly the multi-coloured Roslag Sandstone, but the Gotland Stone is the one really presenting big problems, partly technical but also of an ethical nature. Why





2 *A Corinthian capital, bearing traces of a vain attempt around 1970 to preserve its protruding acanthus leaves by coating them with fibreglass reinforced plastics (Photo Mikael Traung).*

ethical? Because here we understood that we would have to prescribe methods and materials that were contrary to all we had been taught and trained. My career as a conservation architect started a couple of years after 1975 and I have lived with the Swedish Credo of always preserving the authentic material, regarding a copy as deception, and doing minimum interventions, retaining the old patina.

Thus, our hearts wanted to conserve the old, decayed stone and, if this turned out to be impossible, at least to replace it with the same kind of stone. At the same time, intellectually we realised that not only would we have to replace a lot of stone with newly made copies, but these copies would also have to be made from a different and foreign type of stone!

## THE QUESTION OF REPLACEMENT STONE

First of all, the Gotland Stone is not quarried commercially anymore. In order to obtain the necessary quantities, quarries would have to reopen. And the quantities we need are big, but not big enough to finance a reopening. Besides the quarries suitable for reopening do not contain the best stone.

Secondly our studies of rapidly decaying stone on the façades made us realise that it would be irresponsible to once more recommend use of Gotland Stone, no matter the quality, for the most exposed positions. In Sweden we have no other stone, similar to the Gotland Stone.

We started to look for replacement stone abroad. It turned out that in Denmark, in spite of us being close neighbours, they have a completely different ideological approach to architectural stone. They never started conserving stone. Instead they continued the tradition of replacing damaged stone with new. And they accepted the unsuitability of the Gotland Stone already in the 18th century and began to use the strong, silica bound Obernkirchener Sandstone from Northern Germany instead. They do so to this day and as a result Denmark is still full of talented and experienced stone-masons.

Now maybe you think that our problems were solved; let's do like the Danes, and everything will be fine. But we still had qualms of different kinds. When the Danes replace stone they do it thoroughly, exchanging stone that is still fairly OK, in order to avoid trouble with it in the future. We still wanted to follow the Swedish "Minimum Intervention" principle, replacing only the really decayed stone. This meant that we would get single pieces of Obernkirchener Stone surrounded by Gotland Stone, and we were afraid that there could be problems with the interaction between the stones, one of them being so much harder and stronger, and with different thermal expansion properties. Our second doubt was the fact that the Obernkirchener which we saw in Denmark was so much lighter, almost white, compared to the yellowish grey colour of the aged Gotland Stone.

So we started looking for a stone with the same colour, ageing and expansion properties as Gotland Stone, but at the same time much more resistant to weathering. We still haven't found such a stone. If a stone had the right colour and ageing it was also as weak as the Gotland Stone, and if it was strong enough, it was the wrong colour. Gradually we realised that we would have to look for two kinds of replacement stones, one strong for the exposed positions, where we would have to accept a different colour, and one as similar to Gotland Stone as possible, which could be used together with the Gotland Stone in sheltered positions but where we would have to accept more or less the same weakness.

As for the latter kind we found the Swiss Rorschacher Sandstone, which turned out to have almost identical colour and ageing as our stone. It is, just like the Gotland stone, a light blueish grey when newly hewn, and ageing, it gradually turns a darker yellowish grey. The Rorschacher Stone is also mainly calcite bound, but slightly stronger than Gotland Stone. In the meantime we also learnt that the Obernkirchener Stone could be obtained in a darker yellow nuance, more similar to the aged Gotland Stone, and that its colour does not change much over time.

## DECISION AND EXECUTION

So, our final recommendation became to use both Rorschacher and Obernkirchener Sandstone for the restoration work on the façades of the Royal Palace. In 2010 we started preparing the working drawings and other documentation for the first pilot phase of the work. It comprises two façades on the North-East Wing of the Palace. The actual replacement work began in March 2011 and was completed by May 2012.

I will not tire you with tales of the complicated processes of finding craftsmen, of purchasing and of hewing the new stone. We have learnt a lot about the stone market, stone hewing, stone mounting, etc. Many times we have been on the brink of despair when stone hasn't been delivered at all, or delivered much too late, or in the wrong colour or with incorrect hewing (fig. 3).

But eventually most things have turned out in a satisfactory way. I would say 80-85 % of the work is quite good and, luckily, most of the flaws are not visible from the ground. Still, as you can see, the new stone is detectable, the yellow Obernkirchener and the blueish grey Rorschacher (and in some places new Gotland). In Sweden we have a tradition to patinate new stone, so as to make it blend with the old one. We made a test, giving the new stone a very thin coat of paint. Here you cannot say which is new and which is old. But we've decided to wait and see what happens to the new stone, hoping that with time it will blend in without us having to patinate it.

## AFTERWORD

We have been forced to make some tough decisions, partly in conflict with the mainstream ideology and principles that have been governing Swedish architectural conservation for the past three or four decades. Did we make the right decisions? Time will tell, but I believe we did, given our then degree of knowledge and experience. I am sure that the next phase, due to be executed in 2013, will run much more smoothly and give a more satisfactory result. But I am still on the lookout for that perfect replacement stone, exactly like the Gotland Stone but much stronger...



3 The façade after stone replacement. Old Gotland stones are a dark yellowish grey, new Gotland or Rorschacher stones are a blueish grey and new Obernkirchener stones are a light yellowish grey. Whether the colour differences are acceptable or not is a matter of ideology and taste (Photo A. Heymowski).